Intangibles and Their Role in Short- and Long-Run IPO Performance

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TABLE OF CONTENTS

LIST OF TABLES

Chapter 6: Effect of Intangibles on IPO and Seasoned Companies Valuation (Hypothesis 3)

Appendix C (to Chapter 4): Logit Regression Estimates – IPO data measured at fiscal year end in which IPO was conducted

Appendix D (to Chapter 4): Logit Regression Estimates – IPO data measured prior to flotation date

Appendix E (to Chapter 5)

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DECLARATION

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ABSTRACT

Previous studies have investigated the impact of R&D on long-run returns of seasoned companies and IPOs of all industries and of broad time intervals, thereby excluding all intangibles reported on the balance sheet, as well as goodwill. This thesis includes various identifiable intangibles during the "technology" or "Dot Com" IPO boom period from 1995 to 2000.

The objective has been to analyze IPO short- and long-run performance through measurement of intangibles and investigate their impact in valuations and returns comparing two separate samples with IPOs and seasoned companies of same size and industry respectively. Three specific issues were addressed: Do companies decide to go public when growth opportunities are at their highest, expressed in practice by higher IPO intangible intensity as compared to seasoned companies? Are intangibles valued differently in IPOs and seasoned companies? Does intangible intensity influence IPO short- and long-run abnormal returns?

The testing procedure for the three issues comprised five individual hypotheses comparing intangible intensities between IPOs and matching seasoned companies at the time of offer and three years later, investigating whether the issuer/market expenses or capitalizes R&D and MSGA costs of IPOs, comparing the magnitude of intangible valuations between IPOs and seasoned companies, as well as analyzing the effect of intangible intensity upon short- and long-run performance. Issues for further research are outlined.

Results are rather inconclusive demonstrating that the nature of the outcome depends on the definition of intensity as well as the time interval examined. There is certain evidence that IPOs show higher intangible intensities relatively to seasoned firms and that both capitalize their R&D expenses. It is clear that IPOs intangibles are valued higher than those of matching seasoned companies. Further, only in some cases intangible intensive IPOs show higher first day returns and a better market performance. As a result it is understood that IPOs may fail to reach higher growth opportunities and so their higher valuation may not necessarily be justified. Further, the short- and long-run return results of the study agree with literature in that excess returns may vary depending on what and how these are measured.

LIST OF ACRONYMS

AIM	Alternative Investment Market
APB	Accounting Principal Board
ASB	Accounting Standard Board
ASC	Accounting Standard Commission
ASEW	All Shares Equally Weighted
BHAR	Buy and Hold Abnormal Returns
B/M	Book to Market ratio
CAAR	Cumulative Average Abnormal Returns
CBI	Center of Business Innovation
CEO	Chief Executive Officer
CYC	Consumer Cyclical (technology-oriented IPO)
FASB	Financial Accounting Standards Board
FIN	Financial (technology-oriented IPO)
FRS	Financial Reporting Standards
FTA	Financial Times Actuaries
GAAP	Generally Accepted Accounting Principles
HGSC	Hoare Govett Small Companies
HLT	Healthcare (technology-oriented IPO)
IDU	Industrial (technology-oriented IPO)
IAS	International Accounting Standards
IASB	International Accounting Standards Board
IFRS	International Financial Reporting Standards
IPO	Initial Public Offer
LBO	Leverage By Out
MSGA	Marketing, Selling, General and Administrative expenses
MV	Market Value
NASDAQ	National Association of Securities Dealers Automated Quotations
NBER	National Bureau of Economic Research
NCY	Non-Consumer Cyclical (technology-oriented IPO)
NYSE	New York Stock Exchange
P/EBITA	Price Over Earnings Before Interest Tax and Amortization

P/E	Price over Earnings ratio
P/S	Price over Sales ratio
P/BV	Price over Book Value
PVGO/(E/P)	Present Value Growth Opportunities over the ratio of Earnings over Price
R&D	Research and Development
RI	Total Index Returns
SEC	Security Exchange Commission (database)
SEO	Secondary Equity Offering
SFAS	Statements of Financial Accounting Standards
SIC	Standard Industrial Classification
SSAP	Statements of Standard Accounting Practice
TEC	Technology (IPO)
TLS	Telecommunications (technology-oriented IPO)
USD	US Dollar
VC	Venture Capital

Chapter 1: INTRODUCTION

1.1 Foreword

One of the biggest IPO booms in the history of the US stock market is the one of the late 1990ies. During the 1995-2000 period a total of 2809 IPOs were issued, 40% were technology stocks. In contrast, in the previous period from 1990 to 1995 only 1669 IPOs had been issued, 18% of these being technology stocks (Meeker and Cascianelli (2001)). Academic and journalistic literature named it the "technology" or "Dot Com" IPO boom period (Ljungvist and Wilhelm (2003).

Empirical findings in academic literature demonstrate much higher first day returns for IPOs and subsequent under-performance in comparison with matching seasoned companies (Jenkinson and Ljungvist (2001). The main characteristic of technology IPOs is that their first day returns were very high, on average 65% (Jenkinson and Ljungvist (2001), Loughran and Ritter (2004)) compared to the average 21% for all IPOs. (Ljungqvist (2004)) In the long run their under-performance was severe compared to other seasoned firms, indexes, and even IPOs belonging to other industry types (Kooli and Suret (2001), and Brown (1999)). This poor performance was one of the key reasons of the overall sharp correction of the US economy in 2001 (Goldfarb et al (2006)).

The main question concerns the reasons for this initial and subsequent behaviour of technology IPOs. is why technology IPOs gained very high initial returns, while subsequently they under-performed. In general literature argues that IPOs have a limited public history and go public when their operating performance is at its best. This makes IPOs more risky and subject to higher misevaluations compared to seasoned companies, which have more public information available and whose operating performance is more stable (Jenkinson and Ljungqist (2001)).

Therefore, with respect to technology stocks the open question is if investors earned higher first day returns as a form of compensation for investing in risky IPOs, while the subsequent under-performance was the result of the risk? The main source of risk related to technology IPOs is that they are very intangible intensive, their core elements of value being research and development (Damodaran (2001)). All intangibles are subject to high growth opportunities, yet, high risk is associated with them. In case that the investment fails, none of the initial costs can be recovered. Intangible initial costs are higher compared to tangible ones.

The challenging aspect of the risk compensation theory is twofold. First, there is no empirical research comparing intangible intensities between IPOs and seasoned companies. Technology seasoned companies may also be intangible intensive and subject to risk. IPOs could be in general more risky compared to seasoned companies, the latter having lower information asymmetry due to a long public history, being older and larger. Second, while some additional compensation could be provided for technology IPOs in the form of higher first day returns, values in the range of 65% cannot be justified by any kind of compensation (Jenkinson and Ljungvist (2001)). Further, literature on seasoned companies shows that compensation for risk, associated with intangibles, should continue on an annual basis in the form of excess returns (Chan et al (2001), Chambers et al (2002)). With respect to IPOs there is no literature examining technology IPOs and their long-run returns. Few studies look at IPOs of all industries, and when they do, they find mixed results with respect to R&D and long-run excess returns. Guo et al (2006) find that R&D intensive IPOs - belonging to all industries - gain higher first day returns and higher long-run excess returns. Yet they argue that long-run excess returns occur because R&D is initially undervalued. Bhabra and Pettway (2003) find a negative, yet not always significant relationship between R&D intensity and three-year buy and hold IPO abnormal returns.

On the other side, it could be argued that high first day excess returns occur because the market initially overreacts. This occurs when there is high optimism and a larger number of IPOs simultaneously going public at a specific interval (Jenkinson and Ljungqvist (2001)). In such cases also high uncertainty prevails in the market (Miller

(1977)). During the 1995-2000 boom many IPOs belonging to one industry – technology companies – went public. The expected growth opportunities of their intangibles were difficult to measure and, especially in a booming period such as the late 1990ies, may have led to investor sentiment (Damodaran (2001)).

Adding to the difficulty of correct valuations more than half of all technology IPOs went public reporting negative earnings. Part of the reason could be the expensing of intangibles such as R&D. Negative earnings cannot be used for valuation purposes (Damodaran (2001)).

It is an open question of the late 1990ies technology IPO boom whether the very high initial valuations of IPOs are justified. Or in other words, were IPOs more intangible intensive than seasoned companies, and therefore subject to higher risk and misevaluation? Did investors really evaluate IPOs more optimistically with respect to their intangibles compared to seasoned firms? Did intangible investments, generated at the time of the offer, indeed exert a significant effect on short- and long-run technology IPO performance? If so, in what direction and to what extent did intangibles influence the returns?

1.2 Motivations and Formulation of Objectives

Previous studies have investigated the impact of growth opportunities, proxied through the B/M ratio on IPO short and long run returns. Ritter (1991) finds that lower B/M ratios lead to worse long run market performance. On the other side Kim and Ritter (1999), Helwege and Liang (2004) and Damodaran (2001) have criticized the B/M ratios, arguing that these may reflect noise rather than growth. Further, this ratio cannot be used in samples were some IPOs have negative Book value – as is the case in this study.

Because there is a connection between R&D intensity and the B/M ratio (Lev and Sougiannis (1999)) more recent studies investigate R&D on long-run returns of seasoned companies and IPOs, of all industry types and of broad time intervals. In general, the literature is suggesting that intangible intensities are one of the best proxies in understanding IPO performance (Bhabra and Pettway (2003), Balatbat (2006)). Yet, by considering R&D only, their research excludes all other intangibles reported on the balance sheet. Balatbat (2006) sees this as a limitation. Intangibles other than R&D may also have an impact on valuations and excess returns. The objective of this thesis is to expand on this research and include all possible identifiable intangibles and investigate their role in valuations and returns. Another issue is the fact that studies so far never examined valuations and excess returns of IPOs and seasoned companies simultaneously and in comparison to each other. The procedure followed in this thesis uses two individual samples, one with IPOs and one of matching seasoned companies of same size and industry, i.e. of approximately the same risk, in comparative analysis. Previous research uses very broad samples covering more than 15 years of data. In this thesis the specific technology IPO boom period between 1995 and 2000 is examined as especially intangible influenced. The thesis comprises five objectives.

The *first objective* of this thesis is to examine differences in intangible intensities between IPOs and seasoned companies a) at the time of the offer, and b) three years after the issuance of the offer. The motivation derives from literature stating that companies conduct IPOs at periods of high potential growth opportunities in order to attain maximum proceeds out of an offer (Damodaran (2001), Kim and Ritter (1999), Pagano et al (1998), Carpenter and Rondi (2003), Chemmanur et al (2005). This implies that companies conduct IPOs when their operating performance is at its best and is verified by Jain and Kini (1994), Mikkelson et al (1997), De George and Zeckhauser (1993). De George and Zeckhauser (1993) provide a further fact: IPO operating performance is better than that of seasoned companies in these periods. Three years after the offer IPO operating performance deteriorates (Jain and Kini (1994), Mikkelson et al (1997), De George and Zeckhauser (1993)). In practice literature defines operating performance either through the earnings over total assets ratio (Jain and Kini (1994), Mikkelson et al (1997), De George and Zeckhauser (1993)) or through the B/M ratio (Kim and Ritter (1999)). They all use samples of IPOs issued in the 1970ies and 1980ies and include offers reporting positive earnings only. Through these limitations unresolved issues emerge in understanding the operating performance of technology companies, as the value relevance of technology company earnings is low in the 1990ies (Lev and Zarowin (1999)). Further, many technology companies show negative earnings. The B/M ratio is subject to noise and therefore may not reflect growth opportunities accurately. Instead the relationship to intangible intensity - the core element of technology stocks (Damodaran (2001)) – is introduced. Higher intangible intensities reflect higher growth opportunities. By comparing intangible intensities between IPOs and seasoned companies an enhanced understanding about IPO timing with respect to operating performance is attained.

Hypothesis 1 is split into two parts. Hypothesis 1A states that IPOs show higher intangible intensities (measured at the time of the offer) compared to seasoned companies of the same size and industry. Hypothesis 1B states that three years after the offer IPOs (which by now have a public history of three years) show the same intangible intensities compared to seasoned companies. The rationale to Hypothesis 1A is based on literature stating that firms decide to go public at a time of high growth opportunities. This ensues from the fact that companies issue IPOs in periods when maximum proceeds can be raised, and consequently they conduct offers at periods when their operating performance is very good, and in fact when it is better than that of seasoned companies. The rationale to Hypothesis 1B is that three years later IPOs will behave like seasoned companies. Thus their profitability measures should not differ to the ones of seasoned companies of the same industry type. The methodology followed to test the hypothesis is by measuring and comparing (on the basis of t-statistics) intangible intensities between IPOs and matching seasoned companies at the time of the offer as well as three years later. Further, Logit regressions are used as as a robustness check, testing if indeed intangible intensities are different between IPOs and matching seasoned companies. Both Hypothesis 1A and 1B are inconclusive. Results differ depending on the time interval examined and on the definition of intangible intensity. This shows that there is no clear pattern with respect to intangibles and IPO issuance. In other words companies do not necessarily go public at periods when their growth opportunities – measured through intangibles – are best.

The *second objective* of the thesis investigates the treatment of expensed intangibles (R&D and MSGA – marketing, selling general and administrative costs) by the issuer and the market in the case of IPOs, and by the market only in the case of seasoned companies. More specifically, the objective is to understand if the issuer and the market consider R&D and MSGA costs as an expense – as required under US GAAP rules – or if they consider those as valuable and capitalize them - as suggested by Damodaran (2001). Also if the capitalization of expensed intangibles is conducted more efficiently in seasoned companies compared to IPOs. The motivation comes from empirical research showing that market values and returns can be better explained after adjusting earnings and book values for R&D capitalization (Lev and Sougiannis (1996, 1999), Lev et al (2001)). These studies use samples of seasoned companies only, excluding IPOs. Literature does not provide conclusive evidence if and which party, issuer or market, capitalizes expensed intangibles, and if such capitalization is conducted in IPOs in a more effective way than in seasoned companies. Potential differences in capitalization of expensed intangibles between IPOs and seasoned companies may arise as a consequence of the limited public history and ensuing information asymmetry of the first. This lack of knowledge or uncertainty in IPOs could lead to expensing rather than capitalization of intangibles by one of the two valuation parties. One of the two parties may follow the rationale of US GAAP rules, requiring R&D to be expensed as a consequence of their uncertain nature. The issuer may also be motivated by fears of litigation if he does not follow the accounting rules. Two studies provide some evidence – even if partially contradictory – on whether R&D is perceived as of value (capital) or as an expense by the issuer and the market. Bartov et al (2002) find that R&D in US Internet IPOs does not increase the offer value significantly, but it increases the first day closing market value. Bhagat and Rangan (2004) find that R&D capital increases the offer value and the first day closing market value as well. Yet, R&D has had a negative impact on both during the 1997-2001 IPO boom period. They establish further that the R&D of Internet IPOs affects positively both offer and market value. Performing these investigations on both IPOs and seasoned companies contributes to clarification of these issues.

Hypothesis 2 is again split into two parts. Hypothesis 2A states that the issuer treats expensed intangibles as expenses, while the market capitalizes those. The rationale to Hypothesis 2A is that the issuer follows US GAAP – i.e. expenses R&D and MSGA – in order to allow the market to assign a value on those investments. In other words, the issuer may compensate the market for the information asymmetry related to intangibles. He may also be afraid of litigation and follow US GAAP rules. .Both theories – compensation for information asymmetry and litigation have been analysed by Jenkinson and Ljungqvist (2001). The market capitalizes R&D because according to Damodaran (2001) all R&D costs are perceived of value in all investments by the investors and because previous literature implies that this happens (Bartov et al (2002). The methodology used is an application of a model consistent with the Ohlson (1995) study. The correlation coefficient R^2 of the regression with reported earnings and book values as independent variables is compared to the respective R^2 values of the regression with earnings and book values adjusted for expensed intangible capitalization as independent variables. An increase in R^2 values implies that IPO valuations are more reliable and representative when capitalizing expensed intangibles. The hypothesis is rejected as results reveal that both offer and first-day close market values are better explained when treating R&D` and MSGA (in the 1995-1998 sub-period) as capital. Hypothesis 2B states that the R^2 values of seasoned companies will be higher compared to the ones of IPOs. The rationale is that seasoned companies are subject to lower information asymmetry, thus valuation errors will be smaller. The methodology followed is to compare the R^2 values of IPOs to the ones of seasoned companies. Results are again inconclusive. While the hypothesis is accepted in the 1999-2000 period, R^2 values are almost equal in the 1995-1998 interval. Results indicate that after all the issuer has enough information on R&D to be confident to capitalize it, i.e. they do are not afraid of litigation, neither do they wish to compensate investors for the information asymmetry. In fact, information asymmetry between the issuer and the offer is not always very high.

The *third objective* is to compare the valuations of IPOs and seasoned companies. The motivation comes from published research indicating that a dollar invested in R&D does not always have the same impact on market value, but may depend on factors such as industry (Schauvin & Hirschey (1994)) and intangible intensity (Lev and Sougiannis (1996)). IPOs have a limited public history and are subject to higher information asymmetry. The implications are that valuations of IPOs are based on the limited information provided in the prospectuses as well as some information provided in the road shows (Jenkinson and Ljungvist (2001). Seasoned companies have a lot of information gathered through annual statements and years of analyst's coverage. According to Miller's (1977) theoretical valuation model, the higher the information asymmetry the higher the investor sentiment - and therefore the higher the valuation - will be. This occurs because according to Miller the value of a company is being set by the most optimistic rather than the average investor. While few studies only have shown that R&D positively affects IPO valuations (Bartov et al (2002), Bhagat and Rangan (2004)) none have examined possible differences in valuation between IPOs and seasoned companies. The thesis fills this gap with this objective. *Hypothesis 3* states that intangibles are valued higher within IPOs compared to seasoned companies. The rationale is that IPOs are subject to higher information asymmetry as well as higher growth opportunities, e.g. a dollar invested in an intangible will be valued higher by the market compared to one invested in a seasoned company. The methodology used is by examining – through cross-sectional regression analysis - the impact of one unit of investment in R&D and MSGA as well as in balance sheet intangibles on IPO and seasoned companies market value. Results are inconclusive. R&D and MSGA investments are valued higher in IPOs compared to seasoned companies valuations. Yet, balance sheet intangibles do not always affect IPO and seasoned companies valuations. In this respect, it could be the case that after all the Damoraran (2001) comment is proven correct. He argues that for technology companies, it is mainly heir R&D, which has an impact on their valuations and growth opportunities.

The *fourth objective* in the thesis examines whether the level of IPO intangible intensity (measured at the time of the offer) affects the magnitude of IPO first day returns. The motivation comes from research results showing that intangible intensive companies are subject to higher information asymmetry and misevaluation. Literature on IPOs links both these characteristics to higher IPO first day returns as demonstrated by Guo et al (2006) and Choi and Kim (2005) for R&D expense intensity. This thesis contributes to the literature in the following two cases. First, it defines R&D both as an expense and as capital. Defining R&D as capital may express more reliably R&D intensity (Damodaran (2001), Lev and Sougiannis (1996) (1999)). Second, it includes the balance sheet intangible intensities, too. Research on intangibles other than R&D is important according to Baldbat (2006) in understanding IPO first day returns. *Hypothesis 4* states that intangible intensive IPOs show higher first day returns. The rationale of this hypothesis is that higher information asymmetry associated with intangible intensity will have a positive effect on IPO first day returns. The methodology used is to split the sample into IPOs with no, low (below the median intensity) and high (above the median intensity) and measure average and median first day returns. Results are inconclusive. They depend upon the definition of intangible intensity (R&D or balance sheet intangibles), the way of measurement of R&D (expensed or capitalized), the way of measurement of returns (equally- or value-weighted) as well as on the time period of the sample.

The *fifth objective* of the thesis examines if IPO intangible intensity (measured at the time of the offer) affects IPO three-year excess returns. The motivation for this research derives from literature establishing that seasoned companies' excess returns are affected by R&D intensity. This happens because R&D intensive companies are subject to information asymmetry and misevaluation. Yet, literature has not thoroughly examined the effects of intangibles on IPO market performance. IPOs tend to under-perform compared to seasoned companies of the same size and industry (Ritter (Jenkinson and Ljungqist (2004)). Technology IPOs - most intangible intensive – under-perform worse compared IPOs of other industry types (Demers and Joos (2006), Kooli and Suret (2001), Brown (1999)). Further, Ritter (1991) finds that IPOs with lower B/M ratios (B/M being a proxy for intangibles) perform worse in the long run. Bhabra and Pettway (2003) find that intensity expressed as R&D over sales ratio negatively affects three-year BHARs. On the other hand, Guo et al (2006) find that R&D intensive IPOs show a better market performance than less or non R&D intensive offers. The present research contributes to these still inconclusive results in the literature by defining R&D both as an expense as well as capital, and by including balance sheet intangibles, too. Research on intangibles other than R&D is important according to Baldbat (2006) in understanding IPO long-run underperformance. *Hypothesis 5* states that intangible intensive IPOs show a worse market performance (i.e. excess returns) compared to less intangible intensive ones. The rationale of this hypothesis is that intangible intensive IPOs are subject to higher risk and misevaluation. To measure excess returns IPOs are matched with seasoned companies of the same size and industry. BHARs and CAARs are estimated three years after issuance. BHARs and CAARs of IPOs, which did not report intangibles at the time of the offer, are compared to those with low (below the median intangible intensity) and high (above the median intangible intensity) IPOs. Results are inconclusive. They are among the same lines with literature arguing that results can be affected by the benchmark selected and the kind of measurement technique used.

The statements on the inconclusiveness of the different hypotheses should be regarded as a rather very brief and general remark within the introduction. The fact is that since the objectives with their respective hypotheses have been examined for an array of different parameters like time period of the sample or sub-samples, definition of intangible intensity (R&D, MSGA or balance sheet intangibles), the way of measurement of R&D (expensed or capitalized), the way of measurement of returns (equally- or value-weighted), statistical parameter (mean, median, standard deviation), and, of course, the confidence level of statistical test, partial acceptance or rejection of a hypothesis is possible. Detailed results are presented in the final conclusions in Ch. 9.

1.3 Overview of the Study

This thesis contains 11 chapters. Following this introductory Chapter 1, Chapter 2 provides a background on the valuation of intangibles as well as the accounting standards, with the focus on US GAAP rules. Some comparisons are made to UK GAAP and international accounting standards. Definitions of intangibles are also provided.

Chapter 3 provides an outline of the data used in the thesis. It refers to the selection, collection and measurement procedures for intangibles of IPOs and seasoned companies and defines the samples to be analysed and compared. It also gives basic statistical parameters on proceeds and market values.

Chapters 4 to 8 deal with the individual objectives, the respective hypotheses and their tests, as well as with all further details on methodology and ensuing results. These have been outlined above in 1.2.

An assessment of all results is undertaken in the conclusions of Chapter 9 together with information on future research objects.

Appendices to specific issues in respective chapters are given under Chapter 10.

Literature referenced in respective chapters is summarized in Chapter 11.1. Rather extensive further literature, used for the purpose of this thesis but not expressly referenced in the text, is given in Chapter 11.2.

1.4 Limitations to the Study

A number of limitations may be identified in the empirical research of the thesis:

- The thesis defines balance sheet intangibles as goodwill, as well as all intangibles assets, which under APB Opinion 17 may be capitalized and thus reported under the intangible assets balance sheet account. A limitation therefore is that it does not consider prepaid intangibles, such as rent or advertising, nor does it consider some intangibles, which may be grouped together with other items under the other assets balance sheet account.

  The reason for focusing only on those intangibles stated above is because databases define intangibles in this specific way. Databases do provide a separate account titled "prepaid", yet they do not distinguish between tangible and intangible prepaid, and many times this data is missing altogether. The same problems exist with intangibles provided on the balance sheet under other assets. Moreover, in this case, financial statements provide an after amortization grouped value, failing to provide a detailed amortized figure for those intangibles. As a result, even a hand-collected data set would not allow identifying the exact value of each intangible in the group under other assets.

- The thesis defines income statement reported intangibles as R&D, marketing costs and selling, general and administrative expenses. However, when measuring intensities it groups marketing together with selling, general and administrative expenses in one figure. The reason for this limitation is again that databases provide those expenses together only. It is acknowledged however that this is common practice among accountants.

- This thesis uses accounting data to measure intangibles. Although this method is widely used by the literature, the results may suffer by the fact that the valuations given by investors on intangibles are not available. Valuation appraisals are kept private by the banks and not provided to the academic community. US GAAP allow only purchased and very few internally developed intangibles to be capitalized. As a result only the purchased intangibles and the very few internally developed ones will actually have a fair value assigned valuations. All others intangibles are reflected as costs. Further, the market may not necessarily evaluate intangibles at fair value.

- Regression analyses, investigating the role of intangibles, group R&D together with marketing and selling, general and administrative expenses, therefore the coefficient and t statistic refer to all rather than two separate items. The limitation results from the fact that R&D and marketing, selling general and administrative variables are almost collinear. Even when using deflators, the correlation does not drop within acceptable levels. This limitation is also observed in the Lev and Sougiannis (1996) study, who therefore examine R&D together with marketing costs.

- The variations of the Ohlson (1995) model used in the thesis suffer from multi-collinearity. There are ways to solve the problem, such as running regressions twice, each time using one of the two multi-collinear factors. Also deflators can be used Still, this is an issue and had to be addressed in the respective sections.

- IPO first day returns as well as long run return results may give a different outcome depending on how they have been measured. For example equally weighted results may give different results compared to value weighted ones. Further, average values may provide different results from median ones. The phenomenon has been documented by the literature (Kothari and Warner (1997), Brav and Gompers (1997), Fama (1998), Brav et al (2000) and Gompers and Lerner (2003)) and no clear answer has been provided as to which way should be used.

- This thesis includes 551 IPOs which under the "Technology and Internet Yearbook 2001" have been classified as technology stocks. Some further sub-classifications could arise, if one looked at other industry criteria, as for example the Dow Jones Industry classification. In this case one could argue that different sub classifications could have different intangible levels, which could have an impact on the levels of intangibles intensities. Unfortunately the sub-classifications are very small, in some cases including less than 5 observations. Therefore, only the broad sample of technology IPOs is used in the sample.

Chapter 2: ACCOUNTING RULES AND VALUATIONS

2.1 Company Valuations

One of the most important and most commonly used valuation models in empirical academic literature is stated in the theoretical Ohlson (1995) study. Its major advantage is that it can be estimated using accounting data (Lo and Lys (1999)) and that in most cases regressions yield high R^2 values. This shows that accounting data is useful in understanding share prices (Lo and Lys (1999), Frankel and Lee (1996)). The Ohlson model (1995), based on the Peasnell (1982) study, states that companies' value should be equal to the sum of its Book Value plus the value of its contemporaneous and future earnings, as well as the dividends. Other growth opportunities not reflected and reported in the Book Value or in financial statement earnings' estimations should also be added in the valuations. Ohlson (1995), Ohlson and Penman (1992) and Penman (1992) argue that Book Value is a good proxy for expected future abnormal earnings. Therefore many empirical studies (Barth et al (2003), Deng et al (1999), Lev and Zarowin (1999), Chauvin and Hirschey (1994)) do not include future earnings in their Ohlson (1995) regressions.

In general, the valuation based on earnings may not be very reliable. Lev and Zarowin (1999) comment that the quality of earnings in determining share prices decreased from the 1980ies to the 1990ies. They argue that instead valuations should focus more on book value, and especially on the Assets of a company. Also Penman and Zhang (2002), Collins et al (1994), Choi et al (2002) have stated that earnings as well as future earnings may be of poor quality. They argue that one of the reason as to why this happens is that earnings could be depressed due to conservative accounting, i.e. the expensing of investments which could be of value, and timeliness, i.e. a mismatch between revenues and costs. A further severe problem for companies issued or traded in the 1990ies is that many companies report negative earnings. Damodaran (2001) argues that valuations using negative earnings should not be performed. In the context of the Ohlson (1995) model Collins et al (1999) finds that in most samples negative earnings valuations are insignificant or are valued differently compared to positive earnings.

The implications of the low value relevance of earnings as well as their negativity in many technology companies made academic literature in the 1990ies focus more on individual investment valuations. Two major categories of investments exist: Tangible and Intangible ones. Of special interest are intangibles because they have become the key growth opportunity investments of many companies in the last two decades (Lev (2001)). Further, they are the core valuation elements of technology companies (Damodaran (2001)).

Accounting standards recognize the value of an investment by assigning it the "asset" status. According to US GAAP an investment is valuable, i.e. an "asset" if it fulfils four basic criteria, summarized in Table 2.1 (Blair and Wallman (2001)).

Table 2.1: Conditions for an intangible to be classified as an asset and means to maintain the status

No	Condition	Means to maintain the condition
1	Resources must be well defined and distinct from other assets	Legal and/or Conceptual Description
2	The firm must have effective control over them	Legal Rights or Custody
3	It must be possible to predict the future economic benefits from them	Generate Income
4	It must be possible to determine whether their economic value has been impaired and to what extent	Use Depreciation or Depletion

The implications of this recognition are that an investment fulfilling the four criteria should be recognized, "capitalized" on the Balance Sheet (Epstein et al (2006)). Assets should be valued using fair value, i.e. the true value that the asset would cost if it were purchased in the market. (Epstein et al (2006)). The way in which an asset should be valued is either the "income" or the "market" or the "cost" approach. The income approach estimated the NPV of an assets, i.e. it estimates the present value of all revenues generated by the asset. The market approach, also known as the comparables approach, finds similar investments to the one to be valued. It then assigns the value of the respective comparable investment to the investment to be valued. The cost approach estimates the cost required to create the asset. (Reilly and Schweihs (1999)) All three methods in an efficient market should yield the same results; US GAAP recommends the income approach, although they do not prohibit other valuation methods (Epstein et al (2006)).

If an investment fails to fulfil the conditions in Table 2.1 it must be considered as an expense, i.e. of no value, and written as such on the income statement. The implication of this policy is that some investments of uncertain future benefits may have to be recorded as expenses. Yet the market may assign a value on those costs.

2.2 Differences between Tangibles and Intangibles

Four main characteristics are discussed in literature with respect to intangibles: a) high growth opportunities, and b) profits on the background of high risk, c) information asymmetry as well as d) misevaluations. (Lev (2001))

The following description on the nature of intangibles, as well as a comparison of their characteristics relative to tangible investments, will help explain why literature assigns those properties to intangibles, as well as why these properties lead accountants to conservatism, i.e. in certain cases, instead of capitalizing, they will expense intangibles. Detailed intangible accounting rules are discussed in 2.3.

The most widely known difference between tangible and intangible assets is that the former can be seen and touched, i.e. they are corporeal, while the latter lack physical existence or defined shape. Thus intangibles are harder to measure. Consequently, as discussed in Section 2.1, it is more difficult to recognize intangibles as assets or capitalize these (Lev (2001)). Expensing intangibles on the other side leads to lack of a unique value, defined through accounting standards, and as a result leads to higher uncertainty and information asymmetry in the market.

The nature of tangible assets is not specific to a business type and thus may be transferred to and used by another enterprise. In contrast, intangibles have a very specific nature to their owner, sometimes to the extent of possessing no value to anyone else (Lev (2001)). For example a computer, a car or furniture can change ownership through sale from firm A to firm B. However, R&D investment in software or a drug may have zero or limited value for any other form of research, since it applies to that specific project only. In consequence, tangible assets are bought and sold in organized and readily available markets, and such markets cannot exist for intangibles. Tangible assets are of general interest and so abundant as to form a common market, and are therefore bought and sold through retailers and auctions. In contrast, it is extremely difficult or impossible to impose similar market exchange tools for selling R&D, brands and human resources. The only intangible area that has some sort of common market is a patent; however this market is still in its infancy stage. As an implication, tangible assets can be realized in the ordinary course of business while intangibles depend either on the continuation of business operations or on the ability to find a specialized buyer.

For the above reasons intangible investments are perceived as more risky. Investors are worried that in case an intangible investment will not prove profitable, they will lose all initial costs. Instead, when investing in tangibles, at least some of the initial investment may be recovered by selling. Further, lack of comparables, due to the unique nature of intangibles, may lead to misevaluations, and lack of an organized market, i.e. no unanimous view on the value of the intangible, may lead to information asymmetry (Aboody and Lev (2000), Francis et al (2006)).

Because of easy transferability and organized market places, the disposal or replacement of tangible assets does not affect the fundamental operations of the business. In contrast disposal of intangibles may affect and prevent the continuation of all or a substantial part of the activities of a business. Again a computer, a car or furniture is only a tool within a broader cluster of similar or replaceable assets. R&D that is disposed of may permanently hinder the production of a specific drug or may demand significant changes. This increases risk and loss in case of intangible investment failure.

Tangible and intangible assets may further be distinguished between "rival" and "non-rival". Tangibles are rival assets in the sense that alternative uses – due to their "not specific use" – compete simultaneously for the services of those assets (Lev (2001)). A computer can only work for a specific amount of work performed, a car can be used at a specific route and amount of people at a given time, furniture decorates a specific room and allows the accommodation of a distinct number of persons. It is this specific deployment of tangible assets that makes them "rival" by not allowing them simultaneously to be used elsewhere. The opportunities forgone, i.e. alternative work that could have been processed by the computer, people that could have been served by the car or furniture may be viewed as a form of opportunity cost. In contrast, intangible assets are in general non-rival, since they can be deployed simultaneously in multiple uses, and a given deployment does not detract from the usefulness of the asset in other deployments. A computer engineer (human resources) that works in a computer station may work at multiple tasks on more than one computer. A vehicle navigation system (software) may navigate more than one vehicle at the same time; a brand name marking furniture may add value to a firm's reputation in more minds than currently present in the room. There are cases where this rule does not apply; in some exceptions intangible are rivals: a driver can serve one car at a time.

Rival assets, both tangible and intangible, enjoy limited economies of scale and scope limited to the size of the market. Doubling the production of a plant requires rather substantial investments in machinery. On the other hand non-rival intangible assets are generally characterized by large fixed, sunk costs and negligible marginal costs. For example investing in a new drug (R&D, patents etc.) is highly expensive. However, even quadrupling drug quantities requires marginal per unit cost increase. Therefore, intangible assets are characterized by increasing economies of scale (Lev (2001)). This is one of the main reasons why investors associate intangibles with higher growth and future returns compared to tangible assets. Yet, considering the fact that start-up cost is higher and less recoverable in case of failure, higher growth is also subject to higher risk. In many cases investors may be over-optimistic and miscalculate the risk or focus too much on the risk and ignore the potential growth. Levy and Terlecky (1989) point out that a further reason for intangibles – especially R&D – being vulnerable to misevaluations is because it is very difficult for investors to distinguish between profits generated through actual R&D costs and those by economies of scales associated with R&D.

Tangible assets always have a finite life and within this life span their value diminishes in a systematic way. Reasons like wear and tear or technological improvements and accidents limit the usefulness of tangible assets to the extent that they are replaced or terminated. Depreciation methods are used for reducing the value of tangibles with the result that the market considers a price loss. For example a computer, a car and furniture are replaced because of their respective low memory (technological obsolescence), rust (wear and tear) or firebrand.

Intangible assets sometimes have finite and sometimes infinite lives (Mard and others (2002)). Even when their life is considered infinite it may nevertheless be subject to whim of fortune or abrupt curtailment. The infinite life principle is based on the idea that intangibles may accumulate value. For example R&D investment in creation of a new drug integrates earlier medical findings into new knowledge (Lev (2001)). However, at some point all past knowledge may be outdated, or this particular drug has provided a cure and thus its R&D is a sunk cost. This is the case when even intangible life ends, i.e. becomes finite by abrupt curtailment. All this uncertainty causes intangible assets value to fluctuate unpredictably eventually leading to both risk and misevaluation. In practise investors may not really know when an intangible is outdated and what the financial implications are. Tangible assets may have shorter lives, yet they can be estimated more easily and thus uncertainty is lower.

Reilly and Schweihs (1999) link tangible to intangible assets arguing that tangibles are often required to fully realize the value of an intangible asset. The latter thus receive the traits of tangible assets. Computer software, an intangible, needs computers, tangibles, to be created and used. It has a distinct electronic shape and form and is visualized. The opposite is the case when the incremental value of intangible assets is associated to tangible assets. This is called the in-use-value or the going-concern-value element of tangible asset value. A good example is real estate property and its additional value by an existing building on the lot.

2.3 US GAAP Rules

The implications of the uncertain and unique nature of intangibles are reflected in US GAAP accounting rules. US GAAP allow almost all tangible investments to be capitalized. However, they are very conservative on intangibles. Looking at Table 2.2., under US GAAP Opinion 17& 18 (from 1970-2001) and SFAS 141 and 142 (from 2001 to present) only purchased intangibles can be recognized as capitalized and amortized. Internally developed intangibles must be expensed when incurred. The main idea is that purchased intangibles can legally be defined through a contract; they can also be separated. As a result, a value can be assigned in all purchased investments through the value of purchase. Further because purchased intangibles have been separated by the purchase, it is easy to estimate their future revenues and thus use the income valuation approach.

According to US GAAP applying valuations on internally developed intangibles could lead to subjective valuations. cannot happen most of the times on internally developed intangibles. In contrast, UK GAAP allows both internally developed and purchased intangibles to be capitalized, if they fulfil "asset" status criteria of Table 2.1. Critics of UK GAAP argue that this policy leads to inconsistent valuations. Companies capitalize or expense intangibles depending on how they want to manage their book value and earnings accounts. The US GAAP system, leads to more homogeneous measurements across companies. IAS and IFRS agree with US GAAP and do not allow internally developed intangibles to be capitalized. Starting 2005 UK GAAP rules have to follow IFRS.

A detailed list of all recognized intangibles under US GAAP SFAS 141 and 142 is provided in Appendix A.

A description of the main intangibles found in the accounts of a company follows below. In case that a certain intangible has separate rules on capitalization, these are also provided.

Table 2.2: Main Guidelines on Intangibles of US GAAP Opinion 16 and 17 and SFAS 141 and 142.

1	Intangibles are separately recognized as "assets" if they meet one of the two criteria: (a) be legally defined or (b) clearly be separable	SFAS141, par 39, p 12
2	Purchased intangible assets shall be capitalized and amortized over their remaining useful life – the maximum of 40 years is not mentioned as a limitation in the standard	SFAS 142, par 12, p 5
3	Internally generated intangible assets must be expensed immediately. The only exception is advertising costs that may be subject to capitalization.	
4	Purchased intangible assets, which are difficult to separate, should be recognized as long as the accountant can assign a value, i.e. look at their *own* value.	
5	Intangibles, which have uncertain economic life, should be treated as if having infinite lives.	Mard et al (2002)
6	Infinite economic life intangibles should not be amortized, but be treated for impairment every year. This applies only for SFAS 141 & 142, i.e. it does not apply in financial statements prior to 2001.	SFAS 142, par 16, p 6
7	Impairment must be performed whenever the amortization, i.e. the remaining useful life is subject to a change. This applies only for SFAS 141 & 142, i.e. it does not apply in financial statements prior to 2001.	SFAS 142, par 17, p 6

Intellectual Properties

These are the most common intangible assets to be capitalized. Patents, copyrights, trademarks and brands fulfil all four of the asset conditions and are the strongest intangibles in terms of legal protection. In addition most intellectual properties can be traded in an organized market. Definitions and comments on each intellectual property follow.

i. **Patent:** A patent confers the exclusive right to make, use licence or sell an invention in progress. "It is a grant by the U.S Government, administered by the U.S Patent and Trademark Office, to an inventor or the inventor's assignee for a stated period of time." Patents are legally covered within the country in which they filed (Reilly and Schweihs (1999)). Following sub-categories are common:

a) ***Utility Patent*** (www.invention.com/)**:** Whoever invents or discovers any new and useful process, machine, manufacture or composition of matter or any new and useful improvement thereof may obtain a utility patent. The duration of this kind of patent is 20 years and non-renewable.

- Examples: tools, devices, machines, computer programs, games, processes, formulas, internet, electronic, chemical and business methods.
- Their legal protection lasts 20 years from filing and is non-renewable.

b) ***Design Patent*** (www.invention.com/)**:** Whoever invents or discovers any new and useful process, machine, manufacture or composition of matter or any new and useful improvement thereof may obtain a design patent

- Examples: Shapes of articles, dolls, characters, etc.
- Their legal protection lasts 14 years and is non-renewable.

ii) **Copyright:** A copyright is not a single right, but rather a "bundle" of exclusive rights giving an owner the rights to reproduce a work, prepare derivative works, to distribute and display copies of the work, and to perform the work in public. It may be infringed if any one of these excusive rights is violated (Reilly and Schweihs (1999)).

- Examples: Books, dolls, plays, poems, sculptures, paintings, photographs, computer programs, software, written materials, etc (www.invention.com/)
- Their legal protection is 50-75 years subject to its nature and country. (www.invention.com/)
- Copyrights are non-renewable. (www.invention.com/)
- Their coverage is worldwide: Since 1989 copyrights are subject to the Berne Convention, which protects them internationally, in all countries represented in the convention (Blair and Wallman (2001)).

iii) **Trademark (Brand):** A trademark is any "sign" used to denote the trade source (or the origin) of the goods or services. Trademarks include "any letter, word, name, signature, numeral, device, brand, heading, label, ticket, aspect of packaging, shape, color, sound or scent" (http://www.bohanlaw.com /tmmake.html)
- Examples: Names, logos, designs, Internet domain names etc. (http://www.invention.com/).
- Their legal protection is for 10 years, subject to the constraint that they must be in use, else the protection is not guaranteed. Protection may be renewed (www.invention.com/).
- Their legal coverage is limited in the country of filing. In the case of the US the Lanham Act protects them. Commercial trademarks are typically registered with the United States Patent and Trademark office (www.invention.com/).

iv) **Trade Name:** The name on the door of a business, the name in the telephone book, or the name on a Web site, i.e. the name under which a person or company does business. (www.bohanlaw.com/tmmake.html) Trade names are linked to trademarks in a way that the brand name may well be the actual audio-visual representation of the trademark.
- Examples: The context of the Name, Logo, design etc. (www.bohanlaw.com/tmmake.html).

- Selecting a business name is relatively uncomplicated. In general, as long as no one in the same market area owns a similar name it may be used without restrictions (www.bohanlaw.com/tmmake.html).

v) **Licence:** Agreements that a company enters into with the government or another company or party, which enables it to carry out certain trading functions (Horngren et al (1996)).

- Examples: Licence to use software, a patent, a certain kind of technology etc.
- They are of limited duration and for a very specific purpose.

Other frequent Intangibles

i) **Advertising**: Any costs related to advertising campaigns, which aim is improving Sales and company performance.

- Examples: Commercial on television, mail distribution, promotions etc

ii) **Customer Bases – Mailing Lists**: Value due to the fact that the company has clients.

- Examples: Product customers, i.e. customers registered to repeatedly buying the same product (software, hardware etc.).

Human Resources (Capital)

Defined as "skills and knowledge 'owned' by the company due to its employees" this intangible is very difficult to measure and is usually not legally protected (you cannot own employees). However it is worth mentioning since it has been proved that employee skills do add value due to improvement in company performance. In fact an indirect way of measuring human resources is to use sales increase figures or other similar sources.

Under UK-GAAP and IAS accounting standards it is implied that human resources should be omitted from the balance sheet, i.e. not be capitalized. Therefore all costs should be expensed immediately. The same applies for US standards, with the exception of assembled workforce, which may be capitalized. Most human resource expenses are found under the income statement account "Selling General and Administrative Expenses".

Goodwill

As already mentioned US GAAP require valuations of assets to be made on fair value. The difference between purchased and fair value – in both tangible and intangible investments - is recognized as Goodwill. This measure itself is an intangible asset. It follows the same rules as all other intangibles. US GAAP allow only the positive difference of Goodwill to be recognized as an "asset". UK and IFRS allow both positive and negative differences to be capitalized.

R&D – A special Case of Intangible

R&D is the most common intangible found in the financial reports and it is the only one with separate rules on all three accounting systems (US/UK-GAAP and IAS). It is also the most important intangible for technology stocks. Under all rules, R&D is perceived as one of the riskiest intangibles and many argue that sometimes it violates conditions necessary to maintain the asset status - its economic benefit may be difficult to predict and measure. Although all three standards (US/UK-GAAP, IAS) provide only a single figure for R&D, the definition for R&D itself and its estimation by accountants is more complex. The following definitions originate from the IAS rules, but US/UK-GAAP rules are almost identical. The various phases of R&D are as follows:

i. **Research**: "An original and planned investigation undertaken with the process of gaining new scientific or technical knowledge and understanding" [IAS 38, par 7, p 14].

   (1) ***Basic Research***: Research directed towards processes and not yet in use, or goods not yet produced [Jovanovic and Nyark (1995), p 5]. This phase of research is characterized by:

      a. Heavy investment (radical costs)

b. Risky – high uncertainty

c. Associated with corporate productivity and growth

(2) ***Applied Research***: Research that aims at learning more about the technology process that a firm is already using or about a good that it is already producing. This phase of research is characterized by:

a. Costs are not as heavy

b. Some sunk costs

c. Less uncertainty

ii) **Development:** "The application of research findings or other knowledge to a plan or design for the production of new or substantially improved materials, devices, products, processes, systems, or services prior to the commencement of commercial production or use" [IAS 38, par 7, p 14].

The key difference between research and development is that the former aims in gaining knowledge on a relevant to business area or item, and so is not very product specific, while the later describes the process of bringing a specific product or an improvement of an existing product to a marketable state (Brockington (1995), p 88). Moreover, research is associated with much higher risk and uncertainty as opposed to development. Somewhere between research and development are Process R&D and In-process R&D. These are defined as:

i. **Process R&D**: Almost identical to Applied Research, only that the last stages or Research are performed simultaneously with the beginning of the development of the R&D's purpose.

ii. **In-process R&D**: Transferred R&D at its process stage to the buyer firm, through (usually) the purchase of an entire company. [Lev p 87] This phase of R&D is characterized by:

(1) Additional investment

(2) Uncertainty increases

a. Price risk (overvalued)

b. Merger and acquisition anomalies
c. New outcome

A detailed representation of the various phases of R&D and their characteristics is given by Lev (2001) and demonstrated graphically in Table 2.2.

SFAS 2 accounting rules were introduced in 1975 and required all R&D investments, purchased and internally developed, to be expensed when incurred. The rationale requiring R&D investment to be expensed was that this was considered by FASB as very risky, i.e. its future profits, and therefore its valuations, were very uncertain (Damodaran (2001), Horngren et al (1996)). There were further issues whether R&D could fulfil the asset status (legally defined) or be separable from other assets. Yet, by the 1980s software became one of the most valuable components of US companies. A lot of software investments were included in R&D since companies spent money researching and developing new software either internally or by purchase. Therefore allowing software to be capitalized became a necessity.

Table 2.3: Timeline of the various R&D stages and the risk direction

	Basic Research		**Applied Research or Process R&D**		**Development**	
				In-process R&D Acquisition		
→	→	→	→	→	→	***time***
High		***lower***		***additional***		***lowest***
			uncertainty			
factors affecting R&D	Investment and costs					
	Corporate productivity and growth		Initial Sunk costs			Additional sunk costs

In 1985 FASB took respective action in this direction, requiring purchased software to be capitalized, if this has been acquired after completion of the initial implementation/ integration stage. R&D costs assigned to the internal development of software shall be capitalized too. However, it was required to identify and capitalize only those internal costs associated with the development stage of software. In order to understand better what kind of software investments were allowed to capitalized and had to be expensed the following outline is provided along the lines of SFAS 86:

i. Costs of producing product masters incurred subsequent to establishing technological feasibility shall be capitalized (SFAS 86, par 5, p 2).
ii. Costs of maintenance and customer support shall be charged to expense when related revenue is recognized or when those costs are incurred, whichever occurs first (SFAS 86, par 6, p 3).
iii. Costs for duplicating software shall be capitalized (SFAS 86, par 9, p 3).
iv. The amount by which the un-amortized capitalized costs of a computer software product exceed the net realizable value of that asset shall be written off (SFAS 86, par 10, p 3).

The above US-GAAP rules on R&D (SFAS 2 and SFAS 86) are still valid today. UK GAAP and IFRS rules allow some of the development costs of R&D to be capitalized. US GAAP do not adapt this policy because they argue that valuations will be subjective and companies may decide to capitalize or expense R&D in order to generate preferable accounting figures.

On the other hand, the implications of the US GAAP policy is that reported Book Value and earnings – which contains all Assets – may not properly reflect value. Total Assets may be missing important valuation parameters, while earnings maybe depressed, i.e. the phenomenon of conservative accounting and timeliness is related to intangibles and mainly R&D. From an empirical point of view, literature finds that the market capitalizes R&D costs, i.e. the explanatory power of valuation regressions increases when adjusting Book Value and Earnings by treating R&D as an asset R&D (Lev and Sougiannis (1996) (1999), Lev et al (2002)).

2.4 IPOs - A Special Case of Valuation

Seasoned company assets are valued by the market (Damodaran(2001)). In contrast, IPOs share the distinct property of being valued by two different parties: the issuer and the market ((Ljungvist (2004), Bhagat and Rangan (2004), Bartov et al (2002)). Many academic studies argue that these two parties have different levels of information asymmetry (Jenkinson and Ljungvist (2001), Ljungvist (2004)). Notwithstanding the fact, the same accounting standards and valuation models apply for IPOs as for seasoned companies. The implication is that the issuer and the market - despite having the same accounting figures - may assign a different value on IPOs. The differences in valuations can be reflected in the very high returns generated by IPOs in the first day of trading. On average IPOs generate 19% first day returns, compared to the average 0.05% of matching seasoned companies. Overall first day returns are higher in periods when information asymmetry is higher, reflecting the fact that in periods of higher uncertainty valuations between the two parties exhibit larger differences (Jenkinson and Ljungvist (2001), Ljungvist (2004)).

The differences in valuation perspectives between issuer and market have not been investigated thoroughly in valuation models. Bhagat and Raman (2004), Bartov et al (2002) have addressed the issue but have not come to any specific conclusion. Indirectly this has been discussed in the literature review of Kim and Ritter (1999). They argue that in some research R^2 values are different, usually lower in IPOs compared to seasoned companies. It is still an open question though how the issuer and the market value IPOs. This is of interest especially with respect to intangibles, considering the fact that the core value of IPOs issued in the 1990ies was represented mainly by their intangibles (Damodaran (2001). Also considering the uncertain nature of intangibles these present a highly suitable variable to investigate whether differences in IPO valuations can be attributed to information asymmetry. Moreover researching differences in valuations of intangibles between IPOs and matching seasoned companies could show if and to what extent IPOs are indeed more growth promising or over-valued. If IPO intangibles were more growth promising or over-valued this would imply for intangible intensive IPOs in the long run a worse market performance. A long run underperformance of IPOs in relation to seasoned companies has been reported in literature (Jenkinson and Ljungvist (2001)), but research investigating the role of intangibles and its possible link to underperformance is limited and inconclusive.

2.5 Conclusion

The valuation of a company depends mainly on its book value and earnings. Yet, it is argued that it is mainly the intangible assets – encompassed in book value - which contribute to the growth opportunities, especially of a technology company. Intangible assets are more growth promising but also more risky compared to tangible assets. Due to this fact some of these investments, for example R&D and internally developed intangibles, should be expensed. The market however seems to capitalize all intangibles when valuing seasoned companies. It is still an open issue how intangibles in IPOs are valued compared to matching seasoned companies. As mentioned IPOs are valued by two different parties and have higher information asymmetry compared to publicly trading companies. Further, a limited number of publications links information asymmetry to the short and long run excess returns of IPOs. It seems worth investigating whether the level of intangibles in an IPO has an impact, and if so to what extent, on these abnormal first day returns.

Chapter 3: DATA AND DESCRIPTIVE STATISTICS

3.1 Data Selection and Collection Methodology

This research focuses on IPOs issued between 1995 and 2000. This period has been selected considering the reasons and facts pointed out by Ljungvist (2004). In his summary on IPO literature he comments that the very high first day returns in IPOs, associated with the technology IPO boom, started to occur in the mid nineties and lasted up to 2000. Therefore, the raise and fall of the IPO technology boom can be defined in that interval. Ritter and Welch (2002) also identify the 1995-1998 and 1999-2000 intervals as the two main periods of the overall IPO boom. Choi and Kim (2005), focusing on IPO first day returns research, also select a similar overlapping interval, the only difference being that theirs starts in 1997.

The "Technology and Internet Yearbook 2001" of Morgan and Stanley has carried out the identification of all technology IPOs issued between 1995 and 2000. This document provides annual detailed lists of all technology IPOs conducted between 1980 and 2000. Accordingly 1082 technology IPOs, issued in the United States between 1995 and 2000, have been listed. Table 3.1a-b lists the number of technology IPOs in relation to the respective business sector description and the year of issuance as well as the corresponding percentage in relation to the total number of IPOs for a specific year. The bold figure represents the business sector with the highest number of recorded IPOs, the fields in grey indicate the business sectors with the five higher frequencies. The field of the various "Internet Portal" businesses is indicated with numbers in italics. The respective prospectuses (designated as documents 424B1, 424B2, 424B3, and 424B4) have been searched in three different databases: (a) Perfect Information, (b) Thompson Analytics and the (c) Security Exchange Commission (SEC) homepage. If an IPO prospectus is not mentioned in any of the three databases, then the IPO has not been included in the present analysis. Not recorded IPOs are random in character; they do not belong to any specific group. Thus the final number of observations analysed in the thesis (sample size) comprises 551 technology IPOs, as shown in Table 3.2a-b. A comparison of the corresponding frequency figures for the different business descriptions between the two tables, i.e. between "The Yearbook" and the "Thesis Sample", confirms the fact that the thesis sample is absolutely representative of the type of business and the respective occurrence of IPOs issued during the observed time period.

Information is provided further on the underlying cause for the high rate of attrition. A number of IPOs did not survive up to year 3 after issuance for various reasons. Table 3.3 gives the numbers of IPOs surviving per year and industry classification. Table 3.4 gives the numbers merging or acquired in the respective periods. Table 3.5 states the numbers of IPOs de-listing following bankruptcy and Table 3.6 the numbers of IPOs going private and de-listing.

Further, using the guidelines set up by Ritter (1991) and Loughran and Ritter (1995), a matching seasoned firm has been assigned for each IPO. This comparison is necessary in order to test if IPOs show different levels of intangible intensities (referring to Hypothesis 1) or are valued differently (referring to Hypothesis 3) or under-perform (referring to Hypothesis 5) than seasoned companies In order for a seasoned company to qualify as a match it must be of the same industry type, about the same size in terms of market value, and it must have been publicly trading in a U.S stock exchange for more than five years at the time the IPO was issued. Finally it must not have conducted an SEO for at least two years prior to the time that the IPO was issued.

To avoid industry effects a seasoned firm is assigned for each IPO, which is of the same Dow Jones industry classification. In order to control the size effect, the matching company selected must have a market value, on 30 June of the year the IPO was issued, which is between 70% and 130% of the IPO market value on the end of first day trading. The 30 June reference date was selected as a midpoint between January 1 and December 31. The Thompson Analytics database is used for this procedure. It allows users to search for a specific industry type and the market value range, as requested in research, and provides a list of companies fulfilling the requested criteria.

There are two minor differences in the matching firm selection procedure in this thesis compared to the one followed by Ritter (1991) and Loughran and Ritter (1995). First, Ritter (1991) classifies IPOs based on their industry SIC code. Using SIC codes lead to an inadequate number of matching companies within the 30% market value range of IPO value. Therefore the Dow Jones Industry Classification, providing a broader definition of a firm's industry type, is used in this research as a control when assigning matching companies. Secondly, Loughran and Ritter (1995) always select the closest matching company with a higher market value compared to that of the IPO. In the present thesis the matching firm with the closest absolute market value is selected.

Even after loosening the industry match criterion from the narrow Standard Industrial Classification (SIC) to the broader Dow Jones Industry Classification, approximately 20 IPOs cannot be matched with seasoned firms of exactly the same classification. In this case matching companies of very similar classifications are assigned. These exceptions are justified since the current research focuses on measuring intangibles between IPOs and seasoned companies. Assigning matching companies with similar yet not identical classifications - for example matching a technology IPO with a technology oriented firm classified as industrial - does not lead to misleading results.

The alternative solution – not applied in this research - would be assigning in all cases matching firms of exactly the same industry by violating the 30% margin between IPO and matching firm market values. This matching method would lead to bias though, both in measuring intangibles, because a larger company may have more intangible assets than a smaller one, and in performance, because different sizes imply different levels of risk. Loughran and Ritter (1995) highlight this issue, commenting that large differences in IPOs and matching firms may lead to performance comparison problems. In order to get an adequate number of observations in their research with seasoned firms of close market values they omit seasoned firms matched by industry type criteria.

Initially IPOs and seasoned companies have been matched by size and industry. Matching by further characteristics, such as the B/M ratio, did not lead to a sufficient number for analysis. So this characteristic has not been used further in the study.

Moreover another difficulty has been encountered in that about 10% of all IPO Book Values are negative.

The requirement to locate matching seasoned firms with at least five years of public history at the time of the IPO offer is accomplished by checking their financial statement history in the Thompson Analytics, Perfect Information or the SEC databases. To control that matching companies have not publicly raised capital for more than two years a check is conducted through the three databases mentioned. To this purpose the absence of documents 424B1, 424B2, 424B3, and 424B4 for the period of two years prior to the offer has to be verified. The Ritter Secondary Equity Offering (SEO) database provides an additional check by listing SEOs of US companies.

In this thesis the definition of "not having publicly raised capital" is identical to the one used in the Ritter database, i.e. it is required that firms themselves shall not have made an offer to sell shares to the public. Issuing shares to insiders or as an offer to another company in the case of a merger, as well as existing shareholders selling shares to other companies, private parties or the public - in the last two years before the offer - is not an eliminating factor for a company being considered a match.

Having identified technology IPOs and matching seasoned firms three main groups of data are extracted from the downloaded IPO prospectuses as well as the Thompson Analytics Databases, whereby a) and b) relate to values and returns, and c) relate to performance measures:

a) IPO offer related data, i.e. *amount of proceeds raised*, *offer market value* and *first day closing market value*; This data is needed in Hypotheses 2, 3 and 4. Data is used as the dependent variable of regressions in Hypotheses 2 and 3. It is also needed to estimate fist day returns in Hypothesis 4.
b) *Total index returns*, collected from the first day the IPO started to trade and up to three years later for both IPO and the respective matching seasoned companies; this data is needed in order to estimate CAARs and BHARs in Hypothesis 5.

c) Balance sheet accounts (*total assets*, *book value*, *intangible assets*, *goodwill*) and income statement accounts (*sales*, *earnings*, *R&D expenses*, *marketing and selling, general and administrative expenses*) for both IPOs and respective matching seasoned companies. This data is needed in order to estimate intangible intensities. Intangible intensities of IPOs and seasoned companies are compared in Hypothesis 1. They are used as independent variables in Hypotheses 3, 4 and 5.

In regard to the sources of data items, IPO proceeds and offer market value are collected from data provided at the front of the IPO prospectuses. The IPO first day close market value is collected from the DATASTREAM database. Proceeds are defined as the amount raised by the offer, before under-writing commissions. Offer market values and first day close market values are defined by multiplying offer price or first day close price by the number of shares outstanding. The same number of shares outstanding is used for both market values. In establishing the exact IPO trading starting date two further sources are used, Table 3.7:

a) The Technology & Internet IPO Year Book (Morgan and Stanley (2001)), and
b) The IPO Monitor (http://www.ipomonitor.com/).

The "Technology and Internet IPO Yearbook" has been used to identify the IPOs in first place. It also provides on its lists the month in which the IPO went public. The IPO Monitor on the other hand provides IPO lists with the exact trading starting date. Unfortunately this database goes back to 1998 only. For all IPOs not covered by the IPO Monitor the FACTIVA database is used. FACTIVA serves also as a further crosscheck of the IPO Monitor data. It comprises millions of news sources from business newspapers and magazines. The name of the IPO is entered in its search engine. It then provides articles, referring to the IPO and mentioning when exactly stocks began trading. In some cases, IPOs went public on a specific date, yet they started trading one or two days later. In such instances, as recommended by Ritter (1991), the IPO market value on the actual trading starting date is used as the first day closing price.

The DATASTREAM Total Index Returns (RI) are collected for IPOs and matching seasoned companies for a three year period, i.e. from the day IPOs start to trade up to three years later. The collection is conducted on a daily basis. The total index returns have two main advantages: they have been adjusted for stock splits and take into account the effect of dividends.

Turning now to performance related measures a more complex procedure is followed when collecting and estimating IPO and matching firms′ income statement and balance sheet accounts, Table 3.8. As a starting point IPOs prospectuses are used to identify accounts referring to intangibles. On the income statement the following intangibles are identified: research and development expenses, marketing expenses and selling, general and administrative expenses. Intangibles on the balance sheet, allowed to be capitalized according to US-GAAP rules (outlined in Chapter 2) are found in two main accounts, intangible assets and goodwill.

Regarding the income statement, further accounts are collected for intangibles intensities ratio and value analysis. Sales will be used as the denominator for expensed intangible intensities. Earnings will be used in the analysis of value components regarding the balance sheet, while total assets will be used as the denominator for balance sheet intangibles. Book value will be used in the analysis of value components.

The account items are collected for both IPOs and matching seasoned companies. The collection is conducted for two different periods. Accounts are collected "at the time of the offer", as well as in year three after the offer. At the time of the offer accounts are defined as the accounts measured at fiscal year end of the year the IPO was conducted. Fiscal year end is 31 December for most IPOs. For example, if an IPO went public on 30 September 2000 and its financial statement fiscal period end was 31 December 2000, and then the figure provided by the database on 31 December 2000 should be used. In general terms, the procedure to collect accounts of IPOs states that the fiscal year end date may be any date after issuance in the year of issuance of the IPO and even in January and/or February of the year following issuance. The fiscal year end date may precede the issuance date if both are within the March-June time period. For an IPO issued for instance in May 2000 and with a fiscal year end of 31 March account statements will be collected for 31 March 2000. Databases as well as the present research follow this procedure in order to identify data from the financial statements at approximately the same time period. The same procedure is used in the collection of data for seasoned companies.

Using annual data in the present thesis is in compliance with the academic literature. If figures other than annual are given on the IPO prospectus, these would not be used for the following reasons. Some IPO prospectuses provide, in addition to annual, data using different monthly periods, e.g. quarter or semi-annual data. Accounts will have to be measured though within the same interval, i.e. annually or within a specific monthly interval, when research on intangibles intensities ratio analysis is conducted. The same applies in regression analysis for value relevance examination where the accounts are introduced as independent variables. Annualising the three, six and nine months of data may lead to inaccuracies. Since growth of accounts may vary over the year a linear extrapolation will not be true in general.

In order to collect the same accounts for IPOs and seasoned companies in year three after the offer – the IPOs have become by then companies with a 3-year public history - the same methodology is followed. The database values collected refer to financial statements issued three years after the offer.

Table 3.8 shows the database sources for each of the account items. Accounts are extracted from the Thompson Analytics databases. The three databases used in this thesis are WORLDSCOPE, SEC, and COMPUSTAT. More than one database from Thompson Analytics is used in this thesis in order to pinpoint a specific IPO or seasoned company, or an individual account, as not all databases covers all accounts and companies. Information on account data and search parameter definitions relative to the mentioned databases is also given in the table.

A limitation in all Thompson Analytics databases is that they do not provide separate values for the marketing expenses and the selling, general and administrative expenses. SEC provides a single value for both. WORLDSCOPE provides a single value for all three expenses, i.e. R&D, marketing expenses and the selling, general and administrative expenses. By subtracting R&D from the WORLDSCOPE value the combined marketing-selling-general-administrative expense value is derived - as provided by the SEC database in first place – and used in this thesis.

Another problem, affecting only IPOs, is that in order to capitalize R&D and marketing-selling-general and administrative expenses their expenses during the last 10 years are needed. For seasoned companies this is not a major issue because the R&D and the marketing, selling, general and administrative expenses are included in the databases. Yet for IPOs this is not possible because databases provide data only from the year a company has become public. Therefore, all R&D and marketing, selling, general and administrative expenses prior to going public are derived from the IPO prospectus. Usually prospectuses provide data between three and five years before the IPO was conducted.

Differences are observed - for more than one reason - in the values provided by the IPO prospectus and Thompson Analytics as well as between the individual databases WORDLSCOPE, SEC, and COMPUSTAT. First, while WORDLSCOPE usually provides data based on the earliest financial statements, the SEC and COMPUSTAT databases usually provide figures reported by the last financial statements. For example, in collecting the Sales figure of a company for the year 2000, the WORDLSCOPE value would be in accordance with the 2000 income statement accounts. SEC and COMPUSTAT values would provide the Sales figures of the last Income Statement reporting numbers for the year 2000. This last Income Statement would be published probably between 2003 and 2005 and would include Sales figures for the last three to five years accordingly. The respective value for 2000 may differ though from the one given by WORLDSCOPE for the same year. These differences in the values between older and more recent prospectuses can be explained by the fact that companies may correct for mistakes.

Second, unrelated to time, in some instances the one or the other database may provide pro-forma accounts rather than the ones recognized by US-GAAP rules. Pro-forma accounting figures are simply estimates, which accountants of an IPO or seasoned company have calculated using their own rules. It is allowable to report pro-forma data on financial statements provided that US-GAAP estimated figures are also given in the same document. Unfortunately, in most cases, databases mention randomly either the one or the other value. Databases select between the one and the other using their own criteria, which are not even explained in the database tutorials.

To overcome such discrepancies concerning the accuracy of figures for the balance sheet and income statement accounts, the average value is calculated for this thesis from the individual values of a specific account as these are stated in corresponding databases. If a database does not provide a value for a specific item or company this is not considered in the calculation of the average.

Some empirical studies use in their research control variables such as ownership, auditors, investment banks, and use of proceeds. These variables could not be collected here because they could not clearly be identified in the prospectuses or were even missing. To be more specific, all IPOs in this sample have more than one investment banker and auditor, as well as have unclear uses of proceeds. No clear and distinct values could be attributed to this control data.

3.2 Descriptive Statistics

Having outlined the methodology of data selection and collection, descriptive figures on key IPO data are provided in this section. Statistics are given for the IPO sample following the Dow Jones industrial classifications IPO proceeds raised. A comparison of market values between IPOs and matching seasoned firms on the end of first day trading and on 30 June respectively is also included.

3.2.1 IPO Industry Characteristics

The Technology and Internet Yearbook (Morgan and Stanley (2001)) classifies all 551 IPO observations in the sample as technology firms. The fact that they are listed in the NASDAQ, an index that explicitly includes technology-oriented firms, is further evidence that indeed all these IPOs are related to technology. Yet, Table 3.9, Panel A, indicates that according to the Dow Jones industrial classification criterion only 64% of the sample is classified as purely technological, producing computer software or semiconductors mainly. The rest belong to different groupings: Consumer Cyclical - CYC (9%), Financial - FIN (1%), Healthcare - HLT (3%), Industrial - IDU (15%), Non-Consumer Cyclical – NCY (8%), and Telecommunications – TLS (2%). This rest, while technology-oriented and therefore still fitting in the technology IPO definition of the Technology and Internet Yearbook, may also have a non-technological core function. A dot.com firm running a web-site with information and online sales of automobile parts may be classified as consumer cyclical, while one running a website estimating interest rates and giving loans online may be classified as a financial firm.

Technology (TEC) and Industrial (IDU) IPOs show a significant presence in the entire 1995-2000 interval, and constitute more than 90% of IPOs issued between 1995-1998 and 70% of those issued between 1999 and 2000. Technology-oriented consumer cyclical and non-consumer cyclical companies became noticeable in conducting IPOs during the 1999-2000 peak of the IPO boom raising their presence from 4% during 1995-1998 to 15% and 13% respectively.

3.2.2 IPO Money Raised (Proceeds)

Following the above descriptive statistics attention is now focused on proceeds raised by IPOs during the 1995-2000 period. Table 3.9, Panel B, provides average, median and total values of proceeds raised for the entire 551 technology-oriented IPO sample, as well as other industry classifications. The table also relates individual proceeds to totals for the different sub-samples (time periods) and the different industry classifications.

The 551 IPOs used in the research raised a total amount of over 40 billion USD. 263 IPOs, or 47% of the entire sample, where issued in the years 1999-2000. The money that these 263 IPOs raised amounts to more than half of the entire proceeds gained during the whole 1995-2000 period, i.e. 22.7 billion USD or 56% of the entire sample proceeds, indicating the peak of the IPO boom. Accordingly, the mean and median amounts raised through an offer are higher for the 1999-2000 interval. Also the Dow Jones industry classification sub-group mean and median values of proceeds are - consistent with the entire sample - higher for the 1999 to 2000 IPO boom period. These observations indicate the well-known IPO phenomenon of a "hot market", i.e. companies exploit the opportunity of the market boom, and so more of them go public during such a period, raising higher amounts of money through higher firm valuations.

The fact that much higher proceeds were raised during the peak of the IPO boom is also evident looking at sub-groups based on the Dow Jones industrial classification. The following is observed for characteristic industry sub-groups. Whereas consumer cyclical (CYC) technology-oriented IPOs issued between 1999 and 2000 constitute 77% of total number of IPOs for the entire sample period 1995-2000 they raised 86% of the entire CYC sub-group. For industrial technology IPOs (IDU) issued between 1999 and 2000 the respective figures are 41% of IPOs raised 43% of proceeds. Non-consumer cyclical technological IPOs (NCY) issued between 1999 and 2000 give figures of 76% and 81% respectively. Pure technology IPOs (TEC) issued between 1999 and 2000 give figures of 40% and 51%.

Table 3.10 provides descriptive figures on IPOs issued between 1995 and 2000 for all industries from Ritter (2004). They show that 69% of IPOs issued went public during the 1995-1998 interval, while only 31% did so during the 1999-2000 peak. The respective figures for proceeds are 51% and 48%.

Comparing the ratio of these figures for period 1999-2000 vs. period 1995-1998 in Table 3.10 (31/69 = 0.45 for the absolute number of IPOs and 48/51 = 0.94 for the total proceeds) to the ratio of the respective figures from Table 3.9 with data in this thesis relating to technology-oriented IPOs (48/52 = 0.92 from Panel A and 56/44 = 1.27 from Panel B) it is verified that the 1999-2000 peak of the IPO boom was technology driven.

3.2.3 IPO First Day Close Market Value and Matching Sample Market Value on 30 June of the Offer Year

Descriptive figures on market values of IPOs and matching seasoned companies are introduced in the following. IPO market values are measured on the end of the first day of trading, while market values for matching companies are stated for 30 June of the respective IPO issuance year. Matching seasoned companies were selected by the criterion that their market values should be within 30% (higher or lower) of the corresponding IPO market values.

Table 3.11, Panel A and B, provides descriptive figures on all 551 IPOs, as well as Dow Jones industry sub-groups and their matching seasoned firms, with first day close and 30 June market values respectively. Consistently with previous tables descriptive figures are given for the 1995-1998 stage of the IPO boom, as well as for its peak in 1999-2000. Table 3.10, Panel A, focuses on the entire sample as well as on sub-groups with more than 40 observations, Panel B on industries with less than 40 observations. The figures of Table 3.11 indicate clearly the almost perfect match of market values (size) between IPOs and matching seasoned firms.

Descriptive figures on first day close IPO market value show similar patterns as IPO proceeds, as they reflect the amount of money raised through the offer. However, they are higher since they represent the entire value of all shares outstanding, and not just those sold through the IPO. They further may reflect a value increase or decrease as they include first day returns. In many cases during the hot phase of the IPO boom in the late 90ies first day gains are higher than 50% of the offer price. As a result, the 551 IPOs research sample, which raised a total amount of over 40 billion US dollars in proceeds, had a total market value after the first day of trading of 391 billion USD. 47% of the sample issued in the peak of the IPO boom in 1999-2000 had a first day close market value equal to 73% of the entire sample market value, again reflecting the “hot market” IPO boom phenomenon. This is further supported by mean and median IPO first day close market values, all of which are higher for that period.

Splitting the 551 IPOs into sub-groups based on the Dow Jones industrial classification and focusing on classes with more than 40 IPOs similar patterns are recognised for the peak of the IPO boom years. Consumer cyclical (CYC) technology-oriented IPOs issued between 1999 and 2000 constitute 77% of total number of IPOs for the entire sample period 1995-2000 (see Table 3.9, Panel A) and raised 90% of their entire first day CYC sub-group market value (see Table 3.11, Panel A, total values). For industrial technology IPOs (IDU) issued between 1999 and 2000 the respective figures are 41% of IPOs and raised 72% of the entire IDU sub-group first day market value. Non-consumer cyclical technological IPOs (NCY) issued between 1999 and 2000 give figures of 75% and 83% respectively. Pure technology IPOs (TEC) issued between 1999 and 2000 give figures of 40% and 68%. Similar results are obtained for the industrial classifications with less than 40 observations, Table 3.11, Panel B.

Table 3.1-a Business Description of IPOs and Occurrence In Year of Issuance – "The Yearbook 2001"

Year of issuance	2000		1999		1998		1997		1996		1995	
	no	%	no	%	no	%	no	%	no	%	no	%
BUSINESS DESCRIPTION												
CAD/CAM, EDA	3	1,42		0,00	1	1,18		0,00	5	2,45	2	1,38
Computers/PCs	4	1,89	1	0,33	1	1,18	4	3,08	3	1,47	6	4,14
Data Networking	8	3,77	15	4,90	5	5,88	4	3,08	8	3,92	4	2,76
Electronic Manufacturing Services	7	3,30		0,00	1	1,18		0,00	3	1,47	7	4,83
Electronics and Distribution		0,00		0,00		0,00	1	0,77	5	2,45	2	1,38
Gaming		0,00		0,00		0,00		0,00	3	1,47		0,00
Internet Advert. & Direct Marketing	4	1,89	24	7,84	3	3,53		0,00	2	0,98		0,00
Internet/B2B Software	**39**	18,40	**41**	**13,40**	1	1,18		0,00	3	1,47		0,00
Internet Commerce	11	5,19	32	10,46	6	7,06	5	3,85		0,00		0,00
Internet Consulting & Applic. Services	15	7,08	29	9,48	3	3,53	3	2,31	5	2,45	1	0,69
Internet Infrastructure	5	2,36	11	3,59	6	7,06	2	1,54	8	3,92	3	2,07
Internet Infrastructure Services	20	9,43	**41**	**13,40**	5	5,88	4	3,08	7	3,43	3	2,07
Internet Financial Services	3	1,42	15	4,90		0,00	1	0,77	1	0,49		0,00
Internet Portal	*2*	*0,94*	*4*	*1,31*	*4*	*4,71*	*1*	*0,77*	*4*	*1,96*		*0,00*
Internet Portal - *China, Asia*	*3*	*1,42*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Internet Vertical Portal-*Audio Ent.*		*0,00*		*0,00*	*1*	*1,18*		*0,00*		*0,00*		*0,00*
Career Services		*0,00*		*0,00*		*0,00*		*0,00*	*1*	*0,49*		*0,00*
Communication Events		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Domestic Arts		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Education		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Games	*1*	*0,47*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Greetings		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Healthcare, Politics	*2*	*0,94*	*7*	*2,29*		*0,00*		*0,00*		*0,00*		*0,00*
Intern. Serv. Providers		*0,00*	*2*	*0,65*		*0,00*		*0,00*		*0,00*		*0,00*
Internet Research		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Latin America		*0,00*	*3*	*0,98*		*0,00*		*0,00*		*0,00*		*0,00*
Law		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Learning	*3*	*1,42*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Medical Information		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Music	*1*	*0,47*	*4*	*1,31*		*0,00*		*0,00*		*0,00*		*0,00*

highest occurance value first five highest values

(continued)

Table 3.1-b Business Description of IPOs and Occurrence In Year of Issuance – "The Yearbook 2001"

Year of issuance	2000		1999		1998		1997		1996		1995	
Internet Vertical Portal-*Online Directory*	*1*	*0,47*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Public Records		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Question Answering		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Real Estate		*0,00*	*2*	*0,65*	*1*	*1,18*		*0,00*		*0,00*		*0,00*
Recruiting		*0,00*	*4*	*1,31*		*0,00*		*0,00*		*0,00*		*0,00*
Sports		*0,00*	*1*	*0,33*		*0,00*	*1*	*0,77*		*0,00*		*0,00*
Students		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Technology		*0,00*	*2*	*0,65*	*1*	*1,18*		*0,00*	*1*	*0,49*		*0,00*
Teen Entertainm.	*1*	*0,47*	*2*	*0,65*		*0,00*		*0,00*		*0,00*		*0,00*
Tickets		*0,00*	*1*	*0,33*	*1*	*1,18*		*0,00*		*0,00*		*0,00*
Travel		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Weddings		*0,00*	*1*	*0,33*		*0,00*		*0,00*		*0,00*		*0,00*
Internet Vertical Portal- *Women*		*0,00*	*2*	*0,65*		*0,00*		*0,00*		*0,00*		*0,00*
Lasers		0,00		0,00		0,00	1	0,77	1	0,49	2	1,38
Multi-Sector Internet Companies	1	0,47	1	0,33		0,00		0,00		0,00		0,00
Navigation Equipment		0,00		0,00		0,00	1	0,77		0,00		0,00
PCs/Data Storage & Internet Devices	1	0,47		0,00		0,00	1	0,77		0,00		0,00
Peripherals	2	0,94	1	0,33	2	2,35	9	6,92	15	7,35	6	4,14
Radio & TV Equipment		0,00	1	0,33		0,00	7	5,38	2	0,98	5	3,45
Robots		0,00		0,00		0,00		0,00		0,00	1	0,69
Satellites		0,00		0,00		0,00	1	0,77		0,00		0,00
Services	2	0,94	5	1,63	**14**	**16,47**	20	15,38	31	15,20	6	4,14
Semiconductors	21	9,91	11	3,59	5	5,88	10	7,69	2	0,98	16	11,03
Semiconductor Capital Equipment	3	1,42	2	0,65		0,00	3	2,31	4	1,96	7	4,83
Software	17	8,02	11	3,59	18	21,18	**36**	**27,69**	**69**	**33,82**	**57**	**39,31**
Telecom Equipment	23	10,85	18	5,88	4	4,71	12	9,23	20	9,80	7	4,83
Test Equipment	5	2,36	1	0,33	2	2,35	3	2,31	1	0,49	5	3,45
Voice Processing	2	0,94		0,00		0,00		0,00		0,00	3	2,07
Workstations/Servers	2	0,94		0,00		0,00		0,00		0,00	2	1,38
total number per year	**212**	100,00	**306**	100,00	**85**	100,00	**130**	100,00	**204**	100,00	**145**	100,00

total no of IPOs for 1995 to 2000: 1082

highest occurence value first five highest values

Table 3.2-a Business Description of IPOs and Occurrence In Year of Issuance – "The Thesis Sample"

Year of issuance	2000		1999		1998		1997		1996		1995	
	no	%	no	%	no	%	no	%	no	%	no	%
BUSINESS DESCRIPTION												
CAD/CAM, EDA	2	1,87		0,00	1	2,08		0,00	3	2,97	1	1,41
Computers/PCs	2	1,87	1	0,64	1	2,08	2	2,94	1	0,99	1	1,41
Data Networking	4	3,74	11	7,05	3	6,25	3	4,41	4	3,96		0,00
Electronic Manufacturing Services	6	5,61		0,00		0,00		0,00	2	1,98	5	7,04
Electronics and Distribution		0,00		0,00		0,00	1	1,47	3	2,97	1	1,41
Gaming		0,00		0,00		0,00		0,00		0,00		0,00
Internet Advert. & Direct Marketing	2	1,87	12	7,69	1	2,08		0,00	2	1,98		0,00
Internet/B2B Software	**20**	18,69	**20**	12,82	1	2,08		0,00	1	0,99		0,00
Internet Commerce	4	3,74	18	11,54	4	8,33	4	5,88		0,00		0,00
Internet Consulting & Applic. Services	6	5,61	14	8,97	1	2,08	1	1,47	2	1,98		0,00
Internet Infrastructure	1	0,93	6	3,85	4	8,33	1	1,47	5	4,95	3	4,23
Internet Infrastructure Services	10	9,35	14	8,97	3	6,25	1	1,47	3	2,97	2	2,82
Internet Financial Services	1	0,93	6	3,85		0,00		0,00		0,00		0,00
Internet Portal	*1*	*0,93*	*4*	*2,56*	*2*	*4,17*		*0,00*	*2*	*1,98*		*0,00*
Internet Portal - *China, Asia*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Internet Vertical Portal-*Audio Ent.*		*0,00*		*0,00*	*1*	*2,08*		*0,00*		*0,00*		*0,00*
Career Services		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Communication Events		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Domestic Arts		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Education		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Games		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Greetings		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Healthcare, Politics	*2*	*1,87*	*5*	*3,21*		*0,00*		*0,00*		*0,00*		*0,00*
Intern. Serv. Providers		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Internet Research		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Latin America		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Law		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Learning	*1*	*0,93*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Medical Information		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Music	*1*	*0,93*	*2*	*1,28*		*0,00*		*0,00*		*0,00*		*0,00*

highest occurance value first five highest values

(continued)

Table 3.2-b Business Description of IPOs and Occurrence In Year of Issuance – "The Thesis Sample"

Year of issuance	2000		1999		1998		1997		1996		1995	
Internet Vertical Portal-Online Directory		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Public Records		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Question Answering		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Real Estate		*0,00*	*2*	*1,28*		*0,00*		*0,00*		*0,00*		*0,00*
Recruiting		*0,00*	*2*	*1,28*		*0,00*		*0,00*		*0,00*		*0,00*
Sports		*0,00*		*0,00*		*0,00*	*1*	*1,47*		*0,00*		*0,00*
Students		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Technology		*0,00*	*1*	*0,64*	*1*	*2,08*		*0,00*		*0,00*		*0,00*
Teen Entertainm.	*1*	*0,93*		*0,00*		*0,00*		*0,00*		*0,00*		*0,00*
Tickets		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Travel		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Weddings		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Internet Vertical Portal- *Women*		*0,00*	*1*	*0,64*		*0,00*		*0,00*		*0,00*		*0,00*
Lasers		0,00		0,00		0,00	1	1,47		0,00	1	1,41
Multi-Sector Internet Companies		0,00	1	0,64		0,00		0,00		0,00		0,00
Navigation Equipment		0,00		0,00		0,00		0,00		0,00		0,00
PCs/Data Storage & Internet Devices		0,00		0,00		0,00		0,00		0,00		0,00
Peripherals	1	0,93	1	0,64	1	2,08	6	8,82	9	8,91	1	1,41
Radio & TV Equipment		0,00		0,00		0,00	4	5,88	2	1,98	3	4,23
Robots		0,00		0,00		0,00		0,00		0,00	1	1,41
Satellites		0,00		0,00		0,00	1	1,47		0,00		0,00
Services	2	1,87	2	1,28	8	16,67	11	16,18	18	17,82	4	5,63
Semiconductors	6	5,61	4	2,56	4	8,33	3	4,41	1	0,99	9	12,68
Semiconductor Capital Equipment	1	0,93	2	1,28		0,00	2	2,94	2	1,98	4	5,63
Software	10	9,35	6	3,85	**9**	18,75	**20**	**29,41**	**26**	**25,74**	**26**	**36,62**
Telecom Equipment	16	14,95	9	5,77	2	4,17	5	7,35	14	13,86	4	5,63
Test Equipment	4	3,74	1	0,64	1	2,08	1	1,47	1	0,99	2	2,82
Voice Processing	2	1,87		0,00		0,00		0,00		0,00	3	4,23
Workstations/Servers	1	0,93		0,00		0,00		0,00		0,00		0,00
total number per year	**107**	100,00	**156**	100,00	**48**	100,00	**68**	100,00	**101**	100,00	**71**	100,00

total no of IPOs for 1995 to 2000 in the "THESIS": 551

highest occurence value

first five highest values

Table 3.3: Number of surviving IPOs in Year 1, 2 and 3 following the Dow Jones Industry classification

IPO Issuance Year	All Industries	Consumer Cyclical (CYC)	Financial (FIN)	Health Care (HCR)	Industrial (IDU)	Non Consumer Cyclical (NCY)	Technology (TEC)	Tele-Communication (TLS)
Number of IPOs at issuance								
1995-2000	551	52	4	3	81	45	353	13
1995-1998	288	12	1	1	48	11	212	3
1999-2000	263	40	3	2	33	34	141	10
Number of IPOs surviving year 1								
1995-2000	536	50	4	2	81	43	343	13
1995-1998	283	11	1	1	48	10	209	3
1999-2000	253	39	3	1	33	33	134	10
Number of IPOs surviving year 2								
1995-2000	481	37	3	2	78	36	313	12
1995-1998	261	9	0	1	47	7	194	3
1999-2000	220	28	3	1	31	29	119	9
Number of IPOs surviving year 3								
1995-2000	422	26	3	2	72	30	378	11
1995-1998	238	9	0	1	45	4	176	3
1999-2000	184	17	3	1	27	26	102	8

Table 3.4: Number of IPOs merging or acquired in Year 1, 2 and 3 following the Dow Jones Industry classification

IPO Issuance Year	All Industries	Consumer Cyclical (CYC)	Financial (FIN)	Health Care (HCR)	Industrial (IDU)	Non Consumer Cyclical (NCY)	Technology (TEC)	Tele-Communication (TLS)
Total Number of IPOs which merged or acquired								
1995-2000	106	18	1	1	7	12	67	0
1995-1998	46	2	0	0	3	7	33	0
1999-2000	60	18	0	1	4	5	34	0
Number of IPOs merged or acquired up to year 1								
1995-2000	15	2	0	1	0	2	10	0
1995-1998	5	1	0	0	0	1	3	0
1999-2000	10	1	0	1	0	1	7	0
Number of IPOs merged or acquired up to year 2								
1995-2000	45	9	1	0	2	6	27	0
1995-1998	20	1	1	0	1	3	14	0
1999-2000	25	8	0	0	1	3	13	0
Number of IPOs merged or acquired up to year 3								
1995-2000	46	7	0	0	5	4	30	0
1995-1998	21	0	0	0	2	3	16	0
1999-2000	25	7	0	0	3	1	14	0

Table 3.5: Number of IPOs becoming bankrupt and de-listing in Year 1, 2 and 3 after the Dow Jones Industry classification

IPO Issuance Year	All Industries	Consumer Cyclical (CYC)	Financial (FIN)	Health Care (HCR)	Industrial (IDU)	Non Consumer Cyclical (NCY)	Technology (TEC)	Tele-Communication (TLS)
Number of IPOs at issuance								
1995-2000	7	3	0	0	1	1	2	0
1995-1998	2	1	0	0	0	0	1	0
1999-2000	5	2	0	0	1	1	1	0
Number of IPOs de-listing because of financial distress or bankruptcy up until year 1								
1995-2000	0	0	0	0	0	0	0	0
1995-1998	0	0	0	0	0	0	0	0
1999-2000	0	0	0	0	0	0	0	0
Number of IPOs de-listing because of financial distress or bankruptcy up until year 2								
1995-2000	4	1	0	0	1	0	1	0
1995-1998	2	1	0	0	0	0	1	0
1999-2000	2	0	0	0	1	0	0	0
Number of IPOs de-listing because of financial distress or bankruptcy up until year 3								
1995-2000	3	2	0	0	0	1	1	0
1995-1998	0	0	0	0	0	0	0	0
1999-2000	3	2	0	0	0	1	1	0

Table 3.6: Number of IPOs going private and de-listing in Year 1, 2 and 3 after the Dow Jones Industry classification

IPO Issuance Year	All Industries	Consumer Cyclical (CYC)	Financial (FIN)	Health Care (HCR)	Industrial (IDU)	Non Consumer Cyclical (NCY)	Technology (TEC)	Tele-Communications (TLS)
Number of IPOs at issuance								
1995-2000	16	6	0	0	1	2	5	2
1995-1998	2	0	0	0	0	0	2	0
1999-2000	14	6	0	0	1	2	3	2
Number of IPOs de-listing because the company went private up to year 1								
1995-2000	0	0	0	0	0	0	0	0
1995-1998	0	0	0	0	0	0	0	0
1999-2000	0	0	0	0	0	0	0	0
Number of IPOs de-listing because the company went private up to year 2								
1995-2000	6	2	0	0	0	1	2	1
1995-1998	0	0	0	0	0	0	0	0
1999-2000	6	2	0	0	0	1	2	1
Number of IPOs de-listing because the company went private up to year 3								
1995-2000	10	4	0	0	1	1	3	1
1995-1998	2	0	0	0	0	0	2	0
1999-2000	8	4	0	0	1	1	1	1

Table 3.7 Sources of IPO First Day Market Values and Total Index Return Data - IPOs and Matching Firms

Data	*Source / Database*
Proceeds (IPOs only)	IPO prospectus
Offer Market Value (IPOs only)	IPO prospectus
First Day Closing Market Value	DATASTREAM
Total Index Return (RI)	DATASTREAM
concerning trading starting date *back up to 1998 only* *all periods*	IPO Monitor FACTIVA

Table 3.8 Sources of Balance Sheet and Income Statement Accounts IPOs and Matching Firms at Offer and 3 Years after Offer

Account Data	*Source / Database*	*Search Parameter Name*
Income Statement Accounts		
Sales		WS.SALES SEC.SALES
Earnings	WORLDSCOPE SEC	WS.NetIncomeBasic SEC.NetIncome
R&D	IPO prospectus	WS.ResearchAndDevelopmentExpense SEC.ResearchAndDevelopmentExpenses
MSGA Expenses		SEC.SellingGeneralAdminExpense WS.SellingGeneralAdminExpense
Balance Sheet Accounts		
Total Assets	WORLDSCOPE SEC	WS.TotalAssets SEC.TotalAssets CS.TotalAssets
Intangible Assets*		WS.Intangibles SEC.Intangibles CS.Intangibles
Book Value	COMPUSTAT	CS.ShareholdersEquityRstd
Goodwill	WORLDSCOPE, SEC, COMPUSTAT	WS.Goodwill CS.Goodwill

*) *Databases include in their "Intangible Assets" accounts of both Intangible Assets and Goodwill. In order to estimate the actual value of Intangible Assets the Goodwill figure is subtracted from the figure stated in the database.*

Thompson Analytics Databases: WS = Worldscope
SEC = Security Exchange Commission
CS = Compustat

Table 3.9 Number and Pecentage % of Technology-Oriented IPOs following the Dow Jones Industry Classification (Panel A) and Respective Amount of Proceeds Raised in Million USD (Panel B)

PANEL A: Number of IPOs								
IPO Issuance Year	All Industries	Consumer Cyclical (CYC)	Financial (FIN)	Health Care (HCR)	Industrial (IDU)	Non Consumer Cyclical (NCY)	Tech nology (TEC)	Tele-Communi cations (TLS)
No. of IPOs								
1995-2000	551	52	4	3	81	45	353	13
1995-1998	288	12	1	1	48	11	212	3
1999-2000	263	40	3	2	33	34	141	10
Percentage % of IPOs issued per sub-sample (time period) vs. entire sample								
1995-2000	100	100	100	100	100	100	100	100
1995-1998	52	23	25	33	59	24	60	23
1999-2000	48	77	75	67	41	76	40	77
Percentage % of IPOs per industry classification vs. all industries								
1995-2000	100	9	1	1	15	8	64	2
1995-1998	100	4	0	0	17	4	74	1
1999-2000	100	15	1	1	13	13	54	4

PANEL B: Amount of Proceeds Raised in Million $								
Average								
1995-2000	73	70	140	39	78	64	72	115
1995-1998	62	41	174	33	74	50	59	107
1999-2000	86	79	129	42	83	68	91	117
Median								
1995-2000	48	56	157	33	48	63	43	82
1995-1998	35	38	174	33	37	63	34	39
1999-2000	68	60	140	42	72	61	66	86
Total								
1995-2000	40477	3636	561	117	6317	2871	25485	1490
1995-1998	17737	495	174	33	3572	548	12595	321
1999-2000	22740	3141	387	84	2745	2323	12890	1169
Percentage % of Proceeds (based on Total amounts) in sub-samples (time periods)								
1995-2000	100	100	100	100	100	100	100	100
1995-1998	44	14	31	28	57	19	49	44
1999-2000	56	86	69	72	43	81	51	56
Percentage of Proceeds % (based on total amounts) in the different industry classifications								
1995-2000	100	9	1	0	16	7	63	4
1995-1998	100	3	1	0	20	3	71	2
1999-2000	100	14	2	0	12	10	57	5

Table 3.10 Number of IPOs and Respective Amount of Proceeds Raised for All Industries (Ritter (2004)) in Million USD

Time Period	No. of IPOs	% of IPOs	Gross Proceeds (USD)	% of Gross Proceeds
1995-2000	2809	100	270818	100
1995-1998	1934	69	139681	51
1999-2000	875	31	131137	49

Table 3.11 Market Value Comparisons between IPOs (First Day Market Close) and Matching Seasoned Firms (30 June of the offer year of the IPO represented) in Million USD

Panel A: Entire Sample and Industries with MORE than 40 Observations										
	ALL		Consumer Cyclical (CYC)		Industrial (IDU)		Non Consumer Cyclical (NCY)		Technology (TEC)	
	IPOs	Matching Firms	IPOs	Matching Firms	IPOs	Matching Firms	IPOs	Matching Firms	IPOs	Matching Firms
Average										
1995-2000	710	708	737	736	759	753	647	638	696	694
1995-1998	372	369	332	333	360	364	458	465	368	362
1999-2000	1081	1080	858	858	1339	1320	708	694	1190	1194
Median										
1995-2000	286	286	331	330	296	298	470	471	265	255
1995-1998	159	148	162	162	167	164	280	251	146	144
1999-2000	555	527	337	337	626	623	541	499	658	660
Total										
1995-2000	391300	390270	38309	38294	61449	61044	29123	28720	245706	244973
1995-1998	107076	106247	3989	3992	17273	17476	5036	5120	77963	76689
1999-2000	284224	284023	34321	34302	44176	43568	24087	23600	167743	168284
Max										
1995-2000	19500	17313	7793	7701	13263	12411	2041	1956	19501	17313
1995-1998	19500	17313	1458	1461	2717	2794	1883	1931	19501	17313
1999-2000	13263	12411	1559	1527	13263	12411	2041	1956	10227	10310

Panel B: Entire Sample and Industries with LESS than 40 Observations						
	Financial (FIN)		Healthcare (HLT)		Telecommunications (TLS)	
	IPOs	Matching Firms	IPOs	Matching Firms	IPOs	Matching Firms
Average						
1995-2000	1226	1229	292	291	841	881
1995-1998	227	228	108	106	827	878
1999-2000	1559	1563	385	383	845	882
Median						
1995-2000	876	877	165	165	422	436
1995-1998	227	228	108	106	96	100
1999-2000	1525	1527	385	383	481	463
Total						
1995-2000	4904	4917	877	872	10933	11451
1995-1998	227	228	108	106	2481	2635
1999-2000	4677	4689	769	765	8451	8816
Max						
1995-2000	3039	3049	604	600	2651	2913
1995-1998	227	228	108	106	2313	2463
1999-2000	3039	3049	604	600	2651	2913

Differences in values between IPO and MSC statistically not significant

4. COMPARISON OF IPO INTANGIBLE INTENSITIES (Hypothesis 1)

4.1 Introduction

Numerous studies use intangible intensities as an operating performance measure in determining excess returns (Lev and Sougiannis (1996; 1999), Chan et al (2001), Chambers et al (2002), Ho et al (2004), Eberhart (2004), Bernstein (2000; 2001)). Intensity is usually defined through the R&D over Sales ratio. In the case of the Chan et al (2003) study the R&D/Market Value ratio is used instead. R&D intensity is one of the best operating performance predictors for future share price growth and returns (Bernstein (2000; 2001)). R&D intensity is a useful profitability measure for all industries, but it is of particular interest in valuation of technology stocks, especially the ones issued and traded in the 1990ies, as R&D is the core element of their value (Damodaran (2001), Chiang (2006)). Traditional operating performance measures are not necessarily related to R&D intensity. Many intangibles, including R&D, must be expensed under US-GAAP rules. This causes earnings to decrease. There maybe further a mismatch between intangible R&D expenses and sales generated through the R&D investment. Valuations based on earnings lead therefore to poor forecasts in many cases. Lev and Zarowin (1999) and Francis and Shipper (1999) find that the correlation coefficient R^2 between share prices/returns and earnings has sharply decreased from the 1970ies through the 1980ies up to the 1990ies. The decrease is associated with a dramatic increase in intangible intensities. Further, technology stocks often report negative earnings, which cannot be used for valuation purposes. R&D intensity values offer a valuation alternative (Damodaran (2001)). Other intangibles, such as intellectual properties, which in many cases are reported in the balance sheet, also lead to higher future share price growth and returns (Bernstein (2001)).

R&D intangible intensive firms share characteristics of risky growth "glamour" stock. They show lower B/M ratios (Lev and Sougiannis (1999), Amir et al (2006)). Their potential growth derives from future higher sales volume ((Chan et al (2003), Ho et al (2004), Anagnostopoulou and Levis (2006)). This potential growth is associated with risk; sales figures are more volatile and very cyclical, especially for technology stocks (Ho et al (2004)).

As a conclusion from the above information Damodaran (2001), Bernstein (2000; 2001) and Chiang (2006) state that when valuing companies, especially technology firms, and examining their future growth potential and excess returns, one should use intangible intensity as an operating performance measure rather than traditional profitability measures such as earnings.

While literature has thoroughly examined R&D intensity in the context of seasoned companies, studies on IPOs are very limited. IPOs differ from seasoned companies because they show very high first day returns, while their returns subsequently are reduced compared to seasoned companies of the same size and industry (Jenkinson and Ljungqvist (2001)). Bhabra and Pettway (2003) find that R&D intensity measured at the time of the offer negatively affects BHAR three years after the offer. Other measures, such as operating income, earnings and leverage, do not predict future IPO returns. More generally, literature shows that technology IPOs – i.e. the most intangible intensive sector – exhibit the highest under-performance (Demers and Joos (2006), Ritter (1991)) finds that IPOs with lower B/M ratios – B/M being a proxy for R&D intensity (Lev and Sougiannis (1999), Amir et al (2006)) – perform worse compared to seasoned companies.

Many theories exist as to why IPOs show excess returns relative to seasoned companies; Jenkinson and Ljungqvist (2001) provide a summary on these theories. A few empirical studies have attempted to link IPO first day and long-run excess returns to operating performance of earnings. The theoretical backbone of these studies is that firms wish to raise maximum proceeds out of an offer at a time of high potential growth opportunities (Jenkinson and Ljungqvist (2001), Certo et al (2001), Pagano et al (1998), Carpenter and Rondi (2003), Chemmanur et al (2005)). Studies (Jain and Kini (1994), Mikkelson, Partch and Shah (1997), DeGeorge and Zeckhauser (1993)) find evidence that IPOs go public when their earnings and operating income over total assets ratio are very high. In subsequent years these ratios become lower, and researchers claim this could be the cause for the subsequent under-performance. DeGeorge and Zeckhauser (1993) also find that IPOs show higher earnings intensities compared to seasoned companies. One limitation of this research is that it focuses on IPOs with positive earnings. These studies consider the higher operating performance ratios observed in IPOs as the consequence of a simple act of wise timing with respect to growth opportunities (Jenkinson and Ljungqvist (2001)). A few argue that there may be an element of deliberate earnings management by IPO accountants, which contributes to the higher earnings ratios (Teoh et al (1998a; 1998b)).

All the above studies use samples of US IPOs issued in the 1970ies and 1980ies. During that period most IPOs had positive earnings and the relevance of earnings in valuations and predictions of future growth was high. Yet, earnings are of limited use in investigations of technology IPOs operating performance issued between 1995 and 2000 as 56% of those report negative earnings. Kim and Ritter (1999) further argue that earnings do not lead to accurate IPO valuations.

The late 1990ies US IPO technology boom has not been investigated from the IPO operating performance side. As more than half of all technology IPOs and seasoned companies report negative earnings, intangible intensities may provide a perceptible measure of growth and risk (Damodaran (2001). Comparing intangible intensities between IPOs and matching seasoned firms at the time of the offer as well as three years later, may explain why the former showed very high first day returns and subsequently under-performed compared to seasoned firms.

Helwege and Packer (2003) find that during the 1997-1999 period private firms conducting IPOs were much more growth promising, with an R&D over sales ratio of 26.4% vs. 51.4% compared to companies remaining private. It is an open question whether IPOs at the time of the offer were more intangible intensive, growth promising and risky compared to seasoned companies, with their intangible intensities subsequently decreasing and consequently under-performing, while seasoned companies exhibited less change in intangible intensity. There is some indirect evidence that IPO managers may conduct IPOs when their intangibles growth opportunities are very high. For example Kim and Ritter (1999) observe that

IPOs show lower book to market ratios – higher growth opportunities - at the time of the offer compared to three years later. Considering the fact that a lower B/M ratio is associated with higher R&D intensities, they imply that IPOs maybe more R&D intensive than seasoned companies. Helwege and Liang (2004) find that IPOs issued in "hot" markets show lower B/M ratios compared to IPOs issued in "cold" markets. In both periods IPOs show lower B/M ratios compared to seasoned companies. In fact Boone and Raman (2004) clearly state that start-up firms are more R&D intensive, yet they do not provide empirical evidence. There are two main drawbacks with the B/M ratio: a) 10% of all IPOs report negative book value, and b) it may reflect noise and overvaluations rather than intangible intensities. For example, while Helwege and Liang (2004) find that B/M ratios are higher for hot IPOs the respective R&D over sales ratio is lower. An alternative scenario is suggested by the Ernst and Young (1998) study. Technology IPOs failed because they did not invest as much as they should in intangibles. No empirical results accompany this comment.

The hypothesis examined in this chapter is split into two parts: performance (a) at the time of the offer, and (b) three years later. Hypothesis 1A states that IPOs go public - reporting higher expensed intangible intensities (R&D and MSGA/Sales), as well as higher balance sheet intangible intensities ((Intangible Assets + Goodwill)/Total Assets) compared to seasoned companies of the same size and industry. Hypothesis 1B states that by the third year of seasoning neither IPOs nor matching seasoned companies show statistically significant differences on their balance sheet or expensed intangible intensities.

At the time of the offer higher expensed intangibles are expected for two main reasons. First, a higher R&D over sales ratio implies higher growth opportunities and higher returns in the future. Considering the argumentation by Jain and Kini (1994), Mikkelson, Partch and Shah (1997), DeGeorge and Zeckhauser (1993) that firms go public when their operating performance is at its best, IPO managers may decide to go public in a period when their R&D and marketing-selling-general-administrative expenses over sales ratio is very high. Boone and Raman (2004) also support the statement that start-up companies have low sales, and therefore high R&D over sales ratios. Second, Darrough and Rangan (2005) mention that IPOs keep their R&D

expenses low to avoid a decrease in earnings. While this could be evidence favouring lower income statement intangible expenses in IPOs, the Boone and Raman (2004) suggestion implies that lower intangible expenses still lead to higher expensed intangibles ratios, because of the lower sales figures observed in start-up companies.

Higher balance sheet intangible intensities are expected for IPOs than for matching seasoned companies. The assumption is based on the fact that intangibles are the core value element of technology IPOs Ernst and Young (1998). It is expected therefore that technology companies will go public at a time when their balance sheet intangible intensities will be high. They will be higher compared to matching seasoned companies for two main reasons. First, seasoned companies may have less of an incentive to show higher balance sheet intangible intensities at a given time, while IPOs deliberately may select the moment in which their intangibles are at their highest. Second, since IPOs wish to reflect high growth opportunities intangible assets on the balance sheet may be assigned a higher value in expectation of future profits. The last argument is based on literature, e.g. Kim and Ritter (1999) and Guo et al (2005) stating that IPO valuations are more optimistic.

Three years after the offer, according to hypothesis 1B, IPOs and seasoned companies will show about the same levels of intangible intensities. As also suggested by Jain and Kini (1994), Mikkelson, Partch and Shah (1997), DeGeorge and Zeckhauser (1993) the superior IPO performance observed at the time of the offer may deteriorate. Therefore, the higher income statement and balance sheet intangible intensities will be at about the same level.

4.2 Literature Review

4.2.1 Operating Performance

In literature operating performance is checked through two key items: revenues, i.e. sales, and earnings, sometimes also defined as operating income. The theoretical background is simple in that profitable firms show higher operating growth rates, above average relative to the market. Assuming that the market is efficient, there should be some rationale as to which firm is more growth promising. In general, risky firms should exhibit higher sales and earnings growth – based on the profit vs. risk hypothesis. Yet, they should also show a higher variability in sales and earnings, reflecting the risk of investment in such companies.

Chan et al (2003) using a sample of US companies traded between 1951 and 1997 show that a certain pattern may be recognized with firms gaining higher revenues. They find that there is some growth persistence with respect to sales. Consistent with the theory they find that "glamour" stocks", i.e. risky, growth oriented stocks with lower book over market value ratios, show higher future revenue growth. Yet they conclude that there is no guarantee that any kind of firms – risky or not - will constantly generate growing operating income or earnings. The impact of unpredictability of earnings and operating income could be that after all investors maybe vulnerable to misevaluations when using such "traditional" techniques in estimating the value of a firm.

The authors point out intangibles maybe the only factor predicting growth with certain reliability. Referring to intangibles in general terms – by looking at technology companies, which are in general more intangible intensive - they find that technology firms show a high persistence in sales and earnings and operating income growth. Further, focusing on Internet companies they find that while their sales are growing persistently at a high pace, losses in earnings are high.

Focusing on R&D intensive companies they identify those as "glamour" stocks. Amir et al (2006) and Deng et al (1999) confirm this fact. Chan et al (2003) prove this econometrically prove by showing that sales and earnings and operating income growth rates (the regression dependent variable) in subsequent years are positively affected by higher R&D over sales ratios. Their results are in agreement with Chan et al (2001) finding that the highest R&D over sales intensive portfolio shows higher average earnings growth rates 14%, compared to 7% in low R&D intensive portfolios, and 10% for no R&D intensive firms. Anagnostopoulou and Levis (2006) focus on the UK market and find that non R&D reporting stocks do not show any superior operating performance compared to R&D reporting ones. Yet, when looking at only R&D reporting firms of the same industry sector, they find that higher R&D intensive firms show higher sales and gross margin persistence. Earnings growth is not related to R&D intensity.

Gu and Lev (2003), using US companies traded between 1990 and 1999, find that R&D affects annual earnings. They show econometrically that R&D increases earnings (dependent variable). They also show that US firms' earnings are positively affected by brands and advertising, selling, general and administrative expenses, as well as employee incentive pay and employee percentage bonuses. One exception to the rule is goodwill. Chauvin and Hirschley (1994) - using a sample of US companies traded between 1989 and 1991 - and Brown et al (1999) – using a sample of US firms between 1979 and 1997 - find that goodwill is an insignificant factor for net income. One possible explanation for this exception could be that goodwill contributes only to the current value of a firm. It does not reflect growth opportunities (Deng and Lev (1998)).

Having verified through literature findings that intangibles may indeed contribute to higher revenues, attention is now focused on the fact that intangible investments are more risky. Kothari et al (2002), using a sample of 50,000 US companies traded between 1972 and 1997, establish a positive relationship between R&D expenditures and the standard deviation of future earnings. Their conclusion is based on cross-sectional regressions with the dependent variable being the standard deviation of future earnings (1 to 5 years ahead), while the independent variable is R&D intensity. Amir et al (2006) agree with Kothari et al (2002). They use a sample of US companies traded between 1972 and 2002 and find that companies with higher R&D capital over tangible assets ratios yield higher variability in future operating profits. Thus, they confirm the fact that intangible investments are more risky than tangible ones. Lev et al (2002) find that R&D intensive firms' earnings and book values are more volatile.

Ho et al (2004) elaborate on those findings by examining if R&D of sales intensive firms shows higher operating risk. They produce evidence that R&D over sales intensive firms have more cyclical (risky) sales revenues. Cyclicality of sales is especially strong in the technology sector. Yet, they find that R&D intensive firms do not show significant differences in operating leverage, the latter defined as the ratio of changes in EBIT over changes in sales. Their findings are robust in samples including manufacturing companies. In other samples, they can not generate a strong conclusion. This could be in agreement with Chan et al (2001) who do not establish clear patterns about growth and risk. Ho et al (2004) comment that their sample includes firms with positive earnings and of certain size, expressed as market capitalization.

One problem facing operating performance measures, such as earnings, is the fact that earnings have been negative – especially for technology stocks and companies issued or traded in the late 1990s. Empirical studies do not adequately address the issue. Chan et al (2001) include in their sample both positive and negative operating income-reporting firms. Ho et al (2004) omit the negative values. Damodaran (2001) in his guidelines on valuation argues that negative earnings cannot be used as measures on firm valuations. For technology companies, many identified as IPOs, he recommends to use the R&D over sales ratio as a measure of growth and operating performance.

4.2.2 IPO Operating Performance Literature

Various empirical studies have linked the long-term negative excess returns anomaly of IPOs to their operating performance. The argument is that companies time their IPO to coincide with superior operating performance. The objective is to make the market assign high values on IPOs resulting in higher proceeds out of the offer for the issuer. The timing could be a wise managerial decision by the issuer. (Jenkinson and Ljungqvist (2001)) For example, Pagano et al (1998) find that growth promising companies are more likely to go public. Helwege and Liang (2003) find that US IPOs show higher sales growth, as well as lower M/B ratios and R&D investments compared to IPOs companies which are and remain private, as well as compared to matching seasoned companies.

Simultaneously, there could be some form of earnings management, (Jenkinson and Ljungqvist (2001)). Teoh, Welch and Wong (1998a) and Teoh, Wong and Rao (1998b), using 1974 IPOs issued between 1980 and 1984, examine their discretionary current accruals, i.e. recognized current amounts of future sales or expected assets at the time of offer, as well as carry forward current expenses and liabilities at the time they go public. They find that IPOs with higher discretionary accruals ("aggressively reporting") perform 15% to 30% worse in the long run compared to those with lower discretionary accruals ("conservatively reporting"). Aharony et al (1993), Friedlan (1994), Beaver et al (2000) confirm the fact that IPOs exploit accruals as a form of earnings management.

Finally, Chan et al (2003) are the only so far study which jointly examine all the above risk factors which are subject to misevaluation by the market. Using a sample of US IPOs issued between 1980 and 1996 they find that these show higher negative excess returns if they are not venture-backed and higher levels of earnings management and have low reputation under-writers. They define such IPOs as "losers". Further, they find that venture-backed, large IPOs, with lower levels of earnings management and high reputation under-writers in fact over-perform the market.

The implications of the IPO timed superior operating performance is that in the long run, the operating performance of IPOs deteriorates. This could be a factor affecting long run market performance (Jenkinson and Ljungqvist (2001)). Fama (1998) comments that IPOs could be overvalued at offer and thus under-perform in the long run, if earnings growth cannot be predicted accurately. Yet, the unanswered questions are why investors do not learn their lesson and fail to predict the nature of future accounts.

In academic literature the superior (at the time of the offer) and subsequently declining operating performance has been documented with respect to earnings mostly. Jain and Kini (1994) using a sample of US IPOs issued between 1975 and 1988 find that operating returns over total assets and capital expenditures over total assets are higher for IPOs compared to seasoned companies. The higher ratios observed at the time of the offer decrease in the long run. Moreover sales grow less than the IPO assets. In addition sales growth rates, while positive in years one, two and three after the offer, fail to maintain pre-IPO levels. Mikkelson et al (1997) confirm the fact that IPOs have high operating performance before going public, while it deteriorates after going public. DeGeorge and Zeckhauser (1993) using a sample of US IPOs issued between 1979 and 1986 show that LBO – privatised public companies now going public for a second time – have higher operating income relative to their total assets before going public. However, this ratio diminishes after they conduct their IPO.

Coakley et al (2004) focus on UK IPOs issued between 1985 and 2000. They conclude that operating performance, defined as operating cash flow over total assets ratio deteriorates for IPOs five years after they go public. Yet, this overall conclusion is mainly driven by UK IPOs issued between 1998 and 2000. In contrast to most literature, they find that UK IPOs issued before 1998 do not show any statistically significant lower operating performance ratios. Khurshed et al (2004) using a sample of UK IPOs issued between 1995 and 1999 find that pre-IPO operating performance cannot be maintained after the offer.

Agreeing with findings on US and UK IPOs, Pagano et al (1998) find that Italian companies with high growth perspectives are more likely to go public. Italian IPOs investments decline after the offer. The implication of this is that most likely operating performance will decline in the long run.

Two empirical studies challenge to some extent the above findings and observes a different trend. Chemmanur and He (2005) use a sample of US manufacturing companies, which went public between 1972 and 2000. They find that the operating performance of those companies behaved in a U shaped fashion prior and after the offer. To be more specific, empirical results showed that sales, capital expenditure, employment, total labour costs, material costs, and selling, general and administrative costs showed an increasing trend in the years before and after the IPO.. Carpenter and Rondi (2003) find that US IPOs issued in the 1980s and 1990s tend to grow rapidly in terms of assets, capital and employment. This however does not happen with Italian IPOs. Both empirical studies have the uniqueness of measuring absolute values, rather than intensities. Therefore, they cannot directly be compared with all other studies such as Jain and Kini (1994).

As with literature on seasoned companies, a major drawback of all studies investigating IPO operating performance, by examining their earnings or operating income, is that they may have limitations in sample selection. Studies linking operating income or earnings can establish a relationship between earnings and returns only in case of offers reporting positive earning figures. Most studies use a sample of IPOs issued in the 1980ies and early 1990ies. Therefore the fraction of negative earning reporting offers may not be very high. However, Purnanadam and Swaminathan (2004) who look at IPOs issued up to 1997 omit offers with negative earnings, and address this issue as a problem. The sample in the present thesis shows that 56% of all IPOs issued between 1995 and 2000 report negative earnings. Further, Bhabra and Pettway (2003), using US-IPOs issued between 1987 and 1991, question the relationship between long-run returns and traditional profitability measures, such as earnings and leverage. They deduce that traditional operating performance ratios at the time of the offer can predict BHAR performance in year one after the offer only. In contrast, ratios are not significant when examining three-year BHARs.

4.3 Methodology

4.3.1 Accounts Used in Research

Two main groups of intangibles are measured and compared in the thesis: (1) these that are perceived of value by US accounting standards, and thus treated as assets (capitalised) on the balance sheet, and (2) those which are treated as an expense, and therefore reported on the income statement.

Balance sheet intangibles themselves are also split into two main groups: (a) intangible assets and (b) goodwill. Intangible assets consist of intangibles purchased by the firm, such as intellectual properties, customer mailing lists, etc. The criteria for an intangible to be capitalized are provided in Chapter 2. Capitalised software development is the only internally developed intangible. Goodwill, which is reported as a separate account, is defined as the positive value gained by purchased firm's assets through time.

Expensed intangibles are defined as R&D and marketing-selling-general-administrative costs. A detailed review on definitions and accounting standards on those items is found in Chapter 2.

The entire sample in the thesis consists of 551 IPOs issued between 1995 and 2000, and a respective sample of 551 seasoned companies matched by industry (Dow Jones industrial classification) and size (Market Value) at the time of the offer. The intensities of intangibles for both IPOs and seasoned firms are first measured and compared in the short run, i.e. at the end of the year that the IPO went public. In the following, intensities of intangibles are measured and compared in the long run, i.e. three years after the offer.

Defining "long-run operating performance" as a three year interval is based on the following reasons. IPO literature has used this interval in the past to investigate market performance (Ritter (1991), Bhabra and Pettway (2003) Jenkinson and Ljungqvist (2001)). Considering the fact that one of the motivations in comparing operating performance between IPOs and matching seasoned companies is their difference in market performance – as observed in Ritter (1991) and Bhabra and Pettway (2003) – the three year interval presents a consistent definition. Further various studies examining the long-run IPO operating performance, define the long run as a three year interval (Jain and Kini (1994), Loughran and Ritter (1997)).

When looking at the three-year intangibles intensities one must acknowledge the fact that only those IPOs, which survive up until year three, are included in the sample. By doing so the resulting corresponding figures could be considered "biased". Still studies, like Chan et al (2003), do work with companies surviving for a certain period of years only. Thereby they acknowledge a "survival-ship" issue.

The thesis defines intangible intensities both broadly - including all intangibles, either expensed or capitalised - and narrowly - looking at one particular intangible expense or asset. Particular intangible intensities are defined as R&D over sales, marketing-selling-general-administrative expenses over sales, intangible assets over total assets and goodwill over total assets. For all these ratios mean and median values are estimated. R&D and marketing-selling-general-administrative expenses, as well as sales are collected from the income statement. Intangible assets, goodwill and total assets are collected from the balance sheet. Accounts are collected for IPOs and matching firms, in the end of the fiscal year in which the IPO was conducted, as well as on year three after the offer. In order to avoid distort of the results by a "look-ahead bias" pre-flotation data are collected for the IPO sample. The data is collected in the year prior to the offer. Choi et al (2005) and Guo et al (2006) have used the same procedure. Chapter 3 of the thesis provides detailed explanations on data collection and measurement.

Due to the fact that R&D investments must be expensed when incurred and reported in the income statement, firms not reporting R&D show that they have not invested any money in this specific intangible. As observed in the Hand et al (2003a) sample most IPOs and all seasoned companies have incurred some marketing-selling-general-administrative expenses.

Further, according to US-GAAP rules all purchased intangibles must be capitalised. Zero intangible assets on the balance sheet imply that either no investment in intangible assets has been undertaken, or intangibles cannot be capitalised because they are internally generated. Many internally developed intangibles will be reflected in the R&D and marketing-selling-general-administrative expenses.

The reason for defining intangible intensities as the percentage of intangible expenses relative to sales or the percentage of intangible capital relative to total assets is twofold: first, out of compliance to literature also using these measures, to reflect the amount of intangible expenses relative to revenues created by the firm, as well as the amount of intangible assets (capital) relative to total assets; second, sales and total assets are consistent with the intangible expensing and capitalisation accounting policy respectively. As already mentioned capitalised intangibles and total assets are both perceived of value and reported on the balance sheet, while intangible expenses and sales are treated as expenses and revenues and reported therefore on the income statement.

The use of book value as a denominator on intangible intensity is not used, since 10% of the sample reports negative values and the way and timing of IPO book value measurements are not clearly determined. Market value, although used as a size measure in selecting companies, may be inappropriate as a ratio denominator in periods of high share price volatility and rapid growth, like in the late 1990ies.

4.3.2. Statistical Tests and Regressions

Mean and median intangible intensity values of IPOs are compared to the respective values of matching seasoned companies in testing the significance of the hypotheses. The paired two-sample t-test is used to analyze statistically the difference between mean values of intangible intensity of IPOs and respective matching seasoned companies, not assuming equal variances for the two populations. When testing the differences between median values the Wilcoxon-Mann-Whitney test, the median χ^2-test, the Kruskal-Wallis test, and the van-der-Waerden test are used. Failure of even one test to show that medians are statistically different leads to the conclusion that medians are not different. This happens only rarely, in most cases all tests lead to the same conclusion.

In addition to these statistical results the numerator and the denominator values of the intangible intensities ratios are reported in separate sections of the tables. Absolute dollar figures of intangible assets and expenses, as well as total assets and sales are provided in order conceive the influence of these individual parameters upon the intensity performance expressed by the ratios. It is important to understand whether a specific relationship between the two ratio values for IPOs and seasoned companies is influenced primarily by the value of intangible spending or capital or by the denominator value expressed as sales or total assets. Further, the absolute number and the percentage to the total sample of IPO or seasoned companies, within a time interval, is stated, which report a specific asset, expense or revenue.

Further robustness checks have been conducted in order to investigate and compare the behaviour between IPOs and seasoned companies. Logit regressions are used to establish the significance in differences for intangible intensities and intangible investments or additional factors, such as industry type, leverage, sales, and sales growth, which may significantly influence IPOs and seasoned companies. The following five regressions have been used.

[Eq. 4.1]

D_IPO = Intangible Assets / Total Assets + Goodwill / Total Assets + R&D / Sales + MRK&SGA / Sales + Leverage + Sales Growth + D_INDUSTRY

[Eq. 4.2]

D_IPO = (Intangible Assets + Goodwill) / Total Assets + (R&D + MRK&SGA) / Sales + Leverage + Sales Growth + D_INDUSTRY

[Eq. 4.3]

D_IPO = Intangible Assets + Goodwill + R&D + MRK&SGA + Leverage + Sales Growth + D_INDUSTRY

[Eq. 4.4]

D_IPO = (Intangible Assets + Goodwill) + (R&D + MRK&SGA) + Leverage + Sales Growth + D_INDUSTRY

[Eq. 4.5]

D_IPO = Total Assets + Sales + Leverage + Sales Growth +D_INDUSTRY

Regressions 4.1 and 4.2 investigate if intangible intensities, are different between IPOs and matching seasoned companies. Regression 4.1 in particular examines the intensities of all identifiable intangibles on the Balance Sheet (Intangible Assets and Goodwill), as well as on the income statement (R&D and Marketing, Selling General and Administrative Expenses (MRK&SGA)). Regression 4.2 considers additional accounts: Intangible Assets plus Goodwill, i.e. total Balance Sheet Intangibles, and R&D+MSGA expenses, i.e. Total Income Statement Intangibles. Regressions 4.3

and 4.4 are identical in structure to Regressions 4.1 and 4.2 with the difference that they do not examine intangible intensities, but intangible investments instead. In other words, these examine the direct influence of the numerator in the expression for intensities as given in Regressions 4.1 and 4.2 determining differences between IPOs and matching seasoned companies. Note that some control variables have been added in all four regressions. For example an industry dummy will capture the effect of the Dow Jones Industry Classification in which the IPO and matching seasoned company belongs. The classifications examined are technology, industrial, consumer cyclical and consumer non-cyclical companies. There is a separate further classification for the very few IPOs and matching seasoned companies (10 companies), which belong to separate classifications, e.g. companies in the financial or health sector. Sales Growth is measured as three-year growth. Regression 4.5 examines whether Sales and Total Assets, i.e. the denominator of intensities, measured in Regressions 4.1 and 4.2, plays a role in determining differences between IPOs and matching seasoned companies.

In case multicollinearity is an issue in any of the five regressions, the respective multicollinear factor or factors will be removed and the regression repeated. A comprehensive summary of the main Logit regression estimates and results is given in Appendices C and D.

Lastly, Logit regressions are conducted in order to better understand why some IPOs capitalize intangibles on their Balance Sheet. These take the value of 1 if an IPO actually reports some kind of Balance Sheet Intangible, otherwise their value is zero.

4.3.3 Sample Split

The 551 IPOs issued between 1995 and 2000 and the respective 551 matching seasoned companies are further split into two sub-samples for the two periods 1995-1998 and 1999-2000. This is important in order to demonstrate and explain any differences in the performance between IPOs and matching seasoned companies during the different time periods, the beginning of the IPO boom in 1995-1998 and its peak during 1999-2000.

4.4 Empirical Results

4.4.1 Short-Run Intangible Intensities

Table 4.1 Panel A, shows that on average the 551 IPOs issued between 1995 and 2000 have lower balance sheet intangible intensities compared to matching seasoned firms. The average IPO has a balance sheet intangible intensity mean value of 8%, while matching seasoned firms show a value of 10%. The primary cause for IPOs having lower balance sheet intangible intensities is the fact that they are much less goodwill intensive. IPOs mean goodwill intensity is 3.7%, while that of matching seasoned firms 6.6%. In contrast, intangible assets intensities are higher, yet statistically insignificant for IPOs.

Splitting the sample into 1995-1998 and 1999-2000 issued IPOs reveals that firms going public in 1999-2000 exhibited higher balance sheet intangible intensities compared to the ones in 1995-1998. IPOs issued 1995-1998 had exactly the same intangible assets intensities as seasoned companies, i.e. 3%. IPOs issued in the 1999-2000 period increased their intangible assets intensities to 5.6%, where as for seasoned companies the value is 4.3%. Yet, this difference is statistically not significant.

Looking at goodwill intensities, IPOs issued in 1995-1998 showed a value of 2% increasing to 6% for 1999-2000. Matching seasoned companies goodwill intensities were always much higher. For 1995-1998 seasoned companies goodwill intensity shows a mean value of 5%. It increased to 8.5% for 1999-2000 traded companies.

The overall effect was that balance sheet intangible assets intensities between IPO and seasoned companies were reduced from 5% (IPOs) vs. 8% (matching firms) in 1995-1998, to 12% (IPOs) vs. 13% (matching Firms) in 1999-2000. The difference between the two for 1999-2000 is statistically insignificant.

Considering the comment by Lev (2001) that intangibles reflect growth opportunities results reveal that after all IPOs are just as growth promising in terms of intangible capital as seasoned companies. The fact that IPOs are less goodwill intensive could be attributed to the lower number of IPOs generating goodwill. This could well be the case because IPOs may have less of an incentive or purchasing power to merge with other companies at the time of the offer or purchase assets. In fact one of the reasons why IPOs are issued is to conduct those activities subsequently (Helwege and Packer (2003), Ritter (1998)) and thus possibly generate goodwill. Deng and Lev (1998) argue further that goodwill adds value to a company, yet it does not increase its growth opportunities. Thus managers may not be worried after all for the lower goodwill intensity ratios.

A question arises which elements influence primarily the above mentioned ratios and their relationship between IPOs and seasoned companies – is it the intangibles (nominator in the ratio) or total assets, related to the overall size of the company, (denominator in the ratio) which play a role? Table 4.1, Panel B, shows that IPOs have lower absolute dollar amounts of intangible assets and goodwill on their balance sheet compared to seasoned companies. Comparing between IPOs and seasoned companies the difference in the value for goodwill is much larger than for intangible assets. Nevertheless intangible assets intensities are for both IPOs and seasoned companies of about the same value, since IPOs possess less total assets compared to seasoned companies, as revealed from Panel C. It is therefore deduced that IPOs are more risky compared to seasoned companies. Demers and Joos (2006) argue that lower intangible investments (in absolute dollar terms) may seriously affect the survival of IPOs. Further, the overall lower total assets could imply that IPOs are overvalued on the first day of trading. This because IPOs and seasoned companies have been matched based on IPO first day close market value and seasoned companies market value respectively. On the other hand (investigated in subsequent tables), in spite the lower value of total assets for IPOs, growth opportunities and value of IPOs may be generated through R&D expenses rather than assets.

Looking at the sub-samples, IPOs issued in 1999-2000 possess more intangible assets and recognise more goodwill on their balance sheet compared to IPOs issued in the 1995-1998 interval. It seems that IPOs issued in the 1999-2000 interval may have wished to signal to the market that they are investing more in intangibles, thus making their offers safer, compared to those issued in the 1995-1998 interval. Yet seasoned companies from the 1999-2000 period increased the value of their intangible assets much more compared to seasoned companies from 1995-1998. In this context the Ernst and Young (1998) comment that IPO managers did not invest in intangibles as much as they should have had may be justified. A more complete picture of this argument will follow during the examination of expensed intangibles intensity of IPOs in further tables.

Also in the case of the two sub-periods Table 4.1, Panel C, reveals that IPOs posses less total assets compared to seasoned companies. Again this may explain why IPO intangible assets over total assets ratios do not exhibit lower values compared to seasoned firms, even if IPOs posses much lower intangibles assets.

With respect to the increase and subsequent insignificance of total balance sheet intangible intensities of IPOs issued in 1999-2000 the primary driver was not only the fact that IPOs invested more in intangible assets, but also that matching firms increased their assets by much more. This makes the IPO denominator smaller compared to the one of seasoned firms, and therefore the intangible intensity IPO ratio higher.

Median values confirm the fact that IPOs have lower balance sheet intangible intensities (intangible assets as well as goodwill intensities) compared to seasoned companies, Table 4.1, Panel A. Median values are much lower than the respective mean values. This shows that only few IPOs show very high intangibles intensities. Further, it is a fact that many IPOs and seasoned companies do not possess any capitalized intangible assets. Therefore for all periods the median intangible assets intensity (Panel A) and the median intangible asset investment (Panel B) are zero. Goodwill intensity and investment is also zero for IPOs. Seasoned companies goodwill is zero for the 1995-1998 interval. It is 2.6% (Panel A) in the 1999-2000 interval. Median intangible investments and total assets values confirm the findings of mean values; IPOs always exhibit lower values compared to seasoned companies.

Results so far are based on a sample including IPOs possessing or not intangible capital. A question that remains open is if results could be different when focusing only on IPOs reporting intangibles on their balance sheet. Table 4.2, Panel A, shows that focusing on the 327 IPOs which actually have recognized either intangible assets or goodwill or both on their balance sheet at the time they go public, higher balance sheet intangible assets intensities, yet statistically insignificant, compared to seasoned companies are realized. Intangible assets intensities are higher and significantly different between IPOs and seasoned companies, 7.3% vs. 4%. Focusing on the 1995-1998 and 1999-2000 sub-periods results are consistent, intensity values being 6.1% vs. 3.7% and 8.1% vs. 4.3% respectively. Therefore, it is observed and concluded that it is the lower IPO goodwill intensities, which lead to the overall insignificance of balance sheet intangible intensities.

The higher values of intangible assets intensities for IPOs as compared to seasoned companies show also a higher difference in the period of 1999-2000 as compared to the period of 1995-1998, from 6.1% vs. 3.7% to 8.1% vs. 4.3%. Goodwill, which in the 1995-1998 interval is lower for IPOs, 3.1% vs. 5.1% for seasoned companies, becomes statistically insignificant in the 1999-2000 interval.

Panel B shows that even when focusing on only those IPOs, which posses some kind of intangible on their balance sheet, their intangible assets and goodwill capital, measured in absolute dollar terms is lower compared to seasoned companies. This is the result of 1999-2000 issued IPOs with significantly less recognized intangible assets and less recognized goodwill on their balance sheet compared to seasoned companies. Instead, IPOs issued between 1995-1998 show statistically insignificant differences in their balance sheet intangibles. This is attributed mainly to the fact that differences between intangible assets of IPOs issued 1995-1998 and seasoned companies are insignificant. Once more results reveal that IPOs issued in the 1999-2000 interval are more growth promising; yet they are also subject to higher risk, because of lower investments in intangibles.

As observed in Table 4.1 Panel C, Table 4.2 Panel C shows that the higher or statistically insignificant differences in balance sheet intangible intensities are also driven by the fact that seasoned companies possessed more total assets compared to IPOs. Median values support mean values findings

Having compared IPOs and seasoned companies intangibles intensities on the balance sheet attention is now focused on their expensed intangibles, R&D costs as well as marketing-selling-general-administrative costs. Their intensity is expressed in percentage of sales. In Table 4.3, Panel A, IPOs and matching seasoned companies do not show any statistically significant difference on expensed intangible intensities mean values. Yet the median intensity values of IPOs show higher and more significant R&D and marketing-selling-general-administrative expenses compared to respective matching seasoned companies. Median intensity values are much lower than mean values for both IPOs and seasoned companies, indicating once more that high R&D intensities are clustered around a few firms.

Similar with the findings on balance sheet intangible intensities it is observed that both mean and median intangible expenses intensities are higher for IPOs and seasoned companies issued and traded in 1999-2000 relative to 1995-1998. Once more it is concluded that IPOs are more growth promising and risky than seasoned companies. The question that arises is if expensed intangibles intensities are driven by the nominator (intangible expenses) or by the denominator (sales) of the ratio. Table 4.3 Panel B shows that although IPOs have a higher median and a statistically insignificant mean expensed intangible intensity, they incur lower intangible expenses compared to seasoned companies. These results are consistent with Darrough and Rangan (2005) pointing out that IPOs incur lower R&D expenses, possibly to avoid earnings decrease at the time of the offer. IPOs issued in 1999-2000 went public incurring fewer expenses on both R&D and marketing-selling-general-administrative costs compared to ones issued in 1995-1998. In contrast, seasoned companies traded in 1999-2000 incurred higher spending in R&D and marketing-selling-general-administrative expenses, relatively to firms traded in the 1995-1998 interval. The lower spending on intangibles indicates that IPOs are more risky than seasoned companies, since according to Demers and Joos (2006) lower R&D and marketing-selling-general-administrative expenses lead to higher chances of company failure. Based on this criterion, IPOs issued between 1999 and 2000 were more risky compared to 1995-1998; while seasoned companies traded between 1999 and 2000 were less risky compared to 1995-1998.

Table 4.3, Panel C, shows that IPO sales were lower compared to matching firms in accordance with Boone and Raman (2004), who state that young start-up companies have lower sales and therefore higher R&D over sales ratios. IPOs going public in 1999-2000 had lower sales compared to 1995-1998. In contrast matching seasoned companies traded in 1999-2000 reported higher sales compared to 1995-1998. Lower sales are an additional reason for higher risk of IPOs. Again, this supports the idea that IPOs issued in the peak of the IPO boom may have been very growth promising, yet also subject to very high risk. Ritter (1984) uses the volume of sales as a proxy for risk.

Focusing on R&D reporting IPOs only (not presented in the results) leads to very similar results and the same conclusions, since a high proportion of IPOs actually do report R&D.

In order to assure that there is no "look-ahead bias" affecting the results, all the above tests are repeated using pre-flotation data. Tables 4.4 to 4.6 show that the overall findings do not change significantly even when using pre-flotation data. Table 4.4 and Table 4.5, consistent with Tables 4.1 and 4.2, show that overall IPOs exhibit higher, yet not always significant Intangible Assets intensities and lower Goodwill intensities. Table 4.6, consistent with Table 4.3 shows that IPOs have higher, yet not always significant expensed intangibles intensities.

4.4.2 Long-Run Intangible Intensities

Having examined differences in intangible intensities at the time of the offer, between IPOs and matching seasoned companies, attention is now focused on intangible intensity differences in the long run, i.e. three years later.

Table 4.7 shows that IPO balance sheet intangibles mean values three years after issuance continue being lower compared to seasoned companies, 11% vs. 14%. As observed at the time of the offer, it is the IPO goodwill intensity mean, which fails to reach the same level as seasoned companies, 7.2% vs. 10%. Intangible assets intensities are about the same, i.e. differences are less than 1% and insignificant.

It is a fact that IPOs issued in 1995-1998, with balance sheet intangible intensities significantly lower at the time of the offer, i.e. 5% vs. 8% (Table 4.1), and become insignificant in year three compared to matching seasoned companies, i.e. 11% vs. 13% (Table 4.4). Thus intangible intensity values increased for both IPOs and seasoned companies, though this increase was more pronounced for IPOs.

IPOs issued 1999-2000 which at the time of the offer showed statistically insignificant differences in balance sheet intangible intensities compared to seasoned companies, i.e. 12% vs. 13% (Table 4.1), exhibit significantly lower balance sheet intangible intensities compared to seasoned companies three year later, i.e. 11% vs. 16% (Table 4.4). Intensity values for IPOs at the time of the offer and three years later are practically the same.

Looking at the individual components of intangible intensities, like intangible assets and goodwill intensities, it is obvious that the above-mentioned results for the two sub-periods 1995-1998 and 1999-2000 and for both IPOs and matching seasoned companies are influenced by the goodwill intensities primarily.

Median values lead to similar conclusions. They are again much lower than mean values, once more indicating that few IPOs and seasoned companies are very intangible intensive. It is also evident that even three years after their offer many of these companies still have not managed to generate goodwill compared to matching seasoned companies. This could imply that IPOs, up to three years after their offer, still did not purchase as many assets or acquire other companies compared to matching seasoned companies.

Table 4.7, Panel B, shows that even in the long run IPOs still show much lower absolute dollar amounts in capitalised intangible assets and in recognised goodwill compared to seasoned companies. Panel C shows that it is not only intangible assets, but also total assets of IPOs, which remain much lower compared to seasoned companies. In other words it is the denominator which influences the value of the ratios mainly – as was also observed in the case of short run (time of offer) intensity calculations.

It is interesting to observe that IPOs issued between 1995 and 1998 increased the absolute dollar value of their intangible and tangible investments. IPOs issued between 1999 and 2000 did not do so, both their intangible and total assets investment values in year three decreased relative to values at the time of the offer. Matching seasoned companies assigned to IPOs issued in both sub-periods (1995-1998 and 1999-2000) increased their intangible investment values. Median values follow the same pattern.

Focusing now on expensed intangibles, Table 4.5, IPOs three years after issuance do not exhibit statistically significant differences in expensed intangible intensities mean values compared to those of seasoned companies. Median expensed intangible intensities remain significantly higher for IPOs compared to seasoned companies, yet these differences decrease in year three as compared to the time of issuance.

Table 4.8, Panel B, shows that even three years after the offer IPOs incur lower intangible expenses compared to seasoned companies. The primary cost efficiency factor is the marketing-selling-general-administrative expenses. The only exception to the rule is that R&D expenses differences between IPOs and seasoned companies are not statistically significant neither for the entire sample nor the 1995-1998 period. Table 4.5, Panel C shows that even three years after the offer IPOs sales are much lower compared to the ones of seasoned companies.

4.4.3 Closing Remarks in Comparison to Results Reported in Literature

The much higher intangibles assets intensities ratio between 4% and 8% observed for both IPOs and seasoned companies in this thesis is set against the values between 1% and 2% by Chauvin and Hirschey (1994). This reflects the very high intensities of the late 1990ies compared to the 1980ies and early 1990ies and may further be explained by the fact that the thesis covers technology companies while the latter take into account both manufacturing and non-manufacturing companies.

Goodwill intensities observed in the sample of this thesis range between 3.1% and 9,6% and thus are in agreement with results between 5% and 8% from literature for seasoned companies.

In the thesis R&D over sales ratios of IPOs and seasoned companies range between 40% and 50%. The thesis sample consists of technology companies only, which are very R&D intensive. Most other studies find ratios between 5% and 10% for US seasoned companies and refer to more than one industry. For example Gu and Lev (2001) derives a ratio of 5.4% for US companies of all industries traded in 1998. When other studies focus on intangible intensive portfolios of R&D intensities (mostly technology oriented) they do state higher ratios in the range of 20% to 40%.

Even R&D over sales ratios of higher than 100% are reported by Chambers et al (2002) and Boone and Rangan (2004), yet their samples include companies with very low sales figures – moreover in the case of Boone and Ranagan (2004) the reported difference in values is statistically not significant. Such a situation is encountered also in this thesis and the respective ratio reaches a value of 150% for IPOs 3 years after issuance, but the difference in comparison to a ratio of 22% for seasoned companies is statistically insignificant in this case.

Further, IPOs R&D over sales ratios in this thesis are in agreement with Guo et al (2006) reporting a value of 49%. The IPO medians intangible intensities are between 11% and 18%. Guo et al (2006) median is zero, reflecting the fact that much more technology companies in the late 1990ies incurred R&D expenses compared to IPOs issued between 1980 and 1995.

Very few studies report intensities on marketing-sales-general-administrative expenses. Their high mean values in this thesis are supported by results by Hand (2003a), reporting values of 334% and 2.3% in the highest and the lowest quintiles respectively.

4.4.4 Closing Remarks on the Robustness Checks

In order to examine if differences in intangible intensities and investments indeed can determine on whether a company is an IPO or a matching seasoned company, Logit regressions are performed. The value of one is assigned when a company is an IPO and zero when it is a seasoned company. The results are presented in Appendix C (IPOs accounts being measured at fiscal year end in which IPO was conducted) in the corresponding Tables C.1 to C.30, and Appendix D (IPO accounts measured prior to flotation date) in the corresponding Tables D.1 to D.30. Overall, results are consistent with findings of the simple t-test comparison. To be more specific, intangible intensity and intangible investment Logit regression coefficients are significant in the same cases were respective t-test differences of intangibles intensities and investments values are significantly different. In other words, even when including other parameters such as sales growth, leverage or industry dummies, differences in intangibles intensities are still noticeable in the same cases as with the numerical t-test comparison between IPOs and matching seasoned companies. Note that in some cases mutlicollinearity between regression factors is high. This could affect the regression coefficients t-test. In such cases the regression runs again by omitting one of the two multicollinear factors each time.

4.5 Conclusion

Hypothesis 1A, relating to short-run performance and stating that at the time of their offer IPOs show higher balance sheet intangible intensities compared to matching seasoned companies, is only partially supported by the empirical results. It has to be rejected for both the main sample 1995-2000 and the sub-sample 1995-1998. In the case of the sub-sample 1999-2000 the calculated ratio for IPOs was though insignificantly lower.

A complementary picture is displayed when looking at individual components of the sample or the calculated intangible intensities. Intangible assets intensities are again higher yet statistically insignificant when looking at the entire sample for all IPOs, i.e. both balance sheet reporting and non-reporting. Looking at the numerator (intangible assets and goodwill) and the denominator (total assets) of the ratios, it is revealed that IPOs show lower intangible assets and total assets. Thus, their growth opportunities suffer from additional risk because of the smaller investment (Demers and Joos (2006)) and overall IPO company size compared to seasoned companies. IPOs show higher intangible assets intensities only in the context of the 327 IPO balance sheet reporting intangible assets. Such performance reveals that IPOs are more growth promising than seasoned companies in terms of intangible capital.

Goodwill intensity is always lower for IPOs compared to seasoned companies. It may be the case that IPOs have less purchasing power and thus do not acquire other companies or assets as frequently as seasoned companies. This is reflected in the high difference in recognized goodwill between IPOs and matching companies, as well as by the fact that many more IPOs than seasoned companies do not report goodwill. Further, it could be the case that goodwill only reflects value and not growth (Deng and Lev (1998)). Thus managers may not be interested in keeping this ratio high.

Expensed intangibles (R&D and marketing-selling-general-administrative expenses) intensities are higher for IPOs compared to seasoned companies. Results reflect the higher growth opportunities associated with IPOs. Again it is revealed that R&D and marketing-selling-general-administrative expenses investments are lower for IPOs compared to seasoned companies. Thus it is the much lower sales of IPOs which make their intensities become higher. Both these factors bring additional risk to the higher growth opportunities.

Results reveal that while IPOs are more growth promising, there could be an element of misevaluation. Although IPOs are of equal size (total assets or sales) with matching seasoned companies and have invested more in intangibles this is not necessarily the reason for higher growth opportunities. It is rather the fact of much lower total assets and sales - these in connection to already lower intangible investments – as compared to seasoned companies. In other words it is implied that the higher growth opportunities of IPOs are subject to higher risk not only due to higher growth opportunities, but also because of the smaller size in assets, sales, and lower intangible investments.

The fact that IPOs have been matched to seasoned companies by market value could imply that after all the market overvalued IPOs on the first day of trading. Smaller, more risky companies should be valued lower than safer ones.

The results are robust and lead to the same conclusions no matter whether post- or pre-flotation data has been used on the IPO sample. This shows that findings are not affected by any kind of look-ahead bias.

Hypothesis 1B, relating to long-run performance and stating that 3 years after issuance IPOs and seasoned companies show equal ratio values of both balance sheet and income statement intangible intensities is again only partially supported. Total balance sheet intangible intensities are lower for the main sample 1995-2000 and the sub-sample 1999-2000. The sub-sample 1995-1998 with no significant differences between the values is in support of the hypothesis. Goodwill intensities remain lower for IPOs – as was the case in the short-run, too. Intangibles assets intensities are statistically insignificant in support of Hypothesis 1B for all samples. Income statement intangible intensities show statistically insignificant differences between IPOs and seasoned companies for all samples. Differences in mean values are statistically insignificant; differences for median values are statistically significantly higher for IPOs.

Table 4.1: Balance Sheet Intangible Intensities – Investments – Total Assets

for IPOs vs. Matching Seasoned Companies

At offer – all IPOs (Panel A)

Numerator: Investments (Panel B), Denominator: Total Assets (Panel C)

Period	IPOs			Matching Firms		
	Intangible Assets	Goodwill	Total	Intangible Assets	Goodwill	Total
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: Balance Sheet Intangible Intensities in %						
Mean Intangible Intensities in %						
95-00	4.3	3.7***	8.0***	3.7	6.6***	10.0***
95-98	3.0	2.0***	5.0***	3.0	5.0***	8.0***
99-00	5.6	6.0**	12.0	4.3	8.5**	13.0
Median Intangible Intensities in %						
95-00	0	0***	1.0***	0	1.1***	5.3***
95-98	0	0***	0***	0	0***	4.0***
99-00	0	0***	2.8***	0	2.6***	7.7***
Number and Percentage of Companies with Zero Intangible Intensity						
95-00	287 (52%)	398 (72%)	224 (41%)	299 (54%)	262 (48%)	153 (27%)
95-98	164 (57%)	230 (80%)	143 (50%)	169 (59%)	148 (51%)	95 (33%)
99-00	123 (47%)	167 (63%)	81 (31%)	131 (50%)	115 (44%)	58 (22%)
PANEL B: Balance Sheet Intangible Investments in $ millions						
Mean Intangible Investments ($ millions)						
95-00	8.5***	14***	23***	23***	68***	91***
95-98	5.2	2.7***	7.8***	6.9	20***	27***
99-00	12***	27**	39***	40***	121**	161***
Median Intangible Investments ($ millions)						
95-00	0	0***	0.4***	0	1.1***	7.5***
95-98	0	0***	0.2***	0	0***	3.5***
99-00	0.2	0***	2.1***	0	4.5***	23***
Number and Percentage of Companies with Zero Intangible Investments						
95-00	287 (52%)	398 (72%)	224 (41%)	299 (54%)	262 (48%)	153 (27%)
95-98	164 (57%)	230 (80%)	143 (50%)	169 (59%)	148 (51%)	95 (33%)
99-00	123 (47%)	167 (63%)	81 (31%)	131 (50%)	115 (44%)	58 (22%)

Values in (1)-(4), (2)-(5), (3)-(6) statistically significantly different at 10%, 5%**, 1%*** confidence*

PANEL C: Total Assets in $ millions		
	IPOs (1)	Matching Firms (2)
Mean Total Assets ($ millions)		
95-00	179***	732***
95-98	173***	409***
99-00	185***	1087***
Median Total Assets ($ millions)		
95-00	64***	248***
95-98	47***	143***
99-00	94***	464***
Number and Percentage of Companies with Zero Total Assets		
95-00	5 (1%)	0
95-98	2 (1%)	0
99-00	3 (1%)	0

Values in column (1)-(2) statistically significantly different at 10%, 5%**, 1%*** confidence*

Table 4.2: Balance Sheet Intangible Intensities – Investments – Total Assets for IPOs vs. Matching Seasoned Companies
At offer – 327 Balance Sheet Reporting IPOs (Panel A)
Numerator: Investments (Panel B), Denominator: Total Assets (Panel C)

Period	IPOs			Matching Firms		
	Intangible Assets	Goodwill	Total	Intangible Assets	Goodwill	Total
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: Balance Sheet Intangible Intensities in %						
Mean Intangible Intensities in %						
95-00	7.3***	6.2	13.0	4.0***	7.7	12.0
95-98	6.1**	3.1**	9.2	3.7**	5.1**	8.9
99-00	8.1***	8.6	17.0	4.3***	9.6	14.0
Median Intangible Intensities in %						
95-00	2.1***	0*	6.6	0***	2.0*	6.4
95-98	2.0***	0	4.3	0***	0	4.0
99-00	2.2***	0.2	9.4	0***	3.0	8.2
Number and Percentage of Companies with Zero Intangible Intensity						
95-00	63 (19%)	173 (53%)	0	173 (54%)	150 (46%)	82 (25%)
95-98	21 (14%)	87 (60%)	0	82 (57%)	77 (53%)	48 (33%)
99-00	42 (23%)	85 (47%)	0	93 (52%)	73 (40%)	35 (19%)
PANEL B: Balance Sheet Intangible Investments in $ millions						
Mean Intangible Investments ($ millions)						
95-00	14.0**	24.0**	38.0***	30.0**	95.0**	125***
95-98	10.0	5.3**	16.0	8.2	15.0**	24.0
99-00	17.0**	39.0**	56.0***	47.0**	158**	206***
Median Intangible Investments ($ millions)						
95-00	1.1***	0**	4.8	0***	1.5**	9.8
95-98	1.0***	0	2.8	0***	0	4
99-00	1.7**	0.3**	8.2***	0**	5.8**	33.0***
Number and Percentage of Companies with Zero Intangible Investments						
95-00	63 (19%)	173 (53%)	0	173 (54%)	150 (46%)	82 (25%)
95-98	21 (14%)	87 (60%)	0	82 (57%)	77 (53%)	48 (33%)
99-00	42 (23%)	85 (47%)	0	93 (52%)	73 (40%)	35 (19%)

Values in (1)-(4), (2)-(5), (3)-(6) statistically significantly different at 10%, 5%**, 1%*** confidence*

PANEL C: Total Assets in $ millions		
	IPOs (1)	Matching Firms (2)
Mean Total Assets ($ millions)		
95-00	174***	868***
95-98	121***	344***
99-00	217***	1286***
Median Total Assets ($ millions)		
95-00	73***	286***
95-98	50***	147***
99-00	106***	486***
Number and Percentage of Companies with Zero Total Assets		
95-00	0	0
95-98	0	0
99-00	0	0

Values in column (1)-(2) statistically significantly different at 10%, 5%**, 1%*** confidence*

Table 4.3: Income Statement (Expensed) Intangible Intensities–Expenses-Sales for IPOs vs. Matching Seasoned Companies
At offer - all IPOs (Panel A)
Numerator: Expenses (Panel B), Denominator: Sales (Panel C)

Period	IPOs			Matching Firms		
	R&D	MRK & SGA	Total Intangible Expenses	R&D	MRK & SGA	Total Intangible Expenses
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: Income Statement (Expensed) Intangible **Intensities** in %						
Mean Intangible Intensities in %						
95-00	44	134	178	32	92	124
95-98	41	76	117	19	88	107
99-00	48	196	244	46	96	142
Median Intangible Intensities in %						
95-00	13***	43***	60***	2.2***	22***	28***
95-98	11***	33***	42***	1.0***	20***	24***
99-00	18***	78***	106***	4.0***	24***	31***
Percentage of Companies with Zero Intangible Intensity						
95-00	112 (20%)	20 (3.6%)	20 (3.6%)	207 (38%)	0	0
95-98	63 (22%)	11 (4%)	11 (4%)	115 (40%)	0	0
99-00	49 (19%)	9 (3.4%)	9 (3.4%)	92 (35%)	0	0
PANEL B: AT OFFER Intangible **Expenses** in $ millions						
Mean Intangible Expenses ($ millions)						
95-00	11***	36***	48***	24***	157***	181***
95-98	14	38***	52***	13	96***	109***
99-00	8.9***	34***	43***	37***	223***	260***
Median Intangible Expenses ($ millions)						
95-00	4.4	17***	22***	2.9	52***	68***
95-98	3.8***	12***	17***	1.7***	31***	38***
99-00	5.4***	25***	31***	10***	101***	122***
Number and Percentage of Companies with Zero Intangible Expenses						
95-00	112 (20%)	20 (3.6%)	20 (3.6%)	207 (38%)	0	0
95-98	63 (22%)	11 (4%)	11 (4%)	115 (40%)	0	0
99-00	49 (19%)	9 (3.4%)	9 (3.4%)	92 (35%)	0	0

Values in (1)-(4), (2)-(5), (3)-(6) statistically significantly different at 10%, 5%**, 1%*** confidence*

PANEL C: **Sales** in $ millions		
	IPOs (1)	Matching Firms (2)
Mean Sales ($ millions)		
95-00	118***	746***
95-98	152***	458***
99-00	80***	1062***
Median Sales ($ millions)		
95-00	31***	270***
95-98	36***	187***
99-00	25***	426***
Number and Percentage of Companies with Zero Sales		
95-00	20 (3.6%)	2 (0.1%)
95-98	14 (4.9%)	1 (0.3%)
99-00	6 (2.3%)	1 (0.4%)

Values in column (1)-(2) statistically significantly different at 10%, 5%**, 1%*** confidence*

Table 4.4: Balance Sheet Intangible Intensities – Investments – Total Assets for IPOs vs. Matching Seasoned Companies
At offer – Pre-flotation data – all IPOs (Panel A)
Numerator: Investments (Panel B), Denominator: Total Assets (Panel C)

Period	IPOs			Matching Firms		
	Intangible Assets	Goodwill	Total	Intangible Assets	Goodwill	Total
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: Balance Sheet Intangible Intensities in %						
Mean Intangible Intensities in %						
95-00	6***	4***	10	3.7***	6.6***	10.0
95-98	4.6*	2***	6*	3.2*	5.0***	8.0*
99-00	8***	6	14	4.3***	8.5	13.0
Median Intangible Intensities in %						
95-00	0	0***	1***	0	1.1***	5.3***
95-98	0	0	0***	0	0	4.0***
99-00	0	0%***	2***	0	2.6***	7.7***
Number and Percentage of Companies with Zero Intangible Intensity						
95-00	282 (51%)	446 (81%)	244 (44%)	299 (54%)	262 (48%)	153 (27%)
95-98	157 (28%)	251(46%)	143 (26%)	169 (59%)	148 (51%)	95 (33%)
99-00	125 (48%)	195 (74%)	101 (38%)	131 (50%)	115 (44%)	58 (22%)
PANEL B: Balance Sheet Intangible Investments in $ millions						
Mean Intangible Investments ($ millions)						
95-00	4.8***	3***	7.8***	23***	68***	91***
95-98	4.1	1.9***	6***	6.9	20***	27***
99-00	5.6***	4.2***	9.8***	40***	121**	161***
Median Intangible Investments ($ millions)						
95-00	0	0***	104***	0	1.1***	7.5***
95-98	0	0	0***	0	0	3.5***
99-00	0	0***	0.3***	0	4.5***	23***
Number and Percentage of Companies with Zero Intangible Investments						
95-00	282 (51%)	446 (81%)	244 (44%)	299 (54%)	262 (48%)	153 (27%)
95-98	157 (28%)	251 (46%)	143 (26%)	169 (59%)	148 (51%)	95 (33%)
99-00	125 (48%)	195 (74%)	101 (38%)	131 (50%)	115 (44%)	58 (22%)

Values in (1)-(4), (2)-(5), (3)-(6) statistically significantly different at 10%, 5%**, 1%*** confidence*

PANEL C: Total Assets in $ millions		
	IPOs (1)	Matching Firms (2)
Mean Total Assets ($ millions)		
95-00	85***	732***
95-98	111***	409***
99-00	56***	1087***
Median Total Assets ($ millions)		
95-00	16***	247***
95-98	15***	143***
99-00	17***	464***
Number and Percentage of Companies with Zero Total Assets		
95-00	0%	0
95-98	0%	0
99-00	0%	0

Values in column (1)-(2) statistically significantly different at 10%, 5%**, 1%*** confidence*

Table 4.5: Balance Sheet Intangible Intensities – Investments – Total Assets for IPOs vs. Matching Seasoned Companies

At offer – Pre-flotation data -327 Balance Sheet Reporting IPOs (Panel A)

Numerator: Investments (Panel B), Denominator: Total Assets (Panel C)

Period	IPOs			Matching Firms		
	Intangible Assets	Goodwill	Total	Intangible Assets	Goodwill	Total
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: Balance Sheet Intangible **Intensities in %**						
Mean Intangible Intensities in %						
95-00	11***	6.9	18***	3.5***	7.3	11***
95-98	9.2***	3.2	12***	3.3***	5	8.2***
99-00	13***	10	23***	3.7***	9.4	13***
Median Intangible Intensities in %						
95-00	4.4***	0***	8.4*	0***	1.5***	5.9*
95-98	5***	0	6.6*	0***	0	3.7*
99-00	3.8***	0***	12	0***	4***	8
Number and Percentage of Companies with Zero Intangible Intensity						
95-00	38 (12%)	202 (65%)	0 (0%)	166 (53%)	137 (44%)	80 (26%)
95-98	14 (10%)	108 (74%)	0 (0%)	82 (56%)	78 (53%)	50 (34%)
99-00	24 (15%)	94 (58)	0 (0%)	84 (52%)	59 (36%)	30 (18%)
PANEL B: Balance Sheet Intangible **Investments** in $ millions						
Mean Intangible Investments ($ millions)						
95-00	8.6**	5.4***	14***	27**	100***	126***
95-98	8	3.8***	12***	9	20***	29***
99-00	9.1**	6.8***	16***	43**	170***	213***
Median Intangible Investments ($ millions)						
95-00	0.6***	0***	1.4***	0***	2.6***	9.7***
95-98	0.6***	0	0.9	0***	0	4
99-00	0.6*	0***	2.5***	0*	8.4***	31***
Number and Percentage of Companies with Zero Intangible Investments						
95-00	38 (12%)	202 (65%)	0 (0%)	166 (53%)	137 (44%)	80 (26%)
95-98	14 (10%)	108 (74%)	0 (0%)	82 (56%)	78 (53%)	50 (34%)
99-00	24 (15%)	94 (58)	0 (0%)	84 (52%)	59 (36%)	30 (18%)

Values in (1)-(4), (2)-(5), (3)-(6) statistically significantly different at 10%, 5%**, 1%*** confidence*

PANEL C: **Total Assets** in $ millions		
	IPOs (1)	Matching Firms (2)
Mean Total Assets ($ millions)		
95-00	129***	944***
95-98	196	503
99-00	68***	1340***
Median Total Assets ($ millions)		
95-00	20***	272***
95-98	15***	150***
99-00	22***	510***
Number and Percentage of Companies with Zero Total Assets		
95-00	0	0
95-98	0	0
99-00	0	0

Values in column (1)-(2) statistically significantly different at 10%, 5%**, 1%*** confidence*

Table 4.6: Income Statement (Expensed) Intangible Intensities–Expenses-Sales for IPOs vs. Matching Seasoned Companies
At offer – Pre-flotation data - all IPOs (Panel A)
Numerator: Expenses (Panel B), Denominator: Sales (Panel C)

Period	IPOs			Matching Firms		
	R&D	MRK & SGA	Total Intangible Expenses	R&D	MRK & SGA	Total Intangible Expenses
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: Income Statement (Expensed) Intangible **Intensities** in %						
Mean Intangible Intensities in %						
95-00	176**	410**	586**	32**	92**	124**
95-98	89	209	298	19	88	107
99-00	272*	629**	901**	46*	96**	142**
Median Intangible Intensities in %						
95-00	15***	36***	50***	2.2***	22***	28***
95-98	12***	21	34***	1.0***	20	24***
99-00	25***	70***	101***	4.0***	24***	31***
Number and Percentage of Companies with Zero Intangible Investments						
95-00	108 (20%)	18 (3%)	18 (3%)	207 (38%)	0	0
95-98	61 (11%)	9 (2%)	9 (2%)	115 (40%)	0	0
99-00	47 (18%)	9 (3%)	9 (3%)	92 (35%)	0	0
PANEL B: AT OFFER Intangible **Expenses** in $ millions						
Mean Intangible Expenses ($ millions)						
95-00	9.3***	24***	33***	24***	157***	181***
95-98	13	32*	46*	13	96*	109*
99-00	5***	15***	20***	37***	223***	260***
Median Intangible Expenses ($ millions)						
95-00	24	65***	9.6***	2.9	52***	68***
95-98	2.3	4.8***	7.4***	1.7	31***	38***
99-00	2615***	8875***	12383***	10***	101***	122***
Number and Percentage of Companies with Zero Intangible Expenses						
95-00	94(17%)	1%(4)	1%(4)	207 (38%)	0	0
95-98	56 (10%)	4 (1%)	4 (1%)	115 (40%)	0	0
99-00	38 (14)	0 (0%)	0 (0%)	92 (35%)	0	0

Values in (1)-(4), (2)-(5), (3)-(6) statistically significantly different at 10%, 5%**, 1%*** confidence*

	IPOs (1)	Matching Firms (2)
PANEL C: **Sales** in $ millions		
Mean Sales ($ millions)		
95-00	92***	746***
95-98	134***	458***
99-00	45***	1062***
Median Sales ($ millions)		
95-00	16***	270***
95-98	20***	187***
99-00	9.5***	426***
Number and Percentage of Companies with Zero Sales		
95-00	17 (3%)	2 (0.1%)
95-98	8 (1%)	1 (0.3%)
99-00	9 (3%)	1 (0.4%)

Values in column (1)-(2) statistically significantly different at 10%, 5%**, 1%*** confidence*

Table 4.7: Balance Sheet Intangible Intensities – Investments – Total Assets for IPOs vs. Matching Seasoned Companies
All IPOs active in year 3 (Panel A)
Numerator: Investments (Panel B), Denominator: Total Assets (Panel C)

Period	IPOs			Matching Firms		
	Intangible Assets	Goodwill	Total	Intangible Assets	Goodwill	Total
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: Balance Sheet Intangible **Intensities** in %						
Mean Intangible Intensities in %						
95-00	3.7	7.2***	11.0***	3.9	10.0***	14.0***
95-98	4.2	6.4*	11.0	4.0	8.6*	13.0
99-00	3.0	8.3***	11.0***	3.7	13.0***	16.0***
Median Intangible Intensities in %						
95-00	0.01	0***	3.6***	0.2	5.2***	9.2***
95-98	0	0***	3.8***	0	3.0***	7.9***
99-00	0.1**	0***	2.8***	0.8**	6.5***	10.0***
Number and Percentage of Companies with Zero Intangible Intensity						
95-00	209 (49%)	247 (58%)	149 (35%)	196 (46%)	149 (35%)	95 (22%)
95-98	122 (51%)	144 (61%)	81 (34%)	134 (56%)	99 (42%)	62 (26%)
99-00	87 (47%)	103 (56%)	68 (37%)	62 (34%)	50 (27%)	33 (18%)
PANEL B: Balance Sheet Intangible **Investments** in $ millions						
Mean Intangible Investments ($ Millions)						
95-00	12***	31***	43***	37***	137***	174***
95-98	16	31*	46*	23	89*	112*
99-00	7.1***	31***	38***	54***	199***	253***
Median Intangible Investments ($ Millions)						
95-00	0.02	0***	2.4***	0.3	7.3***	16***
95-98	0	0***	3***	0	3.1***	8.3***
99-00	0.05***	0***	1.8***	3.6***	27***	45***
Number and Percentage of Companies with Zero Intangible Investments						
95-00	209 (49%)	247 (58%)	149 (35%)	196 (46%)	149 (35%)	95 (22%)
95-98	122 (51%)	144 (61%)	81 (34%)	134 (56%)	99 (42%)	62 (26%)
99-00	87 (47%)	103 (56%)	68 (37%)	62 (34%)	50 (27%)	33 (18%)

Values in (1)-(4), (2)-(5), (3)-(6) statistically significantly different at 10%, 5%**, 1%*** confidence*

PANEL C: **Total Assets** in $ millions		
	IPOs (1)	Matching Firms (2)
Mean Total Assets ($ millions)		
95-00	304***	982***
95-98	393***	702***
99-00	189***	1342***
Median Total Assets ($ millions)		
95-00	81***	306***
95-98	84***	194***
99-00	69***	526***
Number and Percentage of Companies with Zero Total Assets		
95-00	41 (10%)	11 (3%)
95-98	25 (14%)	6 (3%)
99-00	16 (7%)	5 (2%)

Values in column (1)-(2) statistically significantly different at 10%, 5%**, 1%*** confidence*

Table 4.8: Income Statement (Expensed) Intangible Intensities-Expenses-Sales for IPOs vs. Matching Seasoned Companies
All IPOs active in year 3 (Panel A)
Numerator: Expenses (Panel B), Denominator: Sales (Panel C)

Period	IPOs			Matching Firms		
	R&D	MRK & SGA	Total Intangible Expenses	R&D	MRK & SGA	Total Intangible Expenses
	(1)	(2)	(3)	(4)	(5)	(6)
PANEL A: Income Statement (Expensed) Intangible **Intensities** in %						
Mean Intangible Intensities in %						
95-00	154	425	579	22	48	71
95-98	255	712	967	14	34	48
99-00	24	56	80	33	67	100
Median Intangible Intensities in %						
95-00	14^{***}	39^{***}	53^{***}	2.2^{***}	22^{***}	27^{***}
95-98	12^{***}	34^{***}	46^{***}	1.0^{***}	20^{***}	23^{***}
99-00	16^{***}	47^{***}	66^{***}	4.2^{***}	25^{***}	32^{***}
Number and Percentage of Companies with Zero Intangible Intensity						
95-00	96 (23%)	44 (10%)	43 (10%)	163 (38%)	13 (3%)	14 (3%)
95-98	52 (22%)	17 (7%)	17 (7%)	101 (42%)	6 (3%)	7 (3%)
99-00	44 (24%)	27 (15%)	26 (14%)	62 (34%)	7 (3%)	7 (4%)
PANEL B: Income Statement Intangible **Expenses** in $ millions						
Mean Intangible Expenses ($ Millions)						
95-00	26	61^{***}	88^{***}	28	168^{***}	196^{***}
95-98	35	79^{**}	114	18	122^{**}	140
99-00	15^{***}	38^{***}	54^{***}	41^{***}	227^{***}	268^{***}
Median Intangible Expenses ($ Millions)						
95-00	7.7^{***}	24^{***}	33^{***}	3.4^{***}	58^{***}	73^{***}
95-98	8.1^{***}	25^{***}	37^{*}	1.5^{***}	39^{***}	47^{*}
99-00	7.5	23^{***}	32^{***}	13	96^{***}	135^{***}
Number and Percentage of Companies with Zero Intangible Expenses						
95-00	96 (23%)	44 (10%)	43 (10%)	162 (38%)	13 (3%)	13 (3%)
95-98	52 (22%)	17 (7%)	17 (7%)	100 (42%)	6 (3%)	6 (3%)
99-00	44 (24%)	27 (15%)	26 (14%)	62 (34%)	7 (3%)	7 (4%)

Values in (1)-(4), (2)-(5), (3)-(6) statistically significantly different at 10%, 5%**, 1%*** confidence*

PANEL C: **Sales** in $ millions		
	IPOs (1)	Matching Firms (2)
Mean Sales ($ millions)		
95-00	228^{***}	820^{***}
95-98	312^{***}	650^{***}
99-00	120^{***}	1038^{***}
Median Sales ($ millions)		
95-00	60^{**}	311^{***}
95-98	84^{***}	229^{***}
99-00	44^{***}	419^{***}
Number and Percentage of Companies with Zero Total Assets		
95-00	41 (10%)	13 (3%)
95-98	15 (6%)	6 (3%)
99-00	26 (14%)	7 (4%)

Values in column (1)-(2) statistically significantly different at 10%, 5%**, 1%*** confidence*

5. CAPITALIZATION OF EXPENSED INTANGIBLES (Hypothesis 2)

5.1 Introduction

According to US-GAAP rules R&D as well as marketing-selling-general-administrative investments are considered as of no value and therefore must be expensed when incurred. This conservative accounting policy is required as these intangibles do not fulfil the "asset" status under the rules. An investment may be capitalized only if a specific value can be assigned and distinguished through legal coverage - see Chapter 2 for details. It should also be considered that R&D is very risky and therefore subject to misevaluation. Further, research costs cannot be considered as a distinct entity legally. For similar reasons marketing-selling-general-administrative investments must also be expensed. It is difficult to attribute a certain value to such investments like employee training, improvements in the workforce environment, etc. The positive implication of this conservative accounting policy is that financial statements do not reflect potential value of intangibles, which may not occur or may have been misvalued. On the other hand a negative implication is that current earnings are decreased and that the market may neglect potential increases of future earnings, because of expensed intangibles.

In contrast, the literature is in agreement that the market evaluates companies considering their R&D and marketing-selling-general-administrative expenses as of value. Damodaran (2001) argues in his theoretical guidelines for company valuations that R&D is of value and therefore should be capitalized. He argues further that marketing-selling-general-administrative expenses could be of value. Yet as he points out the value of these expenses may vary depending on the nature of the company.

Empirical studies show that investors agree with the Damodaran (2001) view. Lev and Sougiannis (1996), using a sample of US companies issued between 1975 and 1991, find that market value and returns are better explained when treating R&D and marketing costs as assets. By using cross-sectional regressions with the market value or returns as dependent variables they conclude that the independent variable of intangible capital, i.e. the implied R&D and marketing capital, is positive and very significant. Deng and Lev (1998) and Chambers et al (2003) come to similar conclusions. Oswald and Zarowin (2004) show empirically that the market value of UK firms expensing R&D can be better explained when earnings reported in financial statements are re-estimated assuming R&D as capital. Smith et al (2001), Godfrey and Koh (2001), and Abrahams and Sidhu (1998) come to similar conclusions for R&D of Australian companies.

Lev et al (2002) use a sample of US seasoned companies traded between 1983 and 2000. They apply the Ohlson (1995) cross-sectional regression with the firm market value being the dependent variable. The independent variables are the reported income statement earnings and the reported balance sheet book values. They observe that through adjustment of reported earnings and book values when capitalizing R&D expenses the correlation factor R^2 of the regression increases. The R^2 improvement depends also on the type of industry of the company. The R^2 enhancement is stated as a percentage. An increase of 3.8 percentage points (corresponding to 20% improvement) is registered for companies belonging in the fabrics industry, whereas for companies belonging to the chemical industry the increase is of the order of 32 percentage points (800% improvement). Monahan (1999) empirically shows that by capitalization of R&D the correlation factor improvement is higher the longer the R&D history and the higher previous high growth rates of R&D are.

Based on earlier Lev and Sougiannis (1996) findings, R&D expenses are capitalized when studying their effect on seasoned companies share prices or returns in more recent research by Lev and Sougiannis (1999), Chan et al (2001), Chambers et al (2002), alHorani et al (2003), Darrough and Ye (2005). Kothari et al (2002) is the only study critical about capitalizing R&D. They argue that the US-GAAP rules conservative philosophy is appropriate since R&D intangible intensive firms` future earnings are indeed much more uncertain – expressed through a higher standard deviation of earnings.

Hirschey and Weygandt (1985), Woolridge (1988) and Chan et al (1990) find that both R&D and advertising expenses are perceived as capital in firm valuations. Joshi and Hanssens (2004) provide evidence that advertising investments increase a firm's market value. Hand (2003a) moves one step further and shows that not only a company's R&D costs, being of value, should be capitalized but also all marketing-selling-general-administrative expenses. Using US seasoned companies traded between 1980 and 2000 he runs cross-sectional regressions with the gross margin as the dependent variable, and the implied R&D and the marketing-selling-general-administrative capital as independent variables, all being positive and very significant.

In literature empirical studies report that R&D should be capitalized when valuing publicly trading firms, but very few studies so far have tested the effects of R&D capitalization on IPO market value. These effects may differ in IPOs as they have two distinctly dissimilar properties compared to seasoned companies.

First, IPOs have limited data available on their past performance – usually up to three or five years. The implication is that all IPO investments are subject to higher uncertainty. It is therefore an open question if R&D and marketing and selling-general-administrative expenses should be capitalized – as done with seasoned firms – or if this higher uncertainty makes issuers and/or investors follow US-GAAP rules, arguing that R&D should be expensed, just because of the involved uncertainty.

Second, IPOs have the uniqueness of being valued by two groups with different information levels. This difference in knowledge is also known as information asymmetry (Ljunqvist (2004)). First day returns mean values, the difference between issuer and first day market value, are with 21% very high, implying that the two parties share different views on IPO valuation (Ljunqvist (2004)). Empirical studies directly link IPO under-pricing to information asymmetry associated with R&D investments. They find that higher R&D intensive offers gain higher first day returns, indicating that the issuer and the market value R&D differently (Guo et al (2006), Choi and Kim (2005)). Guo et al (2006) argues that the issuer has more knowledge on the value of R&D and lowers the value of the offer to reflect quality. Money left on the table is regained through SEOs. Choi and Kim (2005) argue that the market has superior knowledge on the value of R&D and thus the issuer compensates the market for revealing its R&D valuations.

Although Guo et al (2005) and Choi and Kim (2005) assume that R&D is of value, i.e. it is perceived as capital by the issuer and the market, they do not apply any of the procedures suggested by Lev et al (2002), Lev and Sougiannis (1996) or Damodaran (2001) to actually capitalize it.

Francis et al (2006), consistent with Guo et al (2005), point out that information asymmetry related to R&D, and more generally to technology companies, could be a factor in increasing IPO first day returns. They favour here the information asymmetry theory, stating again that the issuer is more informed about R&D than the market. Using a sample of US IPOs issued between 1992 and 2000 they find evidence that technology IPOs are more under-priced than other IPOs, and that R&D intensive IPOs do not show any significant differences in their first day returns compared to less intensive ones. This behaviour could be evidence that R&D is not considered as capital either by the issuer or the market or both.

Two studies provide some evidence – even if partially contradictory – on whether R&D is perceived as of value (capital) or as an expense by the issuer and the market. Bartov et al (2002) find that R&D in US Internet IPOs does not increase the offer value significantly, but it increases the first day closing market value. Bhagat and Rangan (2004) find that R&D capital (using a three-year linear capitalization and amortization) increases the offer value and the first day closing market value as well. Yet, R&D has had a negative impact on both during the 1997-2001 IPO boom period. They establish further that the R&D of Internet IPOs affects positively both offer and market value, thus partially disagreeing with Bartov et al (2002). Neither Bartov et al (2002) nor Bhagat and Rangan (2004) have used a method similar to Lev et al (2002) to explicitly test whether R&D capitalization indeed improves the R^2 estimate for the entire company valuation.

From the above, it is an open question if and which of the two parties – issuer or market - capitalize R&D or marketing-selling-general-administrative costs. The objective of this chapter is to investigate this issue. Hypothesis 2A states that the issuer treats R&D and marketing-selling-general-administrative costs of IPOs as expenses in order to allow the market to set its value on expensed intangibles and adjust book value and earnings accordingly. The hypothesis can be supported irrelevant of the fact whether the issuer is either more or less informed about the expensed intangible investments.

In case the issuer is more informed than the market on the value of R&D and marketing-selling-general-administrative costs he may wish to follow US-GAAP rules and expense these intangible costs in order to lower the price and compensate the market for the risk taken when investing in those IPOs. Should the issuer be less informed than the market he may again expense these costs because of fear of litigation (Ljungqvist (2004)). Considering the fact that US-GAAP rules require R&D as well as marketing-selling-general-administrative costs to be expensed – being very risky and subject to misevaluation - the issuer may wish to follow here the expensing policy of the rules rather than increase the price of the IPO by capitalizing expensed intangibles.

The market may wish to capitalize R&D as well as marketing-selling-general-administrative expenses of an IPO. Guo et al (2005) and Choi and Kim (2005) state that R&D is of value and that it leads to better performance of IPOs. CBI (2003) finds that managers perceive all intangibles as value drivers for their offers, implying that the market conceives the value of both capitalized and expensed intangibles.

Damodaran (2001) does not distinguish between IPOs and seasoned companies in firm valuation. He argues that all R&D costs should be capitalized and if the nature of the company is such, marketing-selling-general-administrative expenses as well. Considering that empirical research shows that the market does indeed capitalize R&D (Lev and Sougiannis (1996), Lev et al (2002)) and marketing-selling-general-administrative expenses (Lev and Sougiannis (1996), Hand (2003)) in seasoned companies, it should be expected to do so with its IPO valuations too.

A further open question is how well the Ohlson (1995) model can explain market values concerning IPOs, which have a limited public history and thus limited information on their book values and earnings. It is of special interest to investigate this issue in the context of technology stocks issued in the late 1990ies boom and demonstrate the reliability of the model in IPO valuations compared to seasoned companies. Hypothesis 2B states that in valuations of IPOs R^2 values will be lower than in seasoned companies. The argument is based on literature such as Kim and Ritter (1991) and Bhagat and Rangan (2003) who argue that IPO valuations using accounting data are subject to low R^2 values because of information asymmetry and to some extent noise associated with the offer.

5.2 Literature

Academic literature challenge US GAAP rules conservative accounting policy on R&D. US GAAP require that all R&D investments are expensed when inquired. Damodaran (2001) argues that all intangible investments are valuable and therefore should not be expensed.

Lev and Sougiannis (1994) (1996) are the first empirical academic studies to find that R&D – which under US GAAP must be expensed when incurred – is such an opportunity. Deng and Lev (1998) and Chambers et al (2003), Lev et al (2002) come to similar conclusions. Oswald and Zarowin (2004) show empirically that the market value of UK firms expensing R&D can be better explained when earnings reported in financial statements are re-estimated assuming R&D as capital. Smith et al (2001), Godfrey and Koh (2001), and Abrahams and Sidhu (1998) come to similar conclusions for R&D of Australian companies. All studies use regressions consistent with the Ohlson (1995) model. The dependant variable is market value or returns, and the independent one earnings and book value. R&D capital is either included in the overall Book Value (Lev et al (2002) or separately examined in the regression (Lev and Sougiannis (1994), (1996), Deng and Lev (1998), Chambers et al (2003)). The focus is either on the coefficients significance or the R^2 of the model. Significant coefficients of the Book Value or R&D parameters or higher R^2 in models where R&D is capitalized imply that the market indeed capitalizes R&D. All the above studies use only seasoned companies in their samples.

Two studies provide some evidence – even if partially contradictory – on whether R&D is perceived as of value (capital) or as an expense in IPO samples. They examine if the issuer and the market assign a value on R&D. Bartov et al (2002) find that R&D of US Internet IPOs does not increase significantly the offer value, but it increases the first day closing value. Bhagat and Rangan (2004) find that R&D capital (using a three-year linear capitalization and amortization) increases the value of the offer value and the first day closing market value. Yet, R&D has a negative impact on both during the 1997-2001 IPO boom. They also find that the R&D of internet IPOs positively affects both offer and market value, thus partially disagreeing with Bartov et al (2002). Neither Bartov et al (2002) nor Bhagat and Rangan (2004) used a method similar to Lev et al (2002) to explicitly test whether R&D capitalization indeed improves the R^2 estimate for the entire company valuation. This question is additionally investigated in the present thesis.

While there is agreement in literature on the fact that R&D and – depending on the company – marketing-selling-general-administrative expenses should be capitalized, the issue of proper amortization, i.e. how fast R&D or marketing-selling-general-administrative investments lose their value, is still debated. Damodaran (2001) points out that it depends on the nature of the company and its industry as to how slowly the value of the implied R&D or marketing-selling-general-administrative expense deteriorates.

Lev and Sougiannis (1996) assume that R&D should be capitalized using a depreciation period between four and eight years. Amir et al (2006) argue that a capitalization and amortization of R&D between three and seven years should be used. Lev and Sougiannis (1996) assign a one year life on the implied marketing capital.

Lev and Sougiannis (1996, 1999) and Amir et al (2006), are among the few studies, which do not assume a linear depreciation of the implied R&D capital. Instead, they assign yearly depreciation coefficients, after running regressions whose dependent variable is the operating income before advertising and R&D depreciation. The independent variables are advertising, R&D (depreciated between four and eight years) and total assets. The average coefficients of R&D are used as the percentage for each year to depreciate its implied capital.

The problem with this approach is that the regression used by Lev and Sougiannis (1996, 1999) may be subject to econometrical problems. As pointed out by the authors, operating income and R&D may depend on one another, i.e. R&D may not be a really an independent factor. Correlations within R&D lags may exist and an omitted variables problem as well. In that case coefficients, i.e. the rate of R&D annual depreciation in years one to seven, maybe overstated.

Damodaran (2001) suggests the use of linear capitalization and amortization for R&D, and also in case that any marketing-selling-general-administrative expenses are capitalized. In fact, most other studies also use linear depreciation procedures for capitalizing and amortizing implied intangibles expenses capital. Chan et al (2001) and Chambers et al (2001) use a 20% annual linear depreciation. The National Bureau of Economic Research recommends that the implied R&D capital should be assigned a 15% annual linear depreciation.

Lev et al (2002) conduct a thorough research on how many years of linear depreciation should be used for the implied R&D capital. They find that the optimum improvement - the highest percentage increase of R^2 of the regressions adjusting earnings and book value for the R&D capitalization in relation to R^2 of the regression using reported earnings and book value - requires different depreciation rates depending on the industry in which a company belongs. They conclude that depending on the industry type, a four to nine years linear depreciation should be used. For example, for fabrics companies a maximum of 3.8% improvement in R^2 is derived when using a five-year linear amortization. The 32% maximum in R^2 improvement of chemical companies is derived using an 8 year linear R&D

depreciation. Yet even these researchers comment that the "highest" R^2 improvement does not necessarily imply that all firms belonging to a certain industry require a specific annual capitalization and amortization.

Hand (2003a) uses a one, three, and seven-year depreciation rate for all the above intangible expenses. His depreciation methods are not in agreement with Lev and Sougiannis (1996) who argue that only marketing expenses should be capitalized. These argue further that the life of marketing expenses is not longer than one year. Damodaran (2001) supports the Lev and Sougiannis (1996) methodology for some companies only. He comments that some companies incur marketing-selling-general-administrative expenses with short-lived value to the company. He argues though, in favour of the Hand (2003a) methodology that other firms may invest in these expenses within a certain time, in case the effects of these investments last for a certain number of years.

5.3 Methodology

5.3.1 Accounts Used In Research

The present research capitalizes R&D and marketing-selling-general-administrative expenses assuming linear capitalization and amortization. Following Lev et al (2002) a one to ten year R&D capitalization and amortization analysis is conducted. Marketing-selling-general-administrative expenses are capitalized using a one to six-year capitalization and amortization analysis. The selection of the above time intervals also complies with the rest of the literature, all using capitalization intervals between one and ten years (Amir et al (2006), Lev and Sougiannis (1996), Hand (2003a)). At the time of the offer R&D and marketing-selling-general-administrative expenses are measured at the end of the fiscal period in the year the IPO is conducted. To perform a linear capitalization and amortization analysis between one and ten years of the implied R&D capital, the R&D expense account reported in the income statement is collected for the past ten years before the IPO was conducted. For the linear capitalization and amortization of the implied marketing-selling-general-administrative capital up to six years the marketing-selling-general-administrative expenses in the income statement are collected for the past six years before the IPO was conducted – Chapter 3 provides further details on data collection and measurement.

In case the IPO financial statements do not provide any data for a certain period it is assumed that the intangible expenses for that period are zero. The assumption is based on three facts: First, many IPOs are young companies, which may not have existed prior to that period. Second, prior to that period, many firms did not incur any R&D expenses. In fact, some IPOs clearly show that while they provide financial statements for the last five years before they went public, they incurred intangible expenses only in the last three years. Third, all literature examining the relationship between intangibles and company market value assume that the market derives its information from the financial statements of the company.

AlHorani et al (2003) provide a methodology to find the R&D investments of past years not reporting specific data. They argue that R&D is correlated on a year-by-year basis and so one could estimate a value by extrapolation. Their method is not applied in the present study because their methodology is used for seasoned companies with a long public history and a more stable R&D investment behaviour than IPOs. As mentioned IPOs have a limited time existence only. Further, their R&D growth is not stable and therefore the implied R&D expenses suggested by alHorani et al (2003) could be unrealistic. In support of this argument, Munari et al (2002) argue that the R&D investment strategy and intensities are different when a company is private rather than public.

Earnings and book values are measured at the end of the fiscal period of the year the IPO was conducted. They are collected from the income statement and the balance sheet respectively. An identical collecting procedure is conducted for matching seasoned companies.

The sample used in testing if R&D and marketing-selling-general-administrative expenses are perceived as capital in IPO valuations consists of 439 R&D reporting

IPOs. The same procedure is followed with the matching seasoned companies' sample. A sample of 344 seasoned companies reporting R&D expenses are used in this research out of a total of 551. Lev and Sougiannis (1996; 1999), Lev et al (2002) include in their samples R&D reporting firms only. This procedure is followed here as well since the hypotheses tested involve R&D offers and, consequently, it is irrelevant to those, which do not incur any such expenses.

Almost all 439 IPOs and all 344 matching seasoned companies have incurred also some kind of marketing-selling-general-administrative expense. Therefore, there is no need to subdivide the IPO or the seasoned companies samples further.

5.3.2 Expensed Intangibles Capitalization

The capitalization and amortization of both R&D and marketing-selling-general-administrative expenses is assumed to be linear as suggested by Lev et al (2002) and Damodaran (2001). Table 5.1 provides a detailed numerical description of annual capitalization and depreciation rates when using a one to ten year linear depreciation procedure.

Econometrically derived capitalization and amortization non-linear coefficients are not preferred for two main reasons. First, as observed in Lev and Sougiannis (1996) this kind of approach requires regressions using operating income as a dependent variable and R&D as an independent variable and may provide biased coefficients due to econometrical problems. Second, the present research includes an IPO sample with many companies reporting the time of the offer negative operating income.

The capitalization and amortization procedure of the implied intangible expense capital is estimated based on the guidelines provided by Damodaran (2001). The value of the implied R&D and marketing-selling-general-administrative capital is estimated as:

$$R\&D_{Capital} = \sum_{t=-(n-1)}^{t=0} R\&D_{Expense(t)} \frac{(n+t)}{n} \qquad [5.1]$$

$$MSGA_{Capital} = \sum_{t=-(n-1)}^{t=0} MSGA_{Expense(t)} \frac{(n+t)}{n} \qquad [5.2]$$

The adjusted book value (BV) is estimated as:

$$BV_{Adjusted} = BV_{Reported} + R\&D_{Capital} + MSGA_{Capital} \qquad [5.3]$$

The adjusted earnings (E) are estimated as:

$$E_{Adjusted} = E_{reported} + R\&D_{t\ Expense} + MSGA_{t\ Expense} - Amortization\ of\ R\&D\ Capital - Amortization\ of\ MSGA\ Expense \qquad [5.4]$$

The following definitions are given for Equations [5.1] to [5.4]:

$R\&D_{Capital;}$	The implied R&D capital assuming R&D expenses are considered as of value
$R\&D_{Expense}$	The reported on the income statement R&D expense
$MSGA_{Capital}$	The implied marketing-selling-general-administrative capital assuming marketing-selling-general-administrative expenses are considered as of value
$BV_{adjusted}$	Book value of a company in which the R&D and marketing-selling-general-administrative implied capital is added to the reported on the balance sheet book value
$BV_{Reported}$	The reported book value on a company's balance sheet
$E_{Adjusted}$	Earnings of a company, in which reported earnings reported on the income statement have been adjusted by adding the R&D and marketing-selling-general-administrative expense and subtracted the implied amortization
n	Number of years to amortize the implied R&D and/or marketing-selling-general-administrative capital
t	Depreciation period

5.3.3 Regression Analysis

A very similar methodology to the one reported by Lev et al (2002) is used in this research. The basic model used to test if R&D as well as marketing-selling-general-administrative expenses should be capitalized or not is a regression, which is consistent with the Ohlson (1995) model. Lev et al (2002), Lev and Sougiannis (1994) (1996) and Deng and Lev (1998) have all used it to test for R&D capitalization. It has also been applied in a broader valuation context. For example Barth et al (2003) and Seethamraju (2003) use similar models in the valuations of intellectual properties. It suggests that a company's market value should be equal to its earnings plus its book value, Eq. [5.5].

$$MV_t = E_t + BV_t \qquad [5.5]$$

Earnings and book value are the reported earnings and reported book values found on a firm's income statement and balance sheet respectively. This procedure is followed in the present study, which uses values for earnings and book values for both IPOs and matching firms at the end of the fiscal period at the year the IPO was conducted.

The 439 IPOs sample consists of 58% negative earnings and 8% negative book value reporting offers. The 344 matching seasoned companies report 32% negative earnings and 3% negative book values. Lev et al (2002) and Matolcy and Wyatt (2005) point out that the market values negative earnings and book values differently compared to positive values. In other words, a dollar increase in positive earnings or book value will have a different impact on market value, than an increase in negative earnings or book value. Therefore, the Ohlson (1995) model is estimated using intercept and slope dummy variables, taking the value of 1 if earnings or book values are negative:

$$MV_t = c + D\_BV_t + D\_BV_t * BV_t + BV_t + D\_E_t + D\_E_t * E_t + E_t \qquad [5.6]$$

Definition of cross sectional regression variables at time t (year):

MV_t	Market value of equity (Share price*number of shares outstanding)
D_BV_t	Intercept dummy variable Takes the value of 1 if book value BV is negative
$D\_BV_t*BV_t$	Slope dummy variable Takes the value of 1 if book value BV is negative
BV_t	Reported on the balance sheet book value
D_E_t	Intercept dummy variable Takes the value of 1 if earnings E is negative
$D\_E_t*E_t$	Slope dummy variable Takes the value of 1 if earnings E is negative
E_t	Reported earnings

In a first run of the Ohlson (1995) model, in regression [5.6], book values as reported on the balance sheet and earnings as reported on the income statement are used as independent variables. In a second run the estimate for market value (dependent variable) is derived by adjusting the reported book value and earnings according to Eqs. [5.3] and [5.4], where the implied R&D and implied marketing-selling-general-administrative capital is added to the reported book value, and the R&D expenses and marketing-selling-general-administrative expenses are added to the earnings, while the implied depreciation is subtracted here from the earnings. Table 5.1 provides a detailed explanation as to how expensed intangibles are capitalized and amortized. The above second-run procedure is repeated for consecutive steps of capitalization and amortization from year one onward.

The main interpretation procedure followed in this thesis, as also used by Lev et al (2002), indicates the fitness of data to the regression model and is the main criterion parameter to evaluate whether R&D is capitalized or not. The correlation factor R^2 values of the regressions where the independent variables are the reported book value and earnings are compared to the respective R^2 values of the regressions where the independent variables are the adjusted book values and earnings for R&D and marketing-selling-general-administrative capital. An increase in the R^2 value between the initially reported value and the adjusted (for capitalization of R&D or marketing-selling-general-administrative expenses) value leads to the conclusion that expensed intangibles should be considered as capital.

The R^2 test is a very popular test for comparing regression models and belongs to the so-called relative association studies according to Holthausen and Watts (2000). Monahan (1999), Dhaliwal et al (1999), and Harris et al (1994) - to name a few - also used it. One of its main advantages is its insensitivity to econometrical issues such as multicollinearity and heteroscedasticity.

An analysis of the regression coefficients significance (Ohlson (1995)) in the manner of an incremental association study is presented in Appendix D to this chapter. This is though not the main method applied in the thesis because the objective of the research is to understand the overall effect of expensed intangibles capitalization on IPO and seasoned companies valuations – thus the focus on R^2 estimates.

The above procedure and the R^2 test are applied in this thesis through regression [5.6], the dependent variables taken as (a) Offer Market Value - to test if the issuer of an IPO capitalizes any of its Intangible Expenses (Hypothesis 2A), (b) Market Value - measured at the IPO first day closing price - to test if the market capitalized any of the expensed intangibles (Hypothesis 2A), and (c) Market Value - of seasoned companies measured 30 June of the IPO issuance year (Hypothesis 2B).

In order to control for the differences in Total Assets and Sales (observed in Chapter 4) the Lev et al (2002) model is re-estimated, by specifically taking into account the two parameters. Book Value is assumed to equal Total Assets minus Total Liabilities. The R&D and MRKS capitalization are reflected in the Total Assets components as well as in Earnings. Sales are added in the model as an additional parameter. This component is not affected by R&D or MRKS capitalization. Again, the focus is on the R^2 of the model:

$$MV_t = c + TA_t + LIABILITIES_t + D\_E_t + D\_E_t * E_t + E_t + Sales_t \qquad [5.7]$$

5.4 Empirical Results

The capitalization and amortization of IPO expensed intangibles is treated under 5.4.1 and estimates for R^2 values are given for the samples of the three time periods (1995 to 2000, 1995 to 1998 and 1999-2000) in Tables 5.2 to 5.4 in Panel A and B. The capitalization and amortization of expensed intangibles of seasoned companies is treated under 5.4.2 and corresponding estimates are given in Table 6.5 Panel A, B and C for the three time periods.

5.4.1 Capitalization and Amortization of Expensed Intangibles of IPOs (Hypothesis 2A)

Table 6.2 refers to the R^2 analysis after regression [5.6]. For information on the regression variables see 5.3.3. It shows that the valuations of the 439 R&D reporting IPOs issued between 1995 and 2000 take into account the value of R&D investments. Contrary to the Hypothesis 2A stating that the issuer considers R&D expenses as such and only the market capitalizes them, the R^2 values are enhanced relative to the initial reported value in both Panel A and B. This indicates that both the issuer and the market perceive R&D investments as capital.

In quantitative terms Table 5.2, Panel A focuses on the issuer's IPO valuations and shows book values reported on the balance sheet and earnings on the income statement yielding an initial R^2 value of 0.37. The R^2 increases to 0.59, assuming that R&D has a limited value of one year. Further constant enhancement in R^2 values is observed with increasing capitalization and amortization periods. The maximum R^2 value with 0.84 is derived when using a 9-year linear depreciation. This is a 121% increase compared to the initial value.

Table 5.2, Panel B focuses on the market IPO valuations and shows book values reported on the balance sheet and earnings of the income statement yielding an R^2 value of 0.30. The R^2 increases to 0.38 assuming that R&D has a limited value of one year. A further increase is observed as in Panel A. The highest R^2 value with 0.43 is derived for a 7-year linear depreciation and is 43% higher relative to the original 0.30.

Table 5.2, Panel A and Panel B show that marketing-selling-general-administrative costs capitalization does not cause further increase to the R^2 value. This is an indication that when defining the sample for the whole period between 1995 and 2000 these costs are of no value to either the issuer or the market.

Table 5.3 Panel A focuses on the issuer's valuations of 1995-1998 IPOs and shows book values reported on the balance sheet and earnings of the income statement yielding an R^2 of 0.94. The R^2 increases to 0.96, assuming that R&D has a limited value of one year. A further small improvement in R^2 up to 0.966 is achieved by increasing the R&D capitalization and amortization period. Yet a value of 0.97 is reached in R&D capitalization and amortization between two and five years, and in addition, capitalization of selling-general-administrative expenses between one and two years.

Table 5.3 Panel B focuses on the market valuations of 1995-1998 IPOs and shows book values reported on the balance sheet and earnings on the income statement yielding an R^2 of 0.92. The R^2 increases to 0.94, assuming that R&D has a limited value of one year. Increasing the capitalization and amortization period of R&D between two and five years, as well as perceiving marketing-selling-general-administrative expenses as capital with value lasting between one and two years, leads to an R^2 of 0.95.

Table 54, Panel A contains the issuer's valuations of 1999-2000 IPOs and shows book values reported on the balance sheet and earnings on the income statement yielding an R^2 of 0.205. The R^2 increases to 0.215, assuming that R&D has a limited value of three years. No further increase is observed.

Table 5.4 Panel B contains the market valuations of 1999-2000 IPOs and shows book values reported on the balance sheet and earnings on the income statement yielding an R^2 of 0.09. The R^2 now decreases to 0.08 when treating R&D as capital assuming that R&D has a limited value for one year. This could be an indication that the market considered R&D of 1999-2000 IPOs as an expense in this period. Yet the fact that R^2 increases, when more years in R&D capitalization and amortization are added, indicates that noise may exist in R&D capitalization. Assuming a five-year capitalization for R&D leads to a R^2 of 0.085. The fact that is does not surpass the R^2 value above of 0.09 may come from the fact that the 1999-2000 IPO valuations were rather noisy because investors were very optimistic and uncertain in R&D valuations.

Comparing the 1995-1998 and the 1999-2000 IPO issuance periods big differences are revealed in the R^2 values of the Ohlson (1995) regression. The 1995-1998 IPO regressions have overall much higher R^2 values compared to those issued in the period 1999-2000, a range of 0.90-0.96 compared to 0.10-0.20. The differences may imply that after all during the 1995-1998 period valuations of IPOs were based on rational finance models, using accounting data, such as the Ohlson (1995). Both the issuer and the market followed those guidelines, thus the difference in R^2 between the issuer's and the market's valuation is only 2 percentage points, i.e. 0.94 vs. 0.96.

The very low R^2 values in the 1999-2000 sample reflect the fact that investors may have shifted their attention from accounting data and models like the Ohlson (1995) model to other elements, not reflected in the core elements of value (book value and earnings) of a company. For example market values may be driven by irrational optimism. Irrational optimism can be caused through uncertainty in valuations as suggested by Miller (1977). Further very low R^2 values may imply general "noise" by the market (Collins (1997), or non-linear valuation of accounting data, as Hand (2000a) points out for valuations of intangibles. Empirical research on those issues is beyond the scope of this thesis. It is also of interest that there are differences between issuer and market R^2 values, the market value with 0.08 being lower than that of the issuer with about 0.20. This may reflect the fact that while the issuer still focuses to some extent on accounting data, the market seems to pay little attention to a linear valuation of accounting data.

A challenging aspect is the large increase in R^2 values as a result of R&D capitalization observed in the 1995-2000 interval compared to 1995-1998 and 1999-

2000. The increase is more than 43 percentage points in the 1995-2000 sample, while it is between 1 and 3.5 points in the sub-samples. One possible explanation could be that valuations in earnings and book values (and corresponding R^2 values) may have been different for the 1995-1998 and 1999-2000 intervals. The R^2 values from the original regression analysis of the 1995-2000 sample - treating R&D and marketing-selling-general-administrative costs as expenses – may be low as data is not homogeneous in the individual samples and scatter varies between the time periods. Is R&D capitalized, a common characteristic of the two sub-samples is that variations may be less severe and this leads to an increase of R^2 values. This increase is not due mainly to R&D capitalization though, but rather a time period effect.

Appendix E describes in its first part the coefficients of the Ohlson (1995) model for IPO companies. In the case of IPO negative earnings coefficients become less negative through R&D capitalization. This is strong evidence that as the market subtracts the R&D expenses from earnings – because it capitalizes them – the remaining negative earnings become less valuable (still showing though that some other expenses could be of value) or become insignificant. Collinearity between book value and earnings ranges between 0.20 and 0.62. Yet such collinearity is observed in other studies using the Ohlson (1995) model. For example Matolcky and Wyatt (2005a) use this model in spite of a correlation value of 0.68 between earnings and book value.

5.4.2 Capitalization and Amortization of Expensed Intangibles of Seasoned Companies (Hypothesis 2B)

Table 5.5 refers to the R^2 value estimation after equation [5.6] for seasoned companies. For information on the regression variables see 5.3.3. It provides R^2 estimates for the 344 R&D reporting seasoned companies.

Supporting Hypothesis 2B, the valuations of the market for seasoned companies show higher R^2 values compared to those for IPOs, which do not exceed 0.43. Results confirm Kim and Ritter (1991) and Bhagat and Rangan (2003) stating that the limited public history of IPOs – and therefore the additional uncertainty – may influence the quality of IPO valuations. For the entire 1995-2000 seasoned companies sample the R^2 value is 0.75, Table 5.5 Panel A. It increases steadily to a maximum of 0.79 assuming a 9-year linear capitalization and amortization period of R&D. This is in agreement with empirical findings of the literature demonstrated by Lev and Sougiannis (1996), Damodaran (2001) and Chambers and Jennings (2003)

Comparing seasoned companies R^2 to IPOs (the dependent variable being issuer value) mixed and somewhat inconclusive results are observed. Seasoned companies for 1995-2000 show higher R^2 when reported R&D is expensed, while they show slightly lower R^2 when it is capitalized. As discussed in the previous section, IPO 1995-2000 results maybe affected because of big differences in the 1995-1998 and 1999-2000 periods. Therefore, more accurate and conclusive comparisons can be derived from the sub-period results. Seasoned companies show clearly higher R^2 compared to regressions where the dependant variable is IPO first day close market value.

The R^2 values for seasoned companies are similar to those for IPOs issued 1995-1998, Table 6.5 Panel B, with a range of 0.90 to 0.96. Matolcy and Wyatt (2005a) find similar R^2 values using an identical model on US seasoned technology companies. This indicates that during the optimistic, but not yet the "bubble", period both IPOs and seasoned companies used accounting data to value their companies. In both cases the improvement, following R&D capitalization, is small, between 2.2 and 3 percentage points. This increase is on the lower range of improvement values found by Lev et al (2002). Note that while in IPO valuations, marketing-selling-general-administrative expenses marginally increase the R^2 value, this is not observed with seasoned companies when capitalizing those costs.

Large differences in R^2 values between seasoned companies and IPOs in support of Hypothesis 2B are observed especially for the sample period 1999-2000. Values for seasoned companies range between 0.61 and 0.64. Matolcy and Wyatt (2005a) report R^2 values of 0.69 for both 1999 and 2000 traded seasoned companies. In contrast IPO R^2 values range for this period between 0.08 (market value) and 0.20 (issuer value).

From the above it is understood that accounting data had a lower impact on share prices during 1999-2000 compared to the 1995-1998 period, for both IPOs and seasoned companies. Yet the reduction observed in the second period is much lower for seasoned companies, declining from the 0.90-0.96 range to 0.60-0.65 – instead of a drop from 0.90-0.96 to 0.20-0.08 in case of IPOs.

Appendix E presents the analysis for coefficients of the Ohlson (1995) model in the case of seasoned companies as well. It reveals further that, as observed with IPOs, seasoned companies′ coefficients in the model become more significant and coefficients of earnings become higher when capitalizing R&D. The correlation between book value and earnings is in the range of 0.43 to 0.61 in the entire sample and in the 1999-2000 sub-sample, i.e. similar to the correlations observed in the IPO samples and in Matolcky and Wyatt (2005a). One exception to the rule is the 1995-1998 sub-sample which shows a very high correlation of 0.95 between book value and earnings. Even so, the fact that coefficients and significance levels are within the range observed in the other two less correlated samples, shows that in this case correlation may not be that much of an issue.

5.4.3 Robustness Checks

The big difference in Total Assets and Sales between the IPO and matching seasoned companies sample (Chapter 4) requires some further investigation as to if indeed the above findings are robust. Therefore, all tests are conducted by taking into account the effects of both Total Assets and Sales in the regressions used in Tables 5.2 through 5.5.

Focusing on the 1995-2000 IPO sample, Table 5.6 shows that the R^2 become lower when capitalizing R&D and SGMA, compared to when using reported parameters. This happens no matter if one uses offer market value or IPO first day close as the dependant variable. In other words, the huge increases in R^2 observed in Table 5.2 vanish when considering Total Assets and Sales. This is an argument suggesting that one should focus more into the sub-periods, which are dissimilar in R^2 levels.

Focusing on the 1995-1998 and 1999-2000 sub-periods, Table 5.7 and 5.8 show that the lower R^2 are driven by the 1999-2000 sub-sample. This is consistent with findings in Table 5.3 and 5.4. To be more specific, Table 5.7, consistent with Table 5.3 shows that in the 1995-1998 interval both the issuer and the offer regressions R^2 increase as R&D and MSGA are capitalized. In contrast Table 5.8, consistent with Table 5.4 shows that issuer and offerer regressions for IPOs issued in the 1999-2000 have lower R^2 when capitalizing R&D and MSGA.

Focusing on matching seasoned companies, Table 5.9 is consistent with Table 5.5. It shows that regressions, which are estimated for the matching seasoned companies sample, show higher R^2 when R&D is capitalized. Again, for the 1995-1998 interval, the R^2 of matching seasoned companies regressions are about the same as the ones of IPO regressions. In contrast, matching seasoned companies R^2 values are higher in the 1999-2000 interval.

5.5 Conclusion

Hypothesis 2A assumed that the issuer expenses R&D and marketing-selling-general-administrative costs of IPOs while the market capitalizes those. Empirical results reject the hypothesis.

In agreement with capitalization and amortization durations proposed by Lev and Sougiannis (1996), Amir et al (2006), Lev el al (2002) and Damodaran (2001), IPO R&D value has a life between 3 and 7 years. Tables 6.2, 6.3 and 6.4 show that R^2 values of the Ohlson model (1995) improve when adjusting earnings and book values for R&D capitalization, relative to using reported earnings and book values, i.e. treating R&D as an expense. The only exception to the rule are R^2 values estimated for the period 1999-2000 in regressions with the IPO first day close market value as the dependent variable. In this case R^2 values do not improve relative to the reported value. There is though some improvement as lower depreciation rates are used, and this leads to the conclusion that the market indeed may capitalize R&D. Yet valuations may have been noisy or performed in a non-linear way (Hand (2003a)).

Marketing-selling-general-administrative expenses are of no value, i.e. treated as expenses, by both the issuer and the market in the valuations of IPOs issued 1999-2000. There is evidence, R^2 increases, that the market and the issuer perceive marketing-selling-general-administrative expenses as of value when valuing IPOs issued in 1995-1998. As suggested by Lev and Sougiannis (1996) and Damodaran (2001) the life of this asset is limited between one and two years.

Results indicate that R^2 values as well as corresponding improvement rates for IPOs resulting from the capitalization of R&D and marketing-selling-general-administrative expenses are of the same magnitude for the issuer and market regression analyses in the 1995-1998 interval indicating that both follow accounting data in their valuations. Thus it may be deducted that the level of information asymmetry between the issuer and the market in that interval is low. In other words, both parties may have shared the same view about the value of the IPO, and so with respect to R&D and marketing-selling-general-administrative expenses used the same valuation policy, i.e. capitalized these expenses.

In contrast, R^2 values for the peak of the IPO boom period of 1999-2000 are distinctly higher for regressions with the issuer's IPO valuation as the dependent variable than those with the market's first day close valuation. This could be an indication, as suggested by Guo et al (2006), that the issuer is more confident and possesses more knowledge on pricing IPOs. This is also observed with respect to R&D capitalization. Despite superior knowledge though it seems that the issuer prefers to capitalize R&D at the time of the offer and receive money from its value, rather than wait for a later increase in value.

Mixed results are derived with respect to hypothesis 2B stating that R^2 are higher for seasoned companies compared to IPOs in the period 1995-2000. The 1995-2000 interval shows a varying relationship depending on the capitalization policy of R&D. By looking at the sub-samples a more conclusive analysis may be reached.

The hypothesis is almost rejected in the 1995-1998 period. Seasoned companies show the same levels of R^2 as do IPOs. This point challenges literature such as Kim and Ritter (1999), Bhagat and Raman (2004) who argue that valuations of IPOs are subject to higher information asymmetry, uncertainty and noise, and should therefore correspond to lower R^2 values. On the other hand, Fama (1998) would support the results, stating that, once correctly adjusted for industry and time interval, information asymmetry may be reduced.

Hypothesis 2B is accepted looking at the 1999-2000 interval, but especially so in the case of the 1999-2000 interval. Empirical results show much higher R^2 values for seasoned companies than IPO valuations of both issuer and market. It is therefore understood that the peak of the IPO boom during 1999-2000 is the main source and drives information asymmetry and higher uncertainty in the valuations of IPOs compared to seasoned companies.

Robustness checks, taking into account differences in Total Assets and Sales between the two samples, come to the overall same conclusion.

Table 5.1: Capitalization and Amortization Procedure

Lag	**Intangible Capital (Added to Book Value)**	**Intangible Amortization (Subtracted from Earnings)**
0	100%*$R\&D_{t0}$	100%*$R\&D_{t-1}$
1	100%*$R\&D_{t0}$ + 50%*$R\&D_{t-1}$	50%*$R\&D_{t-1}$+50%*$R*D_{t-2}$
2	100%*$R\&D_{t0}$ + 66%*$R\&D_{t-1}$ + 33% $R\&D_{t-2}$	33%*$R\&D_{t-1}$+ 33%*$R\&D_{t-2}$+33%*$R\&D_{t-3}$
3	100%*$R\&D_{t0}$ + 75%*$R\&D_{t-1}$ + 50% $R\&D_{t-2}$ + 25%* $R\&D_{t-3}$	25%*$R\&D_{t-1}$+ 25%*$R\&D_{t-2}$ + 25%*$R\&D_{t-3}$ + 25%*$R\&D_{t-4}$
4	100%*$R\&D_{t0}$ + 80%*$R\&D_{t-1}$ + 60% $R\&D_{t-2}$ + 40%* $R\&D_{t-3}$ + 20%* $R\&D_{t-4}$	20%*$R\&D_{t-1}$+ 20%*$R\&D_{t-2}$ + 20%*$R\&D_{t-3}$ + 20% * $R\&D_{t-4}$ +20%*$R\&D_{t-5}$
5	100%*$R\&D_{t0}$ + 83%*$R\&D_{t-1}$ + 66% $R\&D_{t-2}$ + 50%* $R\&D_{t-3}$ + 33%* $R\&D_{t-4}$ + 16% * $R\&D_{t-5}$	16.67%*$R\&D_{t-1}$ +16.67% $R\&D_{t-2}$ + 16.67%* $R\&D_{t-3}$ + 16.67%* $R\&D_{t-4}$ + 16.67% * $R\&D_{t-5}$ + 16.67%*$R\&D_{t-6}$
6	100%*$R\&D_{t0}$ + 86%*$R\&D_{t-1}$ + 71% $R\&D_{t-2}$ + 57%* $R\&D_{t-3}$ + 43%* $R\&D_{t-4}$ + 29% * $R\&D_{t-5}$ + 14% * $R\&D_{t-6}$	14%*$R\&D_{t-1}$ + 14% $R\&D_{t-2}$ + 14%* $R\&D_{t-3}$ + 14%* $R\&D_{t-4}$ + 14% * $R\&D_{t-5}$ + 14% * $R\&D_{t-6}$ +14%*$R\&D_{t-7}$
7	100%*$R\&D_{t0}$ + 87.5%*$R\&D_{t-1}$ + 75% $R\&D_{t-2}$ + 62.5%* $R\&D_{t-3}$ + 50%* $R\&D_{t-4}$ + 37.5% * $R\&D_{t-5}$ + 25% * $R\&D_{t-6}$ + 12.5%*$R\&D_{t-7}$	12.5%*$R\&D_{t-1}$ + 12.5% $R\&D_{t-2}$ + 12.5%* $R\&D_{t-3}$ + 12.5%* $R\&D_{t-4}$ + 12.5% * $R\&D_{t-5}$ + 12.5% * $R\&D_{t-6}$ +12.5%*$R\&D_{t-7}$
8	100%*$R\&D_{t0}$ + 89%*$R\&D_{t-1}$ + 78% $R\&D_{t-2}$ + 67%* $R\&D_{t-3}$ + 56%* $R\&D_{t-4}$ + 44% * $R\&D_{t-5}$ + 33% * $R\&D_{t-6}$ + 22%*$R\&D_{t-7}$ + 11%*$R\&D_{t-8}$	11.11%*$R\&D_{t-1}$ + 11.11% $R\&D_{t-2}$ + 11.11%* $R\&D_{t-3}$ + 11.11%* $R\&D_{t-4}$ + 11.11% * $R\&D_{t-5}$ + 11.11% * $R\&D_{t-6}$ +11.11%*$R\&D_{t-7}$ + 11.11%*$R\&D_{t-8}$
9	100%*$R\&D_{t0}$ + 90%*$R\&D_{t-1}$ + 80% $R\&D_{t-2}$ + 70%* $R\&D_{t-3}$ + 60%* $R\&D_{t-4}$ + 50% * $R\&D_{t-5}$ + 40% * $R\&D_{t-6}$ + 30%*$R\&D_{t-7}$ + 20%*$R\&D_{t-8}$ + 10%* $R\&D_{t-9}$	10%*$R\&D_{t-1}$ + 10% $R\&D_{t-2}$ + 10%* $R\&D_{t-3}$ + 10%* $R\&D_{t-4}$ + 10% * $R\&D_{t-5}$ + 10% * $R\&D_{t-6}$ +10%*$R\&D_{t-7}$ + 10%*$R\&D_{t-8}$ + 10% * $R\&D_{t-9}$

Table 5.2: R^2 Analysis (Ohlson model) for IPOs
Reported vs. Adjusted (R&D and MSGA Capitalization)
Book Values and Earnings
Period: 1995-2000

$$MV_t = c + D\_BV_t + D\_BV_t * BV_t + BV + D\_E_t + D\_E_t * E_t + E_t \qquad \text{Eq. [5.6]}$$

Panel A: Dependent variable: IPO final offer price multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **$R^2 = 0.374518$**							
R&D LAGS capitalized	MSGA expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.593447	0.826503	0.821884	0.836910	0.835083	0.825107	0.834208
L(1)	0.644416	0.825096	0.830951	0.836784	0.834281	0.829619	0.835199
L(2)	0.690931	0.828160	0.835737	0.838005	0.836345	0.832936	0.837272
L(3)	0.724823	0.828536	0.838526	0.836755	0.834559	0.832466	0.834924
L(4)	0.749210	0.829163	0.837458	0.832598	0.834599	0.833528	0.834773
L(5)	0.789046	0.825508	0.839681	0.830335	0.833562	0.834402	0.832932
L(6)	0.827231	0.822961	0.838943	0.826744	0.830784	0.834145	0.831012
L(7)	0.834875	0.822897	0.838328	0.825785	0.829941	0.833810	0.830183
L(8)	0.841642	0.822044	0.833876	0.824186	0.828427	0.832742	0.828822
L(9)	**0.842684**	0.822117	0.833197	0.823273	0.827513	0.832094	0.827886
Panel B: Dependent variable: IPO share first day price close multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **$R^2 = 0.296168$**							
R&D LAGS capitalized	MSGA expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.381465	0.422416	0.419514	0.409035	0.415686	0.414034	0.408707
L(1)	0.394364	0.419376	0.417662	0.406270	0.406234	0.409518	0.401527
L(2)	0.407713	0.418520	0.416187	0.404516	0.401287	0.407427	0.400954
L(3)	0.415618	0.418772	0.414528	0.400363	0.395832	0.400051	0.394217
L(4)	0.422743	0.418788	0.412249	0.392702	0.394121	0.399040	0.391710
L(5)	0.432381	0.416409	0.407273	0.388884	0.390824	0.394986	0.387775
L(6)	**0.434345**	0.416438	0.402941	0.387150	0.387896	0.391268	0.384709
L(7)	0.432514	0.416302	0.401381	0.386376	0.386806	0.389909	0.383784
L(8)	0.427983	0.416654	0.392616	0.385882	0.385690	0.387848	0.382699
L(9)	0.425384	0.416422	0.391975	0.385431	0.384838	0.386767	0.382729

Table 5.3: R^2 Analysis (Ohlson model) for IPOs
Reported vs. Adjusted (R&D and MSGA Capitalization)
Book Values and Earnings
Period: 1995-1998

$$MV_t = c + D\_BV_t + D\_BV_t * BV_t + BV + D\_E_t + D\_E_t * E_t + E_t \qquad \text{Eq. [5.6]}$$

Panel A: Dependent variable IPO final offer price multiplied By number of shares outstanding							
Assuming R&D and MSGA are expensed **R^2 = 0.936737**							
R&D LAGS capitalized	MSGA expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.959011	0.969820	0.970405	0.968154	0.969615	0.969092	0.968874
L(1)	0.961775	0.970786	**0.971252**	0.969966	0.970686	0.969963	0.969828
L(2)	0.962914	0.970711	0.971195	0.969631	0.970369	0.969703	0.969588
L(3)	0.963592	0.970552	0.971086	0.969338	0.970022	0.969742	0.969513
L(4)	0.964266	0.970529	0.971077	0.969418	0.970129	0.969883	0.969580
L(5)	0.964205	0.970197	0.970711	0.968479	0.969793	0.969878	0.969498
L(6)	0.963506	0.969826	0.969959	0.967344	0.969354	0.969824	0.969313
L(7)	0.962996	0.969615	0.969693	0.966967	0.969170	0.969784	0.969229
L(8)	0.961854	0.969367	0.969095	0.966034	0.968725	0.969661	0.969046
L(9)	0.961099	0.969221	0.968751	0.965558	0.968621	0.969580	0.968555
Panel B: Dependent variable IPO share price first day close multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **R^2 = 0.918621**							
R&D LAGS capitalized	MSGA expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.938423	0.948780	0.949479	0.945895	0.949802	0.949065	0.948627
L(1)	0.940223	0.948966	0.949582	0.948848	0.950228	0.949340	0.948978
L(2)	0.940708	0.950120	**0.950793**	0.948209	0.949528	0.948642	0.948398
L(3)	0.940878	0.949523	0.950289	0.947578	0.948737	0.948433	0.948072
L(4)	0.941449	0.949294	0.950100	0.947483	0.948748	0.948583	0.948016
L(5)	0.940939	0.948557	0.949363	0.946076	0.948174	0.948478	0.947788
L(6)	0.939536	0.947763	0.948024	0.944374	0.947420	0.948278	0.947422
L(7)	0.938733	0.947297	0.947604	0.943827	0.947125	0.948179	0.947269
L(8)	0.936887	0.946794	0.946670	0.942471	0.946439	0.947928	0.96961
L(9)	0.935744	0.946508	0.946164	0.941789	0.946306	0.947777	0.96268

Table 5.4: R^2 Analysis (Ohlson model) for IPOs
Reported vs. Adjusted (R&D and MSGA Capitalization)
Book Values and Earnings
Period: 1999-2000

$$MV_t = c + D\_BV_t + D\_BV_t * BV_t + BV + D\_E_t + D\_E_t * E_t + E_t \qquad \text{Eq. [5.6]}$$

Panel A: Dependent variable IPO final offer price multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **R^2 =0.205261**							
R&D LAGS capitalized	MSGA expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.201719	0.169752	0.150287	0.138086	0.136596	0.125348	0.132627
L(1)	0.197112	0.158976	0.149708	0.135195	0.125331	0.125101	0.132769
L(2)	**0.214313**	0.173150	0.161246	0.149500	0.140482	0.137011	0.144744
L(3)	0.210000	0.171267	0.161617	0.152674	0.134093	0.132117	0.139674
L(4)	0.204179	0.162651	0.155258	0.136726	0.131890	0.130809	0.138239
L(5)	0.204234	0.164622	0.156186	0.136239	0.133314	0.132274	0.138648
L(6)	0.202469	0.166876	0.156522	0.134505	0.132888	0.134423	0.138909
L(7)	0.201796	0.166276	0.156854	0.135270	0.133760	0.135363	0.143165
L(8)	0.201174	0.165701	0.146717	0.135890	0.134496	0.135512	0.144077
L(9)	0.200000	0.165594	0.146864	0.136283	0.134970	0.136047	0.145300
Panel B: Dependent variable IPO share price first day close multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **R^2 =0.089289**							
R&D LAGS capitalized	MSGA expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.075698	0.045833	0.046819	0.048021	0.049417	0.043884	0.045277
L(1)	0.078419	0.045834	0.049304	0.050482	0.048218	0.047210	0.045433
L(2)	0.082492	0.046320	0.053151	0.054041	0.049906	0.050132	0.048773
L(3)	0.084626	0.048191	0.056392	0.058084	0.052122	0.051959	0.050672
L(4)	0.085102	0.052011	0.057980	0.054606	0.044863	0.044831	0.043638
L(5)	0.082778	0.053048	0.053216	0.044430	0.045118	0.045083	0.043795
L(6)	0.079529	0.059726	0.052915	0.044500	0.045141	0.045121	0.043398
L(7)	0.078440	0.060779	0.052915	0.044607	0.045301	0.045218	0.047981
L(8)	0.076950	0.061382	0.046096	0.044635	0.045320	0.045261	0.047947
L(9)	0.075867	0.061543	0.046072	0.044657	0.045336	0.045252	0.048084

Table 5.5: R^2 Analysis (Ohlson model) for Matched Seasoned Companies Reported vs. Adjusted (R&D and MSGA Capitalization) Book Values and Earnings

$$MV_t = c + D\_BV_t + D\_BV_t * BV_t + BV + D\_E_t + D\_E_t * E_t + E_t \qquad \text{Eq. [5.6]}$$

Dependent variable matching firm share price on June 30 of the year the IPO represented was issued multiplied by number of shares outstanding

Panel A: Period: 1995-2000							
Assuming R&D and MSGA are expensed **R^2 = 0.755585**							
R&D LAGS Capitalized	MSGA Expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.767759	0.756572	0.754721	0.747489	0.746370	0.744411	0.744803
L(1)	0.772986	0.758137	0.753793	0.750729	0.749519	0.747125	0.747193
L(2)	0.776123	0.761398	0.755707	0.751473	0.750084	0.747494	0.747454
L(3)	0.779821	0.764604	0.758413	0.753974	0.752480	0.749956	0.750132
L(4)	0.782106	0.766657	0.759756	0.754937	0.753099	0.750770	0.751041
L(5)	0.784541	0.769395	0.761676	0.756739	0.754686	0.752897	0.753820
L(6)	0.785639	0.772378	0.764573	0.760010	0.757768	0.755848	0.758209
L(7)	0.786523	0.773460	0.765679	0.761358	0.759073	0.757478	0.760036
L(8)	**0.786994**	0.774571	0.766859	0.762765	0.760895	0.759608	0.762290
L(9)	0.786911	0.774912	0.767575	0.763581	0.762007	0.761142	0.763953
Panel B: Period 1995-1998							
Assuming R&D and MSGA are expensed **R^2 = 0.948090**							
R&D LAGS Capitalized	MSGA Expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.955736	0.957203	0.957621	0.956973	0.959235	0.959330	0.957637
L(1)	0.960874	0.960435	0.960675	0.959356	0.961007	0.960947	0.959492
L(2)	0.963347	0.963054	0.962177	0.960720	0.962014	0.961784	0.960132
L(3)	0.965786	0.965867	0.964326	0.962634	0.963611	0.963359	0.961881
L(4)	0.967459	0.967565	0.965506	0.963784	0.964383	0.963971	0.962919
L(5)	0.969012	0.968721	0.966311	0.964636	0.964877	0.964202	0.964079
L(6)	0.969333	0.968715	0.966984	0.965340	0.965274	0.964603	0.964543
L(7)	0.969271	0.968647	0.967122	0.965512	0.965297	0.964672	0.964476
L(8)	0.969601	0.969002	0.967294	0.965674	0.965563	0.964899	0.964732
L(9)	**0.969750**	0.969091	0.967408	0.965782	0.965670	0.964989	0.964812
Panel C: Period 1999-2000							
Assuming R&D and MSGA are expensed **R^2 =0.614226**							
R&D LAGS Capitalized	MSGA Expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.626732	0.604094	0.593632	0.591597	0.585136	0.584542	0.598736
L(1)	0.631585	0.609402	0.699420	0.596379	0.589750	0.588592	0.592615
L(2)	0.635290	0.611868	0.603163	0.597644	0.591005	0.588942	0.592631
L(3)	0.640041	0.616058	0.606854	0.600919	0.594260	0.591882	0.595528
L(4)	0.642286	0.617763	0.608282	0.601819	0.594757	0.592023	0.595385
L(5)	0.644968	0.620834	0.611079	0.604297	0.597140	0.594444	0.597735
L(6)	0.646441	0.625378	0.614512	0.618129	0.600571	0.598265	0.601815
L(7)	0.647925	0.626709	0.616772	0.610411	0.602833	0.600403	0.603891
L(8)	0.648633	0.627653	0.618429	0.612707	0.605542	0.603729	0.607460
L(9)	**0.648664**	0.628120	0.609487	0.614230	0.607457	0.605854	0.609745

Table 5.6: R^2 Analysis (Ohlson model) for IPOs
Reported vs. Adjusted (R&D and MSGA Capitalization)
Book Values, Earnings, and Total Assets and Sales

Period: 1995-2000

$$MV_t = c + TA_t + LIABILITIES_t + D\_E_t + D\_E_t * E_t + E_t + Sales_t \quad \text{Eq.[5.7]}$$

Panel A: Dependent variable: IPO final offer price multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **R^2 =** 0.860096							
R&D LAGS capitalized	MSGA expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.852902	0.850501	0.849425	0.840666	0.845551	0.848017	0.843318
L(1)	0.853295	0.850091	0.850027	0.839757	0.842139	0.847302	0.842327
L(2)	0.856050	0.851167	0.850276	0.840363	0.842655	0.847933	0.843350
L(3)	0.856531	0.851790	0.849748	0.839112	0.839905	0.844826	0.840125
L(4)	**0.857126**	0.851626	0.848498	0.835407	0.839428	0.844712	0.839521
L(5)	0.856308	0.850981	0.845272	0.832671	0.836375	0.841596	0.835909
L(6)	0.853469	0.850782	0.841851	0.829796	0.833076	0.838665	0.833093
L(7)	0.852216	0.850100	0.840696	0.829051	0.832114	0.837631	0.832153
L(8)	0.849530	0.850041	0.835977	0.827977	0.830571	0.835622	0.830621
L(9)	0.848038	0.849988	0.835150	0.827389	0.829738	0.834615	0.829817
Panel B: Dependent variable: IPO share first day price close multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **R^2 = 0.444655**							
R&D LAGS capitalized	MSGA expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.434218	0.425670	0.420833	0.411232	0.418658	0.417403	0.411151
L(1)	0.433362	0.422695	0.419272	0.408086	0.407776	0.4119977	0.403833
L(2)	0.434585	0.420450	0.417737	0.406748	0.402986	0.410035	0.402736
L(3)	0.434631	0.420495	0.416489	0.401013	0.397347	0.402735	0.395618
L(4)	**0.435461**	0.420545	0.414148	0.392602	0.396823	0.402836	0.394923
L(5)	0.434225	0.418324	0.409525	0.389832	0.393148	0.398499	0.390513
L(6)	0.429835	0.418072	0.405202	0.387403	0.389384	0.394419	0.387095
L(7)	0.427867	0.417784	0.403573	0.386524	0.388133	0.392921	0.385818
L(8)	0.424005	0.418016	0.394132	0.385837	0.386668	0.390448	0.384385
L(9)	0.421785	0.417739	0.393323	0.385316	0.385763	0.389172	0.384235

Table 5.7: R^2 Analysis (Ohlson model) for IPOs
Reported vs. Adjusted (R&D and MSGA Capitalization)
Book Values, Earnings, and Total Assets and Sales

Period: 1995-1998

$$MV_t = c + TA_t + LIABILITIES_t + D\_E_t + D\_E_t * E_t + E_t + Sales_t \qquad \text{Eq.[5.7]}$$

Panel A: Dependent variable IPO final offer price multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **R^2 = 0.964049**							
R&D LAGS capitalized	MSGA Expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.960902	0.969236	0.970030	0.968415	0.969096	0.968981	0.968522
L(1)	0.962047	0.970339	**0.971001**	0.969561	0.970290	0.970183	0.969725
L(2)	0.962554	0.969979	0.970537	0.969117	0.969983	0.969905	0.969388
L(3)	0.962828	0.969863	0.970426	0.969917	0.969603	0.969955	0.969312
L(4)	0.963349	0.969867	0.970431	0.968866	0.969732	0.969904	0.969373
L(5)	0.963099	0.969540	0.969958	0.968100	0.969281	0.969717	0.969178
L(6)	0.962528	0.969189	0.969190	0.967259	0.968796	0.969531	0.968894
L(7)	0.962202	0.968971	0.968949	0.966962	0.968610	0.969447	0.968782
L(8)	0.961555	0.968759	0.968431	0.966303	0.968184	0.969249	0.968556
L(9)	0.961137	0.968634	0.968142	0.965958	0.967955	0.969135	0.967966
Panel B: Dependent variable IPO share price first day close multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **R^2 = 0.938097**							
R&D LAGS capitalized	MSGA Expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.936098	0.947054	**0.948476**	0.946678	0.947597	0.947229	0.946652
L(1)	0.937277	0.946971	0.948308	0.946810	0.947849	0.947665	0.947052
L(2)	0.937498	0.945926	0.947261	0.945801	0.947031	0.946798	0.946115
L(3)	0.937378	0.945320	0.946732	0.945058	0.946150	0.946548	0.945725
L(4)	0.937909	0.945147	0.946545	0.944820	0.946151	0.946374	0.945634
L(5)	0.937393	0.944326	0.945692	0.943624	0.945429	0.946051	0.945241
L(6)	0.936512	0.943474	0.944346	0.942281	0.944599	0.945666	0.944715
L(7)	0.936045	0.942993	0.943948	0.941802	0.944284	0.945506	0.944510
L(8)	0.935053	0.942468	0.943113	0.940770	0.943599	0.945137	0.944129
L(9)	0.934421	0.942177	0.942663	0.940225	0.943224	0.944933	0.943197

Table 5.8: R^2 Analysis (Ohlson model) for IPOs
Reported vs. Adjusted (R&D and MSGA Capitalization)
Book Values, Earnings, and Total Assets and Sales

Period: 1999-2000

$$MV_t = c + TA_t + LIABILITIES_t + D\_E_t + D\_E_t * E_t + E_t + Sales_t \qquad \text{Eq.[5.7]}$$

Panel A: Dependent variable IPO final offer price multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **R^2 = 0.337570**							
R&D LAGS capitalized	MSGA Expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.319973	0.293952	0.294071	0.294906	0.294033	0.294334	0.290559
L(1)	0.320387	0.291347	0.294312	0.295571	0.290855	0.292993	0.289373
L(2)	0.322054	0.291620	0.294999	0.297120	0.292715	0.294454	0.291113
L(3)	0.323642	0.292826	0.296372	0.299330	0.292439	0.292209	0.288790
L(4)	**0.323780**	0.293330	0.298439	0.293634	0.292668	0.291504	0.288181
L(5)	0.321650	0.291811	0.297121	0.293274	0.292301	0.290355	0.287017
L(6)	0.319325	0.290794	0.295861	0.293444	0.292383	0.289770	0.286218
L(7)	0.318535	0.290248	0.295459	0.293130	0.292070	0.289494	0.285982
L(8)	0.317367	0.289594	0.290445	0.292446	0.291375	0.288866	0.285558
L(9)	0.316545	0.289308	0.290143	0.292104	0.291029	0.288556	0.285603
Panel B: Dependent variable IPO share price first day close multiplied by number of shares outstanding							
Assuming R&D and MSGA are expensed **R^2** =0.110622							
R&D LAGS capitalized	MSGA Expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.096085	0.067252	0.071531	0.075880	0.078202	0.075639	0.070782
L(1)	0.103369	0.068628	0.074433	0.079104	0.075265	0.075556	0.069682
L(2)	0.106538	0.069251	0.076115	0.081863	0.075415	0.076692	0.071224
L(3)	0.109872	0.070230	0.077437	0.079025	0.076113	0.075691	0.070666
L(4)	**0.112214**	0.071429	0.079759	0.075164	0.077215	0.076287	0.071208
L(5)	0.108433	0.070232	0.078781	0.074971	0.077105	0.075794	0.070731
L(6)	0.103472	0.069639	0.077665	0.074692	0.076614	0.075210	0.070127
L(7)	0.101769	0.069587	0.772640	0.074408	0.076347	0.074980	0.069912
L(8)	0.099089	0.069280	0.071321	0.073864	0.075809	0.074498	0.069544
L(9)	0.097440	0.069008	0.071049	0.073567	0.075515	0.074234	0.069585

Table 5.9: R^2 Analysis (Ohlson model) for Matched Seasoned Companies Reported vs. Adjusted (R&D and MSGA Capitalization) Book Values, Earnings, and Total Assets and Sales

$$MV_t = c + TA_t + LIABILITIES_t + D\_E_t + D\_E_t * E_t + E_t + Sales_t \qquad \text{Eq.[5.7]}$$

Dependent variable matching firm share price on June 30 of the year the IPO represented was issued multiplied by number of shares outstanding

R&D LAGS capitalized	MSGA Expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
Panel A: Period: 1995-2000							
Assuming R&D and MSGA are expensed **R^2 = 0.756255**							
L(0)	0.767430	0.761625	0.760575	0.755735	0.750609	0.747153	0.745269
L(1)	0.772566	0.764697	0.763382	0.759151	0.753869	0.749974	0.748018
L(2)	0.775862	0.767346	0.765482	0.760636	0.755071	0.750509	0.748301
L(3)	0.779823	0.771273	0.768907	0.763638	0.757935	0.753472	0.751363
L(4)	0.782317	0.773688	0.770214	0.764454	0.758352	0.754247	0.752359
L(5)	0.785040	0.776745	0.772151	0.766184	0.759949	0.756558	0.755544
L(6)	0.786199	0.779068	0.774190	0.768930	0.762594	0.759574	0.760452
L(7)	0.787048	0.779864	0.775425	0.770463	0.764014	0.760826	0.762182
L(8)	**0.788018**	0.780580	0.776498	0.771856	0.765950	0.763257	0.764633
L(9)	0.787878	0.780676	0.777049	0.772974	0.767067	0.764777	0.766269
Panel B: Period 1995-1998							
Assuming R&D and MSGA are expensed **R^2 = 0.951056**							
R&D LAGS capitalized	MSGA Expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.956841	0.957404	0.964646	0.962196	0.960686	0.959276	0.957959
L(1)	0.960927	0.961477	0.966503	0.964267	0.962403	0.961054	0.959426
L(2)	0.963271	0.963412	0.967421	0.965200	0.963257	0.961799	0.960075
L(3)	0.965630	0.966304	0.968935	0.966789	0.964775	0.963471	0.961720
L(4)	0.967280	0.968181	0.969514	0.967411	0.965374	0.964243	0.962606
L(5)	0.968833	0.970162	0.969911	0.967844	0.965821	0.964893	0.963660
L(6)	0.969330	0.971478	0.970213	0.968170	0.966326	0.965180	0.964596
L(7)	0.969316	0.971492	0.970143	0.968195	0.966299	0.965054	0.964603
L(8)	0.969931	0.972001	0.970652	0.968603	0.966684	0.965470	0.964951
L(9)	0.970152	**0.972067**	0.970715	0.968677	0.966789	0.965576	0.965052
Panel C: Period 1999-2000							
Assuming R&D and MSGA are expensed **R^2 =0.616063**							
R&D LAGS capitalized	MSGA Expensed	MSGA LAGS capitalized L(0)	L(1)	L(2)	L(3)	L(4)	L(5)
L(0)	0.629596	0.610419	0.601445	0.595100	0.585772	0.584226	0587373
L(1)	0.634254	0.612518	0.604478	0.599707	0.590157	0.587943	0.590894
L(2)	0.638359	0.615690	0.606817	0.601701	0.591919	0.588315	0.590808
L(3)	0.643636	0.620615	0.611451	0.605687	0.595797	0.591719	0.594058
L(4)	0.646095	0.622561	0.612951	0.606537	0.596092	0.591544	0.593650
L(5)	0.648824	0.625551	0.615844	0.608960	0.598480	0.593913	0.595971
L(6)	0.650089	0.627372	0.618475	0.612147	0.601373	0.597835	0.600060
L(7)	0.651341	0.628434	0.620546	0.614905	0.604010	0.599785	0.602005
L(8)	**0.652184**	0.629475	0.622296	0.616889	0.606905	0.603442	0.605830
L(9)	0.651971	0.629639	0.623152	0.618932	0.608745	0.605641	0.608172

6. EFFECT OF INTANGIBLES ON IPO AND SEASONED COMPANIES VALUATION (Hypothesis 3)

6.1 Introduction

Empirical studies analyzing the components of firm value come to the conclusion that the key aspects of valuation are earnings, measured at the time of the valuation and in the future (Kothari and Zimmerman (1995), Ohlson (1995)), and book value (Ohlson (1995)). Future earnings can be proxied through Book Value. But company valuation may be significantly affected by further elements of value, such as growth opportunities reflected by intangibles (Ohlson (1995)). Literature proves that indeed several intangibles are of value. R&D investments (Lev and Sougiannis (1996), Deng and Lev (1998)), advertising/marketing expenses (Chauvin and Hirschey (1994), Lev and Sougiannis (1996), Hand (2003a)), selling-general-administrative expenses (Hand (2003a)), brands (Barth and others (2003), Kallapur and Kwan (2000), Seethamraju (2003)), capitalized intangibles (Chauvin and Hirschey (1994)), goodwill (Chauvin and Hirschey (1994), Deng and Lev (1998)), and even web-traffic (Hand (2001), Rajgopal et al (2003), Demers and Lev (2001)), all show positive and significant coefficients of independent variables in the Ohlson (1995) model investigating their effect on the dependent variable of market value.

Very few studies have investigated whether intangibles are valued differently depending on the nature of the company. For example Lev and Sougiannis (1996) show that the impact of R&D capital on market value depends on the company's current R&D intensity. They show that while a unit of R&D capital increases the value of a company in general by 2.4 units the same investment adds only 2 units to market value of a high R&D capital intensive firm. They propose that R&D intensive firm investments could be undervalued by the market, as the latter may focus on depressed earnings associated with R&D. Chauvin and Hirschey (1994) investigate the effects of industry type and find that each unit of R&D invested in a manufacturing company increases the value of the firm by 6.1 units. One unit of R&D expenditures on a non-manufacturing company increases the market value of the company by 11.5 units. Differences are smaller in the case of advertising expenditures. Manufacturing firms benefit by 7.5 units for each unit spent in advertising, and the figure drops to 6.1 units for non-manufacturing companies. Intangible assets and goodwill are significant in the valuations of non-manufacturing companies, contributing respectively 1.5 and 1 unit in market value per unit recognized on the balance sheet. Both intangible assets and goodwill are insignificant though in valuations of manufacturing firms.

Chauvin and Hirschey (1994) elaborate on intangible investments, i.e. R&D, advertising, and intangibles recognized in the balance sheet, and show that they raise market value more than tangible investments. This reflects the argument by Lev (2001) that intangible investments are more growth promising than tangible. A unit invested in tangible assets increases the value of a company by 0.06 units only.

Whether a firm is a publicly trading company or an IPO is a further characteristic that could affect valuation. IPO valuations are noisier because of uncertainty and information asymmetry. They differ from those of seasoned companies in two main points. First, IPOs do not have a public history and this implies less experience and a lower level of information available. Second, two different parties value IPOs, the issuer and the market. Information asymmetry may exist between these two parties; the issuer or the market may each possess more information than the other about the value of an intangible.

Again very few studies have examined the valuation of IPOs using reported financial statements on the IPO prospectus. Klein (1996) uses a sample of US IPOs issued between 1980 and 1991 and finds empirically that there is a positive relationship between offer price as well as market value (measured one week after the offer) and earnings per share and book value per share (estimated from the IPO prospectus). Kim and Ritter (1999) focus on comparable ratios of US IPOs issued between 1992 and 1993 and argue that the potential falsity of valuations of IPOs by the market is higher compared to that of the issuer. Yet the R^2 correlation coefficient values of the Kim and Ritter regressions are only ca. 0.05. They argue that this is evidence that reported book value and earnings are of little value in understanding IPO valuations.

Guo et al (2006) agree with this comment. Beatty et al (2000), using a sample of 2577 IPOs, with positive book values and earnings issued between 1987 and 1998, find that earnings and book values are of value to both the issuer and the market, the R^2 ranging from 0.14 to 0.90.

Bartov et al (2002) use a sample of US Internet and non-internet IPOs issued between 1996 and 1999 matched for size. Non-internet IPO offer prices are affected by earnings, while first day closing prices are not affected by any of the financial statement profitability measures. Internet IPOs earnings and book value as well as R&D do not affect the offer price. Yet, first day closing prices are positively affected by R&D. Bhagat and Rangan (2004) use a sample of 1655 IPOs issued in the US between 1986-1990 and 1997-2000 and find that the market values R&D higher compared to the issuer. One exception to the rule is during a boom period, where R&D seems to have a negative impact on both market and offer value. Guo et al (2005) find that IPO intangibles are of value, especially for science based IPOs. They comment that valuations are very optimistic.

This present thesis chapter is the first to examine and compare how R&D as well as intangible assets and goodwill reported on the balance sheet of technology IPOs are valued, by the issuer and the market, in comparison to matching seasoned companies of the same size and industry. The research is of interest in investigating whether technology IPO intangibles were valued higher, by either the issuer or the market, compared to seasoned companies. Should this be the case, it could be implied that the IPO intangibles were overvalued. It may also help explain the significant discrepancies between issuer and market valuations during the 1990ies.

Hypothesis 3 states that IPO intangibles are valued higher compared to those of matching seasoned companies, the hypothesis tested for the two different intangibles a) R&D and marketing-selling-general-administrative expenses, b) balance sheet intangibles and goodwill. The idea is based on the argumentation by Guo et al (2005) that the market is much more optimistic in valuing IPO intangibles than seasoned firm intangibles. Also further literature shows that traditional profitability measures, such as earnings and book value, play a secondary role in the valuation of IPOs

(Ritter (1999) Guo et al (2005)). Such evidence is observed particularly in Internet IPOs (Bartov et al (2002)), which are closely related to technology IPOs, the latter comprising the sample investigated in this thesis. This would imply that valuations of IPOs are focused more towards and affected more significantly by their intangibles compared to seasoned companies. This is also suggested by Chung et al (2005).

6.2 Literature

Empirical studies have tried to identify factors in addition to book value and earnings, which affect positively the value of a company. They run cross-sectional regressions with market value as the dependent variable, and earnings as well as some or all of the firm assets as independent variables. As will be demonstrated below they find that intangibles are value relevant, their coefficients being positive and significant.

Seethamraju (2003) using the Ohlson (1995) model performs a cross-sectional regression to check for value relevance of trademarks with respect to market value deflated by book value as the dependent variable, and finds trademarks indeed significant and positive. Barth and others (2003) perform a pooled regression similar to Seethamraju (2003) to check brand value relevance, the dependent variable being market value, and find that brands are positive and significant, too. Kallapur (2000) performs a regression very similar to Seethamraju (2003) and Barth and others (2003) to test empirically brand value relevance on UK companies. He finds that brands are positive and significantly related to market value.

Deng et al (1999) perform a pooled multivariate Ohlson (1995) regression with market value over book value in year one, two and three as the dependent variable. They find that patent count and citation impact are both significant and positive, yet coefficients become smaller and significance diminishes on a year-by-year basis. The technology cycle is negative – which is compatible with their predictions – though insignificant. Deng et al (1999) attribute this insignificance to multicollinearity issues between citation impact and R&D intensity.

Gu and Lev (2001) consider that patents reflect their value through royalties, and by using the Ohlson (1995) model prove these to be first of value relevance, when market value is the dependent variable, and second to be growth promising, when the dependent variable is the market over book value ratio. Their sample consists of companies between 1990 and 1998.

While these rather new empirical studies find that patents are significant in market value relevance, earlier literature has been much more conservative and critical. Cockburn and Griliches (1988) look at firm data between 1960 and 1984, and conclude that while there is "some interesting information in patent counts" it may be subject to much error. They consider that R&D is a better measure and imply – consistent with Deng et al (1999) - that patents and R&D may be related.

Hall et al (1986) make similar conclusions, i.e. they agree that there is a lagged relationship between patents and R&D and that the issue of multicollinearity distorts results. Even more extreme is the statement by Mansfield et al (1981), Grabowski et al (2002), Pakes (1985), Schrenkerman and Pakes (1985) showing a lot of patents being worthless or becoming worthless soon after being granted.

Concluding from the above, empirical studies do not show a unanimous view in respect to patents and their significance for market value. Literature referring to data in the 1980s is inconclusive, while more modern studies are linking patents to company value. This shift in results could be due to the fact that patents are more important in technology companies - dominant in the 1990ies – and also due to the fact of improvements in laws and law enforcement. Moreover, researchers have found that patens may be split to even further sub-categories and this generates a totally different picture as to how patents are defined. The multicollinearity between patent factors and R&D is still an issue.

Jorion and Talmor (2001) apply a regression analysis with market value over asset value being the dependent variable, and the independent variables being R&D and web metrics. Web metrics are defined as the number of unique users (reach), total number of pages viewed (stickiness) and total number of hours viewed (stickiness). Looking at 295 Internet companies from 1995 to 2000 and running pooled regressions they find that web metrics are significant; however, their significance is much higher during the growth phase of a company. The interval between growth and mature phases is defined as 24 months. Similarly, Demers and Lev (2001) find that web metrics such as reach, stickiness and loyalty are significant in market value estimation. Hand (2001) and Rajogopal et al (2003) come to similar conclusions.

Lev and Sougiannis (1996) using a sample of US companies traded between 1975 and 1991 estimate the hypothetical value of R&D. They run cross-sectional regressions similar to the Kothari and Zimmerman (1995) price model. In addition to reported earnings they use, however, coefficients reflecting the difference between normal and capitalized earnings, and add the implied R&D capital. They find that both R&D capital and the proportion of earnings reflecting R&D capitalization are positive and significant. Similar findings support this conclusion as provided by Lev et al (2002). By covering US companies between 1983 and 2000 they establish empirically that the market values R&D differently for different types of industry. This is reflected in the incremental change in R^2 values of Ohlson (1995) regressions. Science and chemical industries have the highest incremental change in R^2 when reported earnings and book values are "replaced" by respective values accounting for R&D capitalization. Transport industry has much less benefit due to R&D capitalization.

Chan et al (1990), Gu and Lev (2001), Darrough and Ye (2005), Bartov et al (2002), Bharat and Rangan (2004) prove empirically the fact that R&D yields positive and significant coefficients in regressions, where market value is the dependent variable. The last two studies refer to IPO samples.

Demers and Lev (2001) examining internet stocks in the late 1990s and 2000 find that buyers-to-consumer companies seem to capitalize R&D (product development costs) and advertising expenses in the beginning of 2000, but not in the second half of the year. Joshi and Hanssens (2004) find evidence that advertising investments increase a firm's market value.

Hand (2003b) empirically proves that the market tends to view Internet companies' R&D and marketing investments as assets, when firm core income is negative. Over time, as the industry matures, the value relevance of intangibles diminishes. His test methodology is different in comparison to most other research. He relies on gross margin as the independent variable in the quarter-by-quarter time series regressions.

Looking at the UK market Green et al (1996), with data for companies between 1990 and 1992, use the Ohlson (1995) model and run cross-sectional and pooled regressions, with the market value as dependent variable. They find that the market capitalized R&D expenditures on the average. Oswald and Zarowin (2003) also examine the UK market and find that capitalized R&D positively affects stock price valuation.

Deng and Lev (1998) conduct a multiple regression analysis – the dependent variables are market over book value as well as "plain" market value. Their sample consists of technology stocks and one of their main findings in the market over book value regression is that in-process R&D is positive and highly significant, while goodwill is positive yet insignificant. When looking at the "plain" market value regression in-process R&D is significant, and so is goodwill too. Thus it is understood that while in-process R&D is always relevant, both for price and growth, goodwill, though reflecting price, is not considered as a growth component. A regression with market adjusted returns as the dependent variable also reveals in-process R&D as positive and significant.

Chauvin and Hirschey (1994), using a sample of US firms traded between 1989 and 1991, provide a system of simultaneous equations to capture the effects of goodwill on financial statement value relevant items, as well the effects of financial items on goodwill. They establish that all intangibles (R&D, advertising, intangible assets on the balance sheet, and goodwill) positively affect market value.

Jennings et al (1996) – using a sample of firms between 1982 and 1988 – find that goodwill as an asset is positive and significant in regressions where market value is the dependent variable. Further, they find a negative relation between equity values and goodwill amortization. Yet, Jennings et al (2001) challenge these results by empirically showing – using a set of firms between 1993 and 1998 – that the R^2 values of cross-sectional regressions on share price (dependent variable) are statistically significantly different when the independent variables are earnings before amortization of goodwill and earnings after amortization of goodwill, respectively. To be more specific, earnings before amortization of goodwill have a higher explanatory power. In fact, a further cross-sectional regression that considers as independent variables both earnings before amortization of goodwill and goodwill amortization itself shows that the latter is insignificant and should be considered as a noise factor.

As a general conclusion, literature unanimously agrees that all intangibles positively contribute to the value of seasoned companies.

6.3 IPO Valuations

IPO valuations differ from those of seasoned companies in two main points. First, IPOs do not have a public history. This could imply that IPOs valuations are noisier. Second, two different parties value IPOs: the issuer and the market. Information asymmetry may exist between these two parties; the issuer or the market may each possess more information than the other about the value of an intangible.

Very few studies have examined the valuation of IPOs, using reported financial statements on the IPO prospectus. Klein (1996), using a sample of US IPOs issued between 1980 and 1991, empirically finds that there is a positive relationship between offer price as well as market value (measured one week after the offer) and earnings per share and book value per share, as estimated from the IPO prospectus. Kim and Ritter (1999), focusing on comparables ratios of US IPOs issued between 1992 and 1993, argue that the market's valuation errors on IPOs are higher compared to the ones of the issuer. Yet the R^2 of their regressions are only 5%. They argue that this is evidence that reported book value and earnings are of little value in understanding IPO valuations. Guo et al (2006) agree with this comment. Beatty et al (2000), using a sample of 2577 IPOs, with positive book values and earnings issued between 1987 and 1998, find that earnings and book values are of value to both the issuer and the market, the R^2 ranging from 14% to 90%.

Bartov et al (2002) use a sample of US Internet and Non-Internet IPOs issued between 1996 and 1999 matched for size. Non-Internet IPO offer prices are affected by earnings, while first day closing prices are not affected by any of the financial statement profitability measures. Internet IPOs earnings and book value as well as R&D do not affect the offer price. Yet, first day closing prices are positively affected by R&D. Bharat and Rangan (2004) use a sample of 1655 IPOs issued in the US between 1986-1990 and 1997-2000 and find that the market values R&D higher compared to the issuer. One exception to the rule is during a boom period, where R&D seems to have a negative impact.

6.4 Methodology

In order to test how much intangibles affect IPOs and matching companies market values an extended version of the Ohlson (1995) model is used, similar to the one used by Chauvin and Hirschey (1994). The model states

$$MV_t = C_0 + C_1*(RD+MSGA)_t + C_2*(INT+GOOD)_t + C_3*TA_t + C_4*E_t \qquad [6.1]$$

With the following parameter definitions:

Parameter	Description
MV_t	Market value of equity at time t (Share price multiplied by number of shares outstanding)
$(RD+MSGA)_t$	R&D and marketing, selling-general-administrative capitalized expenses at time t
$(INT+GOOD)_t$	Intangible assets and goodwill at time t
TA_t	Tangible assets reported on the balance sheet at time t
E_t	Earnings at time t
t	Time in years
C_x	Respective parameter coefficient, x = 0 to 4

Intangible assets and goodwill are collected from the balance sheet of the IPO and measured at the time of the offer. Tangible assets are calculated as the difference between total assets reported on the balance sheet at the time of the offer minus intangible assets minus goodwill.

Earnings (net income) are collected from the income statement and also measured at the time of the offer. Also collected from the income statement are the R&D and marketing-selling-general-administrative expenses. R&D expenses are collected and measured at the time of the offer, as well as for year -1 to -8 before the offer date. This serves the purpose of R&D capitalization. Chapter 3 of this thesis provides a detailed description on sources of data collection as well as principles of data collection and measurement.

R&D and marketing-selling-general and administrative expenses are capitalized. This is performed as a consequence of the results under Hypothesis 2A and 2B (Chapter 5) where it has been demonstrated empirically, that capitalization improves R^2 values of the Ohlson (1995) model, in the case of R&D for all three periods 1995-2000, 1995-1998 and 1999-2000, and in the case of marketing-selling-general-administrative costs for the 1995-1998 period. This is also consistent to the methodology and the findings by Lev et al (2002). R&D expenses are capitalized using a 1 to 8 year linear amortization, as empirically found in Chapter 5, and suggested by Lev et al (2002) and Amir et al (2006) as well. Marketing-selling-general-administrative expenses are capitalized using a one-year amortization. Such a procedure is consistent with findings of Chapter 5, and the Lev and Sougiannis (1996) observation that the useful life of those expenses is limited. Chapter 5.3.2 provides more detailed explanations on how R&D and marketing-selling-general-administrative expenses are capitalized.

One of the main problems of the regression in [6.1] is cross-sectional multicollinearity. The primary reason for multicollinearity is that almost all independent parameters (R&D, marketing-selling-general-administrative expenses, and tangible assets) derive from a common factor, the book value. Gujarati (2003) argues that independent parameters, which are derived from a single component, are subject to high levels of correlations between them.

In order to solve the issue of multicollinearity two techniques are used. First, as suggested by Gujarati (2003), Brooks (2002) and Lev and Sougiannis (1996), R&D and marketing-selling-general-administrative expenses are amalgamated into one single independent variable. A similar merger is conducted between intangible assets and goodwill. Table 6.1 for IPO companies and Table 6.2 for seasoned companies, show that even so there are high levels of multicollinearity between Tangible Assets and R&D, as well as in some cases between R&D and earnings. In order to solve this issue two techniques are used. First, the regression runs by keeping R&D and Intangible Assets and Goodwill. Second, as suggested by Gujarati (2003), all dependent and independent regression parameters may be deflated by a factor, thus reducing multicollinearity. A common deflator used in the literature is the number of shares outstanding. The positive aspect of this technique is perfectly acceptable from an econometrical point of view as the problem of multicollinearity is indeed tackled and resulting coefficient signs and respective t-statistics are correct. The negative aspect of using this method is that it cannot be directly tested with other studies, using un-deflated coefficients or other deflators. The reason is that in this case the magnitude of the coefficients and the R^2 value do change. However, since the main purpose of Hypothesis 3 is to compare coefficients between IPOs and seasoned companies the use of the exponential deflator may be seen as an acceptable tool. Further, even after deflation multicollinearity remains a problem. Tables 6.3 and 6.4 show that correlation reach levels as high as 0.91 between R&D and Tangible Assets, or Earnings.

6.5 Empirical Results

Table 6.5 shows the estimates of coefficients of the two independent variables intangible and tangible investments of IPOs, and seasoned companies respectively. The component of earnings is also considered. The dependent variables in the respective regressions are: a) IPO first day close price (Panel A), b) IPO offer market value (Panel B), and c) seasoned companies market value (Panel C). In Table 6.5 R&D is treated as capital using a four-year linear capitalization method. Marketing-selling-general-administrative costs are treated as expenses. Coefficients show that multicollinearity is indeed a problem and that results are inconclusive. To be more specific, in all Panels, the R&D coefficient becomes negative. This is against the expected outcome, as well as findings of empirical literature such as Lev and Sougiannis ((1996; 1999). It can be interpreted as a clear effect of high levels correlation of R&D with tangible Assets and Earnings.

Lev et al (2002) suggest looking at various capitalization and amortization rates and comparing the effect of their valuations. As a matter of fact, based on the maxima of R^2 values discussed in Chapter 5, the most appropriate linear capitalization rate for IPOs and seasoned companies is in the range of 4 to 10 years depending on the time interval examined and the dependent variable. Marketing-selling-general-administrative expenses are of value, i.e. capitalized, only in IPOs issued in 1995-1998. Their useful life is only 1 year, consistent with the Lev and Sougiannis (1996) findings. Table 6.6 to 6.13 are identical in structure to Table 6.5. However, in these tables all correlating with R&D and Intangibles and Goodwill factors are omitted. Further, in each table a different capitalization of R&D is examined starting with a linear four year capitalization of R&D – Table 6.7– to a linear eight year capitalization of R&D – Table 6.9. In addition to R&D, in Tables 6.10 to 6.13 Marketing and Selling General and Administrative costs are capitalized and added to R&D capital. All R&D (Tables 6.6 to 6.9), and R&D and Marketing Selling General and Administrative (Tables 6.10 to 6.13) coefficients are positive, which is in agreements with the literature and the. Further, all Tables accept the hypothesis. R&D or R&D and Marketing, Selling and Administrative Expenses are in all cases higher for IPO compared to matching seasoned companies.

As an example, Focusing on Table 6.6 –in which R&D is capitalized using a six-year linear capitalization - results show that in agreement with the hypothesis, R&D is valued higher when invested in IPOs compared to seasoned companies. IPOs issued during 1995-1998 show a coefficient of 2.58 (market valuations) and 2.28 (issuer valuations). In contrast seasoned companies R&D coefficient is only 0.48. The low difference in R&D coefficients between issuer and market valuations is in agreement with findings in Chapter 5, where the issuer and the market have shown similar improvement in R^2 values of the valuations with R&D capitalization consistent to the Ohlson (1995) model. On the other hand, the high difference between IPO and seasoned companies is consistent with the idea that IPO valuation is more optimistic (Guo et al (2005)) and that the market may focus on growth opportunities of IPOs rather (Chung et al (2006)).

During the 1999-2000 interval the market and the issuer valued R&D much higher in IPOs relatively to seasoned companies. IPOs issued during 1999-2000 show a coefficient of 15.76 (market valuations) and 8.14 (issuer valuations). In contrast, the coefficient for R&D in seasoned companies is 0.39 only. Focusing on IPO R&D valuations only, the issuer values these lower than the market – in agreement with Bhagat and Rangan (2004). The very high coefficient of 15.76 seems to agree with the empirical results in Chapter 5 where the R^2 value of the Ohlson (1995) regressions did not show improvement with progressing R&D capitalization. This could be due to market irrational optimism, generating noise, and/or non-linear valuation of R&D.

Focusing on Intangible Assets and Goodwill, results are inconclusive. In general for the 1995-2000 and 1995-1998 interval the coefficients of IPO regressions are higher compared to those of matching seasoned companies. However, in the 1999-2000 interval IPO valuations show insignificant valuations on Intangible Assets and Goodwill, while seasoned company valuations coefficients are positive and significant.

The IPO 1999-2000 insignificance of the Intangible Assets and Goodwill coefficient is against the hypothesis. Interestingly Chauvin and Hirschey (1994) come to a similar conclusion in their research using a sample of firms in the manufacturing sector. Further, Damodaran (2001) points out that R&D is the main source of value for technology companies. Still, the insignificant results of balance sheet intangibles and goodwill in this chapter are challenging because they are the only intangibles officially recognized as of value under US-GAAP rules.

Jointly looking at Tables 6.6 to 6.9 reveals the following: Changing the R&D capitalization period (linear between 4 and 8 years) lead to the same conclusions. This could be in agreement with the comment of Lev et al (2002) stating that while selecting the highest R^2 may derive an optimum amortization, other capitalization rates may also be acceptable from a valuation point of view.

Regressions in Tables 6.10 to 6.13 take into consideration as capital not only R&D but also marketing-selling-general-administrative expenses. These regressions provide meaningful evidence in proving Hypothesis 3 mainly in connection with IPOs issued in 1995-1998. The more so, as it has been previously demonstrated by Hypothesis 2 (Chapter 5) that only IPOs issued 1995-1998 show evidence that their marketing-selling-general-administrative expenses may be capitalized. The same conclusions are derived here as shown with the results of Table 6.6 to 6.9 for coefficients of IPOs and seasoned companies.

Table 6.14 examines individually the valuation of Tangible Assets. Tangible assets are also valued higher in IPOs compared to seasoned companies, establishing this as an overall IPO valuation rather than only IPO intangible oriented phenomenon. This indicates that while theories on optimism in intangibles (Guo et al (2005), Chung et al (2005)) still hold, the idea of a general optimism in IPO valuations is universally observed (Kim and Ritter (1999), Ritter and Welch (2002)).

In general, in all tables, valuations for both IPOs and seasoned companies are higher in the 1999-2000 interval compared to the 1995-1998 intervals. Yet the value of R&D and tangible assets increased much more in IPO valuations compared to seasoned companies, indicating that intangibles were indeed valued higher during the peak of the IPO boom compared to the period 1995-1998.

Table 6.15 is identical with Table 6.6. However, in Table 6.13 all variables have been deflated by the number of outstanding shares. Overall, in agreements with the hypothesis, the results show that coefficients are higher for IPOs compared to seasoned companies. Unfortunately the validity of the results could be questionable because of the very low R^2 of the IPO regressions. R^2 reaches values as low as 0.03.

6.6 Conclusion

Hypothesis 3 assumed that IPO intangibles are valued higher compared to those of matching seasoned companies and was tested for the two different intangibles a) R&D and marketing-selling-general-administrative expenses, b) balance sheet intangibles and goodwill. Supporting Hypothesis 3 IPOs show higher R&D capital coefficients compared to seasoned companies, Tables 6.5 to 6.9. The same is also true when capitalizing the integrated sum of R&D and marketing-selling-general-administrative expenses, Tables 6.9 to 6.13. Yet the hypothesis was not always supported in the case of balance sheet intangibles and goodwill.

The higher coefficients of R&D indicate that IPO valuations may be more optimistic with respect to future growth opportunities compared to seasoned companies (Guo et al (2005)). They also support the argument by Chung et al (2005) stating that the market focuses more on growth opportunities in the valuation of IPOs compared to seasoned companies. Using various capitalization and amortization rate scenarios of R&D and marketing-selling-general-administrative expenses does not change coefficients, t- and R^2-values substantially, and leads consequently to the same conclusion. This is in agreement with Lev et al (2002) commenting that there is no specific amortization rate, which should be used.

Empirical results show that valuations for both IPOs and seasoned companies are higher in the 1999-2000 peak of the IPO boom compared to its 1995-1998 beginning. The increase in the R&D coefficient is much higher for IPOs compared to seasoned companies. This is further supporting evidence for higher valuations of R&D of IPOs in times of optimism on the market. This has been stated by Ritter and Welch (2002) too, for all intangibles generally.

Yet contrary to Hypothesis 3 intangible assets and goodwill recognized on the balance sheet do not always add value to IPOs significantly. Moreover, seasoned companies intangible assets and goodwill are valuable only to companies traded between 1999 and 2000. The results are surprising, considering the fact that intangibles and goodwill reported on the balance sheet must pass strict accounting rules in order to be recognized as valuable. One possible explanation for such results could be a comment by Lev (2001) on valuation establishing R&D as the core value element of technology stocks. Chauvin and Hirschey (1994) find that manufacturing company intangibles and goodwill on the balance sheet do not add value.

Optimism in IPO valuations is not solely related to intangibles. Tangible assets are also valued higher in IPOs compared to seasoned companies.

Table 6.1: Correlation between the Regression Independent Variables
IPO Companies -before deflation
For the data of Table 6.6

	MV	RD_L5	INT_GOOD	TA	E_L5
	Sample 1995-2000				
MV	1.00	0.59	0.08	0.62	0.02
RD_L5	0.59	1.00	0.01	0.99	0.24
INT_GOOD	0.08	0.01	1.00	0.04	-0.31
TA	0.62	0.99	0.04	1.00	0.22
E_L5	0.02	0.24	-0.31	0.22	1.00
	Sample 1995-1998				
MV	1.00	0.94	0.11	0.95	0.63
RD_L5	0.94	1.00	0.02	1.00	0.52
INT_GOOD	0.11	0.02	1.00	0.03	0.38
TA	0.95	1.00	0.03	1.00	0.52
E_L5	0.63	0.52	0.38	0.52	1.00
	Sample 1999-2000				
MV	1.00	0.30	0.05	0.42	-0.11
RD_L5	0.30	1.00	0.19	0.73	-0.06
INT_GOOD	0.05	0.19	1.00	0.30	-0.38
TA	0.42	0.73	0.30	1.00	-0.09
E_L5	-0.11	-0.06	-0.38	-0.09	1.00

MV	market value
RD_L5	R&D capitalized using 5 lags (6 years of capitalization)
INT_GOOD	intangibles and goodwill on balance sheet
TA	tangible assets
E_L5	earnings adjusted for R&D capitalization (5 lags)

Table 6.2: Correlation between the Regression Independent Variables
Seasoned Companies - before deflation
For the data of Table 6.6

	MV	RD_L5	INT_GOOD	TA	E_L5
	Sample 1995-2000				
MV	1.00	0.80	0.53	0.81	0.65
RD_L5	0.80	1.00	0.50	0.85	0.40
INT_GOOD	0.53	0.50	1.00	0.53	0.54
TA	0.81	0.85	0.53	1.00	0.64
E_L5	0.65	0.40	0.54	0.64	1.00
	Sample 1995-1998				
MV	1.00	0.96	0.72	0.96	0.97
RD_L5	0.96	1.00	0.70	0.98	0.93
INT_GOOD	0.72	0.70	1.00	0.77	0.72
TA	0.96	0.98	0.77	1.00	0.95
E_L5	0.97	0.93	0.72	0.95	1.00
	Sample 1999-2000				
MV	1.00	0.67	0.54	0.70	0.53
RD_L5	0.67	1.00	0.52	0.76	0.15
INT_GOOD	0.54	0.52	1.00	0.65	0.56
TA	0.70	0.76	0.65	1.00	0.49
E_L5	0.53	0.15	0.56	0.49	1.00

MV market value
RD_L5 R&D capitalized using 5 lags (6 years of capitalization)
INT_GOOD intangibles and goodwill on balance sheet
TA tangible assets
E_L5 earnings adjusted for R&D capitalization (5 lags)

Table 6.3: Correlation between the Regression Independent Variables IPO Companies –after deflation by number of shares outstanding

For the data of Table 6.15

	MV	RD_L5	INT_GOOD	TA	E_L5
	Sample 1995-2000				
MV	1.00	0.01	0.08	0.10	-0.10
RD_L5	0.01	1.00	0.20	0.59	0.58
INT_GOOD	0.08	0.20	1.00	0.17	-0.12
TA	0.10	0.59	0.17	1.00	0.43
E_L5	-0.10	0.58	-0.12	0.43	1.00
	Sample 1995-1998				
MV	1.00	0.15	-0.01	0.33	0.21
RD_L5	0.15	1.00	0.64	0.61	0.65
INT_GOOD	-0.01	0.64	1.00	0.32	0.22
TA	0.33	0.61	0.32	1.00	0.59
E_L5	0.21	0.65	0.22	0.59	1.00
	Sample 1999-2000				
MV	1.00	0.09	0.06	0.13	-0.09
RD_L5	0.09	1.00	0.16	0.54	0.24
INT_GOOD	0.06	0.16	1.00	0.23	-0.29
TA	0.13	0.54	0.23	1.00	-0.09
E_L5	-0.09	0.24	-0.29	-0.09	1.00

MV	market value / Shares Outstanding
RD_L5	R&D capitalized using 5 lags (6 years of capitalization) / Shares Outstanding
INT_GOOD	intangibles and goodwill on balance sheet / Shares Outstanding
TA	tangible assets / Shares Outstanding
E_L5	earnings adjusted for R&D capitalization (5 lags) / Shares Outstanding

Table 6.4: Correlation between the Regression Independent Variables
Seasoned Companies – after deflation by shares outstanding
For the data of Table 6.15

	MV	RD_L5	INT_GOOD	TA	E_L5
	Sample 1995-2000				
MV	1.00	0.75	0.85	0.79	-0.77
RD_L5	0.75	1.00	0.74	0.73	-0.86
INT_GOOD	0.85	0.74	1.00	0.76	-0.83
TA	0.79	0.73	0.76	1.00	-0.63
E_L5	-0.77	-0.86	-0.83	-0.63	1.00
	Sample 1995-1998				
MV	1.00	0.92	0.87	0.90	-0.86
RD_L5	0.92	1.00	0.84	0.91	-0.89
INT_GOOD	0.87	0.84	1.00	0.95	-0.90
TA	0.90	0.91	0.95	1.00	-0.87
E_L5	-0.86	-0.89	-0.90	-0.87	1.00
	Sample 1999-2000				
MV	1.00	0.73	0.73	0.90	-0.55
RD_L5	0.73	1.00	0.80	0.61	-0.89
INT_GOOD	0.73	0.80	1.00	0.68	-0.65
TA	0.90	0.61	0.68	1.00	-0.40
E_L5	-0.55	-0.89	-0.65	-0.40	1.00

MV	market value / Shares Outstanding
RD_L5	R&D capitalized using 5 lags (6 years of capitalization) / Shares Outstanding
INT_GOOD	intangibles and goodwill on balance sheet / Shares Outstanding
TA	tangible assets / Shares Outstanding
E_L5	earnings adjusted for R&D capitalization (5 lags) / Shares Outstanding

Table 6.5: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies

6 Year R&D Amortization L(5)

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	L(5)	reported	484671	-7.59	-0.25	3.41	-3.67	0.44
t statistic			*9.60*	*-2.42*	*-0.73*	*3.27*	*-1.85*	
1995-1998	L(5)	reported	163429	-2.57	0.35	1.62	10.47	0.93
t statistic			*7.42*	*-2.24*	*0.56*	*4.42*	*3.56*	
1999-2000	L(5)	reported	609683	-1.60	-0.84	4.01	-3.60	0.18
t statistic			*4.16*	*-0.28*	*-2.22*	*2.53*	*-1.49*	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	L(5)	reported	238135	-2.43	-0.06	1.57	-0.86	0.84
t statistic			*12.24*	*-2.44*	*-0.25*	*4.74*	*-1.01*	
1995-1998	L(5)	reported	111751	-1.45	0.84	1.17	7.54	0.96
t statistic			*8.09*	*-1.82*	*2.15*	*4.55*	*3.97*	
1999-2000	L(5)	reported	230300	1.73	-0.41	1.55	-2.07	0.47
t statistic			*7.35*	*1.19*	*-5.36*	*4.96*	*-3.71*	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	L(5)	reported	27739	0.33	-0.01	0.01	0.39	0.76
t statistic			*6.45*	*3.65*	*-0.11*	*0.35*	*4.12*	
1995-1998	L(5)	reported	9145	0.23	0.06	0.00	0.73	0.96
t statistic			*4.48*	*2.30*	*0.64*	*-0.04*	*4.11*	
1999-2000	L(5)	reported	49602	0.31	-0.03	0.01	0.38	0.63
t statistic			*6.72*	*2.99*	*-0.34*	*0.35*	*3.58*	

Table 6.6: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies

Omitting Tangible Assets and Earnings due to multicollinearity

6 Year R&D Amortization L(5)

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	L(5)	reported	669010	2.58	0.61	NA	NA	0.35
t statistic			*10.97*	*34.82*	*2.04*	NA	NA	
1995-1998	L(5)	reported	250878	2.58	2.65	NA	NA	0.88
t statistic			*8.18*	*211.16*	*8.37*	NA	NA	
1999-2000	L(5)	reported	825033	15.76	-0.02	NA	NA	0.17
t statistic			*5.94*	*2.89*	*-0.12*	NA	NA	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	L(5)	reported	317304	2.29	0.27	NA	NA	0.79
t statistic			*15.90*	*55.32*	*1.04*	NA	NA	
1995-1998	L(5)	reported	174968	2.28	2.50	NA	NA	0.93
t statistic			*8.38*	*239.39*	*8.63*	NA	NA	
1999-2000	L(5)	reported	336642	8.14	-0.04	NA	NA	0.28
t statistic			*8.06*	*4.19*	*-0.51*	NA	NA	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	L(5)	reported	26058	0.39	0.13	NA	NA	0.66
t statistic			*5.36*	*6.64*	*2.75*	NA	NA	
1995-1998	L(5)	reported	7487	0.48	0.21	NA	NA	0.92
t statistic			*2.61*	*13.86*	*1.16*	NA	NA	
1999-2000	L(5)	reported	52877	0.29	0.15	NA	NA	0.49
t statistic			*6.46*	*4.47*	*3.16*	NA	NA	

Table 6.7: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies

Omitting Tangible Assets and Earnings due to multicollinearity

4 Year R&D Amortization L(3)

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	L(3)	reported	661356	3.51	0.60	NA	NA	0.35
t statistic			*10.89*	*29.96*	*2.02*	NA	NA	
1995-1998	L(3)	reported	245295	3.49	2.52	NA	NA	0.89
t statistic			*8.08*	*179.66*	*8.05*	NA	NA	
1999-2000	L(3)	reported	672479	25.73	-0.10	NA	NA	0.24
t statistic			*3.76*	*2.75*	*-0.59*	NA	NA	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	L(3)	reported	310839	3.10	0.27	NA	NA	0.79
t statistic			*15.70*	*52.45*	*1.02*	NA	NA	
1995-1998	L(3)	reported	170062	3.08	2.39	NA	NA	0.93
t statistic			*8.25*	*207.87*	*8.33*	NA	NA	
1999-2000	L(3)	reported	307081	11.20	-0.05	NA	NA	0.29
t statistic			*6.45*	*4.07*	*-0.56*	NA	NA	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	L(3)	reported	24406	0.54	0.13	NA	NA	0.66
t statistic			*4.95*	*6.71*	*2.96*	NA	NA	
1995-1998	L(3)	reported	5982	0.65	0.25	NA	NA	0.92
t statistic			*2.06*	*14.63*	*1.43*	NA	NA	
1999-2000	L(3)	reported	50936	0.40	0.15	NA	NA	0.50
t statistic			*6.34*	*4.70*	*3.31*	NA	NA	

Table 6.8: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies

Omitting Tangible Assets and Earnings due to multicollinearity

5 Year R&D Amortization L(4)

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	L(4)	reported	665200	2.98	0.61	NA	NA	0.35
t statistic			*10.93*	*32.26*	*2.03*	NA	NA	
1995-1998	L(4)	reported	248063	2.97	2.59	NA	NA	0.89
t statistic			*8.13*	*194.24*	*8.24*	NA	NA	
1999-2000	L(4)	reported	764247	19.46	-0.05	NA	NA	0.20
t statistic			*5.04*	*2.83*	*-0.35*	NA	NA	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	L(4)	reported	314063	2.64	0.27	NA	NA	0.79
t statistic			*15.81*	*53.34*	*1.03*	NA	NA	
1995-1998	L(4)	reported	172492	2.62	2.45	NA	NA	0.93
t statistic			*8.31*	*222.08*	*8.51*	NA	NA	
1999-2000	L(4)	reported	323052	9.39	-0.05	NA	NA	0.29
t statistic			*7.31*	*4.16*	*-0.59*	NA	NA	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	L(4)	reported	25227	0.45	0.13	NA	NA	0.66
t statistic			*5.14*	*6.63*	*2.86*	NA	NA	
1995-1998	L(4)	reported	6806	0.55	0.23	NA	NA	0.92
t statistic			*2.35*	*14.23*	*1.28*	NA	NA	
1999-2000	L(4)	reported	51857	0.34	0.15	NA	NA	0.50
t statistic			*6.39*	*4.55*	*3.24*	NA	NA	

Table 6.9: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies
Omitting Tangible Assets and Earnings due to multicollinearity
8 Year R&D Amortization L(7)

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	L(7)	reported	672527	2.22	0.61	NA	NA	0.35
t statistic			*11.00*	*37.56*	*2.04*	NA	NA	
1995-1998	L(7)	reported	253625	2.22	2.70	NA	NA	0.88
t statistic			*8.24*	*229.16*	*8.49*	NA	NA	
1999-2000	L(7)	reported	880912	12.51	0.02	NA	NA	0.15
t statistic			*6.76*	*2.98*	*0.13*	NA	NA	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	L(7)	reported	320309	1.97	0.28	NA	NA	0.79
t statistic			*15.98*	*57.39*	*1.05*	NA	NA	
1995-1998	L(7)	reported	177387	1.96	2.55	NA	NA	0.93
t statistic			*8.45*	*258.41*	*8.74*	NA	NA	
1999-2000	L(7)	reported	350290	6.91	-0.03	NA	NA	0.27
t statistic			*8.90*	*4.26*	*-0.40*	NA	NA	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	L(7)	reported	27264	0.32	0.12	NA	NA	0.66
t statistic			*5.81*	*6.90*	*2.77*	NA	NA	
1995-1998	L(7)	reported	8572	0.39	0.20	NA	NA	0.93
t statistic			*3.01*	*13.70*	*1.07*	NA	NA	
1999-2000	L(7)	reported	54139	0.24	0.15	NA	NA	0.49
t statistic			*6.69*	*4.45*	*3.14*	NA	NA	

Table 6.10: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies
Omitting Tangible Assets and Earnings due to multicollinearity
4 Year R&D Amortization L(3) and 1 Year MSGA Capitalization L(0)

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	L(3)	L(0)	638346	1.88	0.57	NA	NA	0.36
t statistic			*10.56*	*23.94*	*2.04*	NA	NA	
1995-1998	L(3)	L(0)	232602	1.86	2.36	NA	NA	0.90
t statistic			*8.02*	*95.41*	*8.41*	NA	NA	
1999-2000	L(3)	L(0)	638027	10.34	-0.11	NA	NA	0.17
t statistic			*3.62*	*3.00*	*-0.62*	NA	NA	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	L(3)	L(0)	290696	1.66	0.24	NA	NA	0.80
t statistic			*15.24*	*37.67*	*0.97*	NA	NA	
1995-1998	L(3)	L(0)	158956	1.64	2.25	NA	NA	0.94
t statistic			*8.23*	*111.96*	*8.76*	NA	NA	
1999-2000	L(3)	L(0)	223362	5.60	-0.11	NA	NA	0.34
t statistic			*5.41*	*6.92*	*-1.85*	NA	NA	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	L(3)	L(0)	24213	0.22	0.15	NA	NA	0.69
t statistic			*5.54*	*9.33*	*2.81*	NA	NA	
1995-1998	L(3)	L(0)	10377	0.22	0.10	NA	NA	0.92
t statistic			*3.38*	*13.95*	*0.55*	NA	NA	
1999-2000	L(3)	L(0)	43166	0.20	0.15	NA	NA	0.50
t statistic			*3.30*	*3.03*	*2.07*	NA	NA	

Table 6.11: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies

Omitting Tangible Assets and Earnings due to multicollinearity

5 Year R&D Amortization L(4) and 1 Year MSGA Capitalization L(0)

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	L(4)	L(0)	642517	1.72	0.57	NA	NA	0.36
t statistic			*10.62*	*25.01*	*2.05*	NA	NA	
1995-1998	L(4)	L(0)	235251	1.70	2.41	NA	NA	0.89
t statistic			*8.06*	*100.70*	*8.50*	NA	NA	
1999-2000	L(4)	L(0)	679403	9.24	-0.09	NA	NA	0.16
t statistic			*4.21*	*3.14*	*-0.54*	NA	NA	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	L(4)	L(0)	294241	1.51	0.24	NA	NA	0.80
t statistic			*15.36*	*38.50*	*0.98*	NA	NA	
1995-1998	L(4)	L(0)	161277	1.50	2.29	NA	NA	0.93
t statistic			*8.27*	*117.41*	*8.83*	NA	NA	
1999-2000	L(4)	L(0)	233261	5.23	-0.11	NA	NA	0.34
t statistic			*5.79*	*7.02*	*-1.99*	NA	NA	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	L(4)	L(0)	24273	0.21	0.14	NA	NA	0.69
t statistic			*5.67*	*9.39*	*2.84*	NA	NA	
1995-1998	L(4)	L(0)	10446	0.21	0.11	NA	NA	0.92
t statistic			*3.41*	*13.96*	*0.55*	NA	NA	
1999-2000	L(4)	L(0)	43559	0.19	0.14	NA	NA	0.51
t statistic			*3.49*	*3.12*	*2.11*	NA	NA	

Table 6.12: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies

Omitting Tangible Assets and Earnings due to multicollinearity

6 Year R&D Amortization L(5) and 1 Year MSGA Capitalization L(0)

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	L(5)	L(0)	646648	1.58	0.58	NA	NA	0.36
t statistic			*10.67*	*26.23*	*2.05*	NA	NA	
1995-1998	L(5)	L(0)	237961	1.56	2.46	NA	NA	0.89
t statistic			*8.10*	*106.48*	*8.57*	NA	NA	
1999-2000	L(5)	L(0)	716902	8.37	-0.07	NA	NA	0.15
t statistic			*4.69*	*3.21*	*-0.45*	NA	NA	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	L(5)	L(0)	297772	1.39	0.25	NA	NA	0.80
t statistic			*15.46*	*39.68*	*0.99*	NA	NA	
1995-1998	L(5)	L(0)	163654	1.38	2.34	NA	NA	0.93
t statistic			*8.33*	*123.51*	*8.88*	NA	NA	
1999-2000	L(5)	L(0)	244210	4.90	-0.10	NA	NA	0.34
t statistic			*6.17*	*6.97*	*-1.95*	NA	NA	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	L(5)	L(0)	24547	0.19	0.14	NA	NA	0.69
t statistic			*5.83*	*9.45*	*2.86*	NA	NA	
1995-1998	L(5)	L(0)	10541	0.20	0.11	NA	NA	0.92
t statistic			*3.43*	*13.94*	*0.59*	NA	NA	
1999-2000	L(5)	L(0)	44257	0.18	0.14	NA	NA	0.51
t statistic			*3.71*	*3.20*	*2.13*	NA	NA	

Table 6.13: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies

Omitting Tangible Assets and Earnings due to multicollinearity

8 Year R&D Amortization L(7) and 1 Year MSGA Capitalization L(0)

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	L(7)	L(0)	650946	1.43	0.58	NA	NA	0.36
t statistic			*10.72*	*27.65*	*2.05*	NA	NA	
1995-1998	L(7)	L(0)	240878	1.42	2.51	NA	NA	0.89
t statistic			*8.15*	*113.40*	*8.63*	NA	NA	
1999-2000	L(7)	L(0)	758182	7.42	-0.05	NA	NA	0.14
t statistic			*5.24*	*3.30*	*-0.32*	NA	NA	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	L(7)	L(0)	301458	1.27	0.25	NA	NA	0.80
t statistic			*15.57*	*41.07*	*1.00*	NA	NA	
1995-1998	L(7)	L(0)	166215	1.26	2.38	NA	NA	0.93
t statistic			*8.38*	*130.94*	*8.94*	NA	NA	
1999-2000	L(7)	L(0)	257028	4.51	-0.10	NA	NA	0.33
t statistic			*6.63*	*6.91*	*-1.85*	NA	NA	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	L(7)	L(0)	25250	0.17	0.14	NA	NA	0.69
t statistic			*6.14*	*9.54*	*3.00*	NA	NA	
1995-1998	L(7)	L(0)	10767	0.18	0.13	NA	NA	0.91
t statistic			*3.44*	*13.85*	*0.69*	NA	NA	
1999-2000	L(7)	L(0)	45570	0.16	0.14	NA	NA	0.51
t statistic			*4.09*	*3.32*	*2.20*	NA	NA	

Table 6.14: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies
Impact of Tangible Assets on Market Value
Omitting all other factors due to multicollinearity

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	NA	NA	632949	NA	NA	0.90	NA	0.39
t statistic	NA	NA	*10.96*	NA	NA	*13.76*	NA	
1995-1998	NA	NA	242942	NA	NA	0.86	NA	0.90
t statistic	NA	NA	*8.29*	NA	NA	*67.65*	NA	
1999-2000	NA	NA	716884	NA	NA	3.44	NA	0.29
t statistic	NA	NA	*4.04*	NA	NA	*2.55*	NA	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	NA	NA	283174	NA	NA	0.77	NA	0.82
t statistic	NA	NA	*15.59*	NA	NA	*29.70*	NA	
1995-1998	NA	NA	169427	NA	NA	0.76	NA	0.93
t statistic	NA	NA	*8.25*	NA	NA	*80.68*	NA	
1999-2000	NA	NA	284334	NA	NA	1.66	NA	0.42
t statistic	NA	NA	*8.56*	NA	NA	*6.75*	NA	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	NA	NA	42157	NA	NA	0.07	NA	0.65
t statistic	NA	NA	*8.53*	NA	NA	*8.03*	NA	
1995-1998	NA	NA	16553	NA	NA	0.07	NA	0.91
t statistic	NA	NA	*5.48*	NA	NA	*35.83*	NA	
1999-2000	NA	NA	68131	NA	NA	0.07	NA	0.51
t statistic	NA	NA	*5.25*	NA	NA	*3.50*	NA	

Table 6.15: Market Value Coefficient Estimates for Regression Components Between IPOs and Seasoned Companies

6 Year R&D Amortization L(5)

$$MV_t = C_0 + C_1*(R\&D+MSGA)_t + C_2*(INT+GOOD)_t + C_3*(TA)_t + C_4*E_t$$

All regression parameters deflated by the number of shares outstanding

Dep var MV	R&D (Lags)	MSGA (Lags)	C_0	C_1 RD+MSGA	C_2 INT+GOOD	C_3 TA	C_4 E	Adjusted R^2
Dependent Variable: **MV_FDC** = IPO First Day Close Market Value (Price Close Day 1 multiplied by no. of shares outstanding)								
1995-2000	L(5)	reported	20.75	0.01	0.24	0.56	-2.04	0.03
t statistic			*16.03*	*-0.01*	*0.70*	*3.08*	*-2.36*	
1995-1998	L(5)	reported	14.49	-0.02	-1.02	0.46	0.16	0.11
t statistic			*17.81*	*-0.07*	*-1.40*	*4.24*	*0.40*	
1999-2000	L(5)	reported	26.77	1.71	0.04	0.48	-2.00	0.01
t statistic			*10.07*	*0.85*	*0.16*	*1.10*	*-1.21*	
Dependent Variable: **MV_Offer** = IPO Offer Value (Offer Price multiplied by no. of shares outstanding)								
1995-2000	L(5)	reported	12.07	0.14	-0.10	0.27	-0.38	0.10
t statistic			*33.13*	*0.56*	*-1.34*	*5.43*	*-2.01*	
1995-1998	L(5)	reported	11.16	0.26	-0.64	0.24	-0.05	0.16
t statistic			*23.02*	*0.66*	*-0.81*	*4.28*	*-0.18*	
1999-2000	L(5)	reported	12.99	0.09	-0.11	0.30	-0.41	0.07
t statistic			*25.79*	*0.16*	*-1.63*	*2.84*	*-1.35*	
Dependent Variable: **MV_Seasoned** = Market Value (Price Close at 30 June of year of respective IPO issuance multiplied by no. of shares outstanding)								
1995-2000	L(5)	reported	0.69	0.03	0.38	0.05	-0.07	0.78
t statistic			*2.78*	*0.26*	*2.36*	*2.45*	*-0.56*	
1995-1998	L(5)	reported	0.16	0.44	0.39	-0.01	0.08	0.88
t statistic			*0.35*	*2.43*	*1.37*	*-0.18*	*0.48*	
1999-2000	L(5)	reported	1.29	0.06	0.01	0.05	0.01	0.86
t statistic			*8.33*	*2.49*	*0.26*	*5.53*	*0.10*	

7. IPO SHORT-RUN PERFORMANCE (Hypothesis 4)

7.1 Introduction

According to Francis et al (2006) information asymmetry occurs between investors and managers when the first are unwilling to spend money on or unable to collect information about the firm, and the latter are unwilling to provide information about their company's assets. This is especially the case with R&D intensive companies, since R&D is a very "competitive asset" and managers are reluctant to disclose respective information and jeopardize competitiveness. Intangibles are of unique nature, they lack a market, and are rather prone to information asymmetry – Aboody and Lev (1998) point out these facts for R&D and Lev (2001) for all intangibles in general. The investor's view on intangible value will thus be much less unanimous - due to lack of comparables – in relation to tangible assets.

Intangibles also require higher start-up costs compared to tangible assets. Their expected profits can be much higher at the cost of more uncertainty and risk than those of tangible investments. In failure cases though practically all investments placed in an intangible will be lost. In tangible investments some of the initial cost may usually be recovered by selling the asset. Intangibles promising growth and lucrative returns may generate over-optimism in the market, and lead to neglect of associated potential risk (Lev (2001)).

IPOs have a distinct characteristic in their short-run performance compared to seasoned firms; their first day returns are much higher. IPOs issued from 1960 onward show on mean first day returns of 19%; daily returns of seasoned firms are only at 0.05%. Hundreds of empirical studies have been published providing theories and empirical evidence as to why IPOs show high first day returns. Jenkinson and Ljungqvist (2001) and Ljunqvist (2004) provide excellent summaries of all empirical studies. The causes of IPO high first day returns can be summarized in four main categories: a) The issuer deliberately sets the price lower to compensate investors for information asymmetry, i.e. risky IPOs show higher first day returns, b) Institutional reasons make the issuer lower the price of the IPO, c) Control considerations affect the levels at which the issuer decides to set the price, and d) Behavioural approaches, such as over-reaction and misevaluation, make the market overreact and irrationally increase the price at the end of the first day of trading, i.e. the higher the irrational optimism of the market, the higher the first day returns. The impact of both information asymmetry and misevaluation leads to excess returns in intangible intensive seasoned companies, too. Whether the returns are due to information asymmetry, i.e. investors are compensated for investing in risky firms, or misevaluation is an ongoing debate.

Resulting from the above information in the IPO literature it is observed that the two main causes for high first day returns - information asymmetry and misevaluations - are identical to the main characteristic of intangibles. Jenkinson and Ljungqvist (2001) and Ljunqvist (2004) refer in their literature review to many proxies for information asymmetry and misevaluation; intangibles though have been examined in very broad terms and in a few studies only. Intangible intensities were originally measured through very general proxies. Garfinkel and others (2002), Ljungqvist and Wilhelm (2003), Lowry and Schwert (2002), and Francis et al (2006) use dummy variables, which take the value of unity for "high-tech", sometimes simply designated "tech" or "internet" IPOs. They find that the dummy variable is positive and significant indicating the fact that technology and Internet IPOs show higher first day returns compared to other IPOs belonging to other industries.

A further set of literature proxy intangible intensities indirectly, by referring to industries that share the main characteristics of intangibles, e.g. risk, growth promise, and tendency to innovation (Lev (2001)). Benveniste and others (2003) use a dummy variable of unity if an IPO belongs to a growth promising industry or is emerging, i.e. is subject to innovation.

Some of the above studies move a step further and establish a stronger link between intangible insensitive industries and under-pricing caused by information asymmetry. Jenkinson and Ljungqvist (2001) and Ljungqvist (2004) test whether the levels of price revisions are related to first day returns, indicating that higher price revisions imply higher information asymmetry. Lowry and Schwert (2002), Ljungqvist and

Wilhelm (2003), and Benveniste et al (2003) empirically show that higher price revisions are observed in technology and Internet IPOs.

One may criticize that these papers do not directly test if intangible investments and intensities indeed cause higher first day returns. For example some researchers focusing on Internet IPOs argue that under-pricing itself may be an intangible because the issuer can use it as a marketing tool. They argue that by deliberately setting the price lower IPOs gain media attention (Demers and Lewellen (2003), DuCharme et al (2001a; 2001b), Aggarwal et al (2002), Schrand and Verrechia (2005), Ljungqvist and Wilhelm (2003)).

Further, Francis et al (2006), using a sample of US IPOs issued between 1992 and 2000, find that within their regression the "technology" dummy variable is positive and significant, while their R&D intensity dummy variable is positive yet insignificant. Consequently, they show that the higher first day returns of technology-driven IPOs are not directly linked to R&D. Instead they find that first day returns are positively linked to the percentage of institutional ownership and the magnitude of analyst coverage.

Only a few empirical studies have established a direct link between IPO first day returns and intangibles. Most define R&D expense as the intangible. In order to actually understand if intangibles themselves significantly affect IPO first day returns Choi and Kim (2005) and Guo et al (2006) directly investigate the role of R&D intensity on IPO first day returns, by defining it in the form of R&D over total assets and R&D over sales respectively. Contrary to Francis et al (2006) they link R&D intensity directly to IPO first day returns. Both link higher first day returns to information asymmetry related to R&D. Choi and Kim (2005) find a positive econometrical relationship between IPO first day returns and under pricing, while Guo et al (2006), using a sample of US IPOs issued between 1980 and 2000, confirm their findings. They split their sample into IPOs with a R&D over sales ratio of zero, below or above the median. IPOs with no R&D investments show mean values of 10.7%for first day returns. The respective figures for below and above the median R&D over sales intensive IPOs are 11% and 15%. While Choi and Kim (2005) and

Guo et al (2006) provide evidence that R&D intensity is positively related to IPO first day returns, they do not test if intangibles reported on the balance sheet have an effect on IPO first day returns.

Only one empirical study has established a link between intangible capital – proxied by capitalized software – and first day returns. Givoly and Shi (2005) use a sample of 392 US software-related IPOs issued 1986-1998 and investigate the impact of software (a specific R&D investment) on IPO first day returns. Generally it is allowed to capitalize software R&D investments when they reach the "development" stage, which is less risky, compared to the "research" stage. Their results show IPOs which capitalize their R&D software and therefore are less risky and of lower information asymmetry, with lower first day returns of 19% compared to 29% for IPOs treating R&D as an expense. These figures are rational and in agreement with the information asymmetry theory. Yet, they find contradictory results with respect to the relationship between IPO first day returns and software capital intensity. High compared to low software capital intensive IPOs - intensity measured as the ratio of software R&D capital over overall IPO book value - result in gains of only 11% vs. 31% on first day returns. Givoly and Shi (2005) argue that the higher the percentage of software capital relative to book value the larger the information asymmetry. Therefore capitalization of software decreases information asymmetry more for high than low R&D software capital intensity. But again their research leaves a number of open issues. First, their definition of "software" intensity is defined relative to IPO "book value". This ratio, rarely used in literature, does not measure the relation of software to all assets or the firm's revenues. Book value is instead a measure including all assets and liabilities, and therefore difficult to interpret and compare. In doing so book value captures the size of the firm and does not express the proportion of intangible to tangible assets. The intangible capital over total assets ratio would answer the research question on whether intangible capital raises first day returns because of info asymmetry more appropriately. Second, software capital is not the only intangible to be capitalized on the balance sheet. In other words, to test properly if capitalized intangible intensity leads to lower information asymmetry and lower returns one must include all intangibles recognized on the balance sheet as assets. Third, Lev (2001) argues that all intangibles are subject to information asymmetry.

But Givoly and Shi (2005) do not test the relationship of first day returns between IPOs capitalizing software and IPOs with no software at all. Thus, no clear distinction in the amount of risk and first day returns between the two IPOs groups is possible.

In conclusion it is still debatable if and to what measure first day returns of technology IPOs intangibles, both expensed or capitalized, are directly affected by intangible intensity. This thesis explicitly uses technology IPOs and examines the effects of their intangible intensity on first day returns.

The present research expands on the above literature of Choi and Kim (2005) and Guo et al (2006) by being the first to define R&D both as expense - as required under US-GAAP rules and reported on the Income Statement - as well as implied capital – as proposed by Lev and Sougiannis (1996), Lev et al (2002), Damodaran (2001), and empirically proven by Hypothesis 2. It then measures the R&D intensity as R&D expenses over sales and R&D implied capital over total assets respectively. Treating R&D either as expense or capital is of interest concerning discrepancies between the positive relationship of R&D expenses and first day returns and the negative relationship of intangible capital and first day returns.

It is also the first empirical study to test for a possible relationship between IPO first day returns and balance sheet intangible intensities, i.e. the ratio of intangible assets (R&D software plus all other intangibles allowed to be capitalized under US-GAAP) and goodwill relative to IPO total assets. This is of importance remembering the Lev (2001) argument that not only R&D, but also all intangibles, are risky and subject to information asymmetry. Considering the fact that Givoly and Shi (2005) argue that capitalized intangibles are of lower information asymmetry and therefore should yield lower first day returns, it is interesting to examine if and to what extent balance sheet intangible intensities affect first day returns.

Finally, also in the framework of this chapter research concentrates on the 1995-2000 US technology boom and investigates a respective IPO sample, splitting it into two sub-samples for IPOs issued between 1995 and 1998, the beginning and the 1999 to

2000 peak ("bubble") of the IPO boom. Other studies look at broader time intervals or do not distinguish between the two characteristic time periods, the optimistic 1995-1998 interval and the over-optimistic 1999-2000 "bubble" interval.

A further reason to distinguish between the two time periods can be seen in the necessity to investigate a possible time period effect on intangible intensities and consequently their correlation with IPO first day returns. As observed in Hypothesis 1 intangible intensities are higher in the 1999-2000 interval compared to 1995-1998.

In this chapter Hypothesis 4 states that R&D and balance sheet intensive technology IPOs should show higher first day returns compared to those of lower intensities or not reporting any R&D or balance sheet intangibles. The hypothesis is based on the fact that R&D is characterized by information asymmetry - as pointed out by Guo et al (2006) and Choi and Kim (2005). A further reason to assume this is the fact that researchers have traditionally considered the 1995-2000 interval as a "bubble" (Loughran and Ritter (2003a)), i.e. a period of over-optimism when especially intangibles are most prone for over-valuations (Lev (2001)).

The Givoly and Shi (2005) finding of the negative relationship between capitalized software intensity to first day returns is challenged in this hypothesis. Intangible assets intensity in the present thesis is measured relative to total assets, both tangible and intangible assets. Based on Lev (2001), intangible assets show risk and information asymmetry compared to tangibles assets. Therefore, while capitalizing intangibles may lead to lower information asymmetry, the higher intensities will still increase information asymmetry.

7.2 Literature

A special form of excess returns is the ones observed in the IPO literature. In their first day of trading IPOs show on average returns of 20% (Ljungqvist (2004). In comparison, the average daily seasoned company excess returns are only 0.5%. As a general trend, first day returns are much higher in periods of economic booms and high IPO issuance activity. First day returns increased from 7.4% in the 1980ies to

14% in the mid 1990s. The increase was more dramatic shortly afterwards when under-pricing reached a skyrocketing level of an average of 65% for the late 1990ies Internet IPO boom. The climax of IPO first day returns came during the 1999-2000-bubble period. IPO first day returns reached 80%. First day returns dropped sharply immediately afterwards, and came back to 14% by 2001 (Ritter and Welch (2002) as well as Loughran and Ritter (2003)).

Many researchers have made an attempted to examine the underlying reasons as to why IPOs show very high first day returns. In this section the main findings are summarized. A detailed review of all studies can be found in Jenkinson and Ljungqvist (2001), and Ljungqvist (2004).

Some theories and evidence lean towards explanations that consider the initial offering price as too low. In other words the issuer may deliberately "under price" the IPO, also known as "leave money on the table". The idea is that the issuer may wish to compensate the market for information asymmetry. Other theories, consider that the issuer properly sets the offer price. It is the market that sets the closing price higher, i.e. the market may misprice and overreact. As of today it is a debate as to which of the theories prevails.

7.2.1 Asymmetric Information Theory

Asymmetric Information Theories key principle is that investors, issuers and under-writers do not share the same amount of knowledge about the IPOs true value. As a result, in order to compensate for "purchase" of knowledge, or provide a premium for risk that less informed parties' take in IPOs, the price of the issue is set deliberately lower.

Adverse Selection Models

Winner's Curse: Based on Rock (1986), this theory assumes that the market has higher and heterogeneous information compared to the issuer. To be more specific, the issuer is unaware of the true value of the IPO, while some investors are perfectly informed and other uniformed. The implications of such a market are that informed investors subscribe only to "hot issues", while uniformed ones subscribe equally to all. The outcome of such an investment strategy is a Winner's Curse on uninformed investors, assuming that IPO allocation restrictions exist. In other words, uniformed investors receive all shares that they bid for in over-priced issues, while they may receive less in "hot" ones. As a result, the weighted average return for uninformed investors will lean towards the overpriced offers, and therefore maybe negative. The conclusion is that under-pricing maybe deliberate from the issuer, to compensate uniformed investors for participating in all offers. The issuer will set the price as low, as to make uninformed investors break even, i.e. zero abnormal returns. Seen from a different angle, informed investor's abnormal returns will be equal to the amount they paid to purchase information. The Winner's Curse Theory seems finds support in the framework of fixed offers. As a result it may well hold in the UK (Jenkinson and Ljungqvist (2001)).

Under-Pricing and ex-ante uncertainty: As an implication of the Winner's Curse, under-pricing should increase whenever uncertainty is higher. (Ritter (1984), Beatty and Ritter (1986)) Although this proposition finds solid theoretical background, it is difficult to be tested directly tested empirically. As a result, studies use various proxies to measure uncertainty (Jenkinson and Ljungqvist (2001)).

Under pricing as a Signal of Firm Quality: Assuming that the issuer has higher information than the market about the IPOs present value future cash flows as well as, in some cases, about cash flow variance, investors may fear a "lemon's" problem. To be more specific, the market may fear that the issuer may be willing to issue shares at an average demand price because his/her superior information shows that the true value of the IPO is lower. Therefore, the issuer signals to the market that the IPO is of high quality by deliberately under-pricing its shares (Jenkinson and Ljungqvist (2003)).

Principal-Agent Models: Assuming that banks are better informed than the issuer about investor's IPO shares demand, under-pricing maybe a form of compensation to the underwriter in order to monitor the IPO and gain maximum proceeds out of the offer (Jenkinson and Ljungqvist (2001)).

Analysts Coverage Purchase: An extension of the Principal agent model, this theory assumes that most likely, the under-writer has access to higher information than the issuer about the IPOs present value future cash flows, as a result of superior forecasters services. Therefore, the issuer may wish to lower the asymmetry by hiring those analysts. In other words, analyst's costs may be paid through under-pricing, and thus the offer price is negotiated between the under-writers and its analysts (Loughran and Ritter (2003)).

Information Revelation Theories

Based on the Benveniste and Spindt (1989) study, and more relevant to book-building offers, investors have higher and heterogeneous information about the IPOs value compared to the issuer. The underlying idea is that while the issuer may have a better view about their own firm's expected profitability, the market may have a higher knowledge, about the issuing firm's competitors, and thus have comparables of similar to the IPO firms. Moreover, investors may have a better understanding of the economy and the overall IPO market. Most importantly, investors have higher information about their own demand of shares.

While it is relatively easy to prohibit investors from downscaling the price of the IPO (in the sense that the issuer and underwriter may exclude or limit investors that offer low valuations), it is difficult to make the market reveal higher prices, unless they have an incentive. Therefore the underwriter collects positive price corrections from the market, however, he reduces by a few percent the increased price, in order to compensate investors for their information.

Under an efficient market the under-pricing should reflect the value of the information. As a result, the higher the information asymmetry, the higher the incentive needed in order to make investors reveal higher valuation and the higher the level of under-pricing required.

The positive aspect of the information revelation theory this theory is that it is assumed to make the market more efficient, in a sense that it reduces information asymmetry, and that it provides an incentive for all investors to collect information, and not rely on passive information, thus avoiding a cascade However, the downside of this theory is that under-writers may induce more sceptical investors to increase the IPO price, leading to overreaction and overpricing. The under-writer benefit from such a price increase is that they can charge higher fees.

From an empirical point of view the main tool in measuring how much information issuers/underwriters "acquire" from investors is by examining the level of price revisions, defined as the percentage difference between the offer price and the mean of the indicative price range. However, ideally one must also account for and subtract the spill-over effect, defined as information gained from earlier investors and IPOs, which the underwriter may use as a valuation tool and thus diminish compensation. The result is that the higher the revision the higher the under-pricing, while the higher the spillover, the lower the first day abnormal returns of an IPO. The net effect of those two components sets the final degree of under-pricing for an offer.

Cascades: Based on the Welch (1992) study, assuming that the market has higher and heterogeneous information about the IPOs value compared to the issuer, later coming investors passively accept the price settled by previous ones, even if they may have private information of their own. The implication of such a strategy is that only hot issues will sell all their shares, while an even slightly higher priced IPO will not sell at all. Under pricing may be the solution in avoiding such a risk. The Cascade theory is relevant only with respect to fixed price offers. (Jenkinson and Ljungqvist 2001)

Un-known investors demand curve: Assuming that the market has higher and heterogeneous information about the IPOs value, compared to the under-writer and most probably issuer, the later may face uncertainty about potential demand for the new shares in the marketplace. In other words, the issuer/underwriter may be uncertain about the shape of the share price demand curve, and thus be unsure as to what is the maximum IPO market price tolerated by the market? In order to sell all IPO shares, the offer must be under priced, since investors will only accept prices below that of their common assessment. (Ritter and Welch (2002))

7.2.2 Misevaluation and Overreaction Theories

In contrast to the above theories, misevaluation/overreaction hypotheses consider that IPO initial abnormal returns are not a deliberate act by the issuer or under-writer setting the share price too low, but rather an anomaly by the market which raises the price of the firm too high on the first day of trading. Misevaluation theories imply information asymmetries between issuer/under-writers and investors.

General Misevaluation/Overreaction Theories: A number of researchers (Ritter (1991), Levis (1993)), Ljunsquist and Willhelm (2003)) point out that first day IPO abnormal returns may not be solely be attributed to deliberate under-pricing. They argue that market misevaluation and overreaction may be part of the problem. For example investors may have overvalued the prospects of the IPO too high, or the issuer and/or underwriter may have undervalued the markets expectations.

Of strong evidence relating initial IPO returns to misevaluation, Purnanandam and Swaminathan (2002) empirically find – using 2288 IPOs, issued between 1980 and 1997 - that overvalued at the time of the offer IPOs (high P/BV) earn 5% to 7& higher first day abnormal returns than undervalued offers (low P/BV) The positive aspect of this study is that it actually attempts to measure the true value of the firm, through comparables, and so has a solid point on estimating “misevaluation”. The negative aspect is that the use of comparables may indeed lead to false conclusions.

The Realignment of Incentives Theory: Seen from an opposite view, compared to the Brennan and Franks (1997) study, under-pricing may not be a deliberate action by the issuer to avoid monitoring, but rather a result of under-writer inefficiency, combined with issuer level of commitment to the offer. In other words, unless the issuer does not have an incentive to properly monitor the under-writer, the later may under-price the issue for various irrational reasons. Therefore, the fewer shares pre-owned by “insiders”, defined as the firm’s management and CEO mainly, the higher the degree of under-pricing. In contrast, if “insiders” own a higher fraction of the shares, i.e. the less fragmented ownership is, they have a higher incentive to do their job properly and thus gain the maximum proceeds out of the offer (Loughran and Ritter (2003), Ljungquist and Wilhelm (2003)).

7.2.3 Intangibles and IPO First Day Returns

Intangibles are characterized by both information asymmetries – due to their uniqueness and therefore lack of comparables – as well as misevaluations and overreactions – due to their difficult to estimate promising profits, most papers link intangibles in the framework of such theories. Chapter 2 provides mode details.

With respect to information asymmetry, papers supporting the information revelation theories find a possible link between under-pricing price revisions and intangibles. To be more specific, Lowry and Schwert (2002), Ljungqvist and Wilhelm (2003), and Benveniste et al (2003), empirically find that underpricing (cross-sectional dependent variable) is positively related to price revisions, these defined as the percentage difference between the offer price and the mean of the indicative price range. Price revisions are positively related to intangibles intensive industries. Interestingly, Benveniste et al. (2003) elaborate by defining revisions as related to spillovers from contemporaneous IPOs, an aspect that Ljungqvist and Wilhelm (2003) ignore.

The positive aspect of all three studies is that they hint towards a relationship between intangibles intensity and under-pricing. With respect to intangibles, Ljunqvist and Wilhelm (2003) use the dummy variables "high-tech" and "Internet" IPOs – to capture intangibles intensive IPOs, and see that those are positive and significant with respect to the degree of price revisions (dependent variable). Drake and Noel (2001) find similar results.

Among the same principles, Benveniste et al (2003) perform cross-sectional regressions whereby dependent variables of special interest are the "natural logarithm of proceeds revisions" and the "initial returns". They capture intangibles by using the "nascent" industry as dummy – equal to unity when IPOs belong to emerging markets - and the ratio PVGO/(E/P), which captures the level of growth opportunities of an IPO. The "nascent" industry dummy is positive and significant with respect to "initial returns", while it is positive yet insignificant to the "natural logarithm of proceeds revisions" regression. The PVGO/(E/P) ratio is positive and significant for both regressions. This indicates that intangibles indeed play a role in IPO under-pricing.

Lowry and Schwert (2002) capture intangibles through the "technology" dummy, the dependent variable being initial returns. The dummy is positive and significant and so is the coefficient of "revisions".

The negative aspect of all those studies is that all use dummy variables capturing intangibles intensive industries and not intangibles themselves. As a result, one could argue that price revisions, which cause under-pricing - may not directly be related to intangibles, but rather to some aspects correlating to intangibles intensive industries.

Few empirical studies so far have used a more direct approach in relating intangibles to IPO first day returns. Choi and Kim (2005) use a sample of US IPOs issued between 1997 and 2001 and running the same kind of regressions as Ljungqvist and Wilhelm (2003), and Benveniste et al (2003), find a positive and significant relationship between R&D intensity – measured as the R&D over Total Assets Ratio – and first day returns. They directly link R&D information asymmetry to under-pricing by referring to the Benveniste and Splindt (1989) model, which states that the issuer is less informed than the market about the true value of the IPO. Choi and Kim (2005) argue that this may well apply for R&D. The market may have more knowledge on R&D valuations than the issuer because they may have experience from other IPOs or companies, which have invested in R&D. They establish a positive relationship between first day returns and the levels of price revisions. Yet, they conclude that higher first day returns are observed only when the price revisions are positive. According to them this is an indication that the market reacts positively to good news on R&D. They do not find a significant relationship between first day returns and negative price revisions. Therefore they argue that the market does not react and is not compensated through under-pricing by the issuer for revealing negative information on R&D.

Guo et al (2006), using a sample of US IPOs issued between 1980 and 2000, also favor an information asymmetry theory to explain the IPO higher first day returns like Choi and Kim (2005) and confirm the previous findings. They split their sample into IPOs with a zero, below and above the median R&D over sales ratio. Findings reveal that IPOs with no R&D investments show first day returns of 10.7% on average. The respective figures for LO (below the median) and HI (above the median) R&D over sales intensive IPOs are 11% and 15%. Yet, in their case they argue that the issuer is more informed than the market – and not vice versa - about the value of the offer and its R&D. Consequently the issuer signals the quality of R&D intensive IPOs through under-pricing. They empirically prove that R&D intensive IPOs are indeed of quality, ~~by~~ showing that these exhibit three years after the offer higher returns compared to IPOs with lower or zero R&D intensities. They further find that a higher percentage of HI R&D intensive IPOs subsequently conduct SEOs. This is also supported by Jenkinson and Ljungqvist (2001) who show that subsequently conduct SEOs are linked to higher quality IPOs.

On the other hand, Francis et al (2006), using a sample of US IPOs issued between 1992 and 2000, find that within their regression the "technology" dummy variable is positive and significant, while their R&D intensity dummy variable is positive yet insignificant. Consequently, they show that the higher first day returns of technology-driven IPOs are not directly linked to R&D. Instead they find that first day returns are positively linked to the percentage of institutional ownership and the magnitude of analyst coverage.

While Choi and Kim (2005) and Guo et al (2006) provide evidence that R&D intensity is positively related to IPO first day returns, they do not test if intangibles reported on the balance sheet have an effect on IPO first day returns. Only one empirical study has established a link between intangible capital – proxied by capitalized software – and first day returns. Givoly and Shi (2005) use a sample of 392 US software-related IPOs issued between 1986 and 1998 and focus on this specific R&D investment. US-GAAP rules (SFAS 86) allow this kind of R&D to be capitalized – i.e. accounted for on the balance sheet, most often under "intangible assets"- if it fulfills certain criteria (for more on accounting rules see Chapter 2). Generally, it is allowed to capitalize software R&D investments when they reach the "development" stage, which is less risky compared to the "research" stage. Their results show IPOs, which capitalize their R&D software and therefore are less risky and of lower information asymmetry, with 19% lower first day returns compared to 29% for IPOs treating R&D as an expense. These figures are rational and in agreement with the information asymmetry theory. Yet, they find challenging results with respect to the relationship between IPO first day returns and software capital intensity. High compared to low software capital intensive IPOs - intensity measured as the ratio of software R&D capital relative to overall IPO book value - result in gains of only 11% vs. 31% on first day returns. Givoly and Shi (2005) argue that the higher the percentage of software capital relative to book value the larger the information asymmetry. Therefore, capitalization of software decreases information asymmetry more for high than low software R&D capital intensity.

Two main cases with respect to intangibles relate to the Institutional Explanation Theory. In the first case when underpricing is considered a marketing tool to cause investor and media attention, underpricing itself is considered an intangible such as advertising and web-metrics. Demers and Lewellen (2003), with a sample of US Internet IPOs issued between 1990 and 2000, run cross-sectional regressions with IPO first day returns as the dependent variable and web traffic – among other variables – as the independent variable. They find that the higher the web-traffic on the IPOs web site, the higher the under-pricing. They argue that more investors are interested about the offer, when its price is lowered; potential customers are attracted to purchase the company's goods and services. Lower IPO proceeds are compensated by higher sales volume. However they do not investigate further the actual future sales figures. DuCharme et al (2001a; 2001b), Aggarwal et al (2002), Schrand and Verrechia (2005), focusing on Internet IPOs, find similar results. Ljungqvist and Wilhelm (2003) do not provide empirical evidence but accept this theory as plausible. Stoughton et al (2001) agree with the Demers and Lewellen (2003) and DuCharme et al (2001a; 2001b) findings. Yet they argue that the marketing campaign through under-pricing is primarily observed in quality IPOs. They imply that under-pricing may signal quality rather than being oriented as an advertising tool to generate investor sentiment.

In the second case, in practice expressed also as the "realignment of incentives" theory, under-pricing is associated with the level of pre-insider ownership, which again is related to intangible intensity. More specifically, Ljungsquist and Willhelm (2003) empirically test the realignment of incentives theory and confirm most of its points. Their paper is indirectly of value to intangibles research, since they examine a period of high intangible intensity (1996-2000), and account for two dummy variables directly capturing intangible intensive industries: "Internet" and "High Technology" IPOs. The relevance of empirical results and theoretic explanations of the study are summarised as follows. They use a sample of 2178 IPOs between 1996 and 2000, and demonstrate empirically that "insiders' stakes" have dropped from 64.5% (1996) to 51.8% (2000). CEO ownership has decreased from 20.5% (1996) to 11.6% (2000), while investment banks-underwriter stakes have decreased from 14.5% (1996) to 13.5% (2000). Insider stakes show a decline in venture capital backed IPOs from 44.1% (1996) to 40% (2000), while corporate stakes declined from 42.3% (1996) to 33% (2000).

By running cross sectional regressions - the dependent variable being first day IPO abnormal returns - Ljungsquist and Willhelm (2003) find that the level of pre-ownership by venture capitalists, investment banks and other cooperate stakes, all have negative and significant coefficients, thus verifying the Realignment of Incentives Theory. Pre-ownership of CEO shares has a negative, yet insignificant coefficient, a surprising result. However, when multiplying the "Internet" dummy variable by CEO stake, the coefficient remains negative and becomes significant, thus they conclude that CEOs of Dot Com intangible intensive firms care more about getting maximum proceeds for their firm when they own more shares, and thus under-pricing is less.

Further, the dummy variables "Internet" and "High Tech", assuming unity for firms belonging to these sectors, and zero otherwise, are both positive and significant, indicating that higher under-pricing is related to higher intangibles intensity.

The positive aspect of the Ljunsquist and Willhelm (2003) study is that it verifies the Realignment of Incentives theory and links intangibles to IPO under-pricing. The negative aspect of the Lojungsquist and Willhelm (2003) study is that the relationship between the dummy variables representing intangibles may be insignificant when accounting for endogenous factors.

7.3 Methodology

7.3.1 Accounts Used in the Research

The sample investigated in hypothesis 4 includes all intangibles, which should be capitalized under US-GAAP rules, i.e. intangible assets and goodwill, as well as those, which, although expensed, have proven empirically to be of value, e.g. R&D (Lev and Sougiannis (1996) (1999), Damodaran (2001)). Chapter 2 of this thesis provides detailed accounting guidelines on the nature of intangibles to be included in these accounts. Focusing on balance sheet intangibles, the intensity ratio definition is consistent with the one used in the previous chapter 7 and is defined as balance sheet intangibles (intangible assets plus goodwill) over total assets. Similarly, the accounts of intangible assets and goodwill are integrated into one single value in order to avoid multi-collinearity in regressions. Further, the present research examines the effect of R&D on IPO first day returns. Under US-GAAP rules R&D must be expensed and thus the ratio used to define intensity is the R&D expense over sales ratio. Most researchers, e.g. Guo et al (2006), have also this ratio. On the other hand instigated by the Damodaran (2001) argument that R&D expenses are of value and therefore should be capitalized this study also examines the effects of R&D in IPO first day returns, by assuming that R&D is capitalized. In this case intensity is defined as the ratio of R&D capital over total assets. Choi and Kim (2006) have also used this definition. Total assets are more appropriate as a denominator when capitalizing R&D since both accounts are included in the balance sheet.

R&D expenses and sales are derived from the IPO income statement. Balance sheet intangibles (intangible assets and goodwill) as well as total assets are derived from the balance sheet. Chapter 4 provides details on collection and measurement of such data.

R&D expense implied capital is estimated within the hypothesis using a six-year linear depreciation. The selection of a six-year period is chosen as an in-between solution, based on the various capitalization scenarios proposed in literature. The six-year period has also been demonstrated to be an acceptable working assumption for the present study. More specifically, Chan et al (2001) state that the NBER (National Bureau of Economic Research) optimal R&D depreciation rate is 15%, nevertheless in their research, they capitalize R&D with a 20% depreciation rate, i.e. assuming a five-year capitalization. Hand et al (2003b) use a seven-year linear amortization, while Lev et al (2002) find that a linear depreciation between three and nine years should be used when capitalising R&D expenses depending on the industry type of firms. Hypothesis 2 – for the technology sample in this thesis - confirmed the Lev et al (2002) findings.

For a six-year linear depreciation the R&D expenses starting at the time of the offer and going six years back are collected. An annual 16.67% depreciation rate is assumed. Therefore Equation 7.1 estimates R&D capital itself as follows:

$$\begin{aligned} RD\_Capital = {} & 100\%*RD(OFFER)+83\%*RD(t-1)+67\%*RD(t-2)+50\%*(t-3)+ \\ & +33\% * RD(t-4) + 17\%* RD(t-5) + 0\%* RD(t-6) \qquad [7.1] \end{aligned}$$

When treating R&D as capital a modification has to be made to the denominator of total assets by adding the implied R&D capital to the reported total assets.

7.3.2 Sample Split Procedure

A very similar method to Guo et al (2006) and Choi and Kim (2005) is followed in this hypothesis. Based on Guo et al (2006), in order to test if intangibles intensive IPOs show higher first day returns, the sample is first split into IPOs that report R&D

and those that do not report R&D. Then the R&D reporting IPO sample is further split into IPOs with R&D intensity (expenses to sales ratio) above the median (HI R&D) and intensity below the median (LO R&D). The median R&D over sales ratio is determined excluding all IPOs which do not report, i.e. have not invested in, R&D expenses at the time they go public. In defining intensity as R&D capital over total assets an identical procedure is followed, however this time the median is defined as the R&D capital over total assets ratio.

In addition the entire sample is split into IPOs, which report balance sheet intangibles at the time of the offer, i.e. intangible assets or goodwill or both, and those that do not report balance sheet intangibles. Again the median balance sheet intangibles intensity ratio is estimated excluding IPOs, which do not report any balance sheet intangibles. High and low portfolios are created for balance sheet intangibles with ratios above (HI) and below (LO) the median respectively.

The above procedure for both R&D and balance sheet intangibles is conducted for the main sample period 1995-2000 as well as for the sub samples in the time periods 1995-1998 and 1999-2000.

7.3.3 Measurement of First Day Returns

The effects of intangibles intensities are examined in two different ways. First, as conducted in the research of Guo et al (2006), portfolios are created based on IPO intangible intensity (in terms of R&D over sales, R&D over total assets, and balance sheet intangibles over total assets). A first test is conducted to examine if first day returns are higher for IPOs reporting R&D and balance sheet intangibles compared to those that do not report. The second test examines if IPOs with R&D and balance sheet intangible intensities values below the median also show lower first day returns compared to IPOs with intangible intensities values above the median. It also examines if the two portfolios show significantly different first day returns compared to the ones of zero intensity.

For each portfolio the equally weighted and value weighted mean and median first day returns are estimated. In the equally weighted portfolios each IPO is assigned the same weight (1/n), where n is the number of IPOs included in the portfolio). In a value weighted portfolio, as used by Guo et al (2006), individual IPO first day returns are weighted values, corresponding to the offer market value of the individual IPO over the total offer market value of all IPOs.

In order to test if first day returns means or medians show significant differences between the individual portfolios, the following significance tests are used. For the mean first day returns values the two-sample t-test is used assuming unequal variances between the samples. The unequal variances t-test is preferred compared to the equal variance one because it is more accurate when working with not normally distributed samples. When conducting comparisons between value-weighted returns a respective adjustment has to be undertaken in the t-test. The variances have to be weighted using the same weights applied for the derivation of the means. Goldberg et al (2005) provide the appropriate methodology to this.

To test on the other hand the statistical significance of differences between medians four different tests are applied, the Wilcoxon-Mann-Whitney test, the Median Chi-Square test, the Kruskal-Wallis test, and the van-der-Waerden test. Failure of even one test to provide evidence that medians are statistically different, leads to the rejection of the assumption. This happens though very rarely as in most cases all tests lead to the same conclusion.

An econometrical research is conducted using cross-sectional regressions. Their dependent variable is the IPO first day returns value. The methodology of Choi and Kim (2005) is used to linearize first day returns by taking the natural logarithm of the values. First day returns are defined as the ratio of first day close market value over offer market value avoiding thus any negative values.

Two common parameters are used as independent variables in all regressions to control risk: a) offer market value – the rationale being that smaller firms are more risky; b) the ratio of proceeds over market value to express the percentage of IPO shares sold to the public - higher proceeds implying higher risk (Ljungqvist (2004)). Due to the fact that the offer market value is not normally distributed and depicts significant scatter it is recommended to use its natural logarithm instead and linearize the function.

Equation 7.2 tests if IPOs that report R&D or intangible assets and goodwill show higher first day returns compared to those which do not do so. Guo et al (2006) also use dummy variables, taking the value of unity when IPOs have invested in an intangible.

$$LN\left(\frac{MV\_FDC}{MV\_OFFER}\right) = C + LN(MV\_OFFER) + LN\left(\frac{Proceeds}{MV\_OFFER}\right) + D\_RD + D\_INTGOOD \qquad [7.2]$$

Equations 7.3 and 7.4 examine if R&D intensities affect IPO market value. They are used in samples, which include IPOs that actually have invested in R&D only. In both equations balance sheet intangible intensities are measured in the form of a dummy variable taking the value of unity when an IPO reports either intangible assets or goodwill or both. While Equation 7.3 treats R&D as an expense, Equation 7.4 treats it as an asset. When treating R&D as capital (asset) a six-year capitalization procedure has been assumed.

$$LN\left(\frac{MV\_FDC}{MV\_OFFER}\right) = C + LN(MV\_OFFER) + LN\left(\frac{Proceeds}{MV\_OFFER}\right) + LN\left(\frac{RD_tEXP}{SALES_t}\right) + D\_INTGOOD \qquad [7.3]$$

$$LN\left(\frac{MV\_FDC}{MV\_OFFER}\right) = C + LN(MV\_OFFER) + LN\left(\frac{Proceeds}{MV\_OFFER}\right) + LN\left(\frac{RD_tCapital}{Total\_Assets_t}\right) + D\_INTGOOD \qquad [7.4]$$

Similarly Equations 7.5 and 7.6 investigate the role of intangible intensities on first day returns. Yet they are used in samples including only IPOs which have incurred

R&D expenses as well as recognized some kind of balance sheet intangibles. Therefore they measure the impact of both R&D intensities and balance sheet intensities on first day returns. Again, Equation 7.5 treats R&D as an expense, while Equation 7.6 uses a six-year linear capitalization.

$$LN(\frac{MV\_FDC}{MV\_OFFER}) = C + LN(MV\_OFFER) + LN(\frac{Proceeds}{MV\_OFFER}) + LN(\frac{RD_t EXP}{SALES_t}) + LN(\frac{INTGOOD_t}{Total\_Assets}) \qquad [7.5]$$

$$LN(\frac{MV\_FDC}{MV\_OFFER}) = C + LN(MV\_OFFER) + LN(\frac{Proceeds}{MV\_OFFER}) + LN(\frac{RD_t CAP}{Total\_Assets_t}) + LN(\frac{INTGOOD_t}{Total\_Assets}) \qquad [7.6]$$

In case multicollinearity is an issue in any of the above regressions, the regressions will be run more than one time. The first time the first of the two collinear factors will be included in the regression and the other one will be omitted. The second time, the second collinear factor will be used in the regression, while the first one will be omitted.

7.4 Empirical Results

Table 7.1 provides mean and median first day returns of the entire 551 IPO sample. It further examines if R&D and balance sheet intangibles reporting IPOs show higher first day returns compared to those, which have not invested in R&D and balance sheet intangibles respectively. It reveals that the 551 technology IPOs issued between 1995 and 2000 gained mean first day returns of 57.90% (equally-weighted). Consistent with results reported in literature technology IPOs gain much higher first day returns during the peak of the IPO boom in 1999-2000 with values of 89.62% compared to the 1995-1998 interval values of 28.93%. The 28.93% figure is closer to the mean 21% of first day returns mean for IPOs issued in the 1990ies as elsewhere reported (Ljungqvist (2004)). The 89.62% figure for the 1999-2000 issued IPOs is consistent with the 80% first day returns provided by Ljungqvist (2004) for the same period, and it is almost identical to the 88% first day returns figure provided by Choi and Kim (2005) for technology IPOs issued between 1997 and 2001.

Focusing on the entire 1995-2000 sample and first day returns value-weighted by offer market value are higher compared to equally-weighted ones, 84.39% vs. 57.90%. The higher value-weighted returns contradict the risk/information asymmetry theory, whereby smaller firms are more risky and therefore the smaller the firm the higher the first day returns (Jenkinson and Ljungvist (2001), Ritter (1991; 1984)). Higher value-weighted returns may reflect the fact that in the late 1990ies it was investor sentiment (misevaluation/overreaction) rather than under-pricing for risk that dominated the market. Even when excluding value-weighted min-max figures value-weighted returns still remain higher, i.e. outliers do not affect results.

The higher value-weighted returns (compared to equally-weighted) observed in the 1995-2000 sample are driven mainly by IPOs issued during the 1999-2000 peak. Value-weighted returns means amount to 118.45% compared to 89.62% for equally-weighted for IPOs issued in 1999-2000, while the respective figures for IPOs in 1995-1998 with 31.11% and 28.93% show a smaller difference. The fact that equally- and value-weighted first day returns may not show any large differences in this case of the 1995-1998 sub-period is not a unique observation in this thesis or of the specific sub-sample period. Guo et al (2006) find approximately the same equally- and value-weighted returns for IPOs issued between 1980 and 1995. They report a mean of 10.7% for both. The much lower return values in comparison to this thesis are due to the fact that the Guo et al (2006) sample refers to a very broad time interval, capturing the lower returns of IPOs issued in the 1980s and early 1990s. Their sample consists further of IPOs of all industries rather than purely technology IPOs.

The fact that value-weighted returns are much higher during the 1999-2000 peak of the IPO "bubble" can be seen as re-enforcing evidence that the overall higher value-weighted returns are driven by investor sentiment. This is due to two main reasons. First, Loughran and Ritter (2003a), Ritter and Welch (2002) as well as Ljungqvist (2004) all point out that during the peak of the IPO boom in 1999-2000 investors' sentiment must have influenced a great part of the first day returns. Second, from a technical point of view Miller (1977) provides the divergence of opinion theory. In this theory he states that in very optimistic or "bubble"-oriented periods the most optimistic rather than the average investor sets the price of an IPO. The implications of this paradox are that risk proxies, such as size, age etc., have an inverse effect, i.e. larger offers may be valued higher than smaller ones.

Focusing on the standard deviations of the sample it is observed that the 1995-1998 sample shows a lower deviation that the 1999-2000 one, ca. 0.42 vs. 1.04. This is in agreement with the above, showing that uncertainty was higher in the peak of the IPO boom. Further evidence of higher uncertainty is the fact that the difference between maximum and minimum values is higher for 1999-2000 IPOs compared to 1995-1998 ones, i.e. 549 vs. 383.

In agreement with Guo et al (2006) and Choi and Kim (2005), IPOs reporting R&D show higher first day returns compared to IPOs not incurring any R&D expenses (R&D non-reporting), Table 7.1. R&D reporting IPOs show equally weighted first day returns mean values of 62.64% vs. 39.32% for R&D non-reporting IPOs. Value-weighted first day returns follow the same pattern with 90.78% vs. 50.08%. The higher R&D reporting IPO returns are driven by offers conducted in the 1999 to 2000 interval. R&D reporting IPOs show here higher first day returns compared to R&D non-reporting, 98.52% vs. 57.09% for equally-weighted and 129.67% vs. 62.27% for value-weighted means.

R&D reporting and non-reporting IPOs issued 1995-1998 do not show any significant differences in their first day returns, no matter if estimated as equally- or value-weighted. These results are in general agreement with the conclusion of Francis et al (2006), focusing on a sample of IPOs issued between 1993 and 2000 and finding that their "R&D intensity dummy variable" is insignificant. Yet these findings challenge results by Guo et al (2006) with US IPOs issued between 1990 and 1995, establishing that R&D reporting IPOs show higher mean first day returns, whether equally- or value-weighted, as compared to R&D non-reporting IPOs. R&D non-reporting IPOs first day returns (value-weighted) reach a value of 11% while low R&D intensive IPOs show returns of 13% and high R&D intensive IPOs of 19%. One disadvantage of their study is that they do not use any kind of t-test to examine the significance of these differences.

In order to understand better what causes the above results attention is focused on the values of standard deviation. In agreement with the idea that R&D leads to higher uncertainty, the R&D IPO standard deviation is higher for the 1995-2000 and 1999-2000 interval compared to the one of IPOs, which has not invested in R&D. For the 1995-1998 interval the deviations are about the same between R&D and R&D non-reporting IPOs. Differences between maximum and minimum are also about the same between R&D and non R&D reporting IPOs (332 vs. 345). Thus it could be the case that in the 1995-1998 interval the market did not feel more uncertain about IPOs with R&D investments compared to IPOs with non R&D investments. Compliance to the risk theory is demonstrated by the fact that the relationship of first day returns values vs. standard deviation values shows a positive slope for all time periods, i.e. the higher the scatter, expressed by the standard deviation, the higher the first day returns.

Attention is now focused on median values. The 1995-2000 median leads to a similar conclusion as with mean values, R&D reporting IPOs show first day returns of 29.41%, non-reporting ones only 18.37%. A statistically significant difference between them is established only at a 10% confidence level. On the other hand median values do not differ statistically significantly between the 1999-2000 and 1995-1998 intervals. The 1995-1998 result is consistent with findings on mean values. All differences between R&D and non R&D reporting IPOs become statistically insignificant when looking at value-weighted medians.

The relative insignificant difference in the 1999-2000 median values indicates that the upper level of high R&D intensive IPOs rather and not the entire IPO sample could drive the significance of the difference observed in the mean values of this time period. Further investigation on this issue is performed in subsequent tables when R&D reporting IPOs are split into sub-samples of R&D high and low intensity respectively.

The last four columns of Table 7.1 show that balance sheet intangibles reporting IPOs do not exhibit any significant differences in their equally-weighted mean or median first day returns compared to balance sheet non-reporting IPOs irrespective of the time interval the IPO was conducted. IPOs issued between 1995 and 1998 do not show differences even in their value-weighted first day returns, whether they report some kind of balance sheet intangible or not. The results contradict the Lev (2001) argument in the sense that one would expect that investors should be compensated for investing in IPOs, which have recognized some kind of intangible on their balance sheet. Givoli and Shi (2005) could supply a possible explanation here as according to their view and empirical findings capitalizing intangibles reduces information asymmetry.

Results look different when focusing on value-weighted returns for the other two periods, the main sample 1995-2000 and the sub-sample 1999-2000. In agreement with the idea that IPOs which have invested in balance sheet intangibles are subject to higher over-reaction compared to the ones which have not, 1995-2000 balance sheet reporting IPOs show with 92.16% higher and significantly different first day returns compared to non-reporting ones with 71.02%. On the other hand IPOs issued between 1999-2000 show that value weighted first day returns are significantly lower with 116.74% for reporting vs. 124.87% for non-reporting balance sheet intangibles. This last fact agrees with the idea of Givoli and Shi (2005) expecting lower information asymmetry for reporting IPOs (capitalized intangibles). Looking at the value-weighted standard deviations also reflects the lower information asymmetry, i.e. uncertainty, for balance sheet reporting IPOs. The balance sheet intangibles standard deviation is lower compared to the one of balance sheet non-reporting IPOs, 0.09 vs. 0.15. The discrepancy between the respective mean first day returns of the 1999-2000 to the 1995-2000 sample can be explained by the larger number of reporting IPOs, actually belonging to the 1999-2000 time period with higher first day returns.

Table 7.2 provides the number of observations for each of the IPO categories in Table 7.1. In the first four columns it is shown that much more IPOs actually had invested in R&D at the time they went public compared to the non-R&D reporting ones. The last four columns show that in the 1995-1998 about half of the IPOs had some form of Balance Sheet intangible on their accounts. In contrast in the 1999-2000 about 70% of all IPOs had invested in some form of Balance Sheet intangible. In general even the smallest samples of the subgroups in the tables are more than 30 observations. It is therefore concluded that the t-test used in the research has adequate observations in order to yield correct estimates of significance.

Table 7.3 confirms the findings of Table 7.1 using an econometric approach. Coefficients of Eq. 7.2 are given, where the dependent variable is the natural logarithm of the ratio of first day close market value over offer market value (as also used by Choi and Kim (2005)), while size and the two dummy variables (equal to unity if IPOs have invested in R&D and in balance sheet intangibles respectively) are the independent variables. The regressions show that the R&D dummy is positive and significant when using the 551 IPO sample in the entire period 1995-2000, i.e. first day returns are higher for R&D reporting IPOs. The same is true for IPOs issued between 1999 and 2000. It is insignificant between 1995 and1998.

Balance sheet intangible dummies are insignificant for the entire sample in 1995-2000 as well as for the 1999-2000 period. They confirm the fact that IPOs reporting balance sheet intangibles do not gain any significantly higher first day returns compared to those, which do not report. The respective dummy variable for the 1995-1998 period is negative and significant. While the negative sign is in agreement with Table 7.1, the t-value would have been expected to be insignificant. Further investigation attributes this to the linearization of the dependent variable. Running the regression without taking the natural logarithm of the dependent variable makes the dummy negative and insignificant - other results remaining the same.

In all regressions of Table 7.2 size – proxied by market value at offer – is positive and significant. This proves the point suggested by Table 7.1. There is a positive association between size and first day returns, implying that investor sentiment during the late 1990ies may have driven first day returns higher. The coefficient for market values at offer is higher for the 1999 to 2000 interval, reflecting the fact that investor sentiment peaked during the bubble period. This being significant and positive, though lower, in the 1995 to 1998 interval – 0.06 vs. 0.11 - shows that investor sentiment is not a unique bubble phenomenon. It existed from the beginning of the US technology IPO boom. Choi and Kim (2005) find that the coefficient of offer market value in their regression is positive and insignificant. This insignificance could be caused by the nature of their sample, IPOs issued between 1997 to 2001, i.e. including IPOs after the "bubble" of 2000, as well as IPOs of all industry types rather than only technology. Zhu (2004) and Schrand and Verrecchia (2005), focusing on IPOs issued during the 1990ies, use age as a risk factor and find - similar to size - that younger, more risky IPOs do not show higher first day returns. All the above cases once more reflect the theory of Miller (1977) on divergence of opinion. Findings are in agreement with Loughran and Ritter (2003a) commenting that the very high returns observed in the late 1990ies period must contain some element of overvaluation.

After having compared the returns of IPOs possessing and reporting intangibles to those non-possessing or non-reporting attention is now focused on the relationship between IPO first day returns and their intangible intensities. Table 7.4 provides means and medians of first day returns out of a sample of 439 R&D reporting IPOs, from the total of 551. It examines if IPOs with high intensities (HI = R&D and balance sheet intangible intensities above the median) show higher first day returns compared to IPOs with low intensities (LO = below the median). It compares further their statistical parameters (means, medians) to those of R&D non-reporting IPOs. R&D is defined both as expense and capital.

Concerning R&D expense intensity it is observed that on IPOs with R&D expenses over sales ratios (intensities) higher than the median show significantly higher mean values for first day returns, 82.09% vs. 43.10%, when equally-weighted, and 125.21% vs. 63.10%, when value-weighted. Respective equally weighted median returns values (between high and low intensity values) are 50% and 20.83%, reflecting the fact that a few IPOs gained very high first day returns. Value weighted median values (between high and low intensity values) are 32.50% and 6.24%. Interestingly only for IPOs with high R&D intensities mean and median first day returns are statistically significantly different compared to respective values for R&D non-reporting ones. The results are to some extent in agreement with Guo et al (2006) who find that first day returns for IPOs with low R&D intensity differ only 1% compared to those IPOs which have not invested in R&D.

The 1995-2000 higher first day returns of high R&D intensive IPOs are driven mainly by the 1999-2000 sub-sample. The mean first day returns (equally-weighted) of high compared to low R&D intensities is 107.37% vs. 86.77%, though this difference is statistically insignificant. The fact that the equally-weighted parameters are statistically insignificant may reflect the existence of outliers. This is indicated by the median values of 89.20% and 49.20% that are highly significant. Value-weighted returns are 144.04% vs. 116.33% (for high and low intensity values) respectively, and this difference is statistically significant, though with 10% confidence only. Both equally- and value-weighted figures for high and low intensity values are statistically different compared to those with no R&D. Value weighted median intensities (for high and low intensity values) are 57.04% and 20.42%. In this case only high R&D intensity first day returns are statistically different to the ones of IPOs with no R&D

Only marginal differences for the mean values (equally-weighted) and insignificant differences for the median values are observed for first day returns of 1995-1998 IPOs with 34.58% vs. 25.17% (for high and low R&D expense intensity respectively) for the first and 20.38% vs. 16.73% for the second. All first day return figures are statistically insignificantly different compared to values of R&D non-reporting IPOs. This confirms findings on Table 7.1 that investors are not compensated for investing in R&D. The only exception to the rule are the value-weighted high R&D intensity IPOs which show significantly higher first day returns, 45.33%, compared to both low R&D intensity or R&D non-reporting IPOs with 25% and 30.39%respectively. However, value weighted median values go along the trend of equally weighted returns. In other words value weighted HI R&D intensity returns equal 12.16% while low R&D intensity ones 4%. The difference is not statistically significant compared to IPOs which do not report R&D.

From the 1995-1998 and 1999-2000 value-weighted results it is evident that overvaluations existed from the beginning in high R&D intensive IPOs. They were though accentuated during the second period.

Focusing on the 1995-2000 main sample, standard deviations show an increasing trend from IPOs, which do not report R&D to the ones of low and high R&D intensity. For the 1995-1998 sub-sample the difference between standard deviations of non R&D and low R&D IPOs is rather small, 0.388 vs. 0.342. This shows that uncertainty mainly concentrates on high R&D intensive offers. In this respect investors may not receive enough compensation for the uncertainty involved with R&D.

IPOs issued in 1999-2000 show smaller differences in their standard deviations compared to 1995-1998 issued IPOs. In fact, value-weighted standard deviations show differences of less than one percent. A further point is that standard deviation values of comparable magnitude correspond to statistically insignificant differences in first day return values between high and low R&D intensity IPOs. However, both low and high R&D intensive offers show much higher standard deviations compared to R&D non-reporting IPOs. In this respect it seems that during the interval of 1999-2000 the market was very uncertain about R&D, yet its uncertainty was not influenced much by R&D intensity. Thus the market may have received a general compensation premium rather than been compensated specifically for intensity.

Focusing on differences between maxima and minima of first day return values the same conclusions with respect to uncertainty as in the discussion about standard deviation values and their relationship to first day return values are reached.

Having established a positive relationship between IPO first day returns and R&D expense intensity attention is now focused on the relationship between the first day returns and R&D capital intensity. As argued by Damodaran (2001) and established empirically by Lev and Sougiannis (1996) and Lev et al (2002), as well as through the empirical results of Hypothesis 2, the issuer and the market may capitalize R&D expenses. Correspondingly the last four columns of Table 7.4 assume that R&D is treated as capital using a six-year capitalization and amortization policy. R&D intensity is defined as the ratio of R&D capital over total assets. Capitalizing R&D changes the former result of higher first day returns in case of high R&D expense intensity to the opposite. Specifically, IPOs with above the median R&D capital over total assets ratios show lower first day returns compared to IPOs with values lower than the median, i.e. 47.95% vs. 77.40% (equally-weighted) and 64.04% vs. 112.06% (value-weighted). Yet, only low R&D capital intensive equally- and value-weighted first day returns are statistically significantly higher compared to the ones of IPOs not reporting R&D. Standard deviations of high R&D capital intensive IPOs are somewhat lower than those of low R&D capital ones.

R&D capital intensity does not affect first day returns of IPOs issued between 1999 and 2000 as all calculated values show statistically insignificant differences. An explanation for this insignificance could be that during the 1999-2000 interval R&D was capitalized but in a very noisy way, as derived in Chapter 5.

For the 1995-1998 sub-sample IPOs, with high and low R&D capital over total assets ratios, differences in the respective first day return mean values become statistically insignificant. Standard deviation values between the two sample groups are almost identical. Again, as in the case of treating R&D as an expense, outliers may have an impact on the insignificance of mean value results in sub-periods. Median values show that – in agreement with the conclusion for the whole sample – low R&D capital intensive IPOs exhibit higher first day returns than high R&D capital intensive IPOs, 21.44% vs. 13.31%. Findings are in agreement with the Givoly and Shi (2005) study with higher intangible capital intensities IPOs showing lower first day returns. Low R&D capital-intensive value-weighted first day returns are statistically significantly higher compared to the ones of high R&D capital-intensive ones, 38.04% vs. 24.98%. Value weighted median high R&D capital intensive IPOs confirm this result, they are only 4.60% compared to the 11.10% of low R&D capital intensive IPOs.

Table 7.5 provides the number of observations falling in each group of IPOs in Table 7.4. Since High and Low intensities have been estimated based on the sample intensity median, the groups either have the same number of observations (in case the total sample size is odd), or the one high intensive IPOs will have one observation more than the other (in case the sample size is even) The smallest sample size is 49 observations. The sample is adequate for estimating correct t-tests.

Table 7.6 and 7.7 confirm the findings of Table 7.4 using an econometric approach. Coefficients are given respectively for Eq. 7.3 and 7.4, where the dependent variable is the natural logarithm of the ratio of first day close market value over offer market value (as also used by Choi and Kim (2005)), while size and the R&D expense intensity in Table 7.4 and R&D capital intensity in Table 7.5 are the independent variables. The sample used includes only IPOs, which have invested in R&D.

Table 7.6 regressions show that the R&D expense intensity coefficient is positive and significant both for the whole 551 IPO sample in the entire period 1995-2000 and the 1999-2000 sub-sample, i.e. first day returns are higher for R&D expense intensive IPOs. It is insignificant for IPOs issued between 1995 and 1998, showing that R&D expense intensity did not play a role during that period.

Table 7.7 regressions show that the R&D capital intensity coefficient is not significant. This is consistent with the fact that high and low R&D capital returns portfolios did not show statistically significant differences.

Following this negative relationship between R&D capital intensity and first day returns attention is now shifted to the relationship between balance sheet intangible intensities and first day returns. Table 7.8 compares first day returns of IPOs with intensities above or below the median. It further examines their relation to non-reporting balance sheet intangible intensities. It shows that IPOs issued in 1995-2000 with above the median balance sheet intangible intensities (intangible assets plus goodwill over total assets) do not show on average statistically significant differences in first day returns compared to IPOs with intensities below the median. Further, both figures are not statistically significantly different compared to the ones of IPOs non-reporting balance sheet intangibles.

The insignificant difference in first day returns between high and low balance sheet intangibles intensive IPOs of the 1995-2000 sample is driven by the 1999-2000 sub-sample. This is only in partial agreement with the Givoly and Shi conclusion, stating that higher intangible capital intensities should lower information asymmetry and consequently first day returns, too. In other words, it seems that the market does not consider lower or higher risk for balance sheet intangible reporting IPOs, i.e. values these irrespective of the magnitude of intangible intensity. In support of this theory, standard deviations are also of approximately the same value.

IPOs issued between 1995 and 1998 are in agreement with Givoly and Shi (2005) and show that high balance sheet intangibles intensive IPOs gain lower first day returns compared to low balance sheet intangibles intensive IPOs, 16.31% vs. 38.76%. Reflecting the lower information asymmetry standard deviations are lower for high balance sheet intangibles intensities. The fact that balance sheet non-reporting IPOs show higher or about the same returns compared to high and low balance sheet reporting intensive IPOs once more contradicts the Lev (2001) argument.

Findings imply that while during the 1995-1998 beginning of the IPO boom first day returns may reflect lower information asymmetry through capitalization of intangibles, this is not the case for the "bubble" period. In no sample period equally-weighted first day returns support the idea that intangibles are riskier and therefore subject to higher compensation, as argued by Lev (2001).

The picture looks different when looking at value-weighted returns. In all periods first day returns are significantly higher for low compared to high balance sheet intangible intensive IPOs. While these results are in support of the Givoly and Shi (2005) theory, the results challenge the cause for the lower returns. In other words, while Givoly and Shi (2005) argue that it is information asymmetry that determines the magnitude of first day returns, it seems that it is rather that the market misevaluates IPOs with low and non-reporting balance sheet intangible capital IPOs.

The last four columns of Table 7.8 adjust the denominator – total assets – by adding the implied R&D capital. Their figures are almost the same compared to the abovementioned results, indicating that the treatment of R&D as capital does not have any impact on balance sheet intangibles intensities.

Table 7.9 provides the number of observations falling in each group of IPOs in Table 7.8. Since High and Low intensities have been estimated based on the sample intensity median, the groups either have the same number of observations (in case the total sample size is odd), or the one high intensive IPOs will have one observation more than the other (in case the sample size is even) The smallest sample size is 49 observations. The sample is adequate for estimating correct t-tests.

Tables 7.10 (R&D defined as expense) and 7.11 (R&D defined as capital) confirm econometrically the results of Table 7.8, balance sheet intangible intensities, as well as the relationship between R&D intensity and IPO first day returns by jointly looking at the two intensities. They show that there is a negative and significant relationship between balance sheet intangible intensities and IPO first day returns in the 1995-1998 interval. Further, as already observed in Table 7.6, Table 7.10 confirms the positive relationship between first day returns and the R&D expense over sales ratio in the 1995-2000 sample, driven by IPOs issued between 1999 and 2000. Also as observed in Table 7.7, Table 7.11 confirms the negative and significant relationship between R&D capital over total assets ratio in the 1995-2000 sample, driven by IPOs issued between 1995-1998.

When focusing on intangible capital, both for R&D (Table 7.4) and balance sheet intangibles (Table 7.8) a common characteristic is observed: first day return values for high intensities are either statistically insignificant or lower than corresponding values for low intensities and even compared to R&D and balance sheet intangibles non-reporting IPOs respectively.

One possible explanation for this negative relationship between intangible capital intensity and IPO first day returns could be the downscaling of the risk associated with intangibles by the issuer and/or the market. In other words, if they assume that the intangible assets and goodwill accounts on the balance sheet have been valued properly and that R&D capitalization clearly reflects the future outcomes of the investment, it could be argued that the more intangible capital intensive an IPO is, the safer it could be perceived by the market. This idea however, could be seriously criticized by considering the Lev (2001) argument that intangible assets are much more risky than tangible assets. A higher intangible capital over total assets ratio implies that a higher proportion of a company's assets are intangibles. A counter-argument to Lev (2001) is provided by the Ernst and Young (1998) study as well as in Lev and Zarowin (1999). The former interviewed CEOs of firms going public inquiring what kind of assets make an IPO successful in long-run returns, the answer being: IPO intangibles. The latter comment on technology companies in the 1990ies, arguing that a company's intangible assets define its values and "tangible assets become liabilities". Still such general statements imply an element of investor sentiment rather than proper valuations of IPOs.

7.5 Conclusion

Mixed results are derived with respect to Hypothesis 4 stating that intangible intensive IPOs yield higher first day returns. This depends on the definition of intangible intensity, i.e. R&D or balance sheet intangible, how R&D is measured - expense or capital - as well as to the relevant time period.

Results show that R&D reporting IPOs are priced with higher uncertainty – i.e. show a higher standard deviation and max-min range – compared to non R&D reporting IPOs.

Investors are compensated for investing in IPOs incurring R&D expenses. This is observed for the 1995-2000 sample, thereby driven by IPOs issued 1999-2000. Results are in agreement with Choi and Kim (2005) and Guo et al (2006). Thus the hypothesis that first day returns are higher for R&D reporting IPOs compared to non-reporting IPOs intensities is accepted for these two periods.

An exception is the 1995-1998 interval. During that period standard deviation values between R&D reporting and non-reporting IPOs are almost identical. So is the range of max-min values. Thus, investors were not compensated for investing in R&D during the 1995-1998 intervals.

Focusing on the entire sample 1995-2000 a positive relationship is derived between R&D intensity and equally-weighted IPO first day returns. Again – as measured through the standard deviation and the max-min range – the higher returns may be due to compensation for higher information asymmetry. Results are again driven by the 1999-2000 interval. Furthermore only IPOs with R&D intensity above the median receive significantly higher first day returns compared to those with no R&D. This is in conformity with Guo et al (2006) reporting a difference of only 1% between R&D non-reporting IPOs and those with low R&D intensities.

IPOs issued between 1995 and1998 show no statistically significant difference in their first day returns (equally-weighted) no matter how R&D intangible intensive they are. Results agree rather well with Francis et al (2006) who find that the dummy variable for R&D intensity is positive, yet insignificant.

The same positive relationship is found between value-weighted returns and R&D intensity. Differences between high and low R&D first day returns are more significant for all intervals. Again, only first day returns values for high R&D show statistically significant differences to those of no R&D, the sole exception encountered in the figures of the 1999-2000 sample with both high and low R&D being statistically different to no R&D. These results agree with Lev (2001) stating vulnerability to overvaluations for intangible intensive companies. Results are also supported by argumentation in IPO literature (Jenkinson and Ljungqvist (2001), Ljungqvist (2004)) that some of the IPO first day returns may be due to overreaction rather than under-pricing.

Defining intangibles as capital, either by converting the R&D expense to capital, as suggested by Lev and Sougiannis (1996) and Damodaran (2001)) or as balance sheet intangibles (intangible assets plus goodwill) leads to opposite results. Higher intensities lead to lower, even if not always significantly different, first day returns. Results are in agreement with Givoly and Shi (2005) who state that the higher the percentage of capitalized intangibles relative to firm size, the lower the information asymmetry and the higher the first day returns. Lower standard deviation values are associated with high R&D or balance sheet intangible capital, confirming that higher intensities correspond to lower uncertainty. Yet findings may also imply a downscaling of risk on intangibles because according to Lev (2001) tangible assets are of lower information asymmetry.

Low IPO R&D intensities are combined with higher first day returns, both equally- and value-weighted in the case of 1995-2000 R&D capital over total assets ratios. Yet only low R&D intensive IPOs show higher first day returns compared to no R&D. In the case of the 1995-1998 IPO sub-sample similar results are estimated, although both high and low R&D capital-intensive IPOs are not significantly different compared to IPOs with no R&D investment. In contrast, first day returns of 1999-2000 issued IPOs are not affected by their R&D capital intensities.

Equally-weighted first day returns are lower for high balance sheet intangible intensities compared to low ones in all samples, and significant for the 1995-1998 sample only. In fact, the high balance sheet intangible intensities during this period are even lower compared to the ones of non-reporting balance sheet intangibles IPOs. Value-weighted returns show similar patterns.

A final comment is that size is positively related to first day returns. This is evidence of investor sentiment (Miller (1977), i.e. overvaluation, since under the information asymmetry/risk scenario higher first day returns should be observed in smaller size companies.

Table 7.1: IPO First Day Returns in %
For R&D Reporting and Non-Reporting IPOs
Number of Observations in Table 7.2

	ALL IPOs		R&D Expense at Offer				Balance Sheet Intangibles "INTGOOD" (Intangible Assets + Goodwill)			
			Reporting	Non-Reporting	Reporting	Non-Reporting	Reporting	Non-Reporting	Reporting	Non-Reporting
Sample Period	Equally Weighted	Value Weighted	Equally Weighted		Value Weighted		Equally Weighted		Value Weighted	
	Mean in %									
1995-2000	57.90	84.39	62.64***	39.32***	90.78***	50.08***	62.25	51.63	92.16***	71.02***
1995-1998	28.93	31.11	28.52	25.50	29.82	30.39	27.46	30.64	31.52	31.07
1999-2000	89.62	118.45	98.52***	57.09***	129.67***	62.27***	89.97	89.53	116.74***	124.87***
	Median in %									
1995-2000	26.25	13.32	29.41*	18.37*	15.00	8.21	26.08	27.44	14.54	12.36
1995-1998	17.44	6.78	17.65	15.63	6.60	6.37	15.63	19.72	7.25	6.54
1999-2000	55.00	35.37	60.88	30.88	39.05	18.09	58.73	53.31	34.39	30.46
	Max in %									
1995-2000	525.00	2827	5250	313.33	2672	616.57	473.53	525.00	2618.34	2155.65
1995-1998	298.80	801.48	247.79	248.61	746.22	373.53	298.81	220.00	431.66	761.85
1999-2000	525.00	2211.95	5250	313.33	2133.51	436.79	473.53	525.00	2047.97	1828.87
	Min in %									
1995-2000	-84.08	-60.08	-84.08	31.69	-56.79	-39.43	-84.08	-31.69	-55.65	-16.79
1995-1998	-84.08	-55.80	-84.08	-31.69	-51.95	-10.28	-84.08	-31.69	-59.49	-6.88
1999-2000	-24.46	-47.01	-24.45	-22.89	-45.34	-27.93	-24.46	-22.89	-43.53	-14.25
	Std Dev									
1995-2000	0.834	0.031	0.879	0.596	0.060	0.050	0.878	0.763	0.060	0.060
1995-1998	0.420	0.058604	0.400	0.388	0.030	0.040	0.476	0.356	0.020	0.040
1999-2000	1.036	0.058699	1.085	0.755	0.110	0.090	1.017	1.085	0.090	0.153

* *Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1%*
between R&D a) reporting and b) non-reporting or IntGood a) reporting and b) non-reporting, for equally or value weighted figures respectively

Table 7.2: Number of Observations in Table 7.1

NUMBER	ALL IPOs		R&D Expense at Offer				Balance Sheet Intangibles "INTGOOD" (Intangible Assets + Goodwill)			
			Reporting	**Non-Reporting**	**Reporting**	**Non-Reporting**	**Reporting**	**Non-Reporting**	**Reporting**	**Non-Reporting**
Sample Period	Equally Weighted	Value Weighted	Equally Weighted		Value Weighted		Equally Weighted		Value Weighted	
	Mean									
1995-2000	551	551	439	112	439	112	327	224	327	224
1995-1998	263	263	225	63	225	63	145	143	145	143
1999-2000	288	288	214	49	214	49	182	81	182	81

Table 7.3: Effect of R&D and Balance Sheet Intangibles Reporting on IPO First Day Returns

$$LN\left(\frac{MV\_FDC}{MV\_OFFER}\right) = C + LN(MV\_OFFER) + LN\left(\frac{Proceeds}{MV\_OFFER}\right) + D\_R\&D + D\_INTGOOD$$

Sample Period	C	LN MV_ OFFER	LN Proceeds/ MV_OFFER	D_RD	D_INTGOOD	F-Test (p-value)	Adjusted R^2
	regression coefficients						
	t-value						
1995-2000	-1.28	0.13		0.09	-0.01	0.00	0.13
	-3.75	4.59		2.58	-0.04		
1995-2000	0.09		-0.13	0.09	0.03		
	1.12		-2.51	2.58	0.65	0.00	0.06
1995-1998	-0.50	0.06		0.01	-0.06	0.00	0.04
	-3.29	4.35		0.38	-1.77		
	0.12		-0.07	0.01	-0.05	0.10	0.01
1995-1998	4.02		-2.47	0.23	-1.50		
1999-2000	-1.05	0.11		0.19	0.01	0.00	0.08
	-1.62	2.24		2.87	0.14		
1999-2000	0.20		-0.10	0.19	0.03	0.00	0.04
	1.80		-1.77	2.90	0.40		

Multi-collinearity 1995-2000

	MV/MV_OFFER	LN(MV_ OFFER)	LN(PROCEEDS)/MV_OFFER	D_RD_L0	D_INTGOOD
MV/MV_OFFER	1.00	0.35	-0.23	0.11	0.02
LN(MV_OFFER)	0.35	1.00	-0.73	0.06	0.07
LN(PROCEEDS/MV_OFFER)	-0.23	-0.73	1.00	-0.09	0.03
D_RD_L0	0.11	0.06	-0.09	1.00	0.03
D_INTGOOD	0.02	0.07	0.03	0.03	1.00

Multi-collinearity 1995-1998

	MV/MV_OFFER	LN(MV_ OFFER)	LN(PROCEEDS)/ MV_OFFER	D_RD_L0	D_INTGOOD
MV/MV_OFFER	1.00	0.21	-0.13	0.03	-0.06
LN(MV_OFFER)	0.21	1.00	-0.64	0.06	0.08
(PROCEEDS)/MV_OFFER	-0.13	-0.64	1.00	-0.14	-0.03
D_RD_L0	0.03	0.06	-0.14	1.00	0.05
D_INTGOOD	-0.06	0.08	-0.03	0.05	1.00

Multi-collinearity 1999-2000

	MV/MV_OFFER	LN(MV_OFFER)	LN(PROCEEDS)/MV_OFFER	D_RD_L0	D_INTGOOD
MV/MV_OFFER	1.00	0.25	-0.17	0.16	0.01
MV_OFFER	0.25	1.00	-0.79	0.04	-0.01
LN(PROCEEDS)/MV_OFFER	-0.17	-0.79	1.00	-0.05	0.10
D_RD_L0	0.16	0.04	-0.05	1.00	0.00
D_INTGOOD	0.01	-0.01	0.10	0.00	1.00

Table 7.4: First Day Returns in %
For Zero, Low and High R&D Intensive IPOs
Number of Observations in Table 7.5

	R&D Non-Reporting		Intensity = R&D Expense/Sales				Intensity = R&D Capital/Total Assets			
			HI	LO	HI	LO	HI	LO	HI	LO
Sample Period	Equally Weighted	Value Weighted	Equally Weighted		Value Weighted		Equally Weighted		Value Weighted	
	Mean in %									
1995-2000	39.32	50.08	82.09$^{***\,+++}$	43.10***	125.21$^{***\,+++}$	63.10***	47.95***	77.40$^{***\,+++}$	64.04$^{***\,+}$	112.06$^{***\,+++}$
1995-1998	25.50	30.39	34.58*	25.17*	45.33$^{***\,+++}$	25.00***	26.43	33.40	24.98***	38.04***
1999-2000	57.09	62.27	107.37^{+++}	86.77^{++}	144.04$^{*\,+++}$	116.33$^{*\,+++}$	89.53++	104.61^{+++}	116.72 $^{+++}$	137.28 $^{+++}$
	Median in %									
1995-2000	18.37	8.21	50.00$^{***\,+++}$	20.83***	32.50^{***+++}	6.24***	21.00***	43.06$^{***\,+++}$	7.80***	22.11^{***+++}
1995-1998	15.63	6.37	20.38	16.73	12.16***	4.00***	13.31**	2144**	4.60***	11.10***
1999-2000	30.88	18.09	89.20$^{***\,+++}$	49.20***	57.04^{***+++}	20.42***	61.91^{+}	59.38^{+}	44.22	33.32
	Max in %									
1995-2000	313.33	616.57	482.41	525.00	3004.19	1612.73	357.26	525.00	935.17	2393.50
1995-1998	248.61	373.53	298.81	220.00	608.03	533.03	298.80	247.79	716.88	434.23
1999-2000	313.33	436.79	458.42	525.00	2327.78	1328.09	363.86	525.00	828.95	1781.78
	Min in %									
1995-2000	31.69	-39.43	-84.08	-41.24	-42.82	-51.11	-84.08	-41.24	-43.07	-50.87
1995-1998	-31.69	-10.28	-84.08	-41.24	-81.75	37.11	-84.08	-41.24	-48.14	-53.66
1999-2000	-22.89	-27.93	-20.11	-24.46	-17.53	-42.09	-21.00	-24.46	-17.60	-37.87
	Std Dev									
1995-2000	0.596	0.061	0.981	0.713	0.066	0.079	0.704	1.000	0.056	0.085
1995-1998	0.388	0.040	0.498	0.342	0.050	0.030	0.422	0.435	0.038	0.037
1999-2000	0.755	0.105	0.972	1.170	0.112	0.128	0.913	1.221	0.090	0.136

* *Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1%*
between 1)HI-LO (R&DExpense/Sales) and 2) HI-LO (R&D Capital/Total Assets) respectively
\+ *Difference statistically significant at confidence of: [+] 10%, [++] 5%, [+++] 1%*
between 1) R&D non- reporting and 2) HI or LO Intensities (in both cases), for equally or value weighted figures respectively
HI: high intensity – values above the sample median
LO: low intensity – values below the sample median

Table 7.5: Number of Observations in Table 7.4

	R&D Non-Reporting		Intensity = R&D Expense/Sales				Intensity = R&D Capital/Total Assets			
			HI	LO	HI	LO	HI	LO	HI	LO
Sample Period	Equally Weighted	Value Weighted	Equally Weighted		Value Weighted		Equally Weighted		Value Weighted	
	Mean									
1995-2000	112	112	220	219	220	219	220	219	220	219
1995-1998	63	63	113	112	113	112	113	112	113	112
1999-2000	49	49	107	107	107	107	107	107	107	107

Table 7.6: Effect of R&D Expense Intensity and Balance Sheet Intangibles Reporting on IPO First Day Returns

$$LN\left(\frac{MV\_FDC}{MV\_OFFER}\right) = C + LN(MV\_OFFER) + LN\left(\frac{Proceeds}{MV\_OFFER}\right) + LN\left(\frac{RD_t EXP}{SALES_t}\right) + D\_INTGOOD$$

Sample Period	C	LN MV_OFFER	LN Proceeds/ MV_OFFER	$LN\ \frac{RD_t EXP}{SALES}$	D_INTGOOD	F-Test (p-value)	Adjusted R^2
	Regression coefficients						
	t-value						
1995-2000	-1.17	0.13		0.02	0.01	0.00	0.14
	-3.37	4.51		3.98	0.07		
1995-2000	0.23		-0.12	0.02	0.03	0.00	0.06
	2.93		-2.43	3.84	0.63		
1995-1998	-0.48	0.06		0.01	-0.07	0.00	0.05
	-3.00	4.47		1.43	-2.07		
1995-1998	0.15		-0.06	0.01	-0.06	0.09	0.02
	3.45		-3.08	1.17	-1.80		
1999-2000	-0.85	0.11		0.02	0.01	0.00	0.08
	-1.42	2.40		3.07	0.16		
1999-2000	0.44		-0.09	0.02	0.03	0.00	0.04
	4.86		-1.82	2.95	0.39		

Multi-collinearity 1995-2000

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/ MV	LN(RD_L0/ SALES)	D_INTGOOD
LN(MV_FDC/MV)	1.00	0.35	-0.22	0.16	0.02
LOG(MV)	0.35	1.00	-0.74	0.06	0.07
PROCEEDS/MV	-0.22	-0.74	1.00	-0.11	0.04
LN(RD_L0/SALES)	0.16	0.06	-0.11	1.00	-0.02
D_INTGOOD	0.02	0.07	0.04	-0.02	1.00

Multi-collinearity 1995-1998

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/ MV	LN(RD_L0/ SALES)	D_INTGOOD
LN(MV_FDC/MV)	1.00	0.21	-0.12	0.07	-0.07
LOG(MV)	0.21	1.00	-0.65	0.04	0.07
PROCEEDS/MV	-0.12	-0.65	1.00	-0.16	-0.02
LN(RD_L0/SALES)	0.07	0.04	-0.16	1.00	0.01
D_INTGOOD	-0.07	0.07	-0.02	0.01	1.00

Multi-collinearity 1999-2000

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/ MV	LN(RD_L0/ SALES)	D_INTGOOD
LN(MV_FDC/MV)	1.00	0.25	-0.16	0.17	0.00
LOG(MV)	0.25	1.00	-0.80	0.01	-0.01
PROCEEDS/MV	-0.16	-0.80	1.00	-0.05	0.11
LN(RD_L0/SALES)	0.17	0.01	-0.05	1.00	-0.06
D_INTGOOD	0.00	-0.01	0.11	-0.06	1.00

Table 7.7: Effect of R&D Capital Intensity and Balance Sheet Intangibles Reporting on IPO First Day Returns

$$LN(\frac{MV\_FDC}{MV\_OFFER}) = C + LN(MV\_OFFER) + LN(\frac{Proceeds}{MV\_OFFER}) + LN(\frac{RD_t Capital}{Total\_ASSETS_t}) + D\_INTGOOD$$

Sample Period	C	LN MV_ OFFER	LNProceeds/ MV_OFFER	$LN\frac{RD_t Capital}{Total\_ASSETS}$	D_INTGOOD	F-Test (p-value)	Adjusted R^2
	regression coefficients						
	t-value						
1995-2000	-1.20	0.13		0.01	0.01	0.00	0.12
	-3.57	4.60		1.78	0.05		
1995-2000	0.17		-0.14	0.01	0.04	0.00	0.04
	2.19		-2.53	1.24	0.76		
1995-1998	-0.47	0.06		0.01	-0.06	0.00	0.04
	-3.08	4.47		1.63	-1.79		
1995-1998	0.14		-0.07	0.01	-0.05	0.08	0.02
	3.68		-2.49	1.13	-1.50		
1999-2000	-0.92	0.12		0.01	0.02	0.00	0.06
	-1.53	2.45		1.24	0.21		
1999-2000	0.38		-0.10	0.01	0.03	0.03	0.02
	3.86		-1.88	1.07	0.46		

Multi-collinearity 1995-2000

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/MV	LN(RD_L5/TA_L5)	D_INTGOOD
LN(MV_FDC/MV)	1.00	0.35	-0.23	0.05	0.02
LOG(MV)	0.35	1.00	-0.73	-0.02	0.07
PROCEEDS/MV	-0.23	-0.73	1.00	-0.07	0.03
LN(RD_L5/TA_L5)	0.05	-0.02	-0.07	1.00	-0.03
D_INTGOOD	0.02	0.07	0.03	-0.03	1.00

Multi-collinearity 1995-1998

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/MV	LN(RD_L5/TA_L5)	D_INTGOOD
LN(MV_FDC/MV)	1.00	0.21	-0.13	0.06	-0.06
LOG(MV)	0.21	1.00	-0.64	0.00	0.08
PROCEEDS/MV	-0.13	-0.64	1.00	-0.15	-0.03
LN(RD_L5/TA_L5)	0.06	0.00	-0.15	1.00	-0.01
D_INTGOOD	-0.06	0.08	-0.03	-0.01	1.00

Multi-collinearity 1999-2000

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/MV	LN(RD_L5/TA_L5)	D_INTGOOD
LN(MV_FDC/MV)	1.00	0.25	-0.17	0.06	0.01
LOG(MV)	0.25	1.00	-0.79	-0.05	-0.01
PROCEEDS/MV	-0.17	-0.79	1.00	0.00	0.10
LN(RD_L5/TA_L5)	0.06	-0.05	0.00	1.00	-0.06
D_INTGOOD	0.01	-0.01	0.10	-0.06	1.00

Table 7.8: First Day Returns in %
For Zero, Low and High Balance Sheet Intangible Intensities

	Balance Sheet Intangible Intensities (Intangible Assets + Goodwill) = INTGOOD									
	Zero Ratio		***Denominator:* Total Assets (R&D as Expense)**				***Denominator:* Total Assets + R&D Capital**			
	Non-Reporting		**HI**	**LO**	**HI**	**LO**	**HI**	**LO**	**HI**	**LO**
Sample Period	Equally Weighted	Value Weighted	Equally Weighted		Value Weighted		Equally Weighted		Value Weighted	
	Mean in %									
1995-2000	51.63	71.02	59.93%	64.59	70.83***	116.51$^{***\,+++}$	60.95	63.56	70.36***	119.70$^{***\,+}$
1995-1998	30.64	31.07	16.49$^{***\,+++}$	38.58***	18.88$^{***\,++}$	46.02$^{**\,++}$	16.31$^{***\,+++}$	38.76***	18.84$^{***\,++}$	45.95$^{***\,+}$
1999-2000	89.53	124.87	87.25	92.70	87.18$^{***\,++}$	145.70***	86.95	93.00	87.21$^{***\,++}$	145.38***
	Median in %									
1995-2000	27.44	12.36	25.03	31.25	15.33	13.44	25.40	28.45	15.95	13.70
1995-1998	19.72	6.54	12.53$^{*\,+}$	20.92*	4.76	9.57	11.75$^{*\,+}$	20.92*	4.51	9.77
1999-2000	53.31	30.46	59.38	55.00	34.16	37.91	59.38	55.00	33.25	37.73
	Max in %									
1995-2000	525.00	2155.65	473.53	458.42	682.96	2795.23	473.53	458.42	652.26	29.54
1995-1998	220.00	761.85	122.92	298.81	315.86	460.11	122.92	298.81	317.07	458.11
1999-2000	525.00	1828.87	473.53	458.42	573.66	2027.21	473.53	458.42	576.58	20.17
	Min in %									
1995-2000	-31.69	-16.79	-84.08	-21.00	-52.36	-30.11	-84.08	-21.00	-50.00	-31.82
1995-1998	-31.69	-6.88	-84.08	-4.11	-56.07	-0.55	-84.08	-4.11	-56.28	-0.05
1999-2000	-22.89	-14.25	-24.46	-21.00	-43.98	-21.84	-24.46	-21.00	-44.20	-.21.73
	Std Dev									
1995-2000	0.763	0.070	0.858	0.899	0.067	0.097	0.855	0.903	0.067	0.097
1995-1998	0.356	0.028	0.280	0.596	0.033	0.070	0.280	0.595	0.033	0.070
1999-2000	1.085	0.153	0.990	1.050	0.097	0.134	0.991	1.050	0.097	0.134

* *Difference statistically significant at confidence of: [*]10%, [**] 5%, [***] 1% between 1)HI-LO (R&DExpense/Sales) and 2) HI-LO (R&D Capital/Total Assets) respectively*

Difference statistically significant at confidence of: [+] 10%, [++] 5%, [+++] 1% between 1) non- reporting and 2) HI or LO Intensities (in both cases), for equally or value weighted figures respectively

HI: high intensity – values above the sample median *LO: low intensity – values below the sample median*

Table 7.9: Number of Observations in Table7.8

	Balance Sheet Intangible Intensities (Intangible Assets + Goodwill) = INTGOOD									
	Zero Ratio		Denominator: Total Assets (R&D as Expense)				Denominator: Total Assets + R&D Capital			
	Non-Reporting		HI	LO	HI	LO	HI	LO	HI	LO
Sample Period	Equally Weighted	Value Weighted	Equally Weighted		Value Weighted		Equally Weighted		Value Weighted	
	Mean									
1995-2000	224	224	164	163	164	163	164	224	164	224
1995-1998	143	143	73	72	73	72	73	72	73	72
1999-2000	81	81	91	91	91	91	91	91	91	91

Table 7.10: Effect of R&D Expense Intensity and Balance Sheet Intangibles Intensity on IPO First Day Returns

$$LN\left(\frac{MV\_FDC}{MV\_OFFER}\right) = C + LN(MV\_OFFER) + LN\left(\frac{\Pr oceeds}{MV\_OFFER}\right) + LN\left(\frac{RD_t EXP}{SALES_t}\right) + LN\left(\frac{INTGOOD_t}{Total\_Assets}\right)$$

Sample Period	C	LN MV_ OFFER	LN Proceeds/ MV_OFFER	$LN\frac{RD_t EXP}{SALES}$	$LN\frac{INTGOOD_t}{Total\_Assets}$	F-Test (p-value)	Adjusted R^2
	regression coefficients						
	t-value						
1995-2000	-1.15	0.13		0.02	0.01	0.00	0.14
	-3.20	4.54		3.96	0.22		
1995-2000	0.26		-0.12	0.02	0.01	0.00	0.06
	2.86		-2.42	3.91	0.76		
1995-1998	-0.50	0.06		0.01	-0.01	0.01	0.06
	-3.00	3.87		1.06	-1.65		
1995-1998	0.09		-0.05	0.01	-0.01	0.02	0.02
	1.96		-1.66	0.89	-1.62		
1999-2000	-0.85	0.11		0.02	-0.01	0.00	0.08
	-1.25	2.17		3.08	-0.02		
1999-2000	0.45		-0.09	0.02	0.01	0.00	0.04
	4.15		-1.65	3.00	0.14		

Multi-collinearity 1995-2000

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/MV	LN(RD_L0/SALES)	LN(INT_GOOD/TA)
LN(MV_FDC/MV)	1.00	0.35	-0.22	0.16	0.01
LN(MV)	0.35	1.00	-0.74	0.06	0.06
PROCEEDS/MV	-0.22	-0.74	1.00	-0.11	0.03
LN(RD_L0/SALES)	0.16	0.06	-0.11	1.00	-0.14
LN(INT_GOOD/TA)	0.01	0.06	0.03	-0.14	1.00

Multi-collinearity 1995-1998

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/MV	LN(RD_L0/SALES)	LN(INT_GOOD/TA)
LN(MV_FDC/MV)	1.00	0.21	-0.12	0.07	-0.15
LN(MV)	0.21	1.00	-0.65	0.04	-0.07
PROCEEDS/MV	-0.12	-0.65	1.00	-0.16	0.14
LN(RD_L0/SALES)	0.07	0.04	-0.16	1.00	-0.12
LN(INT_GOOD/TA)	-0.15	-0.07	0.14	-0.12	1.00

Multi-collinearity 1999-2000

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/MV	LN(RD_L0/SALES)	LN(INT_GOOD/TA)
LN(MV_FDC/MV)	1.00	0.25	-0.16	0.17	-0.03
LN(MV)	0.25	1.00	-0.80	0.01	0.02
PROCEEDS/MV	-0.16	-0.80	1.00	-0.05	0.05
LN(RD_L0/SALES)	0.17	0.01	-0.05	1.00	-0.21
LN(INT_GOOD/TA)	-0.03	0.02	0.05	-0.21	1.00

Table 7.11: Effect of R&D Capital Intensity and Balance Sheet Intangibles Intensity on IPO First Day Returns

$$LN(\frac{MV\_FDC}{MV\_OFFER}) = C + LN(MV\_OFFER) + LN(\frac{Proceeds}{MV\_OFFER}) + LN(\frac{RD_tCAP}{Total\_Assets_t}) + LN(\frac{INTGOOD_t}{Total\_Assets})$$

Sample Period	C	LN MV_OFFER	LN Proceeds/ MV_OFFER	$LN\frac{RD_tCAP}{Total\_Assets}$	$LN\frac{INTGOOD_t}{Total\_Assets}$	F-Test (p-value)	Adjusted R^2
	regression coefficients						
	t-value						
1995-2000	-1.19	0.13		0.01	0.01	0.00	0.12
	-3.39	4.64		1.82	0.26		
1995-2000	0.21		-0.14	0.01	0.01	0.00	0.05
	2.21		-2.50	1.39	0.77		
1995-1998	-0.51	0.06		0.01	-0.01	0.01	0.05
	-3.14	3.96		0.95	-1.52		
1995-1998	0.08		-0.06	0.01	-0.01	0.02	0.02
	1.82		-2.08	0.57	-1.47		
1999-2000	-0.91	0.12		0.01	-0.01	0.00	0.06
	-1.36	2.21		1.19	-0.05		
1999-2000	0.39		-0.10	0.01	0.01	0.04	0.02
	3.32		-1.72	1.04	0.07		

Multi-collinearity 1995-2000

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/MV	LN(RD_L5/TA_L5)	INT_GOOD/TA_L5
LN(MV_FDC/MV)	1.00	0.35	-0.23	0.05	0.03
LN(MV)	0.35	1.00	-0.73	-0.02	0.07
PROCEEDS/MV	-0.23	-0.73	1.00	-0.07	0.02
LN(RD_L5/TA_L5)	0.05	-0.02	-0.07	1.00	-0.18
INT_GOOD/TA_L5	0.03	0.07	0.02	-0.18	1.00

Multi-collinearity 1995-1998

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/MV	LN(RD_L5/TA_L5)	INT_GOOD/TA_L5
LN(MV_FDC/MV)	1.00	0.21	-0.13	0.06	-0.13
LN(MV)	0.21	1.00	-0.64	0.00	-0.05
PROCEEDS/MV	-0.13	-0.64	1.00	-0.15	0.13
LN(RD_L5/TA_L5)	0.06	0.00	-0.15	1.00	-0.18
INT_GOOD/TA_L5	-0.13	-0.05	0.13	-0.18	1.00

Multi-collinearity 1999-2000

	LN(MV_FDC/MV)	LN(MV)	LNPROCEEDS/MV	LN(RD_L5/TA_L5)	INT_GOOD/TA_L5
LN(MV_FDC/MV)	1.00	0.25	-0.17	0.06	-0.01
LN(MV)	0.25	1.00	-0.79	-0.05	0.02
PROCEEDS/MV	-0.17	-0.79	1.00	0.00	0.03
LN(RD_L5/TA_L5)	0.06	-0.05	0.00	1.00	-0.20
INT_GOOD/TA_L5	-0.01	0.02	0.03	-0.20	1.00

8. IPO LONG-RUN PERFORMANCE (Hypothesis 5)

8.1 Introduction

One of the main results of literature examining excess returns is that intangible intensive companies, i.e. R&D intensive, earn higher long-run abnormal returns compared to those with lower intensities. Key literature sources include here Lev and Sougiannis (1996; 1999), Chan et al (2001), Eberhard et al (2004), Chambers et al (2002), Lev et al (2002).

The reasons causing seasoned intangible intensive firms to generate higher excess returns, up to ten years after the day their intensities were measured, are still debated. Some researchers ((Lev and Sougiannis (1999), Kothari et al (2002), Chambers et al (2002)) empirically find that higher excess returns are observed because investors are compensated for investing in risky R&D intensive firms. Others argue that the higher excess returns are a result of the market failing to properly value R&D intensive companies. Factors such as conservative accounting and uncertainty associated with R&D may lead to errors in initial valuations (Chan et al (2001), Lev et al (2005), Eberhart et al (2004)). Chapter 3 of this thesis provides an extended review on the properties of intangibles, which make them risky and subject to misevaluation.

While literature has thoroughly examined the relationship between a seasoned company's intangible intensities and excess returns, very few studies have investigated if and in what direction intangible intensities affect the long-run (three years after the offer) excess returns of IPOs. These differ from seasoned companies in the sense that they under-perform, up to five years after the offer, compared to industry related indexes such as the NYSE and NASDAQ, as well as to seasoned companies of the same size and industry (Ritter (1991), Loughran and Ritter (1995), Levis (1993)).

The same main theories as with excess returns of seasoned firms prevail and explain under-performance of IPOs. Literature favouring the risk-compensating scenario hypothesizes that investors receive compensation through higher IPO first-day returns. Long-run under-performance of IPO returns can be explained by the fact that riskier IPOs are subject to higher losses in terms of profitability and consequently share price and more frequent failure. Or, it may that the market initially misevaluates and overreacts to IPO potential benefits. Overreaction may occur because of fads, marketing and timing. Further, part of the misevaluation may be related to risk miscalculation. The market may underestimate or rarely overestimate the potential losses associated with IPOs. The subsequent long-run excess returns reflect the corrections in valuations. Chapter 3 provides more and detailed literature on the subject.

Technology IPOs – which are the most intangible intensive ones and whose long-run returns success should primarily be driven by their intangibles (CBI (2001), Damodaran (2001)) - are among the most poorly performing according to Demers and Joos (2006), Kooli and Suret (2001), and Brown (1999). Brown (1999), using a sample of UK IPOs issued between 1990 and 1995, finds that technology IPOs under-performed by 132%, while the under-performance of all other industries does not exceed 30% - benchmarks used are UK indexes.

Looking at IPOs of various industries issued between 1974 and 1985 Ritter (1991) finds that under-performance is worse for IPOs with lower B/M ratios. The B/M ratio is a good proxy for R&D intensity according to Lev and Sougiannis (1999) and Amir et al (2006). Bhabra and Pettway (2003) link intangibles more directly to IPO long run abnormal returns - by defining them as R&D rather than the B/M ratio – and use a sample of US issued between 1987 and 1991, run cross-sectional regressions with three-year buy-and-hold abnormal returns (BHAR) of the IPO as the dependent variable. They find that the only significant profitability measure (the independent variable), explaining both one and three-year IPO BHAR, is the estimated R&D over sales ratio at the time of the offer. For the one-year BHAR cross-sectional regressions the R&D over sales value is positive and significant, when the controlling portfolio is defined in comparison to seasoned matched firms of same size as the respective IPO. For all other cases the coefficients are positive, yet insignificant. In contrast, for the three-year BHAR a cross-sectional regression the

R&D over sales coefficient is negative and significant when using a benchmark like seasoned matched firms based on B/M and industry. For all other cases, the R&D over sales value is negative and insignificant. It is positive and insignificant when seasoned matched firms of same size are used as a benchmark.

Guo et al (2006) find opposite results. Using US IPOs issued between 1980 and 1995 they find that R&D intensity is positively associated with higher first day returns and higher three-year excess returns. They comment that R&D intensive IPOs could be of higher quality and thus perform better in the long run. Yet, they also argue that it could be the case that the market undervalues R&D intensive IPOs. In that case, positive excess returns could reflect a correction by the market.

In summary while the literature has shown that technology IPOs show higher losses, it is still debated how and to what extent intangibles, i.e. R&D intensity, influence IPO excess returns. It is an open question if R&D is risky and subject to higher losses, or whether it adds value and reflects quality. Further, there are no empirical studies focusing at other than R&D intangibles (like balance sheet intangibles) and their impact on IPO long-run excess returns.

The objective of this chapter is to examine the potential impact of R&D intangibles on long-run performance of technology IPOs. The thesis contributes in several ways to this issue by using more detailed definitions and techniques to define intangibles, as well as looking at a different IPO issuance interval, and this in the following three-fold way: a) account for both R&D expense over sales and R&D capital over total assets, b) account for both R&D and balance sheet intangible intensity, c) examine technology IPOs during the boom period of the late 1990s.

First, Guo et al (2006), and Bhabra and Pettway (2003) define R&D intensity as the R&D expense over sales ratio. As empirically tested by Lev and Sougiannis (1996), Lev et al (2002) and recommended in theory by Damodaran (2001) though, the R&D expenses should be treated as assets and therefore be capitalized and amortized. Their findings have been confirmed by this thesis as well, see chapter 6, Hypothesis 2. As a result and in order to test now the link between R&D intensities and long-run returns the thesis defines IPOs as R&D intensive based on both R&D expense over sales (R&D expensed) and R&D capital over total assets (R&D capitalised).

This contribution is significant considering the fact that Chapter 7 (Hypothesis 4), shows that R&D intensive IPOs do not always show higher first-day returns. Specifically while, consistent with Guo et al (2006), above the median (HI) R&D expense over sales intensive IPOs show with 82% higher first-day returns as compared to below the median (LO) R&D expense over sales intensive IPOs at 43%, the opposite is true for above the median (HI) and below the median (LO) R&D capital over total assets intensive offers with 48% vs. 77%. Further, splitting the sample to the 1995-1998 and 1999-2000 sub-periods makes first-day returns insignificant in many cases. Considering the fact mentioned by Ritter (1991), Levis (1993), Jain and Kini (1994), Purnanandam and Swaminathan (2004), there may be a negative relationship between first-day returns and long-run performance. Therefore long-run abnormal return results may depend on the definition of R&D, i.e. expensed or capitalised.

Second, both Guo et al (2006) and Bhabra and Pettway (2003) limit their definition of intangible intensities to R&D. Balatbat (2006) argues that further research is needed including other intangible assets besides. This thesis is the first to examine the effect of balance sheet intangibles intensities (BSII) on long-run IPO abnormal returns performance.

Third, no empirical study so far has examined a relationship between intangible intensities and long-run returns in the context of technology IPOs issued between 1995 and 2000. Examining this particular sample is of value in order to understand whether the late 1990ies technology IPO boom and its correction in 2001 was due to the lack of sufficient R&D investment as argued by Ernst and Young CBI (2003)).

Expanding the original Bhabra and Pettway (2003) findings which reveal a negative relationship between three-year BHAR and R&D intensity measured at the time of the offer, it is hypothesised that intangible intensive IPOs at the time of the offer perform worse in terms of BHAR and cumulative average abnormal returns (CAAR) as compared to less intangible intensive IPOs. A negative relationship between intangible intensities and long-run abnormal returns implies that the market may have overreacted when initially valuing the offer, a plausible assumption for the period 1995-2000 and US technology IPOs. The source of overvaluation can well be related to the valuation of intangibles (Lev (2001)). As an implication intangible intensive companies are more vulnerable to negative excess returns (Mank and Nystrom (2001)).

8.2 Literature

8.2.1 Excess Returns Due to Intangibles

Lev and Sougiannis (1996) are among the first empirical studies finding that R&D intensive firms gain higher excess returns. They comment that further research is needed in order to understand if excess returns are risk or investor sentiment related. Based on these comments Lev & Sougiannis (1999) use Fama and French (1992, 1993, 1996) cross-sectional regressions and add R&D intensity - defined as R&D capital over book value of total assets and book value of equity - as an additional risk independent variable. Using a sample of firms between 1975 and 1989 they confirm that R&D intensity is indeed significantly associated with subsequent returns, when the Fama and French factors are accounted for.

Specifically their main finding is that low B/M companies have large R&D capital, while high B/M companies have low R&D investment, thus proving the fact that R&D is growth promising. Further, the ratio of R&D intensity ratio is closely associated with the B/M ratio. Even more challenging with respect to R&D intensity and the Fama and French risk components is the fact that Lev and Sougiannis (1999) find that for R&D intensive firms regressions show that R&D capital makes the B/M risk factor insignificant.

Further, they split R&D intensive firms in samples consisting of companies with basic and applied R&D, following the definitions in Chapter 2. Lev and Sougiannis (1999) empirically show that basic research companies, with the more risky stage of

R&D, earn higher excess returns than applied research companies. Finally, when dividing the sample in companies traded during recessions and booms Lev and Sougiannis (1999) find that the risk premium is higher during boom periods than during recessions. Once more the profit vs. risk concept is proven, i.e. R&D realizes higher returns in the good state of the world, while risk during the bad state of the world is associated with lower gains.

Chambers et al (2002) agree with Lev and Sougiannis (1999) on the fact that excess returns of R&D intensive firms are risk related. Using a sample of US companies traded between 1979 and 1998 they find that for year one, two and three after R&D intensity is measured, high R&D intensive companies gain excess returns of 7%, while medium intensive ones gain between 2% and 4%. Low R&D intensive companies show negative excess returns of 1%. Their results are robust both when defining R&D intensity as the R&D capital over market value and R&D expenditures over sales ratios. The higher variability of R&D intensive firms' excess returns is further evidence for their close link to risk. Also analyst forecasts on R&D intensive firms are more volatile. Chambers et al (2002) make a strong case linking R&D excess returns to risk; they comment though that excess returns may be subject to miscalculation of risk.

Ho et al (2004), using a sample of US companies traded between 1989 and 1998 move one step further and examine the possible causes of risk associated with R&D intensive firms. They find firms with high R&D over sales ratios showing higher betas, i.e. "intrinsic business risk of common stock". The implication is that returns of R&D intensive firms are more volatile relative to the market compared to R&D less intensive firms.

It is therefore understood that risk associated with R&D is definitely a factor affecting excess returns. Still, there is the strong possibility that risk is mispriced, either due to accounting problems (conservative accounting) or because the market may overreact. Lev and Zarowin (1999) are among the first empirical studies to argue that the quality of earnings and book value has deteriorated from the 1970s and 1980s to the 1990s. They blame for this the accounting standards, which require intangibles and particularly R&D to be fully expensed when incurred. Using cross-sectional regressions - with the annual return as the dependent variable, and earnings and change of earnings as the independent variables - they find continuously lower values for both R^2 and the earnings response coefficient (sum of all regression coefficients) from the 1970s to the 1980s and to the 1990s. Penman and Zhang (2002) also point out that R&D expenses are the main cause of conservative accounting. Thus, investors fail to see the potential benefits of R&D and so excess returns are generated.

Likewise Chan et al (2001) with a sample of US seasoned companies, traded between 1975 and 1995, do not support the theory that R&D intensive firms' excess returns are due to risk. They split their firms in five portfolios based on the intensity of R&D, defined as the R&D expense over sales and R&D expense over market value ratios. Further, they create a portfolio of firms, which have not invested in R&D. Examining firms based on their R&D expense over sales ratio they find that on average raw returns (for year one, two and three) are about the same for all intensity groups. They comment that this indicates evidence that after all the market is efficient and values all firms at all times correctly. Wu and Wei (1998) partially support Chan et al (2001) findings by arguing that the market is efficient when valuing R&D. To be more specific they find that positive abnormal returns are observed in groups of companies, which announce positive news on their R&D alliances. Negative abnormal returns are observed in all rival firms, which are harmed by their competitor's positive alliance news. Among the same lines, Seethamraju (2003) find that companies earn abnormal returns when announcing trademarks acquisitions.

Yet, Chan et al (2001) now focusing on abnormal returns find that high R&D intensive firms gain higher excess returns. The fact that excess returns are higher could be considered as evidence of risk compensation. Also in favour of risk is the fact that R&D intensive firms show more volatile returns. Evidence of mispricing is observed with non R&D companies gaining higher excess returns than low R&D ones. Further evidence of mispricing, probably due to overreaction, is observed when examining firms based on their past excess returns. Consistent with deBondt and

Thaler (1985), Chan et al (2001) find that only R&D intensive firms, which were past "losers", i.e. were under-valued, now become "winners" by gaining higher excess returns. Undervaluation is higher for R&D intensive companies. Past "winners" show below 1% excess returns, and the most R&D intensive portfolio gains lower excess returns compared to a less R&D intensive.

In agreement with Chan et al (2001), Eberhart et al (2004) find evidence that the market undervalues R&D intensive firms. Using a sample of 8,313 US companies issued between 1951 and 2001, all which at some point unexpectedly increased their R&D intensity, they find, five years after the increase, excess returns between 9% and 13%. They blame conservative accounting, i.e. the immediate expensing of R&D, for the mispricing. Their deduction is based on the fact that operating performance – in terms of earnings – significantly improves after the increase in R&D.

Lev et al (2002), consistent with Lev and Sougiannis (1999), find that R&D intensity is a significant risk factor in Fama and French (1992) cross-sectional regressions. Yet, as observed by Chan et al (2001) they find that R&D intensive firms are undervalued and therefore yield higher excess returns up to four years after measuring intensity.

Lev et al (2005) treat R&D as capital rather as an expense, as also suggested by Lev and Sougiannis (1996). They argue that conservative accounting, i.e. a decrease in profits due to expensing, may exist even if one assumes that R&D is capitalized. The decrease in profits may occur as a result of the high amortization rate associated with the implied R&D capital. They find that R&D capital intensive companies which are considered as "conservative" show excess returns between 5% and 7.5%. These returns may be due to the fact that the market originally assigns a "higher costs of capital" on those firms, i.e. the market under-values them.

Mank and Nystrom (2001) also argue that R&D intensive firm excess returns are due to misevaluations. Yet, they state that the market initially overreacts to potential future benefits of R&D. The initial overreaction occurs because investors downscale the risk associated with R&D. Investors focus only on the potential very high profits, which are realized in few companies only, and they downscale the severe losses observed in most R&D investments. The difference in conclusions of Chan et al (2001) and Mank and Nystrom (2001) may result from the fact that the former look at firms of all industry types traded in a rather broad interval between 1975 and 1995. The latter focus only on software firms traded between 1992 and 1997. Thus their conclusion may highlight the positive overreaction effect observed in technology shares in the late 1990s.

AlHorani et al (2003) focus on 10,847 UK companies traded between 1991 and 2001. They find that high R&D intensive firms earn higher excess returns compared to low R&D intensive ones, 2.47% vs. 0.89%, supporting the risk compensation theory. Yet, there is a clear element of mispricing since UK non R&D companies exhibit 1.09% excess returns, a value higher than just indicated.

While there is a lot of literature examining the relationship between R&D and excess returns, there are only a few studies, on other intangible assets. Barth and others (2003) use Kothari and Zimmerman (1995) type regressions. They find that one-year changes in the value of firm brands (independent variable) are positive and significant, the dependent variable being the one-year buy-and-hold returns. Deng et al (1999), using Fama and French (1992) type regressions, find that the one, two and three year returns are positively affected by the number of patents possessed (this being the case for year 2) or the number of citations (for year 3). Unfortunately the above studies do not examine if risk or misevaluation leads to the higher returns associated with brands and patents.

Finally, a "gap" in the literature is observed in that all empirical studies focus on seasoned companies and do not investigate samples including IPOs; these differ from seasoned companies. They show very high first day returns, on average 19% (Ljungqvist (2004)), and subsequently under-perform, i.e. show negative excess returns, relative to seasoned companies. Risk and misevaluation have been provided as explanations for those excess returns. Very few studies have examined a potential relationship between intangibles and IPO long-run performance, with inconclusive results though. Bhabra and Pettway (2002) find a negative association between R&D over sales ratio and IPO excess returns. Guo et al (2006) on the other hand find that the opposite is true.

8.2.2 IPO Long-Run Market Performance

One special form of excess returns are the ones observed in IPOs academic literature has documented the fact that IPO abnormal returns are observed in years one to five after flotation. During that interval non-issuing seasoned companies, with a public history of more than five years, perform better than IPOs. Further during their first five years of public trading IPOs perform worse than Indexes. The negative excess returns are referred to in literature also as "IPO long-run under-performance". Ritter (1991) finds that 1526 US IPOs issued between 1975 and 1984 show negative CAAR, against the benchmark of the NASDAQ and NYSE value-weighted indexes, as well as of seasoned matching companies. Seasoned firms are assigned to each IPO by the criterion of industry and size (market value) at the time of the offer. Consistently with findings on cumulative returns Ritter (1991) finds that IPOs produced an average return of 34% for the holding period (buy-and-hold). However, matching seasoned firms generate average holding period returns of 62% in the same interval. Ritter (1991) is the first to report this difference in the form of a ratio, which he defines as the "wealth ratio". The numerator is the IPO buy-and-hold returns, while the denominator is the benchmark returns. A ratio value lower than unity indicates under-performance; a value above unity indicates over-performance. In Ritter's (1991) sample, the three-year buy-and-hold wealth ratio is 0.86. Levis (1993) finds that 712 IPOs issued between 1980 and 1988 in the UK under-perform. He reports three-year buy-and-hold wealth ratios of 0.96, 0.92 and 0.79 against the benchmarks of the UK indexes FTA, HGSC and ASEW respectively.

Loughran and Ritter (1995) using a sample of 4753 US IPOs issued between 1970 and 1990 confirm the under-performance of IPOs. They elaborate on the Ritter (1991) study by finding that the IPO under-performance is noticeable even after year three, actually up to year five after a company starts trading. Five-year buy-and-hold return wealth ratios range between 0.75 and 0.85, the benchmark being the equally and value-weighted NASDAQ and NYSE indexes as well as the S&P 500 index. Wealth ratios using matching seasoned firms as a benchmark amount to 0.80 in year three and 0.70 in year five after the offer. However, the way in which benchmark seasoned companies have been selected in the Loughran and Ritter (1995) study differs in two aspects compared to Ritter (1991). First, seasoned companies are assigned to IPOs based on size only. Second, seasoned companies must have raised no capital for at least five years. The second criterion is introduced due to the fact that Loughran and Ritter (1995) empirically find that SEOs, i.e. companies that raise additional capital after they go public, also under-perform compared to seasoned companies, which do not publicly issue any more shares. SEO wealth ratios amount to 0.78 and 0.69 three and five years after the SEO is conducted.

While the fact that IPOs under-perform is empirically proven by the literature, it is still a hot debate as to what causes IPOs to perform worse compared to indexes and non-issuing equity seasoned companies. Jenkinson and Ljungqvist (2001) provide two main groups of literature – relevant to this thesis - explaining the long-run excess returns of IPOs. The first group links the long-run excess returns of IPOs to risk and misevaluation. Misevaluation could be either due to overreaction, or to market miscalculation of the risk involved with IPOs. Both properties characterize intangibles. The second group of literature argues that excess returns of IPOs are a measurement problem in itself.

Risk and Misevaluation Influencing Long-Run Performance

Ritter (1991) argues that the market is initially compensated through higher returns, and the long-run under-performance is the outcome of the risk. Together with Brav and Gompers (1997) they point out that under-performance occurs in small offers and IPOs with low B/M ratios. On the other hand Moltchanov (2004), consistent with literature on seasoned firms' excess returns as reported by Chambers et al (2002), find that risky IPOs gain a premium compensating investors for having invested in them. The Moltchanov (2004) study defines though the "long run" as the first 30 days of trading only.

The majority of the IPO literature hypothesizes that the market overreacts in the short run, while in the long run it corrects its valuation errors. Miller (1977) sets an important theoretical framework on explaining how investor over-optimism affects short- and long-run returns. He assumes in his theoretical study that the market is inefficient and the marginal and not the average investor set the price of a firm. As a result, the value of a company reflects the highest and not the average value. Therefore, the higher the divergence of opinion – i.e. the higher the uncertainty – the higher the price will be. IPOs are characterized by higher levels of uncertainty compared to indexes and seasoned firms, therefore first-day returns will be higher. However, in the long run, the divergence of opinion among investors is reduced and as a result, IPOs under-perform compared to indexes and seasoned companies whose uncertainty is more stable in the same interval.

As with the price support theory, Miller's (1977) divergence of opinion is difficult to test since it is almost impossible to find all investors' opinion on an IPO value. Houge et al (2001) are the first to indirectly test Miller's theory by using proxies reflecting uncertainty. Using 2025 US IPOs issued between 1993-1996, they collect each IPOs bid and ask spread on the first day of trading, the delay of the first day trade and the flipping ratio, defined as the ratio of large sell-signed blocks over the entire volume traded on a specific date. They find that the higher their proxies, the higher the first-day returns and the higher the long-run under-performance.

Their results are consistent with previous studies. Aggarwal and Conroy (2000) find that the longer it takes for an IPO to start trading on the first day, the higher the first-day returns. Krigman et al (1999) find that IPOs with higher flipping ratios in their first day of trading under-perform compared to those with lower ratios. However, Jenkinson and Ljungqvist (2001) criticize those studies because they do not measure uncertainty proxies in the long run. As a result, no empirical study so far has tested if the proxies used to measure divergence of opinion on the first day of trading are indeed reduced three years after the offer.

Ritter and Welch (2002) support Miller's (1977) divergence of opinion theory by arguing that it is mainly achievable in IPOs, i.e. when there are only few investors and not an entire market trading the shares. Once the lock-up period is over – i.e. once every investor can buy shares - the opinion of the average and not the marginal investor dominates the market. Bradley et al (2001), Field and Hanka (2001) and Brav and Gompers (2003) find evidence and show empirically that US IPO share prices drop once the lock-up period is over.

Purnanadam and Swaminathan (2004), using a sample of 2288 US IPOs issued between 1980 and 1997 classify their sample as over- and under-valued compared to seasoned firms of the same industry and about the same sales and earnings before income and taxes. Consistent with Miller's (1977) divergence of opinion theory, they find that the median US IPO is overvalued by 14% to 50% depending on the matching criterion used. High-overvalued IPOs, i.e. the ones whose price multiples, i.e. P/EBITA, P/E and P/S are higher compared to the ones of seasoned firms of about the same earnings or size, show 5% to 7% higher first-day returns, yet 20% to 30% higher long-run under-performance.

Moltchanov (2004) using a sample of US IPOs issued between 1993 and 2001 finds that positive news announced within the first year after the offer leads to higher positive excess returns compared to positive news announced after year one. The same, although in the opposite direction, they conclude with respect to negative news announcements.

Similar and related to Miller's (1977) divergence of opinion theoretical study, the fads, timing and learning theory states that firms conduct IPOs when investors are over-optimistic about future returns. Moreover, the more IPOs occur, the more investors seem to overreact. However as time progresses and more public information become available on a company, investors correct their initial overreacted valuation. This causes IPOs to under-perform in the long run.

Aggarwal and Rivoli (1990), using a sample of US IPOs issued between 1977 and 1987 argue that fads exist where the market overprices IPOs. They deduce misevaluation by showing that even after including first-day returns in measuring long-run IPO performance, IPOs still under-perform. Ritter (1991) and Loughran and

Ritter (1995; 2000) find that wealth ratios are lower in years with high volume IPO issuance, especially in the 1980s. Rajan and Servaes (1994) agree on their findings. Kooli and Suret (2001) find that Canadian IPOs show higher first-day returns and more negative long-run excess returns due to "hot markets". Brown (1999) finds similar results for the UK market. The last two studies indicate that technology IPOs are between the worst performing and that "hot" markets may be the cause.

Lowry and Schwert (2002) come to the same conclusion. They find that higher IPO issuance is associated with higher first day returns. Unfortunately they do not test if there is a relationship between IPO first day returns and long-run returns.

Brav and Gompers (1997) find that US firms go public in specific calendar months. They argue that part of the IPO under-performance is therefore to blame on fads. Schultz (2003) argues that more IPOs occur once a series of successful offers is observed on the market. Therefore, the last series of IPOs, which in the long run will be the least successful one, will be the highest in terms of number of IPOs issued. This causes equally-weighted IPO portfolios to under-perform.

Helwege and Liang (2004) examine hot and cold – high and low IPO issuance - markets, using 6419 US IPOs issued between 1975 and 2000. They derive that hot IPOs have higher first-day abnormal returns and worse long-run performance. They deduce that the underlying reason for hot IPO performing worse is market overreaction and over optimism. Their deduction is based on their finding that both hot and cold issued IPOs do not show any significant differences in structure. Hot and cold issued IPOs are of about the same risk, no significant differences in age, and there is no evidence that IPOs issued in hot periods are of different industries compared to those issued in cold ones. In addition, quality is not different between hot and cold issued IPOs, since Helwege and Liang (2004) do not find any significant differences in hot and cold issued IPOs long-run growth opportunities (sales) or in operating performance. The only difference is the fact that IPOs issued in hot periods have weaker earnings and lower capital expenditures and R&D ratios. Benninga et al (2005) confirm the fact that IPOs cluster in specific time intervals. In contrast to Helwege and Liang (2004) they find that hot markets are industry related.

Yung et al (2005) agree with the literature that hot and cold markets exist. They demonstrate that IPOs show higher abnormal returns, CAARs and BHARs, even one year after the offer. IPOs whose one year CAARs and BHARs fall in a hot market show are higher compared to CAARs and BHARs falling in a cold market. Yet, consistent with the literature, five year excess returns are lower for IPOs issued in hot markets.

Loughran and Marietta-Westberg (2005) use a sample of 1153 US NYSE IPOs issued between 1926 and 1962. They argue that IPO managers decide taking their company public in favourable market conditions. This happens before the downturn of the market. They relate higher IPO issuance activity to good market conditions. Yet because of the subsequent market downfall, IPOs issued during booms show lower first year returns.

Ali (1995) finds that analysts are more optimistic in valuing issuing than non-issuing firms; Rajan and Servaes (1997) agree. They move one step further and show that under-pricing is positively related to analyst over optimism. Moreover, they show that offers with positive forecasts performed worse compared to those with more conservative future expectations. They imply that the issuer exploits the window of opportunities. Loughran (1994), although not examining analyst forecasts, supports this assumption by arguing that the issuer is capable of detecting windows of opportunities. Purnanadam and Swaminathan (2004) suggest that IPO investors pay too much attention to optimistic forecasts of analysts.

Some researchers argue that, while misevaluations are indeed the main reason for IPOs to under-perform, risk is the main cause for misevaluation. In other words, the over-valuations are not due to general overreactions, stated by the fads and timing theory, neither are they related to uncertainty, as Miller's (1977) divergence of opinion suggests. Instead, IPO misevaluations are related to the fact that investors fail to correctly estimate the risk associated with IPOs. If this is the case, Fama (1998) points out that excess returns could be eliminated when samples are controlled for both size and book to market ratios, i.e. the two main risk factors suggested by Fama and French (1992). Supporting this idea, Brav and Gompers (1997) find that IPOs under-perform the market when using indexes as a benchmark. Yet, IPOs perform about the same when matched with portfolios of same size and book to market ratio. Instead, they find that both IPO and seasoned firms with low B/M ratios under-perform compared to those with higher ratios, indicating that risky firms are subject to higher investor sentiment and information asymmetry. Further, when using value weighted by size returns, the under-performance diminishes. Once more, this implies that when controlling for size (risk), excess returns vanish. Brav et al (2000) confirm the earlier Brav and Gompers (1997) findings.

Further, Fama (1998) comments that additional risk factors may exist, which have to be accounted for when finding benchmarks or creating portfolios. For example Brav and Gompers (1997) empirically show that venture backed IPOs – i.e. firms that are perceived safer because a venture capitalist monitors them - perform better compared to non-venture backed ones. In fact, using Fama and French (1992) regressions they find that excess returns are insignificant for venture backed IPOs. Non-venture backed IPOs show negative excess returns. Jain and Kini (1995) support their findings by showing that the operating performance of venture backed IPOs are higher than that of non-venture backed ones. Jain and Kini (2000) establish that venture backed IPOs may perform better when they are R&D and advertising intensive. Yet, as empirically shown by Guo et al (2006) and Bhabra and Pettway (2003) R&D IPOs are still subject to excess returns, i.e. their risk is mispriced. Carter et al (1998) find that IPOs backed by reputable underwriters – assuming that reputable underwriters accept underwriting less risky offers - are less under-priced in their first day of trading and under-perform less than three years after they begin to trade.

A further reason why risk miscalculation may occur is that the nature of firms going public changes over time. According to Clarkson and Thompson (1990) and Fama and French (2004) this happens because the cost of raising equity also changes over time. The trend has been that the issuers have lowered the require premium. According to Fama and French (2004) this implies that more risky firms are also able to raise capital. Riskier firms are characterized by more distant payoffs and weaker profitability measures. For example, weaker profitability measures often show negative earnings. Thus misevaluations of risk and consequently also failures appear more often than expected.

Further, some researchers argue that risk miscalculation may be due to IPO issuance at times of very good operating performance. Jenkinson and Ljungqvist (2001) indicate that there may be a form of "earnings management" from the issuer. Fama (1998) comments that IPOs could be overvalued at offer and thus under-perform in the long run, if earnings growth cannot be predicted accurately. Yet, the unanswered question is why investors do not learn their lesson and fail to predict the nature of future accounts.

Jain and Kini (1994) using a sample of US IPOs issued between 1975 and 1988 find that operating returns over total assets and capital expenditures over total assets decrease in the long run. Moreover sales grow less than the IPO assets. In addition sales growth rates, while positive in years one, two and three after the offer, fail to maintain pre-IPO levels. Mikkelson et al (1997) confirm the fact that IPOs have high operating performance before going public, while it deteriorates after going public. DeGeorge and Zeckhauser (1993) using a sample of US IPOs issued between 1979 and 1986 show that LBO – privatised public companies now going public for a second time – have higher operating income relative to their total assets before going public. However, this ratio diminishes after they conduct their IPO. The negative aspect of those studies is that all of them imply, yet do not empirically test, that IPO long-run returns are affected by the deteriorating operating ratios.

Coakley et al (2004) focus on UK IPOs issued between 1985 and 2000. They conclude that operating performance, defined as operating cash flow over total assets ratio deteriorates for IPOs five years after they go public. Yet, this overall conclusion is mainly driven by UK IPOs issued between 1998 and 2000. In contrast to most literature, they find that UK IPOs issued before 1998 do not show any statistically significant lower operating performance ratios. Khurshed et al (2004) using a sample of UK IPOs issued between 1995 and 1999 find that pre-IPO operating performance cannot be maintained after the offer.

Teoh, Welch and Wong (1998a) and Teoh, Wong and Rao (1998b), using 1974 IPOs issued between 1980 and 1984, examine their discretionary current accruals, i.e. recognized current amounts of future sales or expected assets at the time of offer, as well as carry forward current expenses and liabilities at the time they go public. They find that IPOs with higher discretionary accruals ("aggressively reporting") perform 15% to 30% worse in the long run compared to those with lower discretionary accruals ("conservatively reporting"). Aharony et al (1993), Friedlan (1994), Beaver et al (2000) confirm the fact that IPOs exploit accruals as a form of earnings management.

Finally, Chan et al (2003) are the only so far study which jointly examine all the above risk factors that are subject to misevaluation by the market. Using a sample of US IPOs issued between 1980 and 1996 they find that these show higher negative excess returns if they are not venture-backed and higher levels of earnings management and have low reputation under-writers. They define such IPOs as "losers". Further, they find that venture-backed, large IPOs, with lower levels of earnings management and high reputation under-writers in fact over-perform the market.

A major drawback of all studies investigating IPO operating performance, by examining their earnings or operating income, is that they may have limitations in sample selection. Studies linking operating income or earnings can establish a relationship between earnings and returns only in case of offers reporting positive earning figures. Most studies use a sample of IPOs issued in the 1980ies and early 1990ies. Therefore the fraction of negative earning reporting offers may not be very high. However, Purnanadam and Swaminathan (2004) who look at IPOs issued up to 1997 omit offers with negative earnings, and address this issue as a problem. The sample in the present thesis shows that 56% of all IPOs issued between 1995 and 2000 report negative earnings. Further, Bhabra and Pettway (2003) using US-IPOs issued between 1987 and 1991, question the relationship between long-run returns and traditional profitability measures, such as earnings and leverage. They deduce that traditional operating performance ratios at the time of the offer can predict

BHAR performance in year one after the offer only. In contrast, ratios are not significant when examining three-year BHARs.

Mismeasurement Issues

Finally a third set of literature argues that IPO long-run under-performance may be related to the fact that researchers mismeasure the returns themselves. Barber and Lyon (1997) point out the need of consistency and application of the same measurement techniques for both the IPO and the benchmark portfolios. For example under-performance may be exaggerated if the IPO portfolio is not rebalanced, while the benchmark portfolio is. This is a frequent phenomenon in literature reports. Indexes used as benchmarks, such as the NASDAQ, are by definition rebalanced. If this is the case the benchmark portfolio may show "inflated" returns relative to the IPO portfolio since it eliminates recent losers and promotes winners. Note that the rebalancing bias affects mainly BHARs, due to the fact that those take into account the effect of compounding.

Further, there is the issue of portfolios being biased by including firms of a single type only, or otherwise excluding companies of a specific characteristic. For example the "new listings" bias may apply for IPOs, since the IPO portfolio only includes firms, which are very new in the stock exchange. Elaborating on the Barber and Lyon (1997) study, Kothari and Warner (1997) and Fama (1998) point out that portfolios may be biased through more general factors. For example, IPOs may have lower B/M ratios compared to market indexes and seasoned companies, or be smaller in size compared to seasoned companies. Their idea is related to Brav and Gompers (1997) and Brav et al (2000) relating under-performance to not correctly adjusting for risk. Jenkinson and Ljunqvist (2001) and the above authors comment that despite the fact that bias may exist, the fact that IPOs under-perform relatively to indexes and seasoned companies may still be evident.

Gompers and Lerner (2003), using a sample of US IPOs issued between 1935 and 1972 find that these under-perform when they are on a buy-and-hold value-weighted measurement basis. Yet, when using equally-weighted returns or cumulative abnormal equally and value-weighted returns the excess returns are not statistically significant. Even when using Fama and French (1992) style regressions (taking into account risk components), the excess returns remain insignificant. The authors comment that they cannot find an explanation as to why this is happening and that measurement issues associated with BHARs and CAARs could provide an answer.

8.2.3 Intangibles and IPO Long-Run Performance

Ritter (1991) shows that IPO underperformance is higher when the B/M ratio is lower. This could imply that higher R&D intensive offers should perform worse in the long run. Bhabra and Pettway (2003) run cross-sectional regressions – the dependent IPO variable being one and three year BHARs – and use a set of independent variables, derived from the IPO prospectus and subsequent company financial statements, capturing the effects of age, assets, leverage, risk as well as R&D/sales. Abnormal returns are defined using as a benchmark matching seasoned companies, based on B/M, B/M and industry, as well as size. They find that in year one after the offer there is a negative relationship between BHARs and operating income before taxes as well as firm sizes measured in assets; leverage as well as the number of risk factors measured in the prospectus and the proportion of assets relative to size of offer are insignificant. The above factors – with the exception of the R&D/sales ratio - are insignificant using as a dependent variable the three-year BHARs. Their findings are supported by earlier literature focusing on seasoned companies. Lev and Zarowin (1999), Francis and Shipper (1999) and Colins et al (1994; 1997) find that the relationship between returns and earnings has decreased over time. Lev and Zarowin (1999) use a sample of US seasoned companies issued between 1978 and 1996 and find that cross-sectional regressions with the one-year raw returns as dependent variable, and earnings as the independent variable, show lower R^2 in the 90ies than in the 70ies. He argues that intangibles such as R&D may better explain returns compared to earnings. Damodaran (2001) emphasizes in his guidelines on valuations, that in case of firms reporting negative earnings or belonging to the technology sector, one should use the R&D/sales ratio in estimating prices and returns. In agreement with those comments, the Bhabra and Pettway (2003) study finds that the only significant profitability measure explaining both one and three-year BHAR IPO returns is the estimated R&D/sales ratio at the time of the offer. For the one-year BHAR cross-sectional regressions, R&D/sales is positive and significant when the controlling portfolio is defined with respect to seasoned matched firms of same size as the respective IPO. For all other cases the coefficients are positive, yet insignificant. In contrast, for the three-year BHAR cross-sectional regressions, R&D/sales is negative and significant when using a benchmark like seasoned matched firms based on B/M and industry. For all other cases, R&D/sales are negative and insignificant. It is positive and insignificant when seasoned matched firms of same size are used as a benchmark.

Bhabra and Pettway (2003) findings are consistent with a theory supported by literature, which, argues that it is the firm's intangibles, rather than that of "traditional" measures such as earnings and book values, which really matter in determining the IPO long-run returns success. The Ernst and Young (1998) CBI study interviews CEOs of firms that went public, and reports that they linked the long-run success of their offer to the firm's intangible investments at the time of the offer. However, while Bhabra and Pettway (2003) in accordance with the CBI findings show a positive relationship between R&D intensity and BAHRs, their results are contradictory for year three after the offer. Higher R&D/sales ratios at the time of the offer negatively affect BAHRs. They do not provide any explanation on whether their results are due to risk or misevaluation.

CBI's point is proven by Guo et al (2006) who, in the context of examining 2696 IPOs issued between 1980 and 1995, find that firms going public and reporting higher R&D/ sales ratios at the time of their offer outperformed those with lower or no R&D/sales ratios. They apply the Fama and French (1993) three-factor model, and find that Jensen's α-coefficient is negative and significant only for those IPOs which do not invest in R&D when they go public. Instead α becomes positive and insignificant for low and high R&D intensive IPOs. Further, they derive an α of 0.64 by using a strategy of buying high and low intensive R&D IPOs, while selling IPOs with no R&D. They also comment that the higher excess returns observed in R&D intensive IPOs could be due to the fact that the market initially over-values the risk associated with intangibles.

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8.3 Methodology

8.3.1 Accounts Used in Research

In order to investigate the effect of all-important intangibles identified on a firm's financial statement on long-run excess returns of IPOs, this research defines intangibles as: a) R&D Expenses, and b) Balance Sheet Intangibles, i.e. Intangible Assets and Goodwill. In Chapter 3 a detailed description on data definitions, collection and measurement is provided.

Intangible intensity is the parameter to measure effects of intangibles on IPO performance. For R&D intensity two different forms are used. First, it is defined as the R&D expense over sales ratio. This definition is used frequently in literature, and has the advantage that both R&D expenses and sales are readily found on the income statement – thus being consistent – and are measured at the time of offer. On the other hand, in a considerable number of cases in research R&D expenses are capitalized, by arguing that R&D is of value and should be treated as capital rather (Lev and Sougiannis (1996; 1999), Lev et al (2002; 2005), Chambers et al (2002)). Empirically they find that R&D capital better explains market values and returns. Consequently in this thesis R&D intensity is also measured in terms of R&D capital and it is defined as the R&D capital over total assets ratio.

R&D implied capital is estimated using a six-year linear depreciation within the hypothesis of this chapter. The selection of a six-year period is used as an in-between solution, based on the various capitalization scenarios proposed in literature. The six-year depreciation period may be assumed as an acceptable and satisfactory working proposal for the present study. The following examples support this assumption. Chan et al (2001) do state that the optimal R&D depreciation rate is 15% according to NBER (National Bureau of Economic Research); nevertheless in their research, they capitalize R&D assuming a 20% depreciation rate, i.e. a five-year capitalization. Hand (2003a) use a seven-year linear amortization, while Lev et al (2002) conclude that - depending on the industry type of firms - assumptions of linear depreciation between three and nine years should be used when capitalising R&D expenses. Chapter 5 (Hypothesis 2) – for the technology sample in this thesis – agrees with the Lev et al (2002) findings.

For a six-year linear depreciation the R&D expenses of six years prior to IPO issuance are collected. An annual 16.7% depreciation rate is assumed. Rounding up coefficient values the following expression estimates R&D implied capital as follows:

$$RD\_Capital = 100\%*RD(OFFER)+83\%*RD(t\text{-}1)+66\%*RD(t\text{-}2)+50\%*(t\text{-}3)+ \\ +33\%*RD(t\text{-}4)+17\%*RD(t\text{-}5)+0\%*RD(t\text{-}6) \quad [8.1]$$

where $t = 6$, i.e. the number of years of depreciation and

RD = R&D expenses in the respective year, measured at fiscal year end.

When treating R&D as capital a modification has to be made to the denominator – in the ratio of capital over total assets – by adding the implied R&D capital to the reported total assets.

In a similar way balance sheet intangible intensities are defined as the ratio of balance sheet intangible assets over total assets. This definition is used by literature in general. Intangible assets, goodwill, and total assets are all derived from the balance sheet itself – and so possess consistency - and measured at the time of the offer.

8.3.2 Sample Split Procedure

The sample is split in a similar procedure as in the previous chapter of Hypothesis 4, which examines the effects of intangible intensities on IPO short-run performance. Here, testing if intangible intensive IPOs perform better or worse in the long run, the sample is first split into IPOs reporting or not reporting R&D at the time of the offer. Second, consistent with the methodology followed by Guo et al (2006), the R&D reporting IPO sample is further split into sub-samples of IPOs with R&D intensities or R&D to sales ratio above the median (HI RD), and below the median (LO RD) respectively. The median R&D over sales ratio is determined by excluding all IPOs that do not report any R&D at the time they go public. In defining intensity as R&D capital over total assets an identical procedure is followed, and, accordingly, the median corresponds to the R&D capital over total assets ratio.

In a similar way, investigating the effect of balance sheet intangibles upon the long-run performance of IPOs, the entire sample is split into IPOs reporting balance sheet intangibles, i.e. intangible assets or goodwill or both, at the time of the offer, and those not reporting any balance sheet intangibles. Again the median balance sheet intangibles intensity is estimated excluding IPOs which do not report any balance sheet intangibles. A balance sheet intangibles portfolio with values above (HI) and below (LO) the median intensity is created.

Consistent with previous hypotheses, the entire 1995-2000 IPO sample is further split into two subgroups, the 1995-1998 period at the beginning and rise of the technology IPO boom and the 1999-2000 peak period. As conducted on the entire sample, after splitting the 1995-1998 and 1999-2000 sub-samples into reporting and non-reporting R&D and balance sheet intangibles IPOs, the median intensities of those offers reporting intangibles are estimated and IPOs are classified again as above (HI) or below (LO) the median intensity.

Splitting the sample into two different time periods serves various purposes. First, it contributes towards a better understanding of the long-run performance of IPOs in the context of a boom and a recession period. To be more specific, those IPOs issued between 1995 and 1998 generated all or most of their three-year returns in a period of positive returns, i.e. up to 2000. However, most of the companies that went public in 1999-2000 reflect in their three-year returns the recession starting from 2001 and onward.

Moreover, as shown in Hypothesis 1 of Chapter 4, intangible intensities of firms going public during the 1995-1998 period were lower compared to those, which were issued during the 1999-2000 period. As a result, above and below the median intangible intensities portfolios created on the basis of the 1995-2000 sample may reflect a period effect. IPOs issued in 1999-2000 may cluster more frequently in the high intangible intensity portfolio, while 1995-1998 IPOs appear more frequently in the low intensity portfolio. Low and high intangible intensity portfolios analysed as sub-samples within those two periods clearly reflect low and high intangibles offers. Further, as shown in Hypothesis 4 of Chapter 7, the levels of first-day returns were higher during the 1999-2000 interval. Considering the fact that various empirical studies, establish a link between short- and long-run returns, splitting in subgroups is indeed logical and of value.

8.3.3 Performance Measure Based on Subsequent Stock Returns

The long-run excess returns are defined within this thesis as the abnormal returns measured three years after the IPO was conducted. The three-year interval has been frequently used in literature (e.g. Ritter (1991), Bhabra and Pettway (2003), Guo et al (2006)) as an interval to measure IPO performance against a benchmark like the NASDAQ index or matching seasoned companies. Three-year excess returns are estimated from the second day of trading up to three years later. Excess returns are defined in form of Cumulative Abnormal Average Returns (CAAR) and Buy and Hold Abnormal Returns (BHAR).

Chan et al (2003) point out the main difference between CAAR and BHAR. CAAR estimates the average cumulative gain or loss of an investment for a given time in IPO portfolios compared to the gain or loss of the NASDAQ index or of seasoned matching companies, assuming selling and buying of the portfolio shares in each period within the assumed entire time interval. Ritter (1991) and Barber and Lyon (1997) define CAAR as the mean cumulative returns estimated during a specific interval. BHAR estimates mean gain or loss during an entire interval, assuming the investor bought and held the securities, rather than bought and sold them in this time interval. In other words, CAAR does not take into consideration the effect of compounding, while BHAR does.

The formulae used in estimating CAAR, as well as their significance test values (t-test), are as follows:

$$CAAR_t = \sum_{t=1}^{T} AR_t \qquad [8.2]$$

The monthly abnormal return is estimated as:

$$AR_t = (R_{tIPO} - R_{tBenchmark}) \qquad [8.3]$$

with R_t = monthly raw return

The t-statistic:

$$t = CAAR_t * \sqrt{n_t} / csd_t \qquad [8.4]$$

where n is the number of IPOs active at month t, and

$$csd = [1 * \text{var} + 2 * (t-1) * \text{cov}]^{1/2} \qquad [8.5]$$

with var and cov are the average (over 36 months) cross sectional variance and first order auto-covariance of the AR_t series.

Further, it is tested if CAARs between two groups are significant. In this case a t-test proposed by Berenson et al (1983) is used as follows:

$$t = \frac{CAAR_1 - CAAR_2}{S_p\sqrt{(1/n_1)+(1/n_2)}} \qquad [8.6]$$

where: $$S_p = \sqrt{\frac{(n_1-1)S_1^2 + (n_2-1)S_2^2}{n_1+n_2-2}} \qquad [8.7]$$

The $CAAR_1$ and $CAAR_2$ are the cumulative average abnormal returns of the two portfolios compared. S_1^2 and S_2^2 represent the variances of $CAAR_1$ and $CAAR_2$ respectively. In this case the variance is defined as in Eq. 9.5 raised to the second power. N_1 and N_2 are the number of IPOs included in each portfolio respectively, at the time CAAR is measured.

The formula used in estimating buy-and-hold abnormal returns is

$$BHAR_t = \prod_{t=1}^{\tau}[1 + R_{tIPO}] - \prod_{t=1}^{\tau}[1 + R_{tBenchmark}] \qquad [8.8]$$

For the BHAR two different methods are used to test their statistical significance. First, a simple t test is performed as recommended by Barber and Lyon (1999) :

$$t = \frac{BHAR_t}{\sigma(BHAR_t)/\sqrt{n}} \qquad [8.9]$$

Where σ is the variance and n is the number of observations in the BHAR sample.

Second, based on Barber and Lyon (1999) t-tests are performed using the bootstrap skewness adjusted t-statistic. The bootstrapping is performed by drawing 1000 bootstrapped re-samples from the original sample of size $n_b = n/4$ In this case, the t-statistic is estimated as follows:

$$t_{sa}^{b} = \sqrt{n_b}\,(S^{b} + \frac{1}{3}\hat{\gamma}^{b} S^{b2} + \frac{1}{6n_b}\hat{\gamma}^{b}) \qquad [8.10]$$

where

$$S^{b} = \frac{BHAR_t^{b} - BHAR_t}{\sigma^{b}(BHAR_t)} \text{ and } \hat{\gamma}^{b} = \frac{\sum_{i=1}^{nb} BHAR_{it}^{b} - BHAR_t^{b})^3}{n_b \sigma^{b}(BHAR_t)^3} \qquad [8.11]$$

Further, the significance of BHAR values between two groups is tested. Again, the t-test proposed by Berenson et al (1983) is used.

R_{tIPO} is the average – when equally-weighted – and the sum – when value-weighted – of all active IPOs at month t. $R_{tBenchmark}$ is again the average return – when equally-weighted – and the sum of returns – when value-weighted – of the benchmark portfolio. The benchmark portfolio represents the returns calculated on the basis of the NASDAQ index or of seasoned matching firms. The benchmark returns are proxied by the literature by either using market indexes representing the country, the industry or the risk of the IPO, or seasoned firms matched to the IPO by size and industry.

In this thesis two benchmarks are selected to test the magnitude of abnormal returns between intangible intensive and less intangible intensive IPOs. The first benchmark is the NASDAQ value weighted index. The selection of this benchmark is based on the fact that the technology IPOs belonging to the sample in this thesis are all listed in the NASDAQ, which is technology oriented. Further, almost all studies referring to US-issued IPO abnormal returns performance use the NASDAQ as a benchmark.

The second benchmark selected is seasoned matching companies. Consistent with Ritter (1991), Loughran and Ritter (1995) and Bharba and Pettway (2003) seasoned companies have been matched to each IPO based on size (market value) and industry, Chapter 2 providing detailed definitions on the matching procedure.

IPO and matching firms benchmarks are estimated on an equally or value weighted basis. Equally weighted excess returns weigh each observation excess returns at time t by the ratio of 1/n, where n is the number of IPOs found in the sample in time t. Value weighted excess returns weigh each observations excess returns at time t by the ratio of $MV_{IPO\ t} / MV_{ALL\_IPO\_t}$, where MV_{IPO_t} is the market value of the IPO at the beginning of the period t and $MV_{ALL\_IPO\_t}$ is the sum of IPO market values at the beginning of the period t.

Long-run returns are calculated assuming monthly rebalancing. A rebalancing strategy leads to more accurate results in this thesis, for two main reasons. First, during the 1995-2000 IPO boom period many IPOs de-list. Therefore, keeping their last return, or using an average return of the rest of the portfolio as a proxy, does not accurately reflect gain and loss. A further negative implication of not rebalancing is that when estimating value-weighted returns, market value weights are estimated taking into account de-listed IPOs. In contrast, estimating monthly weights on a monthly-rebalanced portfolio reflects the value weighted investment strategy more accurately. Further, as pointed out by Barber and Lyon (1997) the NASDAQ index component is rebalanced monthly due to firms de-listed or added on its portfolio. Therefore, in order to avoid a rebalancing bias on the IPOs portfolio, both portfolios should be rebalanced. One disadvantage of the rebalancing strategy is that excess returns could be inflated because surviving IPOs may be weighted more heavily when de-listed ones reduce the number of observations. According to Canina et al (1998) the severe problems with rebalancing are observed with daily data. Monthly data reduces the rebalancing bias significantly. Using annual rebalancing does not result in higher improvement.

8.4 Empirical Results

Table 8.1 reports equally- and value-weighted CAAR estimates using as a benchmark the NASDAQ index. It refers first to all IPOs, and further splits the sample into sub-samples of IPOs that report or not report either R&D or balance sheet intangibles.

Panel A shows that the 551 IPOs issued between 1995 and 2000 under-perform the NASDAQ index in year one (-14%) and two (-19%) after the offer only. By year three the under-performance is insignificant. R&D reporting IPOs show less negative excess returns compared to those which have not invested in R&D in years one (-10% vs. 30%) and two (-13% vs. 44%) after the offer. The significance of this difference is at 10%. By year three after the offer, R&D reporting IPOs do not show any significant under-performance. In contrast, non R&D reporting IPOs under-perform the NASDAQ by 63%. Balance sheet intangible reporting IPOs perform worse at -20% than non balance sheet reporting ones at -5% in year one. By year two their differences are insignificant. In year three both reporting and non-reporting balance sheet intangible IPOs do not show any excess returns compared to the NASDAQ.

Panel B and C focus on IPOs issued in the period 1995 to1998 and 1999 to 2000, the beginning of the IPO boom and its peak respectively. From the results in Panel B, it is evident that IPOs issued 1995-1998 did not perform significantly different than the NASDAQ in their long run through the years 1996 and 2001. Also differences between intangible reporting and non-reporting IPOs are insignificant too. In consequence, it seems that intangibles did not lead to higher misevaluations. Some evidence that R&D intensive IPOs performed better in the long run – in agreement with the Guo et al (2006) findings - comes from the fact that R&D reporting IPOs gain in year three after the offer 19% higher excess returns relative to the NASDAQ, while non R&D reporting IPOs do not show any significant excess returns. The 19% value is at a significance of only 10%. The same significance is true for the difference between R&D reporting and non-reporting IPOs, i.e. between the values of 19% and -24%.

Panel C shows that the 1999-2000 IPOs under-performed the NASDAQ in year one and two by 32% and 39% respectively. All IPOs, no matter whether reporting some kind of intangible or not, show a significant under-performance in years one and two reflecting the overvaluation and subsequent correction of the IPO boom after 2000. Yet, IPOs reporting R&D perform better, i.e. show lower under-performance compared to those which fail to invest in R&D, as results show for year one with -25% vs. -65%, and year two with -29% vs. –83%. In this sense the Guo et al (2006) point is verified once more. R&D leads to better performance; even when in this case it is expressed in the form of lower losses. Balance sheet intangible reporting IPOs perform worse than non-reporting ones in year one, yet none of the differences are significant. By year three after the offer, neither R&D reporting, nor balance sheet reporting and non-reporting IPOs, show any significant excess returns relative to the NASDAQ index. Again the only exceptions to the rule are the R&D non-reporting IPOs issued between 1999 and 2000. Those failed dramatically in the long run, showing excess returns of –122%. This very high figure is consistent with Brown (1999). He finds that technology stocks in the UK under-performed during that interval by 130%.

The following Panels D, E, and F of Table 8.1 focus on the value weighted by size (market value excess returns) CAAR estimates. Panel D, consistent with observations of Brav and Gompers (1997), shows that value weighted CAAR estimates are lower compared to equally weighted ones or are at least insignificantly different. For the total sample of 551 IPOs, CAAR estimates are insignificant in year one. By year two they are positive at 6% and significant, while in year 3 they become insignificant again. Splitting the sample into R&D reporting and non reporting IPOs shows no significant differences ~~in~~ between their value weighted CAAR estimates. In contrast to equally weighted, value weighted CAAR estimates show a better performance for balance sheet intangible reporting IPOs with 5% than non balance sheet reporting ones at –11% in year one. In years two and three there are no significant differences between their CAAR values any more. Results are consistent in case of both 1995-1998 and 1999-2000 issued IPOs as well, Panels E and F respectively.

Table 8.2 is identical in structure to Table 8.1. Its only difference is that excess returns are estimated using matching seasoned companies of the same size and industry as a benchmark. The 551 IPOs sample shows in Panel A under-performance for equally weighted CAAR estimates in years one and two (-10% and -25% respectively) compared to seasoned companies, while by year three excess return differences are insignificant – these results agree with results of the previous Table 8.1 benchmarking against the NASDAQ index. Similarly to NASDAQ benchmarked CAARs, R&D reporting IPOs show less negative CAARs compared to non R&D reporting IPOs with -6% vs. -27%, -17% vs. -57%, 0% vs. -63% for year one, two and three respectively. Also, balance sheet intangibles reporting IPOs perform worse than non balance sheet intangibles reporting ones with -16% vs. -1%, -38% vs. -1% , -23% vs. 7% again for year one, two and three respectively.

Long run CAAR estimates for IPOs issued in the 1995-1998 and 1999-2000 intervals are given in Panels B and C. They show a clear trend in that IPOs issued in the 1995-1998 interval over-performed seasoned companies during their booming long run between 1996 and 2001, while IPOs issued in 1999-2000 under-performed following their 2000 correction. With respect to intangibles it is observed that R&D reporting IPOs gain much higher excess returns during booms (Panel B), and show less heavy losses in corrections (Panel C) compared to non R&D reporting IPOs, the respective figures being in the first case for year one 29% vs. 1%, year two 42% vs. –1%, and year three 60% vs. 0%, and in the second case for year two -80% vs. –137%, and year three -64% vs. –201% (here differences are insignificant for year one). Balance sheet intangible reporting IPOs do not show any statistically significant differences in their excess returns either during boom or recession periods.

Panels D, E, and F show that value weighted excess returns are lower but not statistically different between R&D reporting and non reporting IPOs. Balance sheet intangible reporting IPOs perform better in year one after the offer, yet in year two and three differences in excess returns are not statistically significant any more.

Having investigated the performance between intangible reporting and non reporting IPOs, attention is now brought upon the excess returns between IPOs with high (HI) or low (LO) intensity – i.e. above or below the sample intangible median. Further, these excess returns are compared to the ones of IPOs not reporting any kind of intangibles. Table 8.3 examines the impact of R&D intensity on IPO excess returns. The benchmark used in the NASDAQ index. The first column provides CAAR estimates of IPOs, which have not invested in R&D, the second (LO) and third (HI) columns treat R&D as an expense and define intensity as the R&D over sales ratio. The last two columns treat R&D as capital (similarly LO and HI intensities) and define R&D intensity as the R&D capital over total assets ratio.

Panel A shows that for the entire 1995-2000 interval, non R&D reporting IPOs performed worse in terms of equally weighted CAARs compared to low intensity R&D IPOs (LO), -30% vs. –1%, -44% vs. –1%, -63% vs. 22% for year one, two and three. High R&D intensity IPOs (HI) show a less severe under-performance in years one and two compared to non R&D reporting IPOs, yet differences are statistically insignificant. As an implication high intensity R&D IPOs show lower excess returns compared to low intensity R&D ones in years one and two. By year three, both high and low intensity R&D IPOs show higher excess returns compared to non R&D reporting IPOs. Yet, differences between high and low intensity R&D IPOs are insignificant.

Defining R&D intensity as R&D capital over total assets changes the results in the opposite direction. High intensity R&D capital IPOs do not show any excess returns compared to the NASDAQ in years one, two or three. Their differences in excess returns compared to negative excess returns of non R&D reporting IPOs are significant. Low intensity R&D IPOs under-perform the NASDAQ in years one and two, and their differences in excess returns are not significant compared to non-reporting R&D IPOs. By year three, both low and high intensity R&D capital IPOs do not show any excess returns compared to the NASDAQ. Both groups perform better compared to non R&D reporting IPOs that under-perform the NASDAQ index by -63%.

Panel B shows that during the economic boom no, low and high intensity R&D reporting IPOs do not show any excess returns compared to the NASDAQ. Panel C shows that during recessions high intensity R&D expense IPOs perform worse than low intensity R&D expense IPOs in year two, i.e. -49% vs. -9%. The significance of those differences is though at 10%. In year two, high intensity R&D expense IPOs do not show statistically significant CAAR estimates compared to non R&D reporting IPOs. By year three, neither low nor high intensity R&D expense IPOs show any significant excess returns. They perform though better than non R&D reporting IPOs, the latter under-performing the NASDAQ by -122%. The opposite happens when R&D is defined as capital. Low intensity R&D capital IPOs perform much worse compared to high intensity R&D capital IPOs in year one with -49% vs. –1%. In year one, low intensity R&D expense IPOs do not show statistically significant CAAR estimates compared to non R&D reporting IPOs. By year three, both low and high intensity R&D capital IPOs do not show any excess returns. Again, as in the last case above, low and high intensity R&D capital IPOs perform better than non R&D reporting IPOs.

Panels D, E, and F depict only insignificant differences between CAARs when using value weighted returns. This result is in agreement with Brav and Gompers (1997) and Fama (1998), who argue that once correctly adjusting for elements of risk (in this study: intangible intensity, industry and size) excess returns do not exist.

Having examined the relationship between R&D intensity and IPO excess returns using as a benchmark the NASDAQ index, attention is now focused on excess returns using as a benchmark seasoned matching companies of the same size and industry. Table 8.4, Panel A, on equally weighted returns supports the hypothesis that high intensity R&D expense IPOs, issued in the 1995-2000 period, perform worse than low intensity R&D IPOs in year one and two. To be more specific, high intensity R&D expense IPOs show excess returns of –22% and –43%, while low intensity ones do not show any significant values. Further, only low intensity R&D expense IPOs show significantly different excess returns compared to IPOs not investing in R&D. The opposite happens with high and low intensity R&D capital IPOs. High and low intensity R&D IPOs do not show any significant excess returns.

Low intensity R&D IPOs show negative excess returns of –32% in year two. By year three, neither low nor high intensity R&D (either expenses or capital) IPOs show any significant CAARs.

Panel B shows that both high and low intensity R&D expense IPOs issued between 1995-1998 over-perform relative to matching seasoned companies. Yet, differences between them are not significant. Further, in year three differences are not significant compared to non R&D reporting IPOs. The same tendency is observed when defining R&D as capital (last two columns).

Panel C shows that all IPOs issued between 1999-2000 under-perform compared to matching seasoned firms. Excess returns for high and low intensity R&D expense IPOs are not statistically significantly different from each other. In years one and two high and low R&D expense IPOs do not show any significant differences in CAARs compared to non R&D reporting IPOs. By year three, both low and high intensity R&D expense IPOs show significantly less negative CAARs compared to seasoned firms. The same tendencies are observed when defining R&D intensity as R&D capital over total assets ratio.

Panels D, E, and F show that value weighted CAARs between high and low intensity R&D (both expense and capital) intensive IPOs do not show any significant differences between them, as well as when they are compared to non R&D reporting IPOs.

Now attention is moved to the relationship between balance sheet intangible intensities and IPO CAARs. Table 8.5 reports CAARs using as a benchmark the NASDAQ index. The first three columns compare excess returns of IPOs, which do not report balance sheet intangibles, to IPOs with below or above the sample median balance sheet intangible intensity (LO BAL and HI BAL). Here balance sheet intangible intensity is defined as the balance sheet intangibles over total assets ratio. The last four columns define low and high balance sheet intangibles intensities in a slightly different way. The denominator, total assets, now includes the R&D capital. Results show that there are no significant differences between high and low balance sheet intangible intensive offers. Further there are no differences between the latter and non balance sheet reporting IPOs.

Table 8.6 is identical in structure and similar in information compared to Table 8.5. The only difference is that it uses as a benchmark matching seasoned companies of the same size and industry rather than the NASDAQ index. It, too, verifies that balance sheet intangible intensities do not lead to significantly different CAARs.

Having provided figures on CAARs indicating gains and losses, which an investor would have incurred if he had invested in IPOs of different intangibles and respective intensities, attention is now focused on the BHARs. The main difference between CAARs and BHARs is that CAARs do not take into account the effect of compounding, while BHARs do so. Table 8.7 provides equally and value weighted BHARs using as benchmarks both the NASDAQ (Panels A and B) and matching seasoned firms (Panels C and D) It provides BHARs on the entire sample of 551 IPOs from 1995 to 2000, as well as sub-samples of 1995-1998 and 1999-2000 IPOs. It further splits the main sample and sub-samples to data sets of IPOs possessing or not intangibles (R&D or balance sheet intangibles).

Two t-statistics are provided. Results of the simple t-test are provided in the middle row. BHARs are significantly different from zero for t-test values higher than 1.90 at 10% significance, while at 1.96 and 2.00 the corresponding significance is 5% and 1% respectively. When calculating bootstrapped samples, generally, two different critical values emerge. In case that the bootstrapped t_{sa} -value is higher than a critical value the significance is higher than 5%. This is denoted by a symbol [S] next to the t_{sa}-value in the Tables 8.7 to 8.9.

All 551 IPOs BHARs under-perform numerically on both equally- and value-weighted basis. IPOs issued during the 1995-1998 period and their respective 1996-2001 BHARs, reflecting economic booms mainly, show that IPOs numerically over-performed compared both to the NASDAQ and seasoned companies. In contrast IPOs issued in the 1999-2000 interval and their respective 2001-2003 BHARs, reflecting correction losses, show numerically negative excess returns. Still, in most cases the significance of the t-test, both in the simple as well as bootstrapped estimation, show that figures are statistically insignificant.

Overall, R&D reporting IPOs numerically perform better than non R&D reporting ones. However, all differences in the 1995-2000 and 1995-1998 intervals are not significant. NASDAQ Equally Weighted BHARs (PANEL A) and Matching companies Value Weighted BHARs (PANEL D) are statistically significantly different between R&D and non R&D reporing IPOs, showing that loses are lower on R&D reporting IPOs (-0.28 vs –0.45 and –0.66 and –1.05 respectively). Even in this case, when using the Barber and Lyon bootstrap, the differences become insignificant. Thus, even if only in some cases, Guo et al (2006) findings - stating that R&D leads to higher excess returns - are proven. However, one can also argue that the insignificant differences reflect the idea that differences in excess returns are a measurement issue (Brav and Gompers (1997), Gompers and Lerner (2003), and that once portfolios have been adjusted for risk – for example by splitting the sample in correct time intervals or risk factors like R&D – the differences could be eliminated (Kothari and Warner (1997), Fama (1998), Brav et al (2000)).

Overall, Balance Sheet reporting IPOs show worse numerical BHAR estimates than not reporting Balance Sheet intangibles. As with R&D and non R&D reporting IPOs, differences between IPOs reporting and not reporting Balance Sheet intangibles are statistically insignificant.

After having compared BHARs between IPOs reporting or not intangibles attention is now shifted to the relationship of intangible intensities and IPO BHARs. Table 8.8 focuses on R&D intensity. The first column provides BHAR estimates on IPOs that have not invested in R&D. The second and third columns provide respective values for IPOs with low and high (below and above the sample median) R&D expense intensity. The last two columns define R&D intensity as R&D capital over total assets. Consistent with findings of Table 9.7 R&D non-reporting IPOs perform worse than low and high intensity R&D ones. Yet, low intensity R&D expense IPOs show higher or less negative BHARs compared to high intensity R&D expense IPOs. Results are in agreement with Bhabra and Pettway (2003) who find a negative relationship between R&D expense intensity and 3-year BHAR for their IPO sample. An opposite trend is observed when defining intensity in the form of R&D capital over total assets. High intensity R&D capital IPOs perform better than low intensity R&D capital ones. In this case, results are in agreement with Guo et al (2006). However, the differences are in all 1995-2000 and 1995-1998 intervals not statistically significant. In the 1999-2000 interval they are only in some cases significant.

Table 8.9 refers to the intensity of balance sheet intangibles. The first columns refer to IPOs, which have not invested in balance sheet intangibles. The second and third columns refer to IPOs with low and high balance sheet intangibles intensities – intangible intensity defined as the balance sheet intangibles over total assets ratio. The last two columns define low and high balance sheet intangibles intensities in a slightly different way. The denominator, total assets, now includes the R&D capital. Results indicate that high intensity balance sheet intangible IPOs show higher or less negative BHARs compared to low intensity balance sheet intangible ones.

Looking at the relationship between high and low intensity balance sheet intangible IPOs and non balance sheet reporting IPOs it may be overall concluded that high and low intensity balance sheet intangible IPOs show more negative BHARs than non balance sheet reporting ones during recession periods - as observed when looking at 1999-2000 issued IPOs. On the other hand, in most cases, during boom periods, for instance looking at 1995-1998 issued IPOs, high intensity balance sheet intangible IPOs show higher BHARs than non balance sheet intangible reporting ones. Further, in most cases HI Balance Sheet Intangibles Intensive IPOs perform better than LO Balance Sheet Intangible intensive IPOs in boom, while worse in recessions. However, the differences are not statistically significant.

8.5 Conclusion

Hypothesis 5 assumes that intangible intensive IPOs at the time of the offer perform worse in terms of BHAR and CAAR as compared to less intangible intensive IPOs.

Empirical results support the statement only partially. They show that the outcome may differ depending on how returns are measured and weighted. In that sense this research once more proves the Brav and Gompers (1997), Fama (1998) and Lerner and Gosh (2003) argument, stating that occurrence of under-performance may depend on those parameters.

Numerically supporting the hypothesis, BHAR returns show that three years after the offer high R&D expense intensive IPOs perform worse compared to less intensive ones. On the other hand, the hypothesis is numerically rejected when defining R&D as capital, as well as when focusing on balance sheet intangibles. BHARs show a trend, which is consistent with the risk compensation scenario; i.e. higher BHAR values correspond to higher R&D capital and balance sheet intangible intensities measured at the time of IPO issuance. In that sense investors may gain a premium for the risk they undertake when investing in intangibles intensive IPOs, suggested by Lev and Sougiannis (1999), Chan et al (2001), and Chambers and Jennings (2002). Results also confirm the point made by Guo et al (2006) and Joos and Demers (2005) that R&D leads to higher success. The fact that R&D expense intensive IPOs perform worse than less R&D intensive ones may reflect the fact that the market indeed capitalizes R&D and compensation is derived only when treating R&D as capital.

The numerical relationship between high, low and non-reporting balance sheet intangible IPOs is rather complex. High balance sheet intangibles IPOs show higher BHARs than non-reporting balance sheet intangibles IPOs during boom periods (e.g. the 1995-1998 issued IPOs), and lower BHARs during recessions (e.g. the 1999-2000 issued IPOs). Low intensity balance sheet intangible IPOs perform in most cases worse than non-reporting balance sheet intangible IPOs, this could be an element of mis-pricing.

Rejecting the hypothesis, most of the above numerical differences are statistically insignificant.

Mixed results are derived with respect to CAAR returns. Evidence is provided that R&D reporting IPOs perform better than non-reporting ones in years one, two and three after the offer. Yet, these differences become insignificant when looking at value-weighted results. Low R&D expense intensive IPOs perform better in years one and two after the offer compared to high R&D intensive offers. By year three differences are insignificant. Value-weighted returns differences between high and low R&D intensive offers are always insignificant. Defining R&D as capital, equally- and value-weighted CAARs show that high intensity R&D capital IPOs perform better than low intensity ones, differences are not statistically significant though. Therefore one may again deduce that high and low intensity R&D capital IPOs perform about the same. Insignificance in differences between returns is also observed between zero, low and high balance sheet intangibles intensities.

With respect to CAAR and BHARs and as suggested by Kothari and Warner (1997), Brav and Gompers (1997), Fama (1998), Brav et al (2000) and Lerner and Gosh (2003), values indicate that after controlling correctly for risk – by creating portfolios based on intangibles intensities, which is a major risk factor, and by measurig properly equally and value weighted returns – excess returns may become insignificant, i.e. vanish.

Table 8.1: CAAR 3-year Estimates – R&D – INT GOOD

Benchmark: NASDAQ

All IPOs (ALL) and sub-groups reporting or not R&D (RD) or Balance Sheet Intangibles (INT GOOD) at time of offer

Month	ALL	(t)	RD	(t)	NO RD	(t)	INT GOOD	(t)	NO INT GOOD	(t)
	Equally Weighted									
	Panel A		**1995-2000**							
12	-0.14	-3.18	-0.10*	-2.01	-0.30*	-3.14	-0.20*	-3.37	-0.05*	-0.82
24	-0.19	-2.81	-0.13**	-1.70	-0.44**	-2.88	-0.26	-2.89	-0.08	-0.84
36	-0.02	-0.29	0.10***	1.09	-0.63***	-3.07	-0.07	-0.57	0.04	0.32
	Panel B		**1995-1998**							
12	0.02	0.46	0.04	0.70	-0.4	-0.36	-0.02	-0.30	0.07	0.94
24	0	-0.05	0.03	0.37	-0.15	-0.89	-0.01	-0.09	0	0.01
36	0.10	1.00	0.19	1.64	-0.24*	-1.13	0.13	0.95	0.06	0.46
	Panel C		**1999-2000**							
12	-0.32	-4.42	-0.25**	-3.11	-0.65**	-3.74	-0.34	-3.85	-0.28	-2.19
24	-0.39	-3.50	-0.29*	-2.45	-0.83*	-2.75	-0.46	-3.38	-0.22	-1.16
36	-0.16	-1.05	0.02***	0.14	-1.22***	-2.81	-0.23	-1.22	0.01	0.04
	Value Weighted									
	Panel D		**1995-2000**							
12	-0.03	-1.42	-0.02	-0.90	-0.10	-5.87	0.05**	2.49	-0.11**	-6.38
24	0.06	2.56	0.07	2.88	-0.05	-2.19	-0.03	-1.32	0.14	5.98
36	0.01	-0.16	0	0.12	-0.15	-4.97	-0.02	-0.61	0	0.14
	Panel E		**1995-1998**							
12	0.05	3.07	0.06	3.79	-0.04	-2.80	0.12*	7.27	-0.02*	-1.30
24	0.07	3.23	0.08	3.61	-0.05	-2.55	-0.04	-1.90	0.14	7.31
36	0	-0.19	0.01	0.20	-0.17	-6.88	-0.02	-0.63	0	0.10
	Panel F		**1999-2000**							
12	-0.07	-3.69	-0.06	-3.27	-0.14	-7.64	0.01	0.36	-0.18	-9.00
24	0.05	1.65	0.05	1.94	-0.06	-2.38	-0.01	-0.41	0.17	6.03
36	-0.01	-0.18	-0.01	-0.27	0.06	1.93	-0.03	-0.78	0.03	0.77

** Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1% either between 1)R&D reporting and 2) R&D non reporting IPOs or between 1) INT GOOD reporting and 2) INT GOOD non reporting IPOs*

Month	ALL	RD	NO RD	INT GOOD	NO INT GOOD
	Sample Size				
	Panel A	**1995-2000**			
0	551	439	112	327	224
12	536	433	103	320	216
24	481	400	81	285	196
36	422	354	68	242	180
	Panel B	**1995-1998**			
0	288	225	63	145	143
12	281	224	59	144	139
24	257	209	52	132	129
36	238	191	47	120	118
	Panel C	**1999-2000**			
0	263	214	49	182	81
12	253	209	44	176	77
24	220	191	29	153	67
36	184	163	21	122	62

Table 8.2: CAAR 3-year Estimates – R&D – INT GOOD

Benchmark: Matching Seasoned Firms

All IPOs (ALL) and sub-groups reporting or not R&D (RD) or Balance Sheet Intangibles (INT GOOD) at time of offer

Month	ALL	(t)	RD	(t)	NO RD	(t)	INT GOOD	(t)	NO INT GOOD	(t)
	Equally Weighted									
	Panel A		**1995-2000**							
12	-0.10	-1.81	-0.06***	-0.92	-0.27***	-2.29	-0.16*	-2.25	-0.01*	-0.11
24	-0.25	-3.08	-0.17***	-1.93	-0.57***	-3.09	-0.38***	-3.64	-0.05***	-0.39
36	-0.11	-1.04	0***	0.03	-0.63***	-2.54	-0.23*	-1.63	0.07*	0.42
	Panel B		**1995-1998**							
12	0.23	3.54	0.29***	3.95	0.01***	0.11	0.23	2.53	0.23	2.47
24	0.33	3.41	0.42***	3.87	-0.01***	-0.06	0.37	2.80	0.28	2.02
36	0.52	4.22	0.60**	4.36	0.21**	0.77	0.60	3.58	0.43	2.40
	Panel C		**1999-2000**							
12	-0.46	-5.27	-0.42	-4.35	-0.64	-3.31	-0.47	-4.50	-0.45	-2.77
24	-0.90	-6.76	-0.80***	-5.60	-1.37***	-4.08	-1.00	-6.35	-0.65	-2.66
36	-0.82	-4.62	-0.64***	-3.34	-2.01***	-4.16	-0.92	-4.25	-0.60	-1.92
	Value Weighted									
	Panel D		**1995-2000**							
12	0.07	-3.08	-0.06%	-2.75	-0.13	-6.01	0.06***	2.42	-0.20***	-9.83
24	0.03	0.84	0.04%	1.18	-0.13	-4.22	-0.06	-1.84	0.09	3.26
36	-0.01	-0.36	-0.01%	-0.22	-0.10	-2.69	-0.08	-1.94	0.02	0.67
	Panel E		**1995-1998**							
12	0.07	3.90	0.08	4.34	0.01	0.42	0.21***	10.22	-0.05***	-2.83
24	0.04	1.60	0.05	1.99	-0.11	-4.30	-0.04	-1.53	0.10	4.19
36	-0.01	-0.47	-0.01	-0.30	-0.10	-3.23	-0.09	-2.53	0.02	0.81
	Panel F		**1999-2000**							
12	-0.16	-6.85	-0.16	-6.57	-0.23	-10.3	-0.03**	-1.36	-0.33**	-13.9
24	-0.04	-1.13	-0.03	-0.77	-0.21	-6.66	-0.10	-3.07	0.09	2.61
36	0	-0.08	0	0.04	-0.10	-2.66	-0.03	-0.69	0.03	0.80

** Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1% either between 1)R&D reporting and 2) R&D non reporting IPOs or between 1) INT GOOD reporting and 2) INT GOOD non reporting IPOs*

Month	ALL	RD	NO RD	INT GOOD	NO INT GOOD
	Sample Size				
	Panel A	**1995-2000**			
0	551	439	112	327	224
12	536	433	103	320	216
24	480	399	81	285	195
36	419	351	68	241	178
	Panel B	**1995-1998**			
0	288	225	63	145	143
12	281	224	59	144	139
24	257	208	52	132	128
36	238	189	47	120	116
	Panel C	**1999-2000**			
0	263	214	49	182	81
12	253	209	44	176	77
24	220	191	29	153	67
36	183	163	21	121	62

Table 8.3: CAAR 3-year Estimates–R&D EXP/CAP–LO/HI-

Benchmark:NASDAQ

IPOs and sub-groups reporting or not R&D at time of offer

LO / HI: low/high intensity - values below/above the sample median

R&D assumed expensed (EXP) or capitalized (CAP) with six-year linear depreciation

Month	NO RD	(t)	RD EXP LO	(t)	RD EXP HI	(t)	RD CAP LO	(t)	RD CAP HI	(t)
	Equally Weighted									
	Panel A		**1995-2000**							
12	-0.30	-3.14	-0.01^{*+++}	-0.19	-0.19*	-2.53	-0.19*	-2.57	-0.02^{*+++}	-0.22
24	-0.44	-2.88	0.01^{*+++}	0.13	-0.26*	-2.40	-0.20	-1.88	-0.05^{+++}	-0.48
36	-0.63	-3.07	0.22^{+++}	1.70	-0.01^{+++}	-0.05	0.05^{+++}	0.36	0.16^{+++}	1.26
	Panel B		**1995-1998**							
12	-0.04	-0.36	0.13	1.55	-0.04	-0.50	0.15*	1.74	-0.07*	-0.79
24	-0.15	-0.89	0.06	0.47	0.01	0.08	0.08	0.62	-0.01	-0.10
36	-0.24	-1.13	0.19	1.21	0.19	1.14	0.30^{+}	1.77	0.08	0.54
	Panel C		**1999-2000**							
12	-0.65	-3.74	-0.19^{+++}	-1.76	-0.31^{+}	-2.62	-0.49***	-4.30	-0.01^{***+++}	-0.11
24	-0.83	-2.75	-0.09^{*+++}	-0.58	-0.49*	-2.82	-0.47	-2.75	-0.11^{+++}	-0.67
36	-1.22	-2.81	0.31^{*+++}	1.45	-0.27^{*+}	-1.16	-0.14^{+++}	-0.61	0.19^{+++}	0.84
	Value Weighted									
	Panel D		**1995-2000**							
12	-0.10	-5.87	0.04	2.41	-0.06	-2.89	-0.04	-2.23	0.01	0.41
24	-0.05	-2.19	0.09	4.01	0.04	1.32	-0.03	-1.08	0.14	5.85
36	-0.15	-4.97	0.02	0.71	-0.04	-1.21	0.04	1.36	-0.01	-0.41
	Panel E		**1995-1998**							
12	-0.04	-2.80	0.11*	8.14	-0.08*	-4.47	0.11	6.19	0.01	0.42
24	-0.05	-2.55	0.11	5.73	0	0.05	-0.01	-0.35	0.14	8.04
36	-0.17	-6.88	0.05	1.98	-0.09	-2.91	0.05	1.69	-0.01	-0.66
	Panel F		**1999-2000**							
12	-0.14	-7.64	-0.13	-7.03	-0.01	-0.49	-0.06	-3.51	-0.06	-3.13
24	-0.06	-2.38	0.08	3.23	0.01	0.38	-0.03	-1.08	0.13	4.60
36	0.06	1.93	-0.04	-1.21	0.06	1.65	-0.02	-0.77	0	0.12

* *Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1% between 1)HI-LO (R&DExpense/Sales) and 2) HI-LO (R&D Capital/Total Assets) respectively*

$^{+}$ *Difference statistically significant at confidence of: [$^{+}$] 10%, [$^{++}$] 5%, [$^{+++}$] 1% between 1) R&D non- reporting and 2) HI or LO Intensities (in both cases EXP and CAP), for equally or value weighted figures respectively*

Month	NO RD	RD EXP LO	RD EXP HI	RD CAP LO	RD CAP HI
	Sample Size				
	Panel A	**1995-2000**			
0	112	219	220	219	220
12	103	217	216	216	217
24	81	202	198	194	206
36	68	178	176	165	189
	Panel B	**1995-1998**			
0	63	112	113	112	113
12	59	112	117	111	113
24	52	105	104	103	106
36	47	95	96	89	102
	Panel C	**1999-2000**			
0	49	107	107	107	107
12	44	105	104	105	104
24	29	95	96	92	99
36	21	82	81	79	84

Table 8.4: CAAR 3-year Estimates – R&D EXP/CAP – LO/HI

Benchmark: Matching Seasoned Firms

IPOs and sub-groups reporting or not R&D at time of offer

LO / HI: low/high intensity - values below/above the sample median

R&D assumed expensed (EXP) or capitalized (CAP) with six-year linear depreciation

Month	NO RD	(t)	RD EXP LO	(t)	RD EXP HI	(t)	RD CAP LO	(t)	RD CAP HI	(t)
	Equally Weighted									
	Panel A		**1995-2000**							
12	-0.27	-2.29	0.10^{***+++}	1.25	-0.22^{***}	-2.47	-0.09	-1.03	-0.02^{+}	-0.25
24	-0.57	-3.09	0.09^{***+++}	0.73	-0.43^{***}	-3.37	-0.32^{*}	-2.43	-0.03^{*+++}	-0.23
36	-0.63	-2.54	0.20^{***+++}	1.27	-0.20^{***}	-1.16	-0.13^{+}	-0.74	0.13^{+++}	0.86
	Panel B		**1995-1998**							
12	0.01	0.11	0.39^{+++}	3.75	0.19	1.85	0.42^{*+++}	3.91	0.16^{*}	1.61
24	-0.01	-0.06	0.45^{+}	2.98	0.38	2.51^{+}	0.46^{+}	2.91	0.38^{+}	2.56
36	0.21	0.77	0.53	2.70	0.68	3.50	0.68	3.27	0.53	2.88
	Panel C		**1999-2000**							
12	-0.64	-3.31	-0.45	-3.20	-0.40	-2.96	-0.48	-3.57	-0.36	-2.60
24	-1.37	-4.08	-0.66^{+}	-3.18	-0.95	-4.78	-0.96^{+}	-4.73	-0.65^{+}	-3.20
36	-2.01	-4.16	-0.49^{+++}	-1.79	-0.79^{+++}	-2.96	-0.69^{+++}	-2.56	-0.59^{+++}	-2.16
	Value Weighted									
	Panel D		**1995-2000**							
12	-0.13	-6.01	0.04^{*}	2.18	-0.14^{*}	-6.00	-0.03	-1.42	-0.08	-4.09
24	-0.13	-4.22	0.04	1.35	0.03	1.01	-0.01	-0.21	0.07	2.27
36	-0.10	-2.69	-0.02	-0.45	0.01	0.27	-0.09	-2.27	0.02	0.70
	Panel E		**1995-1998**							
12	0.01	0.42	0.14^{*}	8.40	-0.08^{*}	-3.79	0.20	9.27	-0.05	-3.26
24	-0.11	-4.30	0.06	2.38	0.04	1.35	0.04	1.21	0.06	3.03
36	-0.10	-3.23	0	-0.01	-0.03	-0.84	-0.10	-2.77	0.03	1.27
	Panel F		**1999-2000**							
12	-0.23	-10.3	-0.19	-8.56	-0.13	-5.18	-0.06	-2.85	-0.21	-8.99
24	-0.21	-6.66	-0.01	-0.45	-0.04	-1.32	-0.011	-3.28	0.04	1.32
36	-0.10	-2.66	-0.04	-1.15	0.11	2.60	-0.04	-1.14	0.04	1.03

** Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1% between 1)HI-LO (R&DExpense/Sales) and 2) HI-LO (R&D Capital/Total Assets) respectively*

+ Difference statistically significant at confidence of: [+] 10%, [++] 5%, [+++] 1% between 1) R&D non- reporting and 2) HI or LO Intensities (in both cases EXP and CAP), for equally or value weighted figures respectively

Month	NO RD	RD EXP LO	RD EXP HI	RD CAP LO	RD CAP HI
	Sample Size				
	Panel A	**1995-2000**			
0	112	219	220	219	220
12	103	217	216	216	217
24	81	201	198	194	205
36	68	177	174	165	186
	Panel B	**1995-1998**			
0	63	112	113	112	113
12	59	112	112	111	113
24	52	104	104	103	105
36	47	94	95	89	100
	Panel C	**1999-2000**			
0	49	107	107	107	107
12	44	105	104	105	104
24	29	95	96	92	99
36	21	81	81	79	83

Table 8.5: CAAR 3-year Estimates–INT GOOD – LO/HI

Benchmark:NASDAQ

IPOs and sub-samples reporting or not Balance Sheet Intangibles (INT GOOD) at time of offer

LO / HI: low/high intensity - values below/above the sample median

Month	NO INT GOOD	(t)	INT OOD LO	(t)	INTGOOD HI	(t)	INTGOOD LO	(t)	INT GOOD HI	(t)
			Denominator: Total Assets (R&D as Expense)				*Denominator:* Total Assets + R&D Capital			
	Equally Weighted									
	Panel A		**1995-2000**							
12	-0.05	-0.82	-0.23[+]	-2.90	-0.17	-1.93	-0.21	-2.64	-0.19	-2.15
24	-0.08	-0.84	-0.26	-2.22	-0.26	-1.88	-0.21	-1.79	-0.31	-2.25
36	0.04	0.32	-0.13	-0.87	0	0.00	-0.06	-0.39	-0.08	-0.41
	Panel B		**1995-1998**							
12	0.07	0.94	0	0.02	-0.05	-0.42	-0.01	-0.07	-0.04	-0.34
24	0	0.01	0.09	0.61	-0.11	-0.69	0.08	0.52	-0.10	-0.60
36	0.06	0.46	0.06	0.32	0.21	0.99	0.06	0.31	0.21	0.99
	Panel C		**1999-2000**							
12	-0.28	-2.19	-0.49[*]	-4.20	-0.20[*]	-1.45	-0.42	-3.59	-0.27	-1.97
24	-0.22	-1.16	-0.63	-3.57	-0.29	-1.39	-0.52	-2.94	-0.40	-1.92
36	0.01	0.04	-0.45	-1.86	-0.01	-0.03	-0.35	-1.46	-0.10	-0.36
	Value Weighted									
	Panel D		**1995-2000**							
12	-0.11	-6.38	0.04[+]	2.46	0.05	2.56	0.04	2.25	0.05[+]	2.80
24	0.14	5.98	-0.06[+]	-2.47	0	0.08	-0.07	-2.49	0	0.16
36	0	0.14	0.05	1.66	-0.06	-2.03	-0.02	-0.65	-0.02	-0.50
	Panel E		**1995-1998**							
12	-0.02	-1.30	0.14	8.24	0.10	6.49	0.14	8.17	0.10	6.58
24	0.14	7.31	-0.04	-1.67	-0.05	-2.29	-0.05	-1.93	-0.04	-1.92
36	0	0.10	0.06	2.12	-0.06	-2.29	0.06	2.13	-0.06	-2.33
	Panel F		**1999-2000**							
12	-0.18[*]	-9.00	-0.10	-5.76	0.09[*]	4.71	-0.10	-5.85	0.10[+]	5.13
24	0.17	6.03	-0.06	-2.27	0.02	0.64	-0.03	-1.18	0	0.08
36	0.03	0.77	0	-0.17	-0.04	-1.21	-0.01	-0.24	-0.04	-1.19

** Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1% between 1)HI-LO (INT GOOD / Total Assets) and 2) HI-LO (INT GOOD/R&D Capital+Total Assets) respectively*

[+] Difference statistically significant at confidence of: [+] 10%, [++] 5%, [+++] 1% between 1) INT GOOD non- reporting and 2) HI or LO Intensities (in both cases), for equally or value weighted figures respectively

Month	NO INT GOOD	INT OOD LO	INTGOOD HI	INTGOOD LO	INT GOOD HI
	Sample Size				
	Panel A	**1995-2000**			
0	224	163	164	163	164
12	216	160	160	160	160
24	196	145	140	145	140
36	180	125	117	125	117
	Panel B	**1995-1998**			
0	143	72	73	72	73
12	139	72	72	72	72
24	129	66	66	66	66
36	118	61	59	61	59
	Panel C	**1999-2000**			
0	81	91	91	91	91
12	77	88	88	88	88
24	67	77	76	77	76
36	62	62	60	62	60

Table 8.6: CAAR 3-year Estimates – INT GOOD – LO/HI

Benchmark: Matching Seasoned Firms

IPOs and sub-groups reporting or not Balance Sheet Intangibles (INT GOOD) at time of offer

LO / HI: low/high intensity - values below/above the sample median

Month	NO INT GOOD	(t)	INT GOOD LO	(t)	INTGOOD HI	(t)	INTGOOD LO	(t)	INT GOOD HI	(t)
			Denominator: Total Assets (R&D as Expense)				*Denominator:* Total Assets + R&D Capital			
	Equally Weighted									
	Panel A		**1995-2000**							
12	-0.01	-0.11	-0.15	-1.55	-0.17	-1.63	-0.13	-1.32	-0.19	-1.84
24	-0.05^{+}	-0.39	-0.33^{+}	-2.32	-0.43^{+++}	-2.80	-0.26	-1.85	-0.50^{+++}	-3.23
36	0.07^{+}	0.42	-0.20^{+}	-1.06	-0.26^{+++}	-1.23	-0.09	-0.48	-0.37^{+}	-1.76
	Panel B		**1995-1998**							
12	0.23	2.47	0.27	2.16	0.18	1.43	0.24	1.96	0.21	1.63
24	0.28	2.02	0.41	2.19	0.33	1.77	0.37	2.00	0.37	1.96
36	0.43	2.40	0.53***	2.24	0.68***	2.81	0.49	2.10	0.72	2.94
	Panel C		**1999-2000**							
12	-0.45	-2.77	-0.62	-4.34	-0.32	-2.11	-0.55	-3.85	-0.39	-2.56
24	-0.65	-2.66	-1.15^{+}	-5.37	-0.85	-3.67	-1.03	-4.85	-0.97	-4.14
36	-0.60	-1.92	-1.12^{***+++}	-3.85	-0.72***	-2.22	-1.00	-3.47	-0.84	-2.56
	Value Weighted									
	Panel D		**1995-2000**							
12	-0.20	-9.83	0.05^{+++}	1.95	0.07^{+++}	3.55	0.06^{+++}	2.68	0.05^{+++}	2.23
24	0.09	3.26	-0.07	-2.09	-0.05	-1.83	-0.07	-2.16	-0.05	-1.47
36	0.02	0.67	-0.14	-3.46	-0.03	-1.07	-0.16	-3.99	0.01	0.35
	Panel E		**1995-1998**							
12	-0.05	-2.83	0.24^{+++}	11.36	0.17^{+}	9.18	0.24^{+++}	11.3	0.18^{+}	9.30
24	0.10	4.19	-0.02	-0.56	-0.08	-2.91	-0.02	-0.73	-0.07	-2.69
36	0.02	0.81	-0.18	-4.92	-0.04	-1.19	-0.18	-5.00	-0.04	-1.13
	Panel F		**1999-2000**							
12	-0.33	-13.9	-0.20*	-8.94	0.11^{*+++}	4.68	-0.19***	-8.56	0.11^{***+++}	4.80
24	0.09	2.61	-0.11	-3.43	-0.09	-2.83	-0.10	-3.15	-0.10	-3.02
36	0.03	0.80	-0.03	-0.69	-0.03	-0.68	-0.02	-0.59	-0.03	-0.77

** Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1% between 1)HI-LO (INT GOOD / Total Assets) and 2) HI-LO (INT GOOD/R&D Capital+Total Assets) respectively*

+ Difference statistically significant at confidence of: [+] 10%, [++] 5%, [+++] 1% between 1) INT GOOD non- reporting and 2) HI or LO Intensities (in both cases), for equally or value weighted figures respectively

Month	NO INT GOOD	INT GOOD LO	INTGOOD HI	INTGOOD LO	INT GOOD HI
	Sample Size				
	Panel A	**1995-2000**			
0	224	163	164	163	164
12	216	160	160	160	160
24	196	145	140	145	140
36	178	125	116	125	116
	Panel B	**1995-1998**			
0	143	72	73	72	73
12	134	72	72	72	72
24	128	66	66	66	66
36	116	61	59	61	59
	Panel C	**1999-2000**			
0	81	91	91	91	91
12	77	88	88	88	88
24	67	77	76	77	76
36	62	62	59	62	60

Table 8.7: BHAR 3-year Estimates – R&D – INT GOOD

All IPOs (ALL) and sub-groups reporting or not R&D (RD) or Balance Sheet Intangibles (INT GOOD)

Benchmark: NASDAQ or Matching Seasoned Companies

Sample Period		ALL	RD	NO RD	INT GOOD	NO INT GOOD
Panel A		**NASDAQ – Equally Weighted**				
1995-2000	BHAR	-0.09	-0.04	-0.28	-0.001	0.21
	t	(-0.51)	(-0.20)	(-0.72)	(0.01)	(-0.80)
	t(sa)	(-0.43)	(-0.13)	(-0.52)	(0.05)	(-0.58)
1995-1998	BHAR	0.12	0.20	-0.14	0.41	-0.17
	t	(0.38)	(0.53)	(-0.21)	(0.83)	(-0.41)
	t(sa)	(0.44)	(0.62)	(-0.10)	(0.96)	(-0.28)
1999-2000	BHAR	-0.32	-0.28***	-0.45***	-0.33	-0.29
	t	(-8.26)	(-6.44)	(-6.63)	(-6.72)	(-4.93)
	t(sa)	(0.08) [S]	(-0.40)	(-4.33)	(0.91) [S]	(-3.28)
Panel B		**NASDAQ – Value Weighted**				
1995-2000	BHAR	-0.05	0.03***	-0.56***	-0.28***	0.44***
	t	(-0.02)	(0.01)	(-0.37)	(-0.15)	(0.15)
	t(sa)	(-0.39)	(0.31)	(2.16)	(-1.37)	(3.24)
1995-1998	BHAR	0.85	1.16***	-0.80***	0.23***	1.41***
	t	(0.20)	(0.27)	(-0.32)	(0.06)	(0.34)
	t(sa)	(4.60)	(5.62)	(-0.22)	(0.79)	(6.63)
1999-2000	BHAR	-0.39	-0.38	-0.44	-0.41	-0.32
	t	(-0.97)	(-0.94)	(-1.16)	(-1.15)	(-0.64)
	t(sa)	(9.03)	(9.06)	(-3.60)	(23.29)	(-2.34)
Panel C		**Matching Firms – Equally Weighted**				
1995-2000	BHAR	0.21	0.26	-0.01	0.23	0.17
	t	(1.14)	(1.30)	(-0.01)	(-1.00)	(0.60)
	t(sa)	(1.30)	(1.50)	(0.08)	(1.15)	(0.71)
1995-1998	BHAR	1.00	1.09	0.67	1.37	0.62
	t	(2.95)	(2.83)	(0.94)	(2.71)	(1.40)
	t(sa)	(3.74) [S]	(3.66) [S]	(1.19)	(3.55) [S]	(1.73)
1999-2000	BHAR	-0.66	-0.61	-0.87	-0.67	-0.62
	t	(10.50)	(-9.07)	(-5.28)	(-8.42)	(-6.40)
	t(sa)	(-7.53)	(-4.99)	(-6.40)	(-5.55)	(-6.61) [S]
Panel D		**Matching Firms – Value Weighted**				
1995-2000	BHAR	-0.31	-0.24***	-0.76***	-0.42	-0.07
	t	(-0.10)	(-0.08)	(-0.40)	(-0.20)	(-0.02)
	t(sa)	(-2.18)	(-1.52)	(0.01)	(-1.68)	(-0.26)
1995-1998	BHAR	0.75	0.93***	-0.21***	0.73	0.77
	t	(0.14)	(0.17)	(-0.08)	(0.16)	(0.13)
	t(sa)	(2.59)	(2.67)	(-0.38)	(2.42)	(1.59)
1999-2000	BHAR	-0.70	-0.66***	-1.05***	-0.69	-0.73
	t	(-0.92)	(-0.93)	(-0.98)	(-0.93)	(-0.89)
	t(sa)	(-17.40) [S]	(-14.34) [S]	(-8.74)	(-15.32)	-8.46 [S]
		Sample Size Year 0 / Year 3				
Panel A and B		**NASDAQ – Equally or Value Weighted**				
1995-2000		*551 / 422*	*439 / 354*	*112 / 68*	*327 / 242*	*224 / 180*
1995-1998		*288 / 232*	*225 / 191*	*63 / 47*	*145 / 120*	*143 / 118*
1999-2000		*263 / 184*	*214 / 163*	*49 / 21*	*182 / 122*	*81 / 62*
Panel C and D		**Matching Firms – Equally or Value Weighted**				
1995-2000		*551 / 422*	*439 / 351*	*112 / 68*	*327 / 241*	*224 / 178*
1995-1998		*288 / 232*	*225 / 189*	*63 / 47*	*145 / 120*	*143 / 116*
1999-2000		*263 / 183*	*214 / 163*	*49 / 21*	*182 / 121*	*81 / 62*

** Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1% either between 1) R&D reporting and 2) R&D non reporting IPOs or between 1) INT GOOD reporting and 2) INT GOOD non reporting IPOs*

Asterisk at BHAR-value when usual t-test performed / Asterisk at corresponding t(sa)-value in case of bootstrapping

Table 8.8: BHAR 3-year Estimates – R&D EXP/CAP – LO/HI

IPOs and sub-groups reporting or not R&D

LO / HI: low/high intensity - values below/above the sample median

R&D assumed expensed (EXP) or capitalized (CAP) with six-year linear depreciation

Benchmark: NASDAQ or Matching Seasoned Companies

Sample Period		NO RD	RD EXP LO	RD EXP HI	RD CAP LO	RD CAP HI
Panel A		**NASDAQ – Equally Weighted**				
1995-2000	BHAR	-0.28	0.17	-0.25	-0.16	0.08
	t	(-0.72)	(0.52)	(-1.32)	(-0.81)	(0.25)
	t(sa)	(-0.53)	(0.64)	(-0.99)	(-0.60)	(0.33)
1995-1998	BHAR	-0.14	0.10	0.29	0.03	0.36
	t	(-0.21)	(-0.21)	(0.52)	(0.07)	(0.60)
	t(sa)	(-0.10)	(0.30)	(0.65)	(0.15)	(0.72)
1999-2000	BHAR	-0.46	-0.18^{***+++}	-0.39^{***}	-0.36^{*}	-0.20^{*+++}
	t	(-6.62)	(-2.22)	(-12.25)	(-9.92)	(-2.56)
	t(sa)	(-4.33)	(-1.31)	(1.93) [S]	(-3.17)	(-1.28)
Panel B		**NASDAQ – Value Weighted**				
1995-2000	BHAR	-0.56	0.48^{***+++}	-0.36^{***}	-0.30^{***}	0.56^{***+++}
	t	(-0.37)	(0.16)	(-0.24)	(-0.21)	(0.17)
	t(sa)	$(2.15)^{***}$	$(3.38)^{***}$	(-0.04)	(-1.07)	$(3.52)^{+++}$
1995-1998	BHAR	-0.80	1.68^{***+++}	0.12^{***}	0.08^{***+++}	2.25^{***+++}
	t	(-0.32)	(0.49)	(0.02)	(-0.02)	(0.45)
	t(sa)	(-0.22)	(6.67)	(0.32)	(0.32)	(7.94)
1999-2000	BHAR	-0.44	-0.36	-0.40	-0.43^{***}	-0.30^{++***}
	t	(-1.16)	(-0.71)	(-1.52)	(-1.57)	(-0.54)
	t(sa)	(-3.60)	(1.09)	(8.48)	(-4.83)	(-0.46)
Panel C		**Matching Firms – Equally Weighted**				
1995-2000	BHAR	-0.01	0.63^{*}	-0.10^{*}	-0.07^{*}	0.59^{*}
	t	(-0.13)	(1.78)	(-0.46)	(-0.29)	(1.75)
	t(sa)	(0.08)	(2.22)	(-0.36)	(-0.22)	(2.22)
1995-1998	BHAR	0.67	1.02	1.17	0.86	1.33
	t	(0.94)	(2.00)	(2.00)	(1.91)	(2.11)
	t(sa)	(1.19)	(2.58)	(2.63)	(2.36)	(2.79)
1999-2000	BHAR	-0.87	-0.50^{+}	-0.71	-0.73^{*}	-0.49^{*++}
	t	(-5.28)	(-4.37)	(-10.51)	(-8.96)	(-4.60)
	t(sa)	(-6.40)	(-2.89)	(-12.02) [S]	(-11.69) [S]	(-2.16)
Panel D		**Matching Firms – Value Weighted**				
1995-2000	BHAR	-0.76	0.18^{***+++}	-0.59^{***}	-0.67^{***}	-0.47^{***+++}
	t	(-0.40)	(0.04)	(-0.33)	(-0.25)	(0.14)
	t(sa)	(0.01)	(0.69)	(1.07)	(-4.23)	(2.82)
1995-1998	BHAR	-0.21	0.99^{+}	0.80	-0.54^{***}	2.41^{***+++}
	t	(-0.08)	(0.18)	(0.13)	(-0.09)	(0.49)
	t(sa)	(-0.38)	(1.75)	(1.88)	(-1.02)	(9.41)
1999-2000	BHAR	-1.05	-0.56^{***+++}	-0.75^{***+}	-0.67^{+++}	-0.64^{+++}
	t	(-0.98)	(-0.73)	(-1.20)	(-1.00)	(-0.84)
	t(sa)	(-8.74)	(-7.75)	(-15.03) [S]	(-15.78) [S]	(-5.04)
		Sample Size Year 0 / Year 3				
Panel A and B		**NASDAQ – Equally or Value Weighted**				
1995-2000		*112 / 68*	*219 / 178*	*220 / 176*	*219 / 165*	*220 / 189*
1995-1998		*63 / 47*	*112 / 95*	*113 / 96*	*112 / 89*	*113 / 102*
1999-2000		*49 / 21*	*107 / 82*	*107 / 81*	*107 / 79*	*107 / 84*
Panel C and D		**Matching Firms – Equally or Value Weighted**				
1995-2000		*112 / 68*	*219 / 177*	*220 / 174*	*219 / 165*	*220 / 186*
1995-1998		*63 / 47*	*112 / 94*	*113 / 95*	*112 / 89*	*113 / 100*
1999-2000		*49 / 21*	*107 / 81*	*107 / 81*	*107 / 79*	*107 / 83*

** Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1% between 1) HI-LO (R&DExpense/Sales) and 2) HI-LO (R&D Capital/Total Assets) respectively*

+ Difference statistically significant at confidence of: [+] 10%, [++] 5%, [+++] 1% between 1) R&D non- reporting and 2) HI or LO Intensities (in both cases EXP and CAP), for equally or value weighted figures respectively

Asterisk at BHAR-value when usual t-test performed / Asterisk at corresponding t(sa)-value in case of bootstrapping

Table 8.9: BHAR 3-year Estimates – INT GOOD - LO/HI

IPOs and sub-groups reporting or not Balance Sheet Intangibles (INT GOOD)

LO / HI: low/high intensity - values below/above the sample median

Benchmark: NASDAQ or Matching Seasoned Companies

Sample Period		NO INT GOOD	INT GOOD LO	INT GOOD HI	INT GOOD LO	INT GOOD HI
			Denominator: Total Assets (R&D as Expense)		*Denominator:* Total Assets + R&D Capital	
Panel A		**NASDAQ – Equally Weighted**				
1995-2000	BHAR	-0.21	-0.11	0.11	0.04	-0.04
	t	(-0.80)	(-0.36)	(0.36)	(0.11)	(-0.13)
	t(sa)	(-0.58)	(-0.24)	(0.45)	(0.19)	(-0.05)
1995-1998	BHAR	-0.17	0.29	0.53	0.31	0.51
	t	(-0.41)	(0.40)	(0.77)	(0.44)	(0.73)
	t(sa)	(-0.28)	(0.53)	(0.90)	(0.56)	(0.87)
1999-2000	BHAR	-0.29	-0.35	-0.31	-0.27	-0.39
	t	(-4.93)	(-7.54)	(-3.56)	(-3.00)	(-9.58)
	t(sa)	(-3.29)	(-2.13)	(-0.58)	(-0.98)	(-4.38)
Panel B		**NASDAQ – Value Weighted**				
1995-2000	BHAR	0.44	-0.41^{+++}	-0.13^{+++}	-0.34^{*+++}	-0.23^{+++}
	t	(0.15)	(-0.30)	(-0.06)	(-0.18)	(-0.12)
	t(sa)	(3.24)	(1.28)	(-0.55)	(-0.66)	(-0.96)
1995-1998	BHAR	1.41	-0.32^{*+++}	0.81*	-0.30^{*+++}	0.80*
	t	(0.34)	(-0.10)	(0.16)	(-0.10)	(0.16)
	t(sa)	(6.63)	(-0.58)	(1.71)	(-0.55)	(1.68)
1999-2000	BHAR	-0.32	-0.42	-0.40	-0.41	-0.41
	t	(-0.64)	(-1.33)	(-0.98)	(-1.05)	(-1.38)
	t(sa)	(-2.34)	(4.44)	(16.64) [S]	(17.51)	(-3.75)
Panel C		**Matching Firms – Equally Weighted**				
1995-2000	BHAR	0.17	0.20	0.27	0.40	0.07
	t	(0.59)	(0.62)	(0.78)	(1.11)	(0.23)
	t(sa)	(0.71)	(0.78)	(0.92)	(1.39)	(0.31)
1995-1998	BHAR	0.62	1.07	1.67	1.08	1.66
	t	(1.39)	(1.50)	(2.32)	(1.51)	(2.30)
	t(sa)	(1.73)	(1.98)	(3.04) [S]	(2.01)	(3.01) [S]
1999-2000	BHAR	-0.62	-0.60	-0.74	-0.50***	-0.84***
	t	(-6.40)	(-8.05)	(-5.26)	(-4.31)	(-7.88)
	t(sa)	(-6.61) [S]	(-9.11) [S]	(-3.44)	(-1.69)	(-10.78) [S]
Panel D		**Matching Firms – Value Weighted**				
1995-2000	BHAR	-0.07	-0.49	-0.34	-0.34	-0.50
	t	(-0.02)	(-0.31)	(-0.13)	(-0.17)	(-0.22)
	t(sa)	(0.26)	(0.07)	(-1.10)	(-0.89)	(-1.41)
1995-1998	BHAR	0.77	0.13*	1.36*	0.15*	1.35*
	t	(0.13)	(0.04)	(0.26)	(0.04)	(0.26)
	t(sa)	(1.59)	(0.44)	(2.84)	(0.49)	(2.80)
1999-2000	BHAR	-0.73	-0.61*	-0.81*	-0.60***	-0.83***
	t	(-0.89)	(-1.11)	(-0.86)	(-0.97)	(-0.94)
	t(sa)	(-8.46) [S]	(-13.80)	(-9.06)	(-3.59)	(-14.05) [S]
		Sample Size Year 0 / Year 3				
Panel A and B		**NASDAQ – Equally or Value Weighted**				
1995-2000		*224 / 180*	*163 / 125*	*164 / 117*	*163 / 125*	*164 / 117*
1995-1998		*143 / 118*	*72 / 61*	*73 / 59*	*72 / 61*	*73 / 59*
1999-2000		*81 / 62*	*91 / 62*	*91 / 60*	*91 / 62*	*91 / 60*
Panel C and D		**Matching Firms – Equally or Value Weighted**				
1995-2000		*224 / 178*	*163 / 125*	*164 / 116*	*163 / 125*	*164 / 116*
1995-1998		*143 / 116*	*72 / 61*	*73 / 59*	*72 / 61*	*73 / 59*
1999-2000		*81 / 62*	*91 / 62*	*91 / 59*	*91 / 62*	*91 / 62*

* *Difference statistically significant at confidence of: [*] 10%, [**] 5%, [***] 1% between 1)HI-LO (INT GOOD / Total Assets) and 2) HI-LO (INT GOOD/R&D Capital+Total Assets) respectively*

$^{+}$ *Difference statistically significant at confidence of: [$^{+}$] 10%, [$^{++}$] 5%, [$^{+++}$] 1% between 1) INT GOOD non- reporting and 2) HI or LO Intensities (in both cases), for equally or value weighted figures respectively*

Asterisk at BHAR-value when usual t-test performed / Asterisk at corresponding t(sa)-value in case of bootstrapping

9. GENERAL CONCLUSION

9.1 Background Information and Motivation

Motivated by still unresolved questions in the state of the art of existing research the thesis undertakes to investigate aspects of IPO short- and long-run performance and establish indicators to this purpose through measurement of intangibles and intangible intensity as well as by comparison to matching seasoned companies.

Valuation and Accounting rules have been provided in the informative Chapter 2 explaining in detail which intangibles can be found under the income statement and the balance sheet of a company. R&D has been established as a special kind of intangible, which under US GAAP rules must always be expensed. In practice, Damodaran (2001) argues that some expensed intangibles – mainly R&D – should be capitalized. Under US GAAP Intangible assets must always be capitalized when purchased. Goodwill is the difference between purchase and fair value.

Combining the literature review of the research – found in the beginning of each of the research Chapters 4 to 8 an extended review is provided on seasoned companies and IPO literature with respect to operating and financial performance. It addresses risk and misevaluation as the possible causes for excess returns and refers specifically to IPO excess returns. Literature shows that IPOs create unusually high first day returns, 20% on average. During the late 1990ies boom, and especially in the 1999-2000 interval, first day returns skyrocketed to 80%. IPOs exhibit a tendency to under-perform in the long run compared to seasoned companies. Again risk and misevaluation could be associated with the abnormal returns.

The review emphasizes studies linking excess returns to intangibles. Literature results show higher excess returns for R&D intensive seasoned companies. It is debatable though whether this is caused by initial R&D undervaluation, as researchers focus on depressed earnings and potential risks rather than the subsequent growth in sales, or as a form of compensation on risk. One study only, focusing on the late 1990ies US boom, found that R&D was overvalued and that R&D intensive companies performed worse in the long run.

Turning to the performance of IPOs there is only limited literature examining the impact of intangibles and their intensities on IPO short- and long-run returns. Technology IPOs – the most intangible intensive – performed worse in the long run. Studies indicate a correlation between IPO issuance and periods of best operating performance and high growth opportunities, as issuers wish to maximize proceeds from the offer – in this way they intend to attract the interest of prospective investors, too. Results support such timing, as IPOs show higher earnings over total assets ratios and lower B/M ratios than seasoned companies.

The indicators mentioned have limitations though; they are applicable to IPOs with positive earnings only, and the B/M ratio may reflect noise rather than growth opportunities. The association between intangibles and growth opportunities is recognized, but none of the previous studies had examined if IPOs were indeed more intangible intensive than seasoned companies. Indirect evidence derives from the fact that companies going public show higher R&D intensities than those that remain private. These unresolved issues led to objectives for investigation and respective hypotheses in the thesis.

Literature finds that R&D intensive IPOs show higher first day returns. On the other hand, software capital intensive companies show lower first day returns. One empirical study showed that R&D intensity (measured at the time of the offer) is the only performance factor, which can be used to determine long run buy and hold returns. It found that R&D intensity is negatively linked to three-year BHARs. On the other hand another study found that R&D intensive IPOs perform better than less R&D intensive ones. All but one study found that R&D intensive IPOs show higher first day returns.

Here again literature has not provided evidence whether intangibles other than R&D had an impact on IPO performance. Further, none of the studies focused on the 1995-2000 US technology boom period, in which intangibles were the main value driver.

Referring to valuations, studies show that intangibles positively affect the market value of seasoned companies. This is not always the case with respect to IPOs. These issues motivated further objectives and hypotheses.

The thesis addresses five individual objectives and tests the influence of intangibles on the basis of the established sample through five respective hypotheses in the corresponding Chapters 4 to 8.

9.2 The Sample

In order to analyse and quantify the effect of intangibles and the impact of intangible intensity on the timing, the valuation, and the magnitude of excess returns of IPOs a sample of 551 US technology IPOs and 551 respective matching seasoned companies between 1995 and 2000 has been set up. Technology stocks characterized this period with core value in intangibles especially.

Chapter 3 of the thesis describes the selection and collection procedure of the sample used to analyse the hypotheses. Due to incomplete data documentation in the various data banks the total of 1082 technology companies issuing IPOs between 1995 and 2000 had to be reduced eventually to the sample of 551 IPOs and 551 corresponding matching seasoned companies. It has been verified though that there exists a rather high degree of homogeneity between the total number of companies and the thesis sample regarding the various business classifications as well as their respective occurrence numbers – the sample is thus regarded as representative.

9.3 Objective I, Hypothesis 1A and 1B – Methodology and Results

Objective I investigates whether companies decide to go public when growth opportunities are at their highest and how their performance develops subsequently; two sub-hypotheses are formulated correspondingly (Chapter 4). *Hypothesis 1A* at the time of the offer assumes that IPOs report higher expensed intangible intensities

(R&D and MSGA over sales) and higher balance sheet intensities (intangible assets and goodwill over total assets) compared to matching seasoned companies. *Hypothesis 1B* at the third year of seasoning assumes that intensity values between IPOs and seasoned companies are the same.

The two main groups of intangibles are measured: (a) those treated as an expense and reported on the income statement, R&D and MSGA costs, and (b) those that are perceived of value by US accounting standards and treated as assets (capitalized) on the balance sheet, intangible assets and goodwill. Intangible intensity is defined both broadly – including all intangibles expensed or capitalized – and narrowly – a particular expense or asset – as the ratio of R&D or/and MSGA over sales (income statement) or intangible assets or/and goodwill over total assets (balance sheet). Comparison takes place between mean and median values of IPOs and MSC respectively with statistically significant differences established at a confidence level of 10%, 5%, or 1%.

The overall result allows for *Hypothesis 1A* (short-run) to be accepted in the case of income statement intangibles (based on median values, mean values being insignificant), i.e. IPOs, revealing higher intangible intensities, are indeed more growth promising than seasoned companies. This is the case in spite of the effect of lower R&D and MSGA expenses in IPOs compared to seasoned companies, which is ultimately compensated by even lower sales figures in IPOs compared to the seasoned companies. Lower intangible investments and sales add risk to the higher growth opportunities. Statistically insignificant income statement intangible intensity differences (mean values) between IPOs and seasoned companies are generally in support of *Hypothesis 1B* (long-run) assuming equal ratio values. Looking at the median values leads to rejection of the hypothesis. Median values are favoured allowing a more reliable interpretation of the sample in case of outliers.

For balance sheet intangible assets and goodwill the results are less straightforward depending on the time period and whether reporting or non-reporting IPOs are observed. In support of *Hypothesis 1A* intangible assets intensities are higher in IPOs compared to seasoned companies. Yet, intensities are significantly higher only when focusing on the 327 IPOs actually investing in intangible assets. Total balance sheet intangible intensities, driven by goodwill intensities, are lower for IPOs compared to seasoned companies. Reasons as to why IPOs are less goodwill intensive could result from their lower purchasing power. Further some managers may regard that goodwill reflects value but no growth opportunities. In support of *Hypothesis 1B* intangible assets intensities are insignificantly different compared to seasoned companies. Yet, IPO goodwill intensities, and therefore total balance sheet intangible intensities still fail to reach the same levels of intensities compared to seasoned companies. Lower total assets and lower sales could imply overall smaller size of IPO companies, the fact of similar market values to seasoned companies on the other hand indicates some sort of overvaluation. Even when using pre-flotation data the results are the same. Logit regressions confirm the above findings.

This shows that there is no clear pattern with respect to intangibles and IPO issuance. In other words companies do not necessarily go public at periods were their growth opportunities – measured through intangibles – is at its best.

9.4 Objective II, Hypothesis 2A and 2B – Methodology and Results

Objective II examines the treatment of expensed intangibles (R&D and MSGA costs) in IPOs in comparison to matching seasoned companies. The corresponding hypothesis is split in two parts (Chapter 5). *Hypothesis 2A* assumes that the issuer expenses, but the market capitalizes IPO intangibles. *Hypothesis 2B* assumes that correlation coefficients R^2 are higher in matching seasoned companies, thus indicating lower information asymmetry compared to IPOs.

The regression analysis is performed through a regression, which is consistent with the Ohlson model (used by Lev et al (2002)) estimating the impact of the sum earnings and book value upon a company's market value. The model is run with the independent variables (1) book value reported on the balance sheet and earnings reported on the income statement, and (2) reported book values and earnings adjusted by addition of the implied R&D and MSGA expenses (capitalization and amortization assumed linear with estimates after Damodaran) and further subtraction the implied depreciation in the case of earnings. The respective correlation factors are compared; $R^2_{(2)} > R^2_{(1)}$ leads to the conclusion that expensed intangibles should be considered as capital. The mentioned procedure and the R^2 test are applied here with the following dependent variables: (a) for *Hypothesis 2A* the offer market value (testing if the issuer of an IPO capitalizes any intangible expenses) or the market value (as first day closing price, to test if the market capitalizes any expensed intangibles), and (b) for *Hypothesis 2B* the market value of matching seasoned companies measured on 30 June of the IPO issuance year.

Results lead to the rejection of *Hypothesis 2A*. Despite possible information asymmetry between the issuer and the market, both capitalize R&D and MSGA (these for the 1995-1998 interval only). Both Ohlson regression models - with independent variable either the issuer or the first day close market value and adjusted independent variables as mentioned above – show increased R^2 values in comparison to corresponding regressions using reported independent variables. Only in the case of the 1999-2000 sample and with dependent variable the first day close market value the correlation coefficient R^2 does not show an improvement in spite of capitalized R&D costs. If lower depreciation rates are used though some improvement of R^2 may still be observed, and thus concluded that R&D is indeed capitalized. An explanation is that R&D capitalization may be conducted in a very noisy and non-linear way. Higher R^2 values in general for the "issuer" than the "market" regressions indicate that the former have a better knowledge on pricing.

Acceptance of *Hypothesis 2B* depends on the time interval investigated. Seasoned companies show higher R^2 values compared to IPOs in the 1999-2000 interval and the hypothesis is accepted. Differences are very small in the case of the 1995-1998 interval and the hypothesis is rejected.

Results indicate that after all the issuer has enough information on R&D to be confident to capitalize it, i.e. they do are not afraid of litigation, neither do they wish to compensate investors for the information asymmetry. In fact, information asymmetry between the issuer and the offer is not always very high

9.5 Objective III, Hypothesis 3 – Methodology and Results

The valuations between IPOs and seasoned companies are compared in *Objective III*. The corresponding *Hypothesis 3* assumes higher valuation (i.e. higher coefficients of R&D, MSGA, intangible assets and goodwill) in the case of IPOs (Chapter 6).

The hypothesis testing methodology is based on a regression model - consistent to the Ohlson (1995) model - estimating market value from individual coefficients of all income statement and balance sheet intangible and tangible assets as well as earnings at a specific time or year. The test comprises comparisons between IPOs and matching seasoned companies and the respective regression coefficients; the latter estimated in the model for different amortization and capitalization time periods.

The results of the investigation support with higher values for IPOs than for seasoned companies *Hypothesis 3* for income statement intangibles, but results do not support it for balance sheet intangibles. Variation of capitalization and amortization rate scenarios for R&D and MSGA expenses does not affect significantly regression coefficients, correlation coefficients R^2 or t-values and leads to the same conclusion – the higher t values correspond to more reliable values, which are higher for issuer- or market-valued IPOs than for seasoned companies. As already mentioned, contrary to the hypothesis, intangible assets and goodwill do not contribute significantly to the IPO and matching firm value. Surprising as this result may appear (intangibles and goodwill must comply with strict accounting rules to be recognized as valuable) it seems obvious though following the opinion that R&D is the core value element of technology stocks.

In this respect, it could be the case that after all the Damoraran (2001) comment is proven. He argues that for technology companies, it is mainly R&D, which has an impact on their valuations and growth opportunities

The following last two objectives contribute to the identification of an influence of intangible intensity upon IPO short- and long-run market performance.

9.6 Objective IV, Hypothesis 4 – Methodology and Results

Objective IV investigates the relationship between the level of IPO intangible intensity and IPO first day returns (short-run performance). The corresponding *Hypothesis 4* assumes that intangible intensive IPOs show higher first day returns (Chapter 7).

The methodology followed accounts for all intangibles capitalized under US GAAP rules (balance sheet) and those expensed intangibles, which have proven empirically to be of value, e.g. R&D. Intensity is defined as the sum of intangible assets and goodwill (thus avoiding multicollinearity) over total assets or as R&D expenses over sales, alternatively as R&D capital over total assets when assuming a six-year capitalization scenario for R&D. For the investigation of the effect of intangible intensity on first day returns the sample is split accordingly, distinguishing between R&D reporting or non reporting, low or high R&D intensity IPOs. A similar procedure is followed for balance sheet intangibles. These steps are performed on the whole sample for the 1995-2000 period and the sub-samples for 1995-1998 and 1999-2000. Portfolios of corresponding intangible intensities have been created for each of the above options. The test examines the significance of differences of first day returns (means or medians) between the different portfolios on the basis of t-tests of the coefficients of cross-sectional regressions. Details of this analysis as well as the individual equations for each test variant are given in 7.3.3. The investigation is conducted using equally- and value-weighted first day returns.

Acceptance of Hypothesis *4* depends upon the definition of intangible intensity (R&D or balance sheet intangibles), the way of measurement of R&D (expensed or capitalized), the way of measurement of returns (equally- or value-weighted) as well as on the time period of the sample. The following cases and results are distinguished.

- Results with R&D reporting IPOs – these exhibit higher standard deviations and/or max-min range compared to R&D non reporting IPOs - support the hypothesis for the whole period 1995-2000, thereby driven especially by IPOs issued in 1999-2000. Differences between R&D reporting and non-reporting IPOs are statistically insignificant during the 1995-1998 interval. The hypothesis is not supported here.

- A positive relationship is observed between R&D intensity and equally-weighted IPO first day returns during 1995-2000 and 1999-2000, the second sample period obviously influencing the first accordingly. R&D intensities above the median exert stronger influence on first day returns than intensities below the median or with R&D non-reporting IPOs. Similar results and tendencies are observed for value-weighted first day returns during all time intervals. The thesis results support thus the hypothesis, and are in agreement with literature results linking higher returns to compensation for higher information asymmetry or to vulnerability to overvaluations for intangible intensive companies.
- When R&D is defined as capital the relationship to first day returns becomes negative, i.e. higher intensities lead to lower first day returns; the hypothesis is not supported here. This is in agreement with the view that the higher the percentage of capitalized intangibles relative to firm size the lower the information asymmetry; or it even implies a downscaling of risk on intangibles, as tangible assets are of lower information asymmetry.
- The hypothesis is not supported in the case of R&D capital over total assets intensities vs. first day returns, whether equally- or value-weighted for the two periods 1995-2000 and 1995-1998. During 1995-2000 low R&D intensity IPOs show higher first day returns compared to R&D non-reporting IPOs, in 1995-1998 statistically insignificant differences are observed in all cases of high, low or no R&D intensity. For 1999-2000 the relationship becomes indifferent, first day returns are not influenced by intensity.
- Values for equally-weighted first day returns are higher for low balance sheet intangible intensities for all time periods, but more significant in 1995-1998. Similar results are reached with value-weighted first day returns. So the hypothesis is not accepted in these cases either.
- Lower IPO first day returns on intangible capital intensive offers could be in agreement with Givoly and Shy (2005) who argue that the higher the

intangible capital intensity, the safer the offer, and therefore the lower the information asymmetry and therefore the compensation.

9.7 Objective IV, Hypothesis 5 – Methodology and Results

Objective V investigates the relationship between intangible intensity and long-run performance. The respective *Hypothesis 5* assumes worse performance for intangible intensive (at the time of offer) IPOs in terms of BHAR and CAAR as compared to less intangible intensive IPOs (Chapter 8).

The three-year excess returns, defined as BHAR and CAAR, are used as a measure of long-run performance of companies in the testing procedure. Equations for their estimation, whether equally- or value-weighted, and a significance test (t-test) examining differences between values of two groups are provided (in detail under 8.3.3). A benchmark portfolio represents returns calculated after the NASDAQ index or matching seasoned firms. Long-run returns are calculated assuming monthly rebalancing in order to reach more accurate results. Similar to the methodology of Hypothesis 4 the sample is split here into non-reporting, low, and high intangible intensity reporting IPOs at the time of the offer.

The results are only in partial support of *Hypothesis 5* as differences occur depending on the way of measurement and weighting of returns. Again one distinguishes the following cases and results.

- Numerically the hypothesis is accepted when defining R&D as an expense. R&D expense intensive IPOs perform worse than less R&D intensive ones. Results are in agreement with the limited literature examining the impact of R&D intensity on IPO BHARs.
- However, numerically BHAR values apparently follow a risk compensation scenario when focusing on intangible capital rather than expenses. High BHAR correspond to IPOs with higher R&D and balance sheet intangibles intensities. The hypothesis is thus rejected in this case, and is in accordance with literature on seasoned companies concluding that higher R&D intensity

leads to higher returns. The fact that R&D expense intensive IPOs perform worse than less R&D intensive ones may reflect the fact that the market indeed capitalizes R&D and compensation is derived only when treating R&D as capital.

- In most cases differences in returns based on R&D intensity is statistically insignificant. This maybe in accordance with Kothari and Warner (1997), Brav and Gompers (1997), Fama (1998), Brav et al (2000) and Lerner and Gosh (2003), who argue that once portfolios have been properly created based on risk – in this case intangible intensity – differences should be eliminated.
- Comparing between high balance sheet intensity and non-reporting balance sheet IPOs the first exhibit (a) higher BHARs during boom periods (e.g. issued during 1995-1998), but (b) lower BHARs during recession periods (e.g. issued during 1999-2000) – this is an ambivalence in the hypothesis. Low intangible intensity balance sheet IPOs perform generally worse than non-reporting balance sheet intangible IPOs; this indicates some element of mis-pricing. However, almost all differences are statistically insignificant. Once more, Kothari and Warner (1997), Brav and Gompers (1997), Fama (1998), Brav et al (2000) and Lerner and Gosh (2003) point maybe valid
- Mixed results are derived with respect to CAAR values. R&D reporting IPOs perform better than non-reporting ones up to year three after the offer (suggesting a rejection of the hypothesis) in respect to equally-weighted CAARs – differences becoming insignificant though for value-weighted results. Low R&D expense intensive IPOs perform better in years one and two after the offer compared to high R&D intensive offers. By year three differences are insignificant. Value-weighted returns differences between high and low R&D intensive offers are always insignificant.
- When defining R&D as capital high intensity IPOs perform better than low intensity ones – suggesting again rejection of the hypothesis, although at low statistical significance. Insignificant differences are observed also in CAAR returns for zero, low and high balance sheet intangible intensities.- Overall results indicate that differences in excess returns may vanish when risk has been controlled correctly through value-weighted returns.

9.8 Issues for Further Research

Among the many unsolved questions which have been unsolved in the research three main questions are of importance: First, Chapter 4 of this thesis finds that IPOs are less goodwill intensive compared to seasoned companies. While a general explanation could be provided, such as arguing that IPOs may have less purchasing power, further research could be applied. Research could examine the cash flow statements of IPOs and seasoned companies and check the purchasing power of IPOs. It could further examine if companies, which before issuing an IPO merged or acquired other companies also show lower goodwill intensities compared to seasoned companies.

Second, this thesis defined intangibles by looking at accounts on the income statement and balance sheet. It is of interest to examine further if intangible factors rather than assets could reflect IPO growth opportunities. Looking at management rather than financial characteristics of companies could reflect those. For example future research could examine the impact of management networks, alliances with other firms, and other such aspects, which are not recorder neither as expenses neither as assets.

Third, Chapter 7 finds that R&D and balance sheet intangibles intensive IPOs do not always show statistically higher first day returns. As empirically found in the 1995-1998 IPO sample one reason for this could be that information asymmetry – measured through the standard deviation – does not always change substantially as intangible intensity increases. Results challenge the argument by Lev (2001) on risk/information asymmetry associated with intangibles. So the question remains why information asymmetry has not been affected by intangible intensities. Could it be that the market may have over-reacted or under-reacted in some cases when originally pricing the IPO? Future research could examine if during the 1995-2000 period analyst forecasts were affected by intangible intensities and if analyst recommendations had an impact on IPO first day returns.

10. APPENDICES

10.1 APPENDIX A (Chapter 2)

Intangibles according to SFAS 141 and 142

Examples of intangible assets that meet the criteria for recognition apart from goodwill are given below as these are mentioned in Mard et al (2002), p. 20 with permission and under the copyright © 2001 of the Financial Accounting Standards Board.

Assets designated by the symbol (*) are those that would be recognized apart from goodwill because they meet the contractual-legal criterion. Assets designated by the symbol (#) do not arise from contractual or other legal rights, but shall nonetheless be recognized apart from goodwill because they meet the separability criterion. The determination of whether a specific acquired intangible asset meets the criteria in this statement for recognition apart from goodwill shall be based on the facts and circumstances of each individual business combination.

A. Marketing-related intangible assets
   1. Trade marks, trade names (*)
   2. Service marks, collective marks, certification marks (*)
   3. Trade dress (unique color, shape, or package design) (*)
   4. Newspaper mastheads (*)
   5. Noncompetition agreements (*)
B. Customer-related intangible assets
   1. Customer lists (#)
   2. Order or production backlog (*)
   3. Customer contracts and the related customer relationships (*)
   4. Noncontractual customer relationships (#)
C. Artistic-related intangible assets
   1. Plays, operas, ballets (*)
   2. Books, magazines, newspapers, and other literary works (*)
   3. Musical works such as compositions, song lyrics, advertising jingles (*)
   4. Pictures and photographs (*)

5. Video and audiovisual material, including motion pictures, music videos, and television programs (*)

D. Contract-based intangible assets
   1. Licensing, royalty, standstill agreements (*)
   2. Advertising, construction, management, service or supply contracts (*)
   3. Lease agreements (*)
   4. Construction permits (*)
   5. Franchise agreements (*)
   6. Operating and broadcast rights (*)
   7. Use rights such as landing, drilling, water, air, mineral, timber cutting, route authorities, and so forth (*)
   8. Servicing contracts such as mortgage servicing contracts (*)
   9. Employment contracts (*)

E. Technology-based intangible assets
   1. Patented technology (*)
   2. Computer software and mask works (*)
   3. Internet domain names (*)
   4. Unpatented technology (#)
   5. Databases, including title plants (#)
   6. Trade secrets including secret formulas, processes, recipes (*)

10.2 APPENDIX B (Chapter 2)

Impairement

Impairment (Mard et al (2002))

It is a rather new concept and applies to intangible as well as tangible assets. Since it is one of the most important tasks for assets that are amortized, we provide a definition and summarize its treatment with respect to US and UK-IAS accounting standards.

Impairment is a reduction in the recoverable amount of a fixed asset (including goodwill) below the amount at which it is carried in the balance sheet.

Under the US GAAP SFAS 142 the impairment process includes two steps:

i. Step 1:

- Compare the fair value of the reporting unit with its carrying amount (book value), including goodwill.
- If the fair value of the reporting unit exceeds its carrying amount, goodwill of the reporting unit is not impaired and no further work is needed. If the carrying amount of the reporting unit exceeds its fair value, Step 2 – the actual impairment process - is required.

ii. Step 2:

- Compare the "implied fair value of goodwill" to its carrying amount.
- If the carrying amount of reporting unit goodwill exceeds the implied fair value of goodwill, record an impairment loss equal to the excess. After a goodwill impairment loss is recorded, the adjusted carrying amount of goodwill is its new accounting basis and the impairment loss cannot be reversed.
- If step 2 is not finished before the financial statements are issued, and a goodwill impairment loss is probable and can be reasonably estimated, record the best estimate of the loss following SFAS 5.

UK FRS 11, as well as IAS 38, defines impairment among the same guidelines. It requires impairment in case that intangibles and/or goodwill have a carrying value greater than their recoverable amount.

Recoverable amount is determined by selecting either the value in use (i.e. net present value + disposal value) or the net realisable value (disposal value, implying market value) of the subject intangible asset – the one that yields the highest value after tax should be selected.

10.3 APPENDIX C (Chapter 4)
Logit Regression Estimates – IPO data measured at fiscal year end in which IPO was conducted.

The Appendix summarizes the main results of the Logit Regression estimate output in relation to the five defining equations Eq. 1 to Eq. 5 as stated in 4.2.2.

The estimates and the tables are derived from statistical calculations using the SPSS software.

In case of multicollinearity, the regression is repeated excluding in each repetition one of the multicollinear factors.

Interval	Tables
1995 to 2000	C.1 to C.10
1995 to 1998	C.11 to C.20
1999 to 2000	C.21 to C.30

Table C.1: Definition of variables in Eq. 4.1 referring to Logit regression estimates in Tables C.2.A to C.2.E

Eq. 4.1

D_IPO = (Intangible Assets / Total Assets) + (Goodwill / Total Assets) + R&D / Sales + MRK&SGA/ Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
O	Intangible Assets/Total Assets
P	Goodwill / Total Assets
AJ	R&D / Sales
AK	MRK & SGA / Sales
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.2.A: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval

Estimation output

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	,942	,675	1,945	1	,163	2,565
	P	-2,947	,657	20,100	1	,000	,053
	AJ	,006	,038	,024	1	,878	1,006
	AK	-,005	,019	,075	1	,784	,995
	AZ	,112	,031	13,181	1	,000	1,118
	D_Rec			,365	4	,985	
	D_Rec(1)	-,060	,383	,024	1	,876	,942
	D_Rec(2)	,060	,365	,027	1	,869	1,062
	D_Rec(3)	-,031	,395	,006	1	,938	,970
	D_Rec(4)	-,044	,335	,018	1	,895	,957
	Constant	,097	,330	,086	1	,769	1,102

a. Variable(s) entered on step 1: O, P, AJ, AK, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	261	274	48,8
		1 IPO	186	360	65,9
	Overall Percentage				57,4

a. The cut value is ,500

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1452,036[a]	,042	,056

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

(continued)

Table C.2.A: Logit Regression for Eq. 4.1 (continued)

Correlations

		O T0 5.1 A Intangibles	P T0 5.1 A Goodwill	AJ T0 5.3 A RD	AK T0 5.3 A MRK	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
O T0 5.1 A Intangibles	Pearson Correlation	1	-,021	-,013	-,012	-,655	-,048
	Sig. (2-tailed)		,492	,661	,681	,000	,117
	N	1102	1102	1102	1102	1097	1086
P T0 5.1 A Goodwill	Pearson Correlation	-,021	1	-,019	-,021	-,741	-,020
	Sig. (2-tailed)	,492		,519	,487	,000	,503
	N	1102	1102	1102	1102	1097	1086
AJ T0 5.3 A RD	Pearson Correlation	-,013	-,019	1	,994	,024	-,002
	Sig. (2-tailed)	,661	,519		,000	,432	,944
	N	1102	1102	1102	1102	1097	1086
AK T0 5.3 A MRK	Pearson Correlation	-,012	-,021	,994	1	,024	,020
	Sig. (2-tailed)	,681	,487	,000		,420	,510
	N	1102	1102	1102	1102	1097	1086
BB T0 5.3 C Leverage	Pearson Correlation	-,655	-,741	,024	,024	1	,048
	Sig. (2-tailed)	,000	,000	,432	,420		,117
	N	1097	1097	1097	1097	1097	1081
AZ T0 5.3 C Growth	Pearson Correlation	-,048	-,020	-,002	,020	,048	1
	Sig. (2-tailed)	,117	,503	,944	,510	,117	
	N	1086	1086	1086	1086	1081	1086

Table C.2.B: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) *in the 1995-2000 interval* (omitting R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	,890	,674	1,744	1	,187	2,436
	P	-2,986	,658	20,611	1	,000	,050
	AK	-,002	,004	,432	1	,511	,998
	AZ	,111	,031	12,980	1	,000	1,117
	D_Rec			,302	4	,990	
	D_Rec(1)	-,022	,382	,003	1	,953	,978
	D_Rec(2)	,063	,365	,030	1	,863	1,065
	D_Rec(3)	-,031	,395	,006	1	,937	,969
	D_Rec(4)	-,036	,335	,012	1	,915	,965
	Constant	,100	,330	,093	1	,761	1,106

a. Variable(s) entered on step 1: O, P, AK, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1458,708[a]	,042	,056

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	236	299	44,1
		1 IPO	176	375	68,1
	Overall Percentage				56,3

a. The cut value is ,500

Table C.2.C: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) *in the 1995-2000 interval* (omitting MRK&SGA /Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	,889	,674	1,738	1	,187	2,433
	P	-2,986	,658	20,599	1	,000	,051
	AJ	-,004	,007	,455	1	,500	,996
	AZ	,110	,031	12,907	1	,000	1,117
	D_Rec			,308	4	,989	
	D_Rec(1)	-,023	,382	,004	1	,952	,977
	D_Rec(2)	,064	,365	,031	1	,860	1,067
	D_Rec(3)	-,033	,395	,007	1	,934	,968
	D_Rec(4)	-,035	,335	,011	1	,916	,965
	Constant	,099	,330	,090	1	,764	1,104

a. Variable(s) entered on step 1: O, P, AJ, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1458,765[a]	,042	,056

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	236	299	44,1
		1 IPO	176	375	68,1
	Overall Percentage				56,3

a. The cut value is ,500

Table C.2.D: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting Intangibles/Total Assets, Goodwill/Total Assets, MRK&SGA/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AK	-,002	,003	,446	1	,504	,998
	BB	1,107	,456	5,881	1	,015	3,025
	AZ	,109	,032	11,731	1	,001	1,115
	D_Rec			,082	4	,999	
	D_Rec(1)	-,041	,380	,012	1	,915	,960
	D_Rec(2)	-,043	,360	,014	1	,905	,958
	D_Rec(3)	-,098	,390	,064	1	,801	,906
	D_Rec(4)	-,060	,332	,032	1	,857	,942
	Constant	-,989	,519	3,630	1	,057	,372

a. Variable(s) entered on step 1: AK, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1470,291[a]	,026	,034

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	298	237	55,7
		1 IPO	239	307	56,2
	Overall Percentage				56,0

a. The cut value is ,500

Table C.2.E: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting Intangibles/Total Assets, Goodwill/Total Assets, R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AJ	-,004	,006	,459	1	,498	,996
	BB	1,107	,456	5,883	1	,015	3,026
	AZ	,109	,032	11,663	1	,001	1,115
	D_Rec			,084	4	,999	
	D_Rec(1)	-,042	,380	,012	1	,913	,959
	D_Rec(2)	-,041	,360	,013	1	,908	,959
	D_Rec(3)	-,099	,390	,065	1	,799	,905
	D_Rec(4)	-,059	,332	,032	1	,859	,943
	Constant	-,991	,519	3,640	1	,056	,371

a. Variable(s) entered on step 1: AJ, BB, AZ, D_Rec.

B:	regression coefficient	df:	degrees of freedom
SE:	standard error	Sig:	p-value
Wald:	Wald-statistic		

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1470,324[a]	,026	,034

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	298	237	55,7
		1 IPO	238	308	56,4
	Overall Percentage				56,1

a. The cut value is ,500

**Table C.3: Definition of variables in Eq. 4.2
referring to Logit regression estimates in Tables C.4.A and C.4.B**

Eq. 4.2

D_IPO = ((Intangible Assets + Goodwill) / Total Assets) + (R&D + MRK&SGA) / Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
Q	(Intangible Assets+Goodwill)/Total Assets
AL	(R&D+MRK&SGA)/Sales
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.4.A: Logit Regression for Eq. 4.2
testing difference of intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Q	-1,107	,456	5,882	1	,015	,331
	AL	-,001	,002	,447	1	,504	,999
	AZ	,109	,032	11,707	1	,001	1,115
	D_Rec			,083	4	,999	
	D_Rec(1)	-,041	,380	,012	1	,914	,960
	D_Rec(2)	-,042	,360	,014	1	,906	,958
	D_Rec(3)	-,099	,390	,064	1	,800	,906
	D_Rec(4)	-,060	,332	,032	1	,858	,942
	Constant	,117	,327	,129	1	,720	1,124

a. Variable(s) entered on step 1: Q, AL, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1470,299[a]	,026	,034

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	298	237	55,7
		1 IPO	239	307	56,2
	Overall Percentage				56,0

a. The cut value is ,500

(continued)

Table C.4.A: Logit Regression for Eq. 4.2 (continued)

Correlations

		Q T0 5.1 A Total	AL T0 5.3 A Total	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
Q T0 5.1 A Total	Pearson Correlation	1	-,024	-1,000	-,047
	Sig. (2-tailed)		,426	,000	,120
	N	1102	1102	1097	1086
AL T0 5.3 A Total	Pearson Correlation	-,024	1	,024	,013
	Sig. (2-tailed)	,426		,424	,674
	N	1102	1102	1097	1086
BB T0 5.3 C Leverage	Pearson Correlation	-1,000	,024	1	,048
	Sig. (2-tailed)	,000	,424		,117
	N	1097	1097	1097	1081
AZ T0 5.3 C Growth	Pearson Correlation	-,047	,013	,048	1
	Sig. (2-tailed)	,120	,674	,117	
	N	1086	1086	1081	1086

Table C.4.B: Logit Regression for Eq. 4.2
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting (Intangibles+Goodwill)/Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AL	-,001	,002	,447	1	,504	,999
	BB	1,107	,456	5,882	1	,015	3,026
	AZ	,109	,032	11,707	1	,001	1,115
	D_Rec			,083	4	,999	
	D_Rec(1)	-,041	,380	,012	1	,914	,960
	D_Rec(2)	-,042	,360	,014	1	,906	,958
	D_Rec(3)	-,099	,390	,064	1	,800	,906
	D_Rec(4)	-,060	,332	,032	1	,858	,942
	Constant	-,990	,519	3,634	1	,057	,372

a. Variable(s) entered on step 1: AL, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1470,299[a]	,026	,034

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	298	237	55,7
		1 IPO	239	307	56,2
	Overall Percentage				56,0

a. The cut value is ,500

Table C.5: Definition of variables in Eq. 4.3
referring to Logit regression estimates in Tables C.6.A to C.6.C

Eq. 4.3

D_IPO = Intangible Assets + Goodwill + R&D + MRK&SGA + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
U	Intangible Assets
V	Goodwill
AP	R&D
AQ	MRK & SGA
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.6.A: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	U	,000	,000	1,025	1	,311	1,000
	V	,000	,000	,419	1	,517	1,000
	AP	,000	,000	20,232	1	,000	1,000
	AQ	,000	,000	66,203	1	,000	1,000
	BB	,429	,562	,583	1	,445	1,536
	AZ	,074	,026	7,774	1	,005	1,076
	D_Rec			11,815	4	,019	
	D_Rec(1)	,136	,415	,108	1	,742	1,146
	D_Rec(2)	-,019	,390	,002	1	,961	,981
	D_Rec(3)	,372	,435	,730	1	,393	1,450
	D_Rec(4)	-,380	,361	1,111	1	,292	,684
	Constant	,314	,630	,248	1	,619	1,369

a. Variable(s) entered on step 1: U, V, AP, AQ, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1325,395[a]	,148	,197

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO 0 MSC	Predicted IPO 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	272	263	50,8
		1 IPO	64	482	88,3
	Overall Percentage				69,8

a. The cut value is ,500

(continued)

Table C.6.A: Logit Regression for Eq. 4.3 (continued)

Correlations

		U T0 5.1 B Intangibles	V T0 5.1 B Goodwill	AP T0 5.3 B RD	AQ T0 5. 3 B MRK	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
U T0 5.1 B Intangibles	Pearson Correlation	1	,049	,029	,462	-,291	-,023
	Sig. (2-tailed)		,107	,340	,000	,000	,444
	N	1102	1102	1102	1102	1097	1086
V T0 5.1 B Goodwill	Pearson Correlation	,049	1	,120	,144	-,261	-,009
	Sig. (2-tailed)	,107		,000	,000	,000	,768
	N	1102	1102	1102	1102	1097	1086
AP T0 5.3 B RD	Pearson Correlation	,029	,120	1	,621	,018	-,016
	Sig. (2-tailed)	,340	,000		,000	,545	,606
	N	1102	1102	1102	1102	1097	1086
AQ T0 5.3 B MRK	Pearson Correlation	,462	,144	,621	1	-,030	-,030
	Sig. (2-tailed)	,000	,000	,000		,320	,316
	N	1102	1102	1102	1102	1097	1086
BB T0 5.3 C Leverage	Pearson Correlation	-,291	-,261	,018	-,030	1	,048
	Sig. (2-tailed)	,000	,000	,545	,320		,117
	N	1097	1097	1097	1097	1097	1081
AZ T0 5.3 C Growth	Pearson Correlation	-,023	-,009	-,016	-,030	,048	1
	Sig. (2-tailed)	,444	,768	,606	,316	,117	
	N	1086	1086	1086	1086	1081	1086

Table C.6.B: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC) *in the 1995-2000 interval* (omitting R&D due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	V	,000	,000	,291	1	,590	1,000
	AQ	,000	,000	55,919	1	,000	1,000
	BB	,374	,498	,565	1	,452	1,454
	AZ	,077	,029	7,011	1	,008	1,080
	D_Rec			4,847	4	,303	
	D_Rec(1)	,094	,407	,053	1	,818	1,098
	D_Rec(2)	-,018	,384	,002	1	,962	,982
	D_Rec(3)	,258	,423	,372	1	,542	1,294
	D_Rec(4)	-,210	,353	,354	1	,552	,811
	Constant	,263	,573	,211	1	,646	1,301

a. Variable(s) entered on step 1: V, AQ, BB, AZ, D_Rec.

B:	regression coefficient	df:	degrees of freedom
SE:	standard error	Sig:	p-value
Wald:	Wald-statistic		

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1349,262[a]	,129	,172

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO 0 MSC	Predicted IPO 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	269	266	50,3
		1 IPO	58	488	89,4
	Overall Percentage				70,0

a. The cut value is ,500

Table C.6.C: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting MRK&SGA due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	U	,000	,000	3,603	1	,058	1,000
	V	,000	,000	8,185	1	,004	1,000
	AP	,000	,000	1,731	1	,188	1,000
	BB	-,105	,557	,035	1	,851	,900
	AZ	,107	,033	10,461	1	,001	1,113
	D_Rec			,390	4	,983	
	D_Rec(1)	-,022	,390	,003	1	,956	,978
	D_Rec(2)	-,044	,370	,014	1	,906	,957
	D_Rec(3)	-,117	,399	,086	1	,769	,889
	D_Rec(4)	-,118	,342	,119	1	,730	,889
	Constant	,299	,617	,235	1	,628	1,349

a. Variable(s) entered on step 1: U, V, AP, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1442,379[a]	,051	,067

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
	Observed		0 MSC	1 IPO	
Step 1	IPO	0 MSC	231	304	43,2
		1 IPO	167	379	69,4
	Overall Percentage				56,4

a. The cut value is ,500

Table C.7: Definition of variables in Eq. 4.4 referring to Logit regression estimates in Table C.8.A

Eq. 4.4

D_IPO = (Intangible Assets + Goodwill) + (R&D + MRK&SGA) + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
W	Intangible Assets + Goodwill
AR	R&D+MRK&SGA
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.8.A: Logit Regression for Eq. 4.4 testing differences in intangible investments between IPOs and matching seasoned companies (MSC) *in the 1995-2000 interval*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	W	,000	,000	,357	1	,550	1,000
	AR	,000	,000	44,211	1	,000	1,000
	BB	,495	,508	,948	1	,330	1,640
	AZ	,084	,031	7,462	1	,006	1,088
	D_Rec			1,843	4	,765	
	D_Rec(1)	,060	,401	,022	1	,882	1,062
	D_Rec(2)	-,023	,378	,004	1	,951	,977
	D_Rec(3)	,149	,414	,130	1	,719	1,161
	D_Rec(4)	-,128	,348	,136	1	,713	,880
	Constant	,032	,577	,003	1	,956	1,033

a. Variable(s) entered on step 1: W, AR, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1374,294[a]	,109	,145

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	269	266	50,3
		1 IPO	69	477	87,4
	Overall Percentage				69,0

a. The cut value is ,500

(continued)

Table C.8.A: Logit Regression for Eq. 4.4 (continued)

Correlations

		W T0 5.1 B Total	AR T0 5. 3 B Total	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
W T0 5.1 B Total	Pearson Correlation	1	,244	-,323	-,014
	Sig. (2-tailed)		,000	,000	,634
	N	1102	1102	1097	1086
AR T0 5.3 B Total	Pearson Correlation	,244	1	-,022	-,029
	Sig. (2-tailed)	,000		,473	,335
	N	1102	1102	1097	1086
BB T0 5.3 C Leverage	Pearson Correlation	-,323	-,022	1	,048
	Sig. (2-tailed)	,000	,473		,117
	N	1097	1097	1097	1081
AZ T0 5.3 C Growth	Pearson Correlation	-,014	-,029	,048	1
	Sig. (2-tailed)	,634	,335	,117	
	N	1086	1086	1081	1086

Table C.9: Definition of variables in Eq. 4.5
referring to Logit regression estimates in Table C.10.A to C.10.C

Eq. 4.5

D_IPO = Total Assets + Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
AA	Total Assets
AV	Sales
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.10.A: Logit Regression for Eq. 4.5
testing differences in Total Assets and Sales
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AA	,000	,000	7,414	1	,006	1,000
	AV	,000	,000	68,734	1	,000	1,000
	BB	,792	,492	2,590	1	,108	2,208
	AZ	,114	,039	8,536	1	,003	1,121
	D_Rec			6,221	4	,183	
	D_Rec(1)	,419	,418	1,003	1	,317	1,520
	D_Rec(2)	,514	,397	1,680	1	,195	1,672
	D_Rec(3)	,549	,441	1,544	1	,214	1,731
	D_Rec(4)	,131	,361	,133	1	,716	1,140
	Constant	-,414	,573	,523	1	,470	,661

a. Variable(s) entered on step 1: AA, AV, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1273,132[a]	,188	,251

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	309	226	57,8
		1 IPO	48	498	91,2
	Overall Percentage				74,7

a. The cut value is ,500

(continued)

Table C.10.A: Logit Regression for Eq. 4.5 (continued)

Correlations

		AA T0 5.1 C Total Assets	AV T0 5.3 C Sales(0)	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
AA T0 5.1 C Total Assets	Pearson Correlation	1	,884	-,063	-,026
	Sig. (2-tailed)		,000	,036	,394
	N	1102	1102	1097	1086
AV T0 5.3 C Sales(0)	Pearson Correlation	,884	1	-,026	-,011
	Sig. (2-tailed)	,000		,390	,720
	N	1102	1102	1097	1086
BB T0 5.3 C Leverage	Pearson Correlation	-,063	-,026	1	,048
	Sig. (2-tailed)	,036	,390		,117
	N	1097	1097	1097	1081
AZ T0 5.3 C Growth	Pearson Correlation	-,026	-,011	,048	1
	Sig. (2-tailed)	,394	,720	,117	
	N	1086	1086	1081	1086

Table C.10.B: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC) *in the 1995-2000 interval* (omitting Sales Growth due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AV	,000	,000	81,065	1	,000	1,000
	BB	,695	,486	2,045	1	,153	2,004
	AZ	,118	,038	9,459	1	,002	1,125
	D_Rec			5,651	4	,227	
	D_Rec(1)	,191	,412	,216	1	,642	1,211
	D_Rec(2)	,280	,390	,515	1	,473	1,323
	D_Rec(3)	,337	,434	,602	1	,438	1,401
	D_Rec(4)	-,089	,355	,063	1	,802	,915
	Constant	-,095	,559	,029	1	,865	,910

a. Variable(s) entered on step 1: AV, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1278,586[a]	,184	,245

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
	Observed		0 MSC	1 IPO	
Step 1	IPO	0 MSC	313	222	58,5
		1 IPO	46	500	91,6
	Overall Percentage				75,2

a. The cut value is ,500

Table C.10.C: Logit Regression for Eq. 4.5
testing differences in Total Assets and Sales
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting Sales due to multicollineaity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AA	,000	,000	43,994	1	,000	1,000
	BB	,562	,478	1,387	1	,239	1,755
	AZ	,089	,031	7,982	1	,005	1,093
	D_Rec			3,431	4	,488	
	D_Rec(1)	-,384	,422	,829	1	,363	,681
	D_Rec(2)	-,370	,401	,850	1	,356	,691
	D_Rec(3)	-,336	,430	,610	1	,435	,714
	D_Rec(4)	-,550	,374	2,158	1	,142	,577
	Constant	,315	,570	,305	1	,581	1,370

a. Variable(s) entered on step 1: AA, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1384,149[a]	,100	,134

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	264	271	49,3
		1 IPO	74	472	86,4
	Overall Percentage				68,1

a. The cut value is ,500

Table C.11: Definition of variables in Eq. 4.1 referring to Logit regression estimates in Tables C.12.A to C.12.E

Eq. 4.1

D_IPO = (Intangible Assets / Total Assets) + (Goodwill / Total Assets) + R&D / Sales + MRK&SGA / Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
O	Intangible Assets/Total Assets
P	Goodwill / Total Assets
AJ	R&D / Sales
AK	MRK & SGA / Sales
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.12.A: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) ***in the 1995-1998 interval***

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	,126	1,162	,012	1	,914	1,134
	P	-8,198	1,766	21,551	1	,000	,000
	AJ	,074	,075	,972	1	,324	1,077
	AK	-,043	,038	1,263	1	,261	,958
	AZ	,217	,058	13,745	1	,000	1,242
	D_Rec			,622	4	,961	
	D_Rec(1)	,315	,777	,164	1	,686	1,370
	D_Rec(2)	,413	,684	,364	1	,546	1,511
	D_Rec(3)	,351	,804	,190	1	,663	1,420
	D_Rec(4)	,254	,651	,152	1	,697	1,289
	Constant	-,142	,646	,048	1	,826	,868

a. Variable(s) entered on step 1: O, P, AJ, AK, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	724,312[a]	,103	,137

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	142	139	50,5
		1 IPO	79	207	72,4
	Overall Percentage				61,6

a. The cut value is ,500

(continued)

Table C.12.A: Logit Regression for Eq. 4.1 (continued)

Correlations

		O T0 5.1 A Intangibles	P T0 5.1 A Goodwill	AJ T0 5.3 A RD	AK T0 5.3 A MRK	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
O T0 5.1 A Intangibles	Pearson Correlation	1	-,017	-,020	-,019	-,715	-,022
	Sig. (2-tailed)		,688	,638	,653	,000	,593
	N	576	576	576	576	574	569
P T0 5.1 A Goodwill	Pearson Correlation	-,017	1	-,023	-,023	-,687	-,060
	Sig. (2-tailed)	,688		,578	,580	,000	,153
	N	576	576	576	576	574	569
AJ T0 5.3 A RD	Pearson Correlation	-,020	-,023	1	,998	,031	-,018
	Sig. (2-tailed)	,638	,578		,000	,464	,675
	N	576	576	576	576	574	569
AK T0 5.3 A MRK	Pearson Correlation	-,019	-,023	,998	1	,030	-,016
	Sig. (2-tailed)	,653	,580	,000		,474	,709
	N	576	576	576	576	574	569
BB T0 5.3 C Leverage	Pearson Correlation	-,715	-,687	,031	,030	1	,059
	Sig. (2-tailed)	,000	,000	,464	,474		,161
	N	574	574	574	574	574	567
AZ T0 5.3 C Growth	Pearson Correlation	-,022	-,060	-,018	-,016	,059	1
	Sig. (2-tailed)	,593	,153	,675	,709	,161	
	N	569	569	569	569	567	569

Table C.12.B: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	,070	1,161	,004	1	,952	1,073
	P	-8,292	1,772	21,903	1	,000	,000
	AK	-,006	,012	,229	1	,632	,994
	AZ	,214	,058	13,378	1	,000	1,238
	D_Rec			,708	4	,950	
	D_Rec(1)	,265	,774	,118	1	,732	1,304
	D_Rec(2)	,441	,684	,416	1	,519	1,554
	D_Rec(3)	,309	,802	,148	1	,700	1,362
	D_Rec(4)	,265	,651	,166	1	,684	1,304
	Constant	-,143	,646	,049	1	,824	,866

a. Variable(s) entered on step 1: O, P, AK, AZ, D_Rec.

B:	regression coefficient	df:	degrees of freedom
SE:	standard error	Sig:	p-value
Wald:	Wald-statistic		

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	728,495[a]	,100	,134

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	137	144	48,8
		1 IPO	77	211	73,3
	Overall Percentage				61,2

a. The cut value is ,500

Table C.12.C: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting (MRK&SGA)/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	,074	1,161	,004	1	,949	1,076
	P	-8,274	1,770	21,859	1	,000	,000
	AJ	-,005	,008	,387	1	,534	,995
	AZ	,214	,058	13,422	1	,000	1,239
	D_Rec			,715	4	,950	
	D_Rec(1)	,254	,773	,108	1	,743	1,289
	D_Rec(2)	,440	,684	,415	1	,520	1,553
	D_Rec(3)	,302	,802	,142	1	,706	1,353
	D_Rec(4)	,264	,651	,164	1	,685	1,302
	Constant	-,145	,646	,051	1	,822	,865

a. Variable(s) entered on step 1: O, P, AJ, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	728,889[a]	,100	,133

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	137	144	48,8
		1 IPO	79	209	72,6
	Overall Percentage				60,8

a. The cut value is ,500

Table C.12.D: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting Goodwill/Total Assets and R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	,118	1,141	,011	1	,918	1,125
	AK	-,004	,007	,221	1	,638	,997
	AZ	,247	,060	17,229	1	,000	1,281
	D_Rec			,109	4	,999	
	D_Rec(1)	,035	,769	,002	1	,964	1,035
	D_Rec(2)	,006	,678	,000	1	,993	1,006
	D_Rec(3)	,073	,796	,008	1	,927	1,076
	D_Rec(4)	,077	,653	,014	1	,905	1,081
	Constant	-,167	,648	,066	1	,797	,846

a. Variable(s) entered on step 1: O, AK, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	759,896[a]	,049	,066

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	239	42	85,1
		1 IPO	130	158	54,9
	Overall Percentage				69,8

a. The cut value is ,500

Table C.12.E: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting Goodwill/Total Assets and MRK&SGA/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	,120	1,141	,011	1	,916	1,127
	AJ	-,004	,007	,353	1	,553	,996
	AZ	,248	,060	17,259	1	,000	1,281
	D_Rec			,107	4	,999	
	D_Rec(1)	,029	,769	,001	1	,970	1,029
	D_Rec(2)	,007	,678	,000	1	,992	1,007
	D_Rec(3)	,070	,796	,008	1	,930	1,072
	D_Rec(4)	,077	,653	,014	1	,906	1,080
	Constant	-,168	,648	,067	1	,795	,845

a. Variable(s) entered on step 1: O, AJ, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	760,200[a]	,049	,065

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Predicted Percentage Correct
Step 1	IPO	0 MSC	239	42	85,1
		1 IPO	130	158	54,9
	Overall Percentage				69,8

a. The cut value is ,500

Table C.13: Definition of variables in Eq. 4.2
referring to Logit regression estimates in Table C.14.A

Eq. 4.2

$$D\_IPO = ((\text{Intangible Assets} + \text{Goodwill}) / \text{Total Assets}) + (R\&D + MRK\&SGA) / \text{Sales} + \text{Leverage} + \text{Sales Growth} + D\_INDUSTRY$$

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
Q	(Intangible Assets+Goodwill)/Total Assets
AL	(R&D+MRK&SGA)/Sales
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.14.A: Logit Regression for Eq. 4.2 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) *in the 1995-1998 interval*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Q	-3,151	,929	11,514	1	,001	,043
	AL	-,002	,004	,283	1	,595	,998
	AZ	,235	,060	15,584	1	,000	1,265
	D_Rec			,040	4	1,000	
	D_Rec(1)	,041	,768	,003	1	,957	1,042
	D_Rec(2)	,080	,677	,014	1	,906	1,084
	D_Rec(3)	,137	,800	,029	1	,864	1,146
	D_Rec(4)	,065	,651	,010	1	,921	1,067
	Constant	,023	,646	,001	1	,972	1,023

a. Variable(s) entered on step 1: Q, AL, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	744,208[a]	,071	,095

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	186	95	66,2
		1 IPO	101	185	64,7
	Overall Percentage				65,4

a. The cut value is ,500

(continued)

Table C.14.A: Logit Regression for Eq. 4.2 (continued)

Correlations

		Q T0 5.1 A Total	AL T0 5.3 A Total	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
Q T0 5.1 A Total	Pearson Correlation	1	-,030	-1,000	-,059
	Sig. (2-tailed)		,472	,000	,163
	N	576	576	574	569
AL T0 5.3 A Total	Pearson Correlation	-,030	1	,030	-,016
	Sig. (2-tailed)	,472		,470	,698
	N	576	576	574	569
BB T0 5.3 C Leverage	Pearson Correlation	-1,000	,030	1	,059
	Sig. (2-tailed)	,000	,470		,161
	N	574	574	574	567
AZ T0 5.3 C Growth	Pearson Correlation	-,059	-,016	,059	1
	Sig. (2-tailed)	,163	,698	,161	
	N	569	569	567	569

Table C.15: Definition of variables in Eq. 4.3
referring to Logit regression estimates in Tables C.16.A to C.16.D

Eq. 4.3

D_IPO = (Intangible Assets) + (Goodwill) + R&D + MRK&SGA + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
U	Intangible Assets
V	Goodwill
AP	R&D
AQ	MRK&SGA
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.16.A: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC) *in the 1995-1998 interval*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	U	,000	,000	,977	1	,323	1,000
	V	,000	,000	2,065	1	,151	1,000
	AP	,000	,000	15,586	1	,000	1,000
	AQ	,000	,000	15,579	1	,000	1,000
	BB	2,433	1,100	4,892	1	,027	11,394
	AZ	,185	,058	10,261	1	,001	1,203
	D_Rec			3,174	4	,529	
	D_Rec(1)	,110	,824	,018	1	,893	1,117
	D_Rec(2)	,196	,734	,071	1	,790	1,216
	D_Rec(3)	,437	,871	,252	1	,616	1,547
	D_Rec(4)	-,172	,703	,060	1	,807	,842
	Constant	-2,039	1,254	2,645	1	,104	,130

a. Variable(s) entered on step 1: U, V, AP, AQ, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	698,902[a]	,142	,190

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	170	111	60,5
		1 IPO	57	229	80,1
	Overall Percentage				70,4

a. The cut value is ,500

(continued)

Table C.16.A: Logit Regression for Eq. 4.3 (continued)

Correlations

		U T0 5.1 B Intangibles	V T0 5.1 B Goodwill	AP T0 5.3 B RD	AQ T0 5. 3 B MRK	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
U T0 5.1 B Intangibles	Pearson Correlation	1	,025	,024	,078	-,357	-,024
	Sig. (2-tailed)		,547	,568	,060	,000	,562
	N	576	576	576	576	574	569
V T0 5.1 B Goodwill	Pearson Correlation	,025	1	,191	,414	-,253	-,042
	Sig. (2-tailed)	,547		,000	,000	,000	,322
	N	576	576	576	576	574	569
AP T0 5.3 B RD	Pearson Correlation	,024	,191	1	,851	,033	-,011
	Sig. (2-tailed)	,568	,000		,000	,430	,794
	N	576	576	576	576	574	569
AQ T0 5.3 B MRK	Pearson Correlation	,078	,414	,851	1	,004	-,030
	Sig. (2-tailed)	,060	,000	,000		,923	,469
	N	576	576	576	576	574	569
BB T0 5.3 C Leverage	Pearson Correlation	-,357	-,253	,033	,004	1	,059
	Sig. (2-tailed)	,000	,000	,430	,923		,161
	N	574	574	574	574	574	567
AZ T0 5.3 C Growth	Pearson Correlation	-,024	-,042	-,011	-,030	,059	1
	Sig. (2-tailed)	,562	,322	,794	,469	,161	
	N	569	569	569	569	567	569

Table C.16.B: Logit Regression for Eq. 4.3
testing differences in intangible investments
between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting MRK&SGA expenses due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	U	,000	,000	,360	1	,549	1,000
	V	,000	,000	8,074	1	,004	1,000
	AP	,000	,000	,205	1	,651	1,000
	BB	1,703	1,055	2,606	1	,106	5,493
	AZ	,210	,059	12,920	1	,000	1,234
	D_Rec			,587	4	,964	
	D_Rec(1)	,202	,772	,069	1	,793	1,224
	D_Rec(2)	,336	,681	,244	1	,622	1,399
	D_Rec(3)	,285	,803	,126	1	,723	1,329
	D_Rec(4)	,167	,650	,066	1	,797	1,182
	Constant	-1,765	1,193	2,189	1	,139	,171

a. Variable(s) entered on step 1: U, V, AP, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	725,895[a]	,101	,134

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	157	124	55,9
		1 IPO	79	207	72,4
	Overall Percentage				64,2

a. The cut value is ,500

Table C.16.C: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting R&D expenses due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	U	,000	,000	,617	1	,432	1,000
	V	,000	,000	7,176	1	,007	1,000
	AQ	,000	,000	1,063	1	,303	1,000
	BB	1,885	1,068	3,114	1	,078	6,586
	AZ	,208	,059	12,559	1	,000	1,231
	D_Rec			,615	4	,961	
	D_Rec(1)	,168	,774	,047	1	,828	1,183
	D_Rec(2)	,307	,683	,202	1	,653	1,359
	D_Rec(3)	,303	,807	,141	1	,707	1,354
	D_Rec(4)	,136	,653	,043	1	,835	1,146
	Constant	-1,878	1,200	2,449	1	,118	,153

a. Variable(s) entered on step 1: U, V, AQ, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	724,352[a]	,103	,137

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Predicted Percentage Correct
Step 1	IPO	0 MSC	154	127	54,8
		1 IPO	76	210	73,4
	Overall Percentage				64,2

a. The cut value is ,500

Table C.16.D: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC) *in the 1995-1998 interval* (omitting Goodwill and R&D expenses due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	U	,000	,000	1,642	1	,200	1,000
	AQ	,000	,000	2,538	1	,111	1,000
	BB	3,551	1,007	12,444	1	,000	34,850
	AZ	,227	,060	14,520	1	,000	1,255
	D_Rec			,126	4	,998	
	D_Rec(1)	,013	,776	,000	1	,987	1,013
	D_Rec(2)	,050	,685	,005	1	,942	1,051
	D_Rec(3)	,161	,810	,039	1	,843	1,175
	D_Rec(4)	,004	,660	,000	1	,995	1,004
	Constant	-3,401	1,161	8,580	1	,003	,033

a. Variable(s) entered on step 1: U, AQ, BB, AZ, D_Rec.

B:	regression coefficient	df:	degrees of freedom
SE:	standard error	Sig:	p-value
Wald:	Wald-statistic		

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	738,135[a]	,081	,108

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
	Observed		0 MSC	1 IPO	
Step 1	IPO	0 MSC	184	97	65,5
		1 IPO	90	196	68,5
	Overall Percentage				67,0

a. The cut value is ,500

Table C.17: Definition of variables in Eq. 4.4 referring to Logit regression estimates in Table C.18.A

Eq. 4.4

D_IPO = (Intangible Assets + Goodwill) + (R&D + MRK&SGA) + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
W	(Intangible Assets + Goodwill)
AR	(R&D+MRK&SGA)
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.18.A: Logit Regression for Eq. 4.4 testing differences in intangible investments between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	W	,000	,000	2,459	1	,117	1,000
	AR	,000	,000	,623	1	,430	1,000
	BB	2,233	1,036	4,646	1	,031	9,330
	AZ	,227	,060	14,534	1	,000	1,255
	D_Rec			,192	4	,996	
	D_Rec(1)	,064	,772	,007	1	,934	1,066
	D_Rec(2)	,115	,678	,029	1	,865	1,122
	D_Rec(3)	,230	,805	,082	1	,775	1,259
	D_Rec(4)	,053	,651	,007	1	,935	1,054
	Constant	-2,188	1,178	3,447	1	,063	,112

a. Variable(s) entered on step 1: W, AR, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	739,321[a]	,079	,105

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	186	95	66,2
		1 IPO	87	199	69,6
	Overall Percentage				67,9

a. The cut value is ,500

(continued)

Table C.18.A: Logit Regression for Eq. 4.4 (continued)

Correlations

		W T0 5.1 B Total	AR T0 5. 3 B Total	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
W T0 5.1 B Total	Pearson Correlation	1	,341	-,403	-,048
	Sig. (2-tailed)		,000	,000	,257
	N	576	576	574	569
AR T0 5.3 B Total	Pearson Correlation	,341	1	,011	-,026
	Sig. (2-tailed)	,000		,785	,529
	N	576	576	574	569
BB T0 5.3 C Leverage	Pearson Correlation	-,403	,011	1	,059
	Sig. (2-tailed)	,000	,785		,161
	N	574	574	574	567
AZ T0 5.3 C Growth	Pearson Correlation	-,048	-,026	,059	1
	Sig. (2-tailed)	,257	,529	,161	
	N	569	569	567	569

Table C.19: Definition of variables in Eq. 4.5
referring to Logit regression estimates in Tables C.20.A to C.20.C

Eq. 4.5

D_IPO = Total Assets + Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
AA	Total Assets
AV	Sales
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.20.A: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC)

in the 1995-1998 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AA	,000	,000	10,277	1	,001	1,000
	AV	,000	,000	13,724	1	,000	1,000
	BB	3,149	,924	11,622	1	,001	23,312
	AZ	,205	,060	11,599	1	,001	1,227
	D_Rec			1,361	4	,851	
	D_Rec(1)	,433	,809	,286	1	,593	1,542
	D_Rec(2)	,506	,718	,496	1	,481	1,658
	D_Rec(3)	,825	,860	,922	1	,337	2,283
	D_Rec(4)	,362	,690	,275	1	,600	1,436
	Constant	-3,259	1,102	8,744	1	,003	,038

a. Variable(s) entered on step 1: AA, AV, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	719,164[a]	,111	,148

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	187	94	66,5
		1 IPO	63	223	78,0
	Overall Percentage				72,3

a. The cut value is ,500

Table C.20.A: Logit Regression for Eq. 4.5 (continued)

Correlations

		AA T0 5.1 C Total Assets	AV T0 5.3 C Sales(0)	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
AA T0 5.1 C Total Assets	Pearson Correlation	1	,942	,009	-,030
	Sig. (2-tailed)		,000	,822	,482
	N	576	576	574	569
AV T0 5.3 C Sales(0)	Pearson Correlation	,942	1	,005	-,042
	Sig. (2-tailed)	,000		,898	,318
	N	576	576	574	569
BB T0 5.3 C Leverage	Pearson Correlation	,009	,005	1	,059
	Sig. (2-tailed)	,822	,898		,161
	N	574	574	574	567
AZ T0 5.3 C Growth	Pearson Correlation	-,030	-,042	,059	1
	Sig. (2-tailed)	,482	,318	,161	
	N	569	569	567	569

Table C.20.B: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AV	,000	,000	9,605	1	,002	1,000
	BB	3,069	,925	11,013	1	,001	21,529
	AZ	,206	,060	11,933	1	,001	1,229
	D_Rec			,806	4	,938	
	D_Rec(1)	,019	,778	,001	1	,981	1,019
	D_Rec(2)	,103	,685	,023	1	,880	1,109
	D_Rec(3)	,392	,826	,226	1	,635	1,480
	D_Rec(4)	-,019	,658	,001	1	,978	,982
	Constant	-2,809	1,089	6,650	1	,010	,060

a. Variable(s) entered on step 1: AV, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	728,818[a]	,096	,128

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	185	96	65,8
		1 IPO	62	224	78,3
	Overall Percentage				72,1

a. The cut value is ,500

Table C.20.C: Logit Regression for Eq. 4.5
testing differences in Total Assets and Sales
between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AA	,000	,000	1,347	1	,246	1,000
	BB	3,110	,928	11,221	1	,001	22,422
	AZ	,229	,060	14,623	1	,000	1,257
	D_Rec			,096	4	,999	
	D_Rec(1)	-,067	,781	,007	1	,931	,935
	D_Rec(2)	-,011	,689	,000	1	,987	,989
	D_Rec(3)	,076	,809	,009	1	,925	1,079
	D_Rec(4)	-,052	,667	,006	1	,938	,950
	Constant	-2,929	1,102	7,069	1	,008	,053

a. Variable(s) entered on step 1: AA, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	741,347[a]	,076	,101

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO 0 MSC	Predicted IPO 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	196	85	69,8
		1 IPO	92	194	67,8
	Overall Percentage				68,8

a. The cut value is ,500

Table C.21: Definition of variables in Eq. 4.1
referring to Logit regression estimates in Tables C.22.A to C.22.E

Eq. 4.1

D_IPO = (Intangible Assets / Total Assets) + (Goodwill / Total Assets) + R&D / Sales + MRK&SGA/ Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
O	Intangible Assets/Total Assets
P	Goodwill / Total Assets
AJ	R&D / Sales
AK	MRK & SGA / Sales
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.22.A: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) *in the 1999-2000 interval*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	1,171	,854	1,881	1	,170	3,226
	P	-1,495	,725	4,258	1	,039	,224
	AJ	-,160	,153	1,089	1	,297	,852
	AK	,098	,077	1,638	1	,201	1,103
	AZ	,043	,031	1,943	1	,163	1,044
	D_Rec			,436	4	,979	
	D_Rec(1)	-,115	,441	,068	1	,794	,891
	D_Rec(2)	,065	,455	,020	1	,887	1,067
	D_Rec(3)	-,109	,452	,059	1	,809	,896
	D_Rec(4)	,003	,397	,000	1	,994	1,003
	Constant	,015	,386	,002	1	,969	1,015

a. Variable(s) entered on step 1: O, P, AJ, AK, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	697,746[a]	,028	,038

a. Estimation terminated at iteration number 6 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	140	114	55,1
		1 IPO	91	169	65,0
	Overall Percentage				60,1

a. The cut value is ,500

(continued)

Table C.22.A: Logit Regression for Eq. 4.1 (continued)

Correlations

		O T0 5.1 A Intangibles	P T0 5.1 A Goodwill	AJ T0 5.3 A RD	AK T0 5.3 A MRK	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
O T0 5.1 A Intangibles	Pearson Correlation	1	-,049	,014	,005	-,623	-,070
	Sig. (2-tailed)		,259	,747	,903	,000	,114
	N	526	526	526	526	523	517
P T0 5.1 A Goodwill	Pearson Correlation	-,049	1	-,038	-,050	-,750	,011
	Sig. (2-tailed)	,259		,390	,256	,000	,810
	N	526	526	526	526	523	517
AJ T0 5.3 A RD	Pearson Correlation	,014	-,038	1	,785	,021	,215
	Sig. (2-tailed)	,747	,390		,000	,635	,000
	N	526	526	526	526	523	517
AK T0 5.3 A MRK	Pearson Correlation	,005	-,050	,785	1	,036	,383
	Sig. (2-tailed)	,903	,256	,000		,409	,000
	N	526	526	526	526	523	517
BB T0 5.3 C Leverage	Pearson Correlation	-,623	-,750	,021	,036	1	,039
	Sig. (2-tailed)	,000	,000	,635	,409		,383
	N	523	523	523	523	523	514
AZ T0 5.3 C Growth	Pearson Correlation	-,070	,011	,215	,383	,039	1
	Sig. (2-tailed)	,114	,810	,000	,000	,383	
	N	517	517	517	517	514	517

Table C.22.B: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	1,148	,851	1,819	1	,177	3,153
	P	-1,569	,724	4,695	1	,030	,208
	AK	,032	,029	1,193	1	,275	1,032
	AZ	,043	,031	1,993	1	,158	1,044
	D_Rec			,234	4	,994	
	D_Rec(1)	-,066	,438	,023	1	,880	,936
	D_Rec(2)	,062	,454	,019	1	,892	1,064
	D_Rec(3)	-,098	,450	,047	1	,828	,907
	D_Rec(4)	-,031	,394	,006	1	,937	,970
	Constant	,060	,382	,025	1	,875	1,062

a. Variable(s) entered on step 1: O, P, AK, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	703,352[a]	,025	,034

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	128	126	50,4
		1 IPO	77	186	70,7
	Overall Percentage				60,7

a. The cut value is ,500

Table C.22.C: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting MRK&SGA/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	O	1,182	,848	1,944	1	,163	3,261
	P	-1,618	,723	5,007	1	,025	,198
	AJ	,028	,049	,327	1	,567	1,028
	AZ	,048	,030	2,524	1	,112	1,049
	D_Rec			,214	4	,995	
	D_Rec(1)	-,073	,438	,028	1	,868	,930
	D_Rec(2)	,059	,454	,017	1	,897	1,061
	D_Rec(3)	-,085	,450	,036	1	,849	,918
	D_Rec(4)	-,043	,394	,012	1	,914	,958
	Constant	,090	,381	,056	1	,812	1,095

a. Variable(s) entered on step 1: O, P, AJ, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	704,951[a]	,022	,030

a. Estimation terminated at iteration number 4 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	113	141	44,5
		1 IPO	76	187	71,1
	Overall Percentage				58,0

a. The cut value is ,500

Table C.22.D: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) *in the 1999-2000 interval* (omitting R&D/Sales and Intangibles/Total Assets and Goodwill/Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AK	,040	,033	1,470	1	,225	1,041
	BB	,367	,544	,456	1	,499	1,444
	AZ	,038	,030	1,599	1	,206	1,038
	D_Rec			,185	4	,996	
	D_Rec(1)	-,072	,437	,027	1	,870	,931
	D_Rec(2)	-,020	,449	,002	1	,964	,980
	D_Rec(3)	-,138	,447	,096	1	,757	,871
	D_Rec(4)	-,035	,392	,008	1	,930	,966
	Constant	-,317	,605	,274	1	,601	,729

a. Variable(s) entered on step 1: AK, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	705,615[a]	,013	,018

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	162	92	63,8
		1 IPO	106	154	59,2
	Overall Percentage				61,5

a. The cut value is ,500

Table C.22.E: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) *in the 1999-2000 interval* (omitting MRK&SGA/Sales and Intangibles/Total Assets and Goodwill/Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AJ	,035	,052	,457	1	,499	1,036
	BB	,378	,543	,485	1	,486	1,460
	AZ	,042	,029	2,108	1	,147	1,043
	D_Rec			,125	4	,998	
	D_Rec(1)	-,077	,437	,031	1	,859	,925
	D_Rec(2)	-,028	,449	,004	1	,951	,973
	D_Rec(3)	-,125	,446	,079	1	,779	,882
	D_Rec(4)	-,050	,391	,017	1	,898	,951
	Constant	-,290	,603	,230	1	,631	,749

a. Variable(s) entered on step 1: AJ, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	707,765[a]	,009	,012

a. Estimation terminated at iteration number 3 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	130	124	51,2
		1 IPO	120	140	53,8
	Overall Percentage				52,5

a. The cut value is ,500

Table C.23: Definition of variables in Eq. 4.2
referring to Logit regression estimates in Tables C.24.A to C.24.C

Eq. 4.2

D_IPO = ((Intangible Assets + Goodwill) / Total Assets) + (R&D + MRK&SGA) / Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
Q	(Intangible Assets+Goodwill)/Total Assets
AL	(R&D+MRK*SGA)/Sales
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.24.A: Logit Regression for Eq. 4.2
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Q	-,370	,544	,464	1	,496	,691
	AL	,025	,023	1,156	1	,282	1,026
	AZ	,038	,030	1,642	1	,200	1,039
	D_Rec			,162	4	,997	
	D_Rec(1)	-,073	,437	,028	1	,867	,929
	D_Rec(2)	-,022	,449	,002	1	,961	,978
	D_Rec(3)	-,135	,447	,091	1	,763	,874
	D_Rec(4)	-,042	,392	,012	1	,915	,959
	Constant	,063	,380	,027	1	,869	1,065

a. Variable(s) entered on step 1: Q, AL, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	706,238[a]	,012	,016

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Predicted Percentage Correct
Step 1	IPO	0 MSC	156	98	61,4
		1 IPO	113	147	56,5
	Overall Percentage				58,9

a. The cut value is ,500

(continued)

Table C.24.A: Logit Regression for Eq. 4.2 (continued)

Correlations

		Q T0 5.1 A Total	AL T0 5.3 A Total	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
Q T0 5.1 A Total	Pearson Correlation	1	-,033	-1,000	-,038
	Sig. (2-tailed)		,449	,000	,391
	N	526	526	523	517
AL T0 5.3 A Total	Pearson Correlation	-,033	1	,034	,358
	Sig. (2-tailed)	,449		,439	,000
	N	526	526	523	517
BB T0 5.3 C Leverage	Pearson Correlation	-1,000	,034	1	,039
	Sig. (2-tailed)	,000	,439		,383
	N	523	523	523	514
AZ T0 5.3 C Growth	Pearson Correlation	-,038	,358	,039	1
	Sig. (2-tailed)	,391	,000	,383	
	N	517	517	514	517

Table C.24.B: Logit Regression for Eq. 4.2 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting Leverage due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	Q	-,417	,543	,591	1	,442	,659
	AL	,024	,023	1,127	1	,288	1,025
	AZ	,038	,030	1,633	1	,201	1,039
	D_Rec			,167	4	,997	
	D_Rec(1)	-,024	,435	,003	1	,957	,977
	D_Rec(2)	-,020	,449	,002	1	,965	,980
	D_Rec(3)	-,134	,447	,090	1	,765	,875
	D_Rec(4)	-,036	,392	,008	1	,927	,965
	Constant	,070	,380	,034	1	,855	1,072

a. Variable(s) entered on step 1: Q, AL, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	710,334[a]	,012	,016

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	119	135	46,9
		1 IPO	88	175	66,5
	Overall Percentage				56,9

a. The cut value is ,500

Table C.24.C: Logit Regression for Eq. 4.2
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting (Intangibles+Goodwill)/Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AL	,025	,023	1,156	1	,282	1,026
	BB	,370	,544	,464	1	,496	1,448
	AZ	,038	,030	1,642	1	,200	1,039
	D_Rec			,162	4	,997	
	D_Rec(1)	-,073	,437	,028	1	,867	,929
	D_Rec(2)	-,022	,449	,002	1	,961	,978
	D_Rec(3)	-,135	,447	,091	1	,763	,874
	D_Rec(4)	-,042	,392	,012	1	,915	,959
	Constant	-,308	,604	,259	1	,611	,735

a. Variable(s) entered on step 1: AL, BB, AZ, D_Rec.

B:	regression coefficient	df:	degrees of freedom
SE:	standard error	Sig:	p-value
Wald:	Wald-statistic		

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	706,238[a]	,012	,016

a. Estimation terminated at iteration number 5 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	156	98	61,4
		1 IPO	113	147	56,5
	Overall Percentage				58,9

a. The cut value is ,500

Table C.25: Definition of variables in Eq. 4.3 referring to Logit regression estimates in Table C.26.A

Eq. 4.3

D_IPO = (Intangible Assets) + (Goodwill) + R&D + MRK&SGA + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
U	Intangible Assets
V	Goodwill
AP	R&D
AQ	MRK & SGA
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.26.A: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC) *in the 1999-2000 interval*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	U	,000	,000	1,331	1	,249	1,000
	V	,000	,000	,005	1	,946	1,000
	AP	,000	,000	2,470	1	,116	1,000
	AQ	,000	,000	62,566	1	,000	1,000
	BB	-,411	,830	,245	1	,620	,663
	AZ	,045	,030	2,257	1	,133	1,046
	D_Rec			2,299	4	,681	
	D_Rec(1)	,290	,517	,315	1	,575	1,336
	D_Rec(2)	,323	,538	,360	1	,548	1,381
	D_Rec(3)	,622	,540	1,326	1	,250	1,862
	D_Rec(4)	,098	,467	,044	1	,833	1,103
	Constant	1,765	,889	3,941	1	,047	5,839

a. Variable(s) entered on step 1: U, V, AP, AQ, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	501,999[a]	,336	,448

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	167	87	65,7
		1 IPO	28	232	89,2
	Overall Percentage				77,6

a. The cut value is ,500

(continued)

Table C.26.A: Logit Regression for Eq. 4.3 (continued)

Correlations

		U T0 5.1 B Intangibles	V T0 5.1 B Goodwill	AP T0 5.3 B RD	AQ T0 5. 3 B MRK	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
U T0 5.1 B Intangibles	Pearson Correlation	1	,037	,034	,640	-,267	-,026
	Sig. (2-tailed)		,395	,434	,000	,000	,562
	N	526	526	526	526	523	517
V T0 5.1 B Goodwill	Pearson Correlation	,037	1	,198	,138	-,276	-,005
	Sig. (2-tailed)	,395		,000	,001	,000	,906
	N	526	526	526	526	523	517
AP T0 5.3 B RD	Pearson Correlation	,034	,198	1	,300	,037	-,024
	Sig. (2-tailed)	,434	,000		,000	,402	,580
	N	526	526	526	526	523	517
AQ T0 5.3 B MRK	Pearson Correlation	,640	,138	,300	1	-,021	-,028
	Sig. (2-tailed)	,000	,001	,000		,630	,524
	N	526	526	526	526	523	517
BB T0 5.3 C Leverage	Pearson Correlation	-,267	-,276	,037	-,021	1	,039
	Sig. (2-tailed)	,000	,000	,402	,630		,383
	N	523	523	523	523	523	514
AZ T0 5.3 C Growth	Pearson Correlation	-,026	-,005	-,024	-,028	,039	1
	Sig. (2-tailed)	,562	,906	,580	,524	,383	
	N	517	517	517	517	514	517

Table C.27: Definition of variables in Eq. 4.4
referring to Logit regression estimates in Tables C.28.A

Eq. 4.4

D_IPO = (Intangible Assets + Goodwill) + (R&D + MRK&SGA) + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependent Variable, taking the value of 1 for IPOs
W	(Intangible Assets + Goodwill)
AR	(R&D+MRK&SGA)
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

**Table C.28.A: Logit Regression for Eq. 4.4
testing differences in intangible investments
between IPOs and matching seasoned companies (MSC)**
in the 1999-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	W	,000	,000	,050	1	,822	1,000
	AR	,000	,000	76,360	1	,000	1,000
	BB	-,764	,713	1,147	1	,284	,466
	AZ	,043	,028	2,387	1	,122	1,044
	D_Rec			1,568	4	,815	
	D_Rec(1)	,277	,508	,297	1	,586	1,319
	D_Rec(2)	,298	,529	,318	1	,573	1,348
	D_Rec(3)	,605	,532	1,293	1	,255	1,831
	D_Rec(4)	,231	,448	,267	1	,606	1,260
	Constant	2,039	,788	6,690	1	,010	7,679

a. Variable(s) entered on step 1: W, AR, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	505,137[a]	,332	,443

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	170	84	66,9
		1 IPO	31	229	88,1
	Overall Percentage				77,6

a. The cut value is ,500

(continued)

Table C.28.A: Logit Regression for Eq. 4.4 (continued)

Correlations

		W T0 5.1 B Total	AR T0 5. 3 B Total	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
W T0 5.1 B Total	Pearson Correlation	1	,303	-,330	-,011
	Sig. (2-tailed)		,000	,000	,800
	N	526	526	523	517
AR T0 5.3 B Total	Pearson Correlation	,303	1	-,014	-,030
	Sig. (2-tailed)	,000		,747	,493
	N	526	526	523	517
BB T0 5.3 C Leverage	Pearson Correlation	-,330	-,014	1	,039
	Sig. (2-tailed)	,000	,747		,383
	N	523	523	523	514
AZ T0 5.3 C Growth	Pearson Correlation	-,011	-,030	,039	1
	Sig. (2-tailed)	,800	,493	,383	
	N	517	517	514	517

Table C.29: Definition of variables in Eq. 4.5 referring to Logit regression estimates in Tables C.30.A to C.30.C

Eq. 4.5

D_IPO = Total Assets + Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AA	Total Assets
AV	Sales
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table C.30.A: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC) *in the 1999-2000 interval*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AA	,000	,000	,992	1	,319	1,000
	AV	,000	,000	64,132	1	,000	1,000
	BB	-,371	,721	,265	1	,606	,690
	AZ	,049	,053	,864	1	,353	1,050
	D_Rec			6,648	4	,156	
	D_Rec(1)	,574	,554	1,075	1	,300	1,775
	D_Rec(2)	1,327	,628	4,462	1	,035	3,769
	D_Rec(3)	,655	,577	1,291	1	,256	1,926
	D_Rec(4)	,298	,480	,384	1	,535	1,347
	Constant	1,236	,809	2,334	1	,127	3,443

a. Variable(s) entered on step 1: AA, AV, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	457,115[a]	,392	,522

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	179	75	70,5
		1 IPO	20	240	92,3
	Overall Percentage				81,5

a. The cut value is ,500

(continued)

Table C.30.A: Logit Regression for Eq. 4.5 (continued)

Correlations

		AA T0 5.1 C Total Assets	AV T0 5.3 C Sales(0)	BB T0 5.3 C Leverage	AZ T0 5.3 C Growth
AA T0 5.1 C Total Assets	Pearson Correlation	1	,844	-,074	-,020
	Sig. (2-tailed)		,000	,092	,652
	N	526	526	523	517
AV T0 5.3 C Sales(0)	Pearson Correlation	,844	1	-,013	,021
	Sig. (2-tailed)	,000		,769	,633
	N	526	526	523	517
BB T0 5.3 C Leverage	Pearson Correlation	-,074	-,013	1	,039
	Sig. (2-tailed)	,092	,769		,383
	N	523	523	523	514
AZ T0 5.3 C Growth	Pearson Correlation	-,020	,021	,039	1
	Sig. (2-tailed)	,652	,633	,383	
	N	517	517	514	517

Table C.30.B: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC) *in the 1999-2000 interval* (omitting Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AV	,000	,000	75,304	1	,000	1,000
	BB	-,447	,712	,395	1	,530	,639
	AZ	,054	,053	1,016	1	,314	1,055
	D_Rec			6,137	4	,189	
	D_Rec(1)	,423	,531	,634	1	,426	1,527
	D_Rec(2)	1,165	,605	3,708	1	,054	3,207
	D_Rec(3)	,528	,561	,887	1	,346	1,696
	D_Rec(4)	,157	,459	,117	1	,733	1,170
	Constant	1,470	,774	3,606	1	,058	4,351

a. Variable(s) entered on step 1: AV, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	458,039[a]	,390	,521

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	178	76	70,1
		1 IPO	19	241	92,7
	Overall Percentage				81,5

a. The cut value is ,500

Table C.30.C: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC)

in the 1999-2000 interval

(omitting Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AA	,000	,000	51,515	1	,000	1,000
	BB	-,574	,634	,819	1	,365	,563
	AZ	,043	,026	2,715	1	,099	1,044
	D_Rec			3,060	4	,548	
	D_Rec(1)	-,683	,550	1,544	1	,214	,505
	D_Rec(2)	-,348	,567	,376	1	,540	,706
	D_Rec(3)	-,546	,559	,956	1	,328	,579
	D_Rec(4)	-,717	,505	2,016	1	,156	,488
	Constant	2,082	,757	7,560	1	,006	8,021

a. Variable(s) entered on step 1: AA, BB, AZ, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	582,122[a]	,224	,299

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	152	102	59,8
		1 IPO	25	235	90,4
	Overall Percentage				75,3

a. The cut value is ,500

10.4 APPENDIX D (Chapter 4) Logit Regression Estimates – IPO data measured prior to flotation date.

The Appendix summarizes the main results of the Logit Regression estimate output in relation to the five defining equations Eq. 1 to Eq. 5 as stated in 4.2.2.

The estimates and the tables are derived from statistical calculations using the SPSS software.

In case of multicollinearity, the regression is repeated excluding in each repetition one of the multicollinear factors.

Interval	Tables
1995 to 2000	D.1 to D.10
1995 to 1998	D.11 to D.20
1999 to 2000	D.21 to D.30

Table D.1: Definition of variables in Eq. 4.1
referring to Logit regression estimates in Tables D.2.A to D.2.E

Eq. 4.1

D_IPO = (Intangible Assets / Total Assets) + (Goodwill / Total Assets) + R&D / Sales + MRK&SGA/ Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AC	Intangible Assets/Total Assets
AD	Goodwill / Total Assets
BD	R&D / Sales
BE	MRK & SGA / Sales
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.2.A: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AC	2,555	,619	17,038	1	,000	12,867
	AD	-1,881	,472	15,881	1	,000	,152
	BD	-,005	,018	,070	1	,792	,995
	BE	,003	,008	,113	1	,737	1,003
	BL	,337	,041	66,261	1	,000	1,401
	D_Rec			1,641	4	,801	
	D_Rec(1)	,118	,415	,080	1	,777	1,125
	D_Rec(2)	,052	,397	,017	1	,895	1,054
	D_Rec(3)	-,202	,435	,217	1	,642	,817
	D_Rec(4)	-,094	,367	,066	1	,798	,910
	Constant	-,312	,359	,755	1	,385	,732

a. Variable(s) entered on step 1: AC, AD, BD, BE, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1298,305[a]	,174	,231

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
	Observed		0 MSC	1 IPO	
Step 1	IPO	0 MSC	460	75	86,0
		1 IPO	229	322	58,4
	Overall Percentage				72,0

a. The cut value is ,500

(continued)

Table D.2.A: Logit Regression for Eq. 4.1 (continued)

Correlations

		AC T-1 IPO 5.1 A Intangibles	AD T-1 IPO 5. 1 A Goodwill	BD T-1 IPO 5.3 A RD	BE T-1 IPO 5.3 A MRK	BM T-1 IPO 5. 3 C Leverage	BL T-1 IPO 5.3 C Growth
AC T-1 IPO 5.1 A Intangibles	Pearson Correlation	1	,199	-,005	,029	-,737	-,012
	Sig. (2-tailed)		,000	,863	,343	,000	,691
	N	1102	1102	1102	1102	1102	1086
AD T-1 IPO 5.1 A Goodwill	Pearson Correlation	,199	1	-,023	-,024	-,809	-,012
	Sig. (2-tailed)	,000		,446	,423	,000	,692
	N	1102	1102	1102	1102	1102	1086
BD T-1 IPO 5.3 A RD	Pearson Correlation	-,005	-,023	1	,979	,019	,213
	Sig. (2-tailed)	,863	,446		,000	,529	,000
	N	1102	1102	1102	1102	1102	1086
BE T-1 IPO 5.3 A MRK	Pearson Correlation	,029	-,024	,979	1	,000	,148
	Sig. (2-tailed)	,343	,423	,000		,988	,000
	N	1102	1102	1102	1102	1102	1086
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,737	-,809	,019	,000	1	,016
	Sig. (2-tailed)	,000	,000	,529	,988		,609
	N	1102	1102	1102	1102	1102	1086
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,012	-,012	,213	,148	,016	1
	Sig. (2-tailed)	,691	,692	,000	,000	,609	
	N	1086	1086	1086	1086	1086	1086

Table D.2.B: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AC	2,576	,613	17,667	1	,000	13,139
	AD	-1,887	,472	16,010	1	,000	,152
	BE	,001	,001	,226	1	,634	1,001
	BL	,337	,041	66,242	1	,000	1,401
	D_Rec			1,674	4	,795	
	D_Rec(1)	,120	,415	,084	1	,773	1,127
	D_Rec(2)	,053	,397	,018	1	,895	1,054
	D_Rec(3)	-,203	,435	,219	1	,640	,816
	D_Rec(4)	-,095	,367	,066	1	,797	,910
	Constant	-,312	,359	,755	1	,385	,732

a. Variable(s) entered on step 1: AC, AD, BE, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1298,377[a]	,173	,231

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	458	77	85,6
		1 IPO	229	322	58,4
	Overall Percentage				71,8

a. The cut value is ,500

Table D.2.C: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting MRK&SGA /Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AC	2,582	,612	17,808	1	,000	13,230
	AD	-1,889	,471	16,053	1	,000	,151
	BD	,001	,003	,181	1	,671	1,001
	BL	,337	,041	66,229	1	,000	1,401
	D_Rec			1,676	4	,795	
	D_Rec(1)	,121	,415	,084	1	,771	1,128
	D_Rec(2)	,053	,397	,018	1	,894	1,054
	D_Rec(3)	-,203	,435	,218	1	,641	,816
	D_Rec(4)	-,094	,367	,066	1	,797	,910
	Constant	-,312	,359	,754	1	,385	,732

a. Variable(s) entered on step 1: AC, AD, BD, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1298,423[a]	,173	,231

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	458	77	85,6
		1 IPO	230	321	58,3
	Overall Percentage				71,7

a. The cut value is ,500

Table D.2.D: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting Intangibles/Total Assets, Goodwill/Total Assets,
R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BE	,000	,001	,007	1	,935	1,000
	BM	,030	,289	,010	1	,919	1,030
	BL	,000	,000	,219	1	,640	1,000
	D_Rec			,018	4	1,000	
	D_Rec(1)	-,031	,376	,007	1	,933	,969
	D_Rec(2)	-,038	,357	,011	1	,915	,962
	D_Rec(3)	-,029	,384	,006	1	,939	,971
	D_Rec(4)	-,021	,329	,004	1	,950	,980
	Constant	,024	,412	,003	1	,954	1,024

a. Variable(s) entered on step 1: BE, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1503,126[a]	,002	,003

a. Estimation terminated at iteration number 2 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	2	533	,4
		1 IPO	6	545	98,9
	Overall Percentage				50,4

a. The cut value is ,500

Table D.2.E: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting Intangibles/Total Assets, Goodwill/Total Assets, MRK&SGA/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BD	,000	,003	,005	1	,942	1,000
	BM	,030	,289	,011	1	,918	1,030
	BL	,000	,000	,225	1	,636	1,000
	D_Rec			,018	4	1,000	
	D_Rec(1)	-,031	,376	,007	1	,934	,969
	D_Rec(2)	-,038	,357	,011	1	,915	,962
	D_Rec(3)	-,028	,384	,005	1	,942	,972
	D_Rec(4)	-,020	,329	,004	1	,952	,980
	Constant	,024	,412	,003	1	,954	1,024

a. Variable(s) entered on step 1: BD, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1503,128[a]	,002	,003

a. Estimation terminated at iteration number 2 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	3	532	,6
		1 IPO	8	543	98,5
	Overall Percentage				50,3

a. The cut value is ,500

Table D.3: Definition of variables in Eq. 4.2
referring to Logit regression estimates in Tables D.4.A to D.4.C

Eq. 4.2

D_IPO = ((Intangible Assets + Goodwill) / Total Assets) + (R&D + MRK&SGA) / Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AE	(Intangible Assets+Goodwill)/Total Assets
BF	(R&D+MRK*SGA)/Sales
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.4.A: Logit Regression for Eq. 4.2
testing difference of intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AE	-,029	,289	,010	1	,919	,971
	BF	,000	,001	,001	1	,974	1,000
	BL	,000	,000	,220	1	,639	1,000
	D_Rec			,018	4	1,000	
	D_Rec(1)	-,031	,376	,007	1	,934	,969
	D_Rec(2)	-,038	,357	,011	1	,915	,962
	D_Rec(3)	-,029	,384	,006	1	,940	,971
	D_Rec(4)	-,020	,329	,004	1	,951	,980
	Constant	,053	,322	,028	1	,868	1,055

a. Variable(s) entered on step 1: AE, BF, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1503,132[a]	,002	,003

a. Estimation terminated at iteration number 2 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO 0 MSC	Predicted IPO 1 IPO	Predicted Percentage Correct
Step 1	IPO	0 MSC	2	533	,4
		1 IPO	6	545	98,9
	Overall Percentage				50,4

a. The cut value is ,500

(continued)

Table D.4.A: Logit Regression for Eq. 4.2 (continued)

Correlations

		AE T-1 IPO 5.1 A Total	BF T-1 IPO 5.3 A Total	BM T-1 IPO 5. 3 C Leverage	BL T-1 IPO 5.3 C Growth
AE T-1 IPO 5.1 A Total	Pearson Correlation	1	-,006	-1,000	-,016
	Sig. (2-tailed)		,847	,000	,609
	N	1102	1102	1102	1086
BF T-1 IPO 5.3 A Total	Pearson Correlation	-,006	1	,006	,169
	Sig. (2-tailed)	,847		,847	,000
	N	1102	1102	1102	1086
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-1,000	,006	1	,016
	Sig. (2-tailed)	,000	,847		,609
	N	1102	1102	1102	1086
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,016	,169	,016	1
	Sig. (2-tailed)	,609	,000	,609	
	N	1086	1086	1086	1086

Table D.4.B: Logit Regression for Eq. 4.2
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting Leverage due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AE	-,029	,289	,010	1	,919	,971
	BF	,000	,001	,001	1	,974	1,000
	BL	,000	,000	,220	1	,639	1,000
	D_Rec			,018	4	1,000	
	D_Rec(1)	-,031	,376	,007	1	,934	,969
	D_Rec(2)	-,038	,357	,011	1	,915	,962
	D_Rec(3)	-,029	,384	,006	1	,940	,971
	D_Rec(4)	-,020	,329	,004	1	,951	,980
	Constant	,053	,322	,028	1	,868	1,055

a. Variable(s) entered on step 1: AE, BF, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1503,132[a]	,002	,003

a. Estimation terminated at iteration number 2 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	2	533	,4
		1 IPO	6	545	98,9
	Overall Percentage				50,4

a. The cut value is ,500

TableD.4.C: Logit Regression for Eq. 4.2
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting (Intangible Assets+Goodwill)/Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BF	,000	,001	,001	1	,974	1,000
	BM	,029	,289	,010	1	,919	1,030
	BL	,000	,000	,220	1	,639	1,000
	D_Rec			,018	4	1,000	
	D_Rec(1)	-,031	,376	,007	1	,934	,969
	D_Rec(2)	-,038	,357	,011	1	,915	,962
	D_Rec(3)	-,029	,384	,006	1	,940	,971
	D_Rec(4)	-,020	,329	,004	1	,951	,980
	Constant	,024	,412	,003	1	,953	1,024

a. Variable(s) entered on step 1: BF, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1503,132[a]	,002	,003

a. Estimation terminated at iteration number 2 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO 0 MSC	Predicted IPO 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	2	533	,4
		1 IPO	6	545	98,9
	Overall Percentage				50,4

a. The cut value is ,500

Table D.5: Definition of variables in Eq. 4.3 referring to Logit regression estimates in Tables D.6.A to D.6.C

Eq. 4.3

D_IPO = Intangible Assets + Goodwill + R&D + MRK&SGA + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AF	Intangible Assets
AG	Goodwill
BG	R&D
BH	MRK & SGA
BM	Leverage
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.6.A: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC) ***in the 1995-2000 interval***

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AF	,000	,000	3,119	1	,077	1,000
	AG	,000	,000	24,679	1	,000	1,000
	BG	,000	,000	13,573	1	,000	1,000
	BH	,000	,000	26,078	1	,000	1,000
	BM	-2,578	,661	15,198	1	,000	,076
	BL	,254	,040	39,630	1	,000	1,289
	D_Rec			11,838	4	,019	
	D_Rec(1)	,261	,464	,316	1	,574	1,298
	D_Rec(2)	,137	,443	,096	1	,757	1,147
	D_Rec(3)	,291	,500	,339	1	,561	1,338
	D_Rec(4)	-,364	,409	,791	1	,374	,695
	Constant	2,828	,743	14,469	1	,000	16,908

a. Variable(s) entered on step 1: AF, AG, BG, BH, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1139,691[a]	,286	,381

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	405	130	75,7
		1 IPO	101	450	81,7
	Overall Percentage				78,7

a. The cut value is ,500

(continued)

Table D.6.A: Logit Regression for Eq. 4.3 (continued)

Correlations

		AF T-1 IPO 5.1 B Intangibles	AG T-1 IPO 5. 1 B Goodwill	BG T-1 IPO 5.3 B RD	BH T-1 IPO 5.3 B MRK	BM T-1 IPO 5. 3 C Leverage	BL T-1 IPO 5.3 C Growth
AF T-1 IPO 5.1 B Intangibles	Pearson Correlation	1	,023	,146	,530	-,152	-,006
	Sig. (2-tailed)		,449	,000	,000	,000	,836
	N	1102	1102	1102	1102	1102	1086
AG T-1 IPO 5.1 B Goodwill	Pearson Correlation	,023	1	,120	,145	-,134	-,004
	Sig. (2-tailed)	,449		,000	,000	,000	,883
	N	1102	1102	1102	1102	1102	1086
BG T-1 IPO 5.3 B RD	Pearson Correlation	,146	,120	1	,687	,019	-,006
	Sig. (2-tailed)	,000	,000		,000	,519	,833
	N	1102	1102	1102	1102	1102	1086
BH T-1 IPO 5.3 B MRK	Pearson Correlation	,530	,145	,687	1	-,004	-,009
	Sig. (2-tailed)	,000	,000	,000		,901	,771
	N	1102	1102	1102	1102	1102	1086
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,152	-,134	,019	-,004	1	,016
	Sig. (2-tailed)	,000	,000	,519	,901		,609
	N	1102	1102	1102	1102	1102	1086
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,006	-,004	-,006	-,009	,016	1
	Sig. (2-tailed)	,836	,883	,833	,771	,609	
	N	1086	1086	1086	1086	1086	1086

Table D.6.B: Logit Regression for Eq. 4.3
testing differences in intangible investments
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting Intangible Assets and R&D due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AG	,000	,000	25,525	1	,000	1,000
	BH	,000	,000	23,261	1	,000	1,000
	BM	-1,986	,564	12,383	1	,000	,137
	BL	,257	,040	40,365	1	,000	1,293
	D_Rec			6,093	4	,192	
	D_Rec(1)	,243	,453	,287	1	,592	1,275
	D_Rec(2)	,145	,434	,112	1	,738	1,156
	D_Rec(3)	,189	,485	,152	1	,696	1,208
	D_Rec(4)	-,201	,399	,255	1	,614	,818
	Constant	2,168	,657	10,875	1	,001	8,737

a. Variable(s) entered on step 1: AG, BH, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1160,173[a]	,272	,363

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
	Observed		0 MSC	1 IPO	
Step 1	IPO	0 MSC	408	127	76,3
		1 IPO	98	453	82,2
	Overall Percentage				79,3

a. The cut value is ,500

Table D.6.C: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC)

in the 1995-2000 interval

(omitting MRK&SGA due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AF	,000	,000	11,449	1	,001	1,000
	AG	,000	,000	41,590	1	,000	1,000
	BG	,000	,000	,078	1	,781	1,000
	BM	-3,380	,663	25,975	1	,000	,034
	BL	,284	,041	48,576	1	,000	1,329
	D_Rec			5,028	4	,284	
	D_Rec(1)	,184	,448	,169	1	,681	1,202
	D_Rec(2)	,193	,430	,200	1	,654	1,212
	D_Rec(3)	,039	,474	,007	1	,935	1,039
	D_Rec(4)	-,188	,395	,226	1	,634	,829
	Constant	3,286	,743	19,584	1	,000	26,737

a. Variable(s) entered on step 1: AF, AG, BG, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1181,707[a]	,258	,344

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	406	129	75,9
		1 IPO	165	386	70,1
	Overall Percentage				72,9

a. The cut value is ,500

**Table D.7: Definition of variables in Eq. 4.4
referring to Logit regression estimates in Table D.8.A**

Eq. 4.4

D_IPO = (Intangible Assets + Goodwill) + (R&D + MRK&SGA) + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
W	(Intangible Assets + Goodwill)
AR	(R&D+MRK&SGA)
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.8.A: Logit Regression for Eq. 4.4 testing differences in intangible investments between IPOs and matching seasoned companies (MSC) *in the 1995-2000 interval*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AH	,000	,000	25,837	1	,000	1,000
	BI	,000	,000	11,062	1	,001	1,000
	BM	-2,563	,639	16,091	1	,000	,077
	BL	,268	,040	44,025	1	,000	1,307
	D_Rec			3,306	4	,508	
	D_Rec(1)	,170	,443	,146	1	,702	1,185
	D_Rec(2)	,086	,423	,042	1	,838	1,090
	D_Rec(3)	,062	,470	,018	1	,894	1,064
	D_Rec(4)	-,167	,390	,182	1	,669	,846
	Constant	2,629	,718	13,392	1	,000	13,857

a. Variable(s) entered on step 1: AH, BI, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1190,941[a]	,251	,335

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	427	108	79,8
		1 IPO	130	421	76,4
	Overall Percentage				78,1

a. The cut value is ,500

(continued)

Table D.8.A: Logit Regression for Eq. 4.4 (continued)

Correlations

		AH T-1 IPO 5.1 B Total	BI T-1 IPO 5.3 B Total	BM T-1 IPO 5. 3 C Leverage	BL T-1 IPO 5.3 C Growth
AH T-1 IPO 5.1 B Total	Pearson Correlation	1	,266	-,169	-,006
	Sig. (2-tailed)		,000	,000	,845
	N	1102	1102	1102	1086
BI T-1 IPO 5.3 B Total	Pearson Correlation	,266	1	,001	-,009
	Sig. (2-tailed)	,000		,976	,772
	N	1102	1102	1102	1086
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,169	,001	1	,016
	Sig. (2-tailed)	,000	,976		,609
	N	1102	1102	1102	1086
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,006	-,009	,016	1
	Sig. (2-tailed)	,845	,772	,609	
	N	1086	1086	1086	1086

Table D.9: Definition of variables in Eq. 4.5
referring to Logit regression estimates in Table D.10.A to D.10.C

Eq. 4.5

D_IPO = Total Assets + Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AA	Total Assets
AV	Sales
BB	Leverage
AZ	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.10.A: Logit Regression for Eq. 4.5
testing differences in Total Assets and Sales
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AI	,000	,000	2,058	1	,151	1,000
	BJ	,000	,000	31,491	1	,000	1,000
	BM	-,246	,425	,335	1	,563	,782
	BL	,239	,033	52,831	1	,000	1,270
	D_Rec			5,876	4	,209	
	D_Rec(1)	,200	,461	,188	1	,664	1,222
	D_Rec(2)	,179	,441	,165	1	,685	1,196
	D_Rec(3)	,175	,489	,128	1	,720	1,192
	D_Rec(4)	-,202	,404	,250	1	,617	,817
	Constant	,688	,557	1,527	1	,216	1,989

a. Variable(s) entered on step 1: AI, BJ, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1144,434[a]	,283	,377

a. Estimation terminated at iteration number 10 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
Observed			0 MSC	1 IPO	
Step 1	IPO	0 MSC	401	134	75,0
		1 IPO	75	476	86,4
	Overall Percentage				80,8

a. The cut value is ,500

(continued)

Table D.10.A: Logit Regression for Eq. 4.5 (continued)

Correlations

		AI T-1 IPO 5.1 C Total Assets	BJ T-1 IPO 5.3 C Sales(0)	BM T-1 IPO 5.3 C Leverage	BL T-1 IPO 5.3 C Growth
AI T-1 IPO 5.1 C Total Assets	Pearson Correlation	1	,885	-,021	-,009
	Sig. (2-tailed)		,000	,478	,774
	N	1102	1102	1102	1086
BJ T-1 IPO 5.3 C Sales(0)	Pearson Correlation	,885	1	-,002	-,010
	Sig. (2-tailed)	,000		,944	,736
	N	1102	1102	1102	1086
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,021	-,002	1	,016
	Sig. (2-tailed)	,478	,944		,609
	N	1102	1102	1102	1086
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,009	-,010	,016	1
	Sig. (2-tailed)	,774	,736	,609	
	N	1086	1086	1086	1086

Table D.10.B: Logit Regression for Eq. 4.5
testing differences in Total Assets and Sales
between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BJ	,000	,000	101,795	1	,000	1,000
	BM	-,211	,421	,252	1	,616	,810
	BL	,255	,030	72,748	1	,000	1,291
	D_Rec			6,267	4	,180	
	D_Rec(1)	,380	,441	,742	1	,389	1,462
	D_Rec(2)	,351	,421	,694	1	,405	1,420
	D_Rec(3)	,332	,473	,491	1	,483	1,393
	D_Rec(4)	-,043	,384	,013	1	,910	,958
	Constant	,462	,531	,757	1	,384	1,587

a. Variable(s) entered on step 1: BJ, BM, BL, D_Rec.

B:	regression coefficient	df:	degrees of freedom
SE:	standard error	Sig:	p-value
Wald:	Wald-statistic		

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1146,912[a]	,281	,375

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	402	133	75,1
		1 IPO	82	469	85,1
	Overall Percentage				80,2

a. The cut value is ,500

Table D.10.C: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC)
in the 1995-2000 interval
(omitting Sales due to multicollineaity

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AI	,000	,000	69,605	1	,000	1,000
	BM	-,402	,442	,827	1	,363	,669
	BL	,237	,040	35,946	1	,000	1,267
	D_Rec			4,375	4	,358	
	D_Rec(1)	-,231	,472	,239	1	,625	,794
	D_Rec(2)	-,267	,453	,346	1	,556	,766
	D_Rec(3)	-,258	,496	,270	1	,604	,773
	D_Rec(4)	-,535	,423	1,595	1	,207	,586
	Constant	1,125	,577	3,805	1	,051	3,079

a. Variable(s) entered on step 1: AI, BM, BL, D_Rec.

B:	regression coefficient	df:	degrees of freedom
SE:	standard error	Sig:	p-value
Wald:	Wald-statistic		

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	1171,404[a]	,265	,353

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
	Observed		0 MSC	1 IPO	
Step 1	IPO	0 MSC	401	134	75,0
		1 IPO	77	474	86,0
	Overall Percentage				80,6

a. The cut value is ,500

Table D.11: Definition of variables in Eq. 4.1
referring to Logit regression estimates in Tables D.12.A to D.12.E

Eq. 4.1

D_IPO = (Intangible Assets / Total Assets) + (Goodwill / Total Assets) + R&D / Sales + MRK&SGA / Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AC	Intangible Assets/Total Assets
AD	Goodwill / Total Assets
BD	R&D / Sales
BE	MRK & SGA / Sales
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.12.A: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AC	2,136	1,080	3,912	1	,048	8,469
	AD	-6,229	1,686	13,653	1	,000	,002
	BD	-,027	,043	,389	1	,533	,973
	BE	,012	,020	,362	1	,548	1,012
	BL	,450	,069	42,424	1	,000	1,569
	D_Rec			1,674	4	,795	
	D_Rec(1)	-,241	,839	,082	1	,774	,786
	D_Rec(2)	,288	,713	,163	1	,686	1,334
	D_Rec(3)	,277	,837	,110	1	,740	1,320
	D_Rec(4)	,009	,678	,000	1	,989	1,009
	Constant	-,349	,670	,272	1	,602	,705

a. Variable(s) entered on step 1: AC, AD, BD, BE, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	651,347[a]	,214	,286

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	243	38	86,5
		1 IPO	91	197	68,4
	Overall Percentage				77,3

a. The cut value is ,500

(continued)

Table D.12.A: Logit Regression for Eq. 4.1 (continued)

Correlations

		AC T-1 IPO 5.1 A Intangibles	AD T-1 IPO 5. 1 A Goodwill	BD T-1 IPO 5.3 A RD	BE T-1 IPO 5.3 A MRK	BM T-1 IPO 5. 3 C Leverage	BL T-1 IPO 5.3 C Growth
AC T-1 IPO 5.1 A Intangibles	Pearson Correlation	1	-,040	-,020	-,018	-,758	,012
	Sig. (2-tailed)		,344	,634	,674	,000	,775
	N	576	576	576	576	576	569
AD T-1 IPO 5.1 A Goodwill	Pearson Correlation	-,040	1	-,025	-,026	-,622	-,029
	Sig. (2-tailed)	,344		,551	,537	,000	,483
	N	576	576	576	576	576	569
BD T-1 IPO 5.3 A RD	Pearson Correlation	-,020	-,025	1	,997	,032	-,002
	Sig. (2-tailed)	,634	,551		,000	,446	,961
	N	576	576	576	576	576	569
BE T-1 IPO 5.3 A MRK	Pearson Correlation	-,018	-,026	,997	1	,031	-,002
	Sig. (2-tailed)	,674	,537	,000		,464	,966
	N	576	576	576	576	576	569
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,758	-,622	,032	,031	1	,010
	Sig. (2-tailed)	,000	,000	,446	,464		,812
	N	576	576	576	576	576	569
BL T-1 IPO 5.3 C Growth	Pearson Correlation	,012	-,029	-,002	-,002	,010	1
	Sig. (2-tailed)	,775	,483	,961	,966	,812	
	N	569	569	569	569	569	569

Table D.12.B: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC)

in the 1995-1998 interval

(omitting MRK&SGA/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AC	2,128	1,079	3,889	1	,049	8,401
	AD	-6,253	1,687	13,748	1	,000	,002
	BD	-,001	,004	,114	1	,735	,999
	BL	,449	,069	42,286	1	,000	1,566
	D_Rec			1,751	4	,781	
	D_Rec(1)	-,216	,838	,066	1	,797	,806
	D_Rec(2)	,288	,713	,163	1	,686	1,334
	D_Rec(3)	,333	,831	,161	1	,688	1,395
	D_Rec(4)	,008	,677	,000	1	,991	1,008
	Constant	-,347	,670	,268	1	,605	,707

a. Variable(s) entered on step 1: AC, AD, BD, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	651,719[a]	,214	,285

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	242	39	86,1
		1 IPO	89	199	69,1
	Overall Percentage				77,5

a. The cut value is ,500

Table D.12.C: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting (R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AC	2,130	1,079	3,895	1	,048	8,416
	AD	-6,252	1,687	13,741	1	,000	,002
	BE	-,001	,002	,087	1	,767	,999
	BL	,449	,069	42,287	1	,000	1,567
	D_Rec			1,752	4	,781	
	D_Rec(1)	-,215	,838	,066	1	,798	,806
	D_Rec(2)	,288	,713	,163	1	,686	1,334
	D_Rec(3)	,333	,831	,161	1	,688	1,395
	D_Rec(4)	,007	,677	,000	1	,991	1,007
	Constant	-,347	,670	,268	1	,605	,707

a. Variable(s) entered on step 1: AC, AD, BE, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	651,755[a]	,214	,285

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	242	39	86,1
		1 IPO	89	199	69,1
	Overall Percentage				77,5

a. The cut value is ,500

Table D.12.D: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) *in the 1995-1998 interval* (omitting Intangibles/Total Assets and Goodwill/Total Assets and MRK&SGA/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BD	-,001	,004	,103	1	,748	,999
	BM	,763	,790	,932	1	,334	2,145
	BL	,480	,069	48,074	1	,000	1,615
	D_Rec			1,853	4	,763	
	D_Rec(1)	-,476	,831	,328	1	,567	,621
	D_Rec(2)	-,075	,703	,011	1	,916	,928
	D_Rec(3)	,438	,822	,284	1	,594	1,549
	D_Rec(4)	-,106	,675	,024	1	,876	,900
	Constant	-1,023	1,011	1,025	1	,311	,359

a. Variable(s) entered on step 1: BD, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	674,185[a]	,182	,243

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	253	28	90,0
		1 IPO	110	178	61,8
	Overall Percentage				75,7

a. The cut value is ,500

Table D.12.E: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting Intangibles/Total Assets and Goodwill/Total Assets and R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BE	,000	,002	,075	1	,784	1,000
	BM	,762	,790	,928	1	,335	2,142
	BL	,480	,069	48,077	1	,000	1,616
	D_Rec			1,849	4	,764	
	D_Rec(1)	-,475	,831	,327	1	,567	,622
	D_Rec(2)	-,075	,703	,011	1	,915	,928
	D_Rec(3)	,437	,822	,283	1	,595	1,549
	D_Rec(4)	-,106	,675	,025	1	,875	,899
	Constant	-1,022	1,011	1,022	1	,312	,360

a. Variable(s) entered on step 1: BE, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	674,222[a]	,182	,243

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	253	28	90,0
		1 IPO	110	178	61,8
	Overall Percentage				75,7

a. The cut value is ,500

Table D.13: Definition of variables in Eq. 4.2 referring to Logit regression estimates in Table D.14.A

Eq. 4.2

D_IPO = ((Intangible Assets + Goodwill) / Total Assets) + (R&D + MRK&SGA) / Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AE	(Intangible Assets+Goodwill)/Total Assets
BF	(R&D+MRK*SGA)/Sales
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.14.A: Logit Regression for Eq. 4.2 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) ***in the 1995-1998 interval***

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AE	-,762	,790	,930	1	,335	,467
	BF	,000	,001	,084	1	,772	1,000
	BL	,480	,069	48,075	1	,000	1,616
	D_Rec			1,850	4	,763	
	D_Rec(1)	-,475	,831	,327	1	,567	,622
	D_Rec(2)	-,075	,703	,011	1	,915	,928
	D_Rec(3)	,438	,822	,283	1	,594	1,549
	D_Rec(4)	-,106	,675	,025	1	,875	,900
	Constant	-,260	,667	,152	1	,696	,771

a. Variable(s) entered on step 1: AE, BF, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	674,211[a]	,182	,243

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	253	28	90,0
		1 IPO	110	178	61,8
	Overall Percentage				75,7

a. The cut value is ,500

(continued)

Table D.14.A: Logit Regression for Eq. 4.2 (continued)

Correlations

		AE T-1 IPO 5.1 A Total	BF T-1 IPO 5.3 A Total	BM T-1 IPO 5. 3 C Leverage	BL T-1 IPO 5.3 C Growth
AE T-1 IPO 5.1 A Total	Pearson Correlation	1	-,031	-1,000	-,010
	Sig. (2-tailed)		,458	,000	,812
	N	576	576	576	569
BF T-1 IPO 5.3 A Total	Pearson Correlation	-,031	1	,031	-,002
	Sig. (2-tailed)	,458		,458	,964
	N	576	576	576	569
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-1,000	,031	1	,010
	Sig. (2-tailed)	,000	,458		,812
	N	576	576	576	569
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,010	-,002	,010	1
	Sig. (2-tailed)	,812	,964	,812	
	N	569	569	569	569

Table D.15: Definition of variables in Eq. 4.3 referring to Logit regression estimates in Tables D.16.A to D.16.E

Eq. 4.3

D_IPO = (Intangible Assets) + (Goodwill) + R&D + MRK&SGA + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AF	Intangible Assets
AG	Goodwill
BG	R&D
BH	MRK & SGA
BM	Leverage
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.16.A: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC) *in the 1995-1998 interval*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AF	,000	,000	,289	1	,591	1,000
	AG	,000	,000	4,549	1	,033	1,000
	BG	,000	,000	15,192	1	,000	1,000
	BH	,000	,000	14,929	1	,000	1,000
	BM	,012	,929	,000	1	,990	1,012
	BL	,404	,068	35,776	1	,000	1,498
	D_Rec			5,186	4	,269	
	D_Rec(1)	-,300	,894	,112	1	,737	,741
	D_Rec(2)	,101	,767	,018	1	,895	1,107
	D_Rec(3)	,625	,902	,480	1	,488	1,868
	D_Rec(4)	-,338	,732	,213	1	,645	,714
	Constant	,069	1,159	,004	1	,952	1,072

a. Variable(s) entered on step 1: AF, AG, BG, BH, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	623,854[a]	,252	,335

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	235	46	83,6
		1 IPO	66	222	77,1
	Overall Percentage				80,3

a. The cut value is ,500

(continued)

Table D.16.A: Logit Regression for Eq. 4.3 (continued)

Correlations

		AF T-1 IPO 5.1 B Intangibles	AG T-1 IPO 5.1 B Goodwill	BG T-1 IPO 5.3 B RD	BH T-1 IPO 5.3 B MRK	BM T-1 IPO 5.3 C Leverage	BL T-1 IPO 5.3 C Growth
AF T-1 IPO 5.1 B Intangibles	Pearson Correlation	1	,039	,556	,529	-,258	-,025
	Sig. (2-tailed)		,346	,000	,000	,000	,546
	N	576	576	576	576	576	569
AG T-1 IPO 5.1 B Goodwill	Pearson Correlation	,039	1	,178	,362	-,206	-,027
	Sig. (2-tailed)	,346		,000	,000	,000	,514
	N	576	576	576	576	576	569
BG T-1 IPO 5.3 B RD	Pearson Correlation	,556	,178	1	,900	,028	-,013
	Sig. (2-tailed)	,000	,000		,000	,501	,763
	N	576	576	576	576	576	569
BH T-1 IPO 5.3 B MRK	Pearson Correlation	,529	,362	,900	1	,013	-,022
	Sig. (2-tailed)	,000	,000	,000		,747	,605
	N	576	576	576	576	576	569
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,258	-,206	,028	,013	1	,010
	Sig. (2-tailed)	,000	,000	,501	,747		,812
	N	576	576	576	576	576	569
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,025	-,027	-,013	-,022	,010	1
	Sig. (2-tailed)	,546	,514	,763	,605	,812	
	N	569	569	569	569	569	569

Table D.16.B: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting R&D expenses due to multicollinearity

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AF	,000	,000	,209	1	,647	1,000
	AG	,000	,000	10,131	1	,001	1,000
	BH	,000	,000	,496	1	,481	1,000
	BM	-,453	,901	,253	1	,615	,635
	BL	,430	,068	39,877	1	,000	1,537
	D_Rec			2,059	4	,725	
	D_Rec(1)	-,238	,837	,081	1	,777	,788
	D_Rec(2)	,232	,710	,107	1	,744	1,261
	D_Rec(3)	,509	,829	,377	1	,539	1,663
	D_Rec(4)	-,014	,675	,000	1	,984	,986
	Constant	,185	1,097	,029	1	,866	1,204

a. Variable(s) entered on step 1: AF, AG, BH, BM, BL, D_Rec.

B:	regression coefficient	df:	degrees of freedom
SE:	standard error	Sig:	p-value
Wald:	Wald-statistic		

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	649,500[a]	,217	,289

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	248	33	88,3
		1 IPO	88	200	69,4
	Overall Percentage				78,7

a. The cut value is ,500

Table D.16.C: Logit Regression for Eq. 4.3
testing differences in intangible investments
between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting R&D and MRK&SGA expenses due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AF	,000	,000	,012	1	,913	1,000
	AG	,000	,000	10,173	1	,001	1,000
	BM	-,630	,869	,525	1	,469	,533
	BL	,433	,068	40,444	1	,000	1,542
	D_Rec			2,061	4	,724	
	D_Rec(1)	-,241	,835	,084	1	,772	,785
	D_Rec(2)	,228	,707	,104	1	,747	1,256
	D_Rec(3)	,513	,827	,385	1	,535	1,670
	D_Rec(4)	-,014	,672	,000	1	,984	,986
	Constant	,346	1,073	,104	1	,747	1,414

a. Variable(s) entered on step 1: AF, AG, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	650,028[a]	,216	,288

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
	Observed		0 MSC	1 IPO	
Step 1	IPO	0 MSC	245	36	87,2
		1 IPO	91	197	68,4
	Overall Percentage				77,7

a. The cut value is ,500

Table D.16.D: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC) *in the 1995-1998 interval* (omitting R&D and Intangible Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AG	,000	,000	10,049	1	,002	1,000
	BH	,000	,000	,284	1	,594	1,000
	BM	-,582	,856	,462	1	,497	,559
	BL	,431	,068	40,058	1	,000	1,539
	D_Rec			2,117	4	,714	
	D_Rec(1)	-,248	,835	,088	1	,767	,781
	D_Rec(2)	,223	,708	,099	1	,753	1,250
	D_Rec(3)	,519	,828	,393	1	,530	1,681
	D_Rec(4)	-,020	,673	,001	1	,976	,980
	Constant	,315	1,058	,089	1	,766	1,370

a. Variable(s) entered on step 1: AG, BH, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	649,704[a]	,217	,289

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	246	35	87,5
		1 IPO	90	198	68,8
	Overall Percentage				78,0

a. The cut value is ,500

Table D.16.E: Logit Regression for Eq. 4.3 testing differences in intangible investments between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting MRK&SGA and Intangible Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AG	,000	,000	10,259	1	,001	1,000
	BG	,000	,000	,423	1	,516	1,000
	BM	-,623	,855	,532	1	,466	,536
	BL	,434	,068	40,680	1	,000	1,544
	D_Rec			2,108	4	,716	
	D_Rec(1)	-,238	,835	,082	1	,775	,788
	D_Rec(2)	,228	,707	,104	1	,747	1,256
	D_Rec(3)	,510	,826	,380	1	,538	1,665
	D_Rec(4)	-,021	,672	,001	1	,975	,979
	Constant	,335	1,058	,100	1	,752	1,398

a. Variable(s) entered on step 1: AG, BG, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	649,498[a]	,217	,289

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Predicted Percentage Correct
Step 1	IPO	0 MSC	246	35	87,5
		1 IPO	90	198	68,8
	Overall Percentage				78,0

a. The cut value is ,500

Table D.17: Definition of variables in Eq. 4.4 referring to Logit regression estimates in Tables D.18.A to D.18.C

Eq. 4.4

D_IPO = (Intangible Assets + Goodwill) + (R&D + MRK&SGA) + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AH	(Intangible Assets + Goodwill)
BI	(R&D+MRK&SGA)
BM	Leverage
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.18.A: Logit Regression for Eq. 4.4 testing differences in intangible investments between IPOs and matching seasoned companies (MSC)

in the 1995-1998 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AH	,000	,000	7,339	1	,007	1,000
	BI	,000	,000	2,093	1	,148	1,000
	BM	-,586	,884	,440	1	,507	,557
	BL	,459	,069	44,581	1	,000	1,582
	D_Rec			2,032	4	,730	
	D_Rec(1)	-,392	,830	,224	1	,636	,675
	D_Rec(2)	,030	,700	,002	1	,966	1,031
	D_Rec(3)	,498	,824	,366	1	,545	1,645
	D_Rec(4)	-,107	,669	,026	1	,873	,899
	Constant	,342	1,082	,100	1	,752	1,408

a. Variable(s) entered on step 1: AH, BI, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	660,311[a]	,202	,269

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	246	35	87,5
		1 IPO	104	184	63,9
	Overall Percentage				75,6

a. The cut value is ,500

(continued)

Table D.18.A: Logit Regression for Eq. 4.4 (continued)

Correlations

		AH T-1 IPO 5.1 B Total	BI T-1 IPO 5.3 B Total	BM T-1 IPO 5. 3 C Leverage	BL T-1 IPO 5.3 C Growth
AH T-1 IPO 5.1 B Total	Pearson Correlation	1	,526	-,295	-,035
	Sig. (2-tailed)		,000	,000	,400
	N	576	576	576	569
BI T-1 IPO 5.3 B Total	Pearson Correlation	,526	1	,017	-,020
	Sig. (2-tailed)	,000		,681	,634
	N	576	576	576	569
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,295	,017	1	,010
	Sig. (2-tailed)	,000	,681		,812
	N	576	576	576	569
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,035	-,020	,010	1
	Sig. (2-tailed)	,400	,634	,812	
	N	569	569	569	569

Table D.18.B: Logit Regression for Eq. 4.4
testing differences in intangible investments
between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting Intangibles + Goodwill due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BI	,000	,000	,711	1	,399	1,000
	BM	,774	,789	,961	1	,327	2,168
	BL	,476	,069	47,413	1	,000	1,610
	D_Rec			1,912	4	,752	
	D_Rec(1)	-,481	,832	,335	1	,563	,618
	D_Rec(2)	-,078	,704	,012	1	,911	,925
	D_Rec(3)	,443	,822	,291	1	,590	1,558
	D_Rec(4)	-,112	,675	,027	1	,868	,894
	Constant	-1,010	1,011	,998	1	,318	,364

a. Variable(s) entered on step 1: BI, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	673,258[a]	,184	,245

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	252	29	89,7
		1 IPO	109	179	62,2
	Overall Percentage				75,7

a. The cut value is ,500

Table D.18.C: Logit Regression for Eq. 4.4
testing differences in intangible investments
between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting R&D and MRK&SGA due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AH	,000	,000	6,742	1	,009	1,000
	BM	-,340	,861	,156	1	,693	,712
	BL	,457	,069	44,193	1	,000	1,579
	D_Rec			2,084	4	,720	
	D_Rec(1)	-,409	,831	,243	1	,622	,664
	D_Rec(2)	,004	,700	,000	1	,995	1,004
	D_Rec(3)	,502	,825	,371	1	,542	1,653
	D_Rec(4)	-,120	,670	,032	1	,858	,887
	Constant	,129	1,070	,015	1	,904	1,138

a. Variable(s) entered on step 1: AH, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	661,909[a]	,200	,266

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	247	34	87,9
		1 IPO	103	185	64,2
	Overall Percentage				75,9

a. The cut value is ,500

Table D.19: Definition of variables in Eq. 4.5
referring to Logit regression estimates in Tables D.20.A to D.20.C

Eq. 4.5

D_IPO = Total Assets + Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AI	Total Assets
BJ	Sales
BM	Leverage
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

**Table D.20.A: Logit Regression for Eq. 4.5
testing differences in Total Assets and Sales
between IPOs and matching seasoned companies (MSC)**
in the 1995-1998 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AI	,000	,000	,000	1	,995	1,000
	BJ	,000	,000	2,443	1	,118	1,000
	BM	,871	,788	1,221	1	,269	2,390
	BL	,446	,070	41,134	1	,000	1,562
	D_Rec			3,041	4	,551	
	D_Rec(1)	-,445	,854	,271	1	,602	,641
	D_Rec(2)	-,032	,727	,002	1	,964	,968
	D_Rec(3)	,670	,861	,607	1	,436	1,955
	D_Rec(4)	-,142	,699	,041	1	,839	,868
	Constant	-,960	1,032	,866	1	,352	,383

a. Variable(s) entered on step 1: AI, BJ, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	664,661[a]	,196	,261

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	250	31	89,0
		1 IPO	98	190	66,0
	Overall Percentage				77,3

a. The cut value is ,500

(continued)

Table D.20.A: Logit Regression for Eq. 4.5 (continued)

Correlations

		AI T-1 IPO 5.1 C Total Assets	BJ T-1 IPO 5. 3 C Sales(0)	BM T-1 IPO 5. 3 C Leverage	BL T-1 IPO 5.3 C Growth
AI T-1 IPO 5.1 C Total Assets	Pearson Correlation	1	,929	,014	-,023
	Sig. (2-tailed)		,000	,731	,580
	N	576	576	576	569
BJ T-1 IPO 5.3 C Sales(0)	Pearson Correlation	,929	1	,015	-,030
	Sig. (2-tailed)	,000		,711	,468
	N	576	576	576	569
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	,014	,015	1	,010
	Sig. (2-tailed)	,731	,711		,812
	N	576	576	576	569
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,023	-,030	,010	1
	Sig. (2-tailed)	,580	,468	,812	
	N	569	569	569	569

Table D.20.B: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BJ	,000	,000	5,521	1	,019	1,000
	BM	,871	,788	1,222	1	,269	2,389
	BL	,446	,069	41,346	1	,000	1,562
	D_Rec			3,042	4	,551	
	D_Rec(1)	-,446	,838	,284	1	,594	,640
	D_Rec(2)	-,034	,708	,002	1	,962	,967
	D_Rec(3)	,669	,838	,637	1	,425	1,953
	D_Rec(4)	-,143	,679	,044	1	,833	,867
	Constant	-,959	1,011	,899	1	,343	,383

a. Variable(s) entered on step 1: BJ, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	664,661[a]	,196	,261

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
Observed			0 MSC	1 IPO	
Step 1	IPO	0 MSC	250	31	89,0
		1 IPO	98	190	66,0
	Overall Percentage				77,3

a. The cut value is ,500

Table D.20.C: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC)
in the 1995-1998 interval
(omitting Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AI	,000	,000	3,687	1	,055	1,000
	BM	,786	,788	,994	1	,319	2,195
	BL	,450	,069	41,961	1	,000	1,568
	D_Rec			2,407	4	,661	
	D_Rec(1)	-,619	,858	,520	1	,471	,539
	D_Rec(2)	-,207	,733	,080	1	,777	,813
	D_Rec(3)	,361	,848	,181	1	,670	1,434
	D_Rec(4)	-,291	,706	,170	1	,680	,747
	Constant	-,753	1,032	,533	1	,466	,471

a. Variable(s) entered on step 1: AI, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	667,515[a]	,192	,256

a. Estimation terminated at iteration number 8 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	252	29	89,7
		1 IPO	101	187	64,9
	Overall Percentage				77,2

a. The cut value is ,500

Table D.21: Definition of variables in Eq. 4.1
referring to Logit regression estimates in Tables D.22.A to D.22.G

Eq. 4.1

D_IPO = (Intangible Assets / Total Assets) + (Goodwill / Total Assets) + R&D / Sales + MRK&SGA/ Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AC	Intangible Assets/Total Assets
AD	Goodwill / Total Assets
BD	R&D / Sales
BE	MRK & SGA / Sales
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.22.A: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AC	2,184	,762	8,219	1	,004	8,885
	AD	-1,037	,548	3,584	1	,058	,355
	BD	,007	,055	,017	1	,897	1,007
	BE	,032	,032	1,021	1	,312	1,033
	BL	,241	,048	25,636	1	,000	1,273
	D_Rec			2,126	4	,713	
	D_Rec(1)	,204	,479	,182	1	,670	1,227
	D_Rec(2)	,076	,497	,023	1	,879	1,079
	D_Rec(3)	-,299	,505	,350	1	,554	,742
	D_Rec(4)	-,077	,438	,031	1	,860	,926
	Constant	-,376	,421	,800	1	,371	,686

a. Variable(s) entered on step 1: AC, AD, BD, BE, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	618,485[a]	,173	,230

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	227	27	89,4
		1 IPO	119	144	54,8
	Overall Percentage				71,8

a. The cut value is ,500

(continued)

Table D.22.A: Logit Regression for Eq. 4.1 (continued)

Correlations

		AC T-1 IPO 5.1 A Intangibles	AD T-1 IPO 5.1 A Goodwill	BD T-1 IPO 5.3 A RD	BE T-1 IPO 5.3 A MRK	BM T-1 IPO 5.3 C Leverage	BL T-1 IPO 5.3 C Growth
AC T-1 IPO 5.1 A Intangibles	Pearson Correlation	1	,255	,017	,117	-,737	-,018
	Sig. (2-tailed)		,000	,694	,007	,000	,680
	N	526	526	526	526	526	517
AD T-1 IPO 5.1 A Goodwill	Pearson Correlation	,255	1	-,039	-,041	-,842	-,018
	Sig. (2-tailed)	,000		,368	,344	,000	,689
	N	526	526	526	526	526	517
BD T-1 IPO 5.3 A RD	Pearson Correlation	,017	-,039	1	,869	,018	,581
	Sig. (2-tailed)	,694	,368		,000	,683	,000
	N	526	526	526	526	526	517
BE T-1 IPO 5.3 A MRK	Pearson Correlation	,117	-,041	,869	1	-,036	,384
	Sig. (2-tailed)	,007	,344	,000		,406	,000
	N	526	526	526	526	526	517
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,737	-,842	,018	-,036	1	,022
	Sig. (2-tailed)	,000	,000	,683	,406		,610
	N	526	526	526	526	526	517
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,018	-,018	,581	,384	,022	1
	Sig. (2-tailed)	,680	,689	,000	,000	,610	
	N	517	517	517	517	517	517

Table D.22.B: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AC	2,184	,762	8,215	1	,004	8,883
	AD	-1,036	,548	3,579	1	,059	,355
	BE	,035	,020	3,098	1	,078	1,036
	BL	,242	,048	25,662	1	,000	1,273
	D_Rec			2,109	4	,716	
	D_Rec(1)	,201	,479	,176	1	,674	1,223
	D_Rec(2)	,074	,496	,023	1	,881	1,077
	D_Rec(3)	-,298	,505	,349	1	,555	,742
	D_Rec(4)	-,077	,438	,031	1	,861	,926
	Constant	-,377	,421	,803	1	,370	,686

a. Variable(s) entered on step 1: AC, AD, BE, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	618,502[a]	,173	,230

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	227	27	89,4
		1 IPO	119	144	54,8
	Overall Percentage				71,8

a. The cut value is ,500

Table D.22.C: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) ***in the 1999-2000 interval*** **(omitting MRK&SGA/Sales due to multicollinearity)**

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AC	2,266	,747	9,196	1	,002	9,640
	AD	-1,072	,547	3,848	1	,050	,342
	BD	,055	,046	1,400	1	,237	1,056
	BL	,240	,047	25,605	1	,000	1,271
	D_Rec			2,475	4	,649	
	D_Rec(1)	,238	,478	,247	1	,619	1,268
	D_Rec(2)	,082	,497	,027	1	,869	1,085
	D_Rec(3)	-,298	,506	,348	1	,555	,742
	D_Rec(4)	-,078	,438	,032	1	,858	,925
	Constant	-,364	,421	,747	1	,387	,695

a. Variable(s) entered on step 1: AC, AD, BD, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	619,867[a]	,171	,227

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	224	30	88,2
		1 IPO	120	143	54,4
	Overall Percentage				71,0

a. The cut value is ,500

Table D.22.D: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting MRK&SGA/Sales and Sales Growth due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AC	2,106	,737	8,175	1	,004	8,216
	AD	-1,004	,502	4,002	1	,045	,367
	BD	,242	,100	5,879	1	,015	1,274
	D_Rec			,294	4	,990	
	D_Rec(1)	-,112	,435	,066	1	,798	,894
	D_Rec(2)	-,030	,448	,004	1	,947	,970
	D_Rec(3)	-,048	,445	,012	1	,913	,953
	D_Rec(4)	-,139	,390	,127	1	,721	,870
	Constant	-,058	,373	,024	1	,876	,943

a. Variable(s) entered on step 1: AC, AD, BD, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	700,295[a]	,053	,071

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	225	38	85,6
		1 IPO	159	104	39,5
	Overall Percentage				62,5

a. The cut value is ,500

Table D.22.E: Logit Regression for Eq. 4.1 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting Intangible Assets/Total Assets, Goodwill/Total Assets and R&D/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BE	,040	,022	3,177	1	,075	1,041
	BM	-,297	,469	,403	1	,526	,743
	BL	,236	,046	26,193	1	,000	1,266
	D_Rec			2,432	4	,657	
	D_Rec(1)	,296	,474	,391	1	,532	1,345
	D_Rec(2)	,076	,491	,024	1	,877	1,079
	D_Rec(3)	-,274	,502	,297	1	,586	,761
	D_Rec(4)	,036	,433	,007	1	,934	1,036
	Constant	-,153	,574	,071	1	,790	,858

a. Variable(s) entered on step 1: BE, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	628,512[a]	,157	,209

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO 0 MSC	Predicted IPO 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	238	16	93,7
		1 IPO	127	136	51,7
	Overall Percentage				72,3

a. The cut value is ,500

Table D.22.F: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting Intangible Assets/Total Assets, Goodwill/Total Assets and MRK&SGA/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BD	,079	,073	1,189	1	,276	1,082
	BM	-,362	,477	,578	1	,447	,696
	BL	,233	,046	25,856	1	,000	1,262
	D_Rec			2,833	4	,586	
	D_Rec(1)	,340	,473	,518	1	,472	1,405
	D_Rec(2)	,089	,490	,033	1	,857	1,093
	D_Rec(3)	-,269	,502	,287	1	,592	,764
	D_Rec(4)	,043	,433	,010	1	,921	1,044
	Constant	-,087	,580	,023	1	,880	,916

a. Variable(s) entered on step 1: BD, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	631,034[a]	,152	,203

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	238	16	93,7
		1 IPO	127	136	51,7
	Overall Percentage				72,3

a. The cut value is ,500

Table D.22.G: Logit Regression for Eq. 4.1
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting Intangible Assets/Total Assets, Goodwill/Total Assets, MRK&SGA/Sales and Sales Growth due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BD	,279	,099	7,986	1	,005	1,322
	BM	-,186	,348	,285	1	,594	,831
	D_Rec			,052	4	1,000	
	D_Rec(1)	-,025	,432	,003	1	,954	,975
	D_Rec(2)	-,008	,444	,000	1	,985	,992
	D_Rec(3)	-,036	,442	,007	1	,935	,965
	D_Rec(4)	-,057	,387	,022	1	,883	,945
	Constant	,073	,478	,023	1	,878	1,076

a. Variable(s) entered on step 1: BD, BM, D_Rec.

B:	regression coefficient	df:	degrees of freedom
SE:	standard error	Sig:	p-value
Wald:	Wald-statistic		

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	710,569[a]	,035	,046

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
	Observed		0 MSC	1 IPO	
Step 1	IPO	0 MSC	257	6	97,7
		1 IPO	173	90	34,2
	Overall Percentage				66,0

a. The cut value is ,500

Table D.23: Definition of variables in Eq. 4.2
referring to Logit regression estimates in Tables D.24.A to D.24.F

Eq. 4.2

D_IPO = ((Intangible Assets + Goodwill) / Total Assets) + (R&D + MRK&SGA) / Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AE	(Intangible Assets+Goodwill)/Total Assets
BF	(R&D+MRK*SGA)/Sales
BL	Sales Growth
BM	Leverage
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.24.A: Logit Regression for Eq. 4.2 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) *in the 1999-2000 interval*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AE	,295	,468	,396	1	,529	1,343
	BF	,029	,019	2,240	1	,134	1,029
	BL	,236	,046	26,063	1	,000	1,266
	D_Rec			2,526	4	,640	
	D_Rec(1)	,306	,473	,419	1	,517	1,359
	D_Rec(2)	,081	,491	,028	1	,868	1,085
	D_Rec(3)	-,273	,502	,296	1	,586	,761
	D_Rec(4)	,034	,433	,006	1	,937	1,035
	Constant	-,449	,420	1,145	1	,285	,638

a. Variable(s) entered on step 1: AE, BF, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	628,604[a]	,156	,209

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	238	16	93,7
		1 IPO	127	136	51,7
	Overall Percentage				72,3

a. The cut value is ,500

(continued)

Table D.24.A: Logit Regression for Eq. 4.2 (continued)

Correlations

		AE T-1 IPO 5.1 A Total	BF T-1 IPO 5.3 A Total	BM T-1 IPO 5. 3 C Leverage	BL T-1 IPO 5.3 C Growth
AE T-1 IPO 5.1 A Total	Pearson Correlation	1	,020	-1,000	-,022
	Sig. (2-tailed)		,648	,000	,610
	N	526	526	526	517
BF T-1 IPO 5.3 A Total	Pearson Correlation	,020	1	-,020	,459
	Sig. (2-tailed)	,648		,648	,000
	N	526	526	526	517
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-1,000	-,020	1	,022
	Sig. (2-tailed)	,000	,648		,610
	N	526	526	526	517
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,022	,459	,022	1
	Sig. (2-tailed)	,610	,000	,610	
	N	517	517	517	517

**Table D.24.B: Logit Regression for Eq. 4.2
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting Sales Growth and Leverage due to multicollinearity)**

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AE	,202	,349	,336	1	,562	1,224
	BF	,080	,029	7,438	1	,006	1,084
	D_Rec			,053	4	1,000	
	D_Rec(1)	-,076	,432	,031	1	,861	,927
	D_Rec(2)	-,023	,444	,003	1	,959	,977
	D_Rec(3)	-,047	,441	,012	1	,914	,954
	D_Rec(4)	-,024	,386	,004	1	,950	,976
	Constant	-,137	,371	,136	1	,713	,872

a. Variable(s) entered on step 1: AE, BF, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	709,825[a]	,036	,048

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	254	9	96,6
		1 IPO	159	104	39,5
	Overall Percentage				68,1

a. The cut value is ,500

Table D.24.C: Logit Regression for Eq. 4.2
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting (R&D+MRK&SGA)/Sales and Leverage due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AE	,229	,348	,434	1	,510	1,258
	BL	,000	,001	,086	1	,770	1,000
	D_Rec			,032	4	1,000	
	D_Rec(1)	-,039	,435	,008	1	,928	,962
	D_Rec(2)	-,049	,447	,012	1	,913	,952
	D_Rec(3)	-,071	,444	,025	1	,873	,932
	D_Rec(4)	-,033	,391	,007	1	,932	,967
	Constant	,038	,374	,010	1	,919	1,039

a. Variable(s) entered on step 1: AE, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	714,279[a]	,004	,006

a. Estimation terminated at iteration number 3 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO 0 MSC	Predicted IPO 1 IPO	Predicted Percentage Correct
Step 1	IPO	0 MSC	37	217	14,6
		1 IPO	47	216	82,1
	Overall Percentage				48,9

a. The cut value is ,500

Table D.24.D: Logit Regression for Eq. 4.2 testing differences in intangible intensities between IPOs and matching seasoned companies (MSC) *in the 1999-2000 interval* (omitting (Intangibles+Goodwill)/Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BF	,029	,019	2,240	1	,134	1,029
	BM	-,295	,468	,396	1	,529	,745
	BL	,236	,046	26,063	1	,000	1,266
	D_Rec			2,526	4	,640	
	D_Rec(1)	,306	,473	,419	1	,517	1,359
	D_Rec(2)	,081	,491	,028	1	,868	1,085
	D_Rec(3)	-,273	,502	,296	1	,586	,761
	D_Rec(4)	,034	,433	,006	1	,937	1,035
	Constant	-,154	,574	,072	1	,788	,857

a. Variable(s) entered on step 1: BF, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	628,604[a]	,156	,209

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	238	16	93,7
		1 IPO	127	136	51,7
	Overall Percentage				72,3

a. The cut value is ,500

Table D.24.E: Logit Regression for Eq. 4.2
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting (Intangibles+Goodwill)/Total Assets and Sales Growth due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BF	,080	,029	7,438	1	,006	1,084
	BM	-,202	,349	,336	1	,562	,817
	D_Rec			,053	4	1,000	
	D_Rec(1)	-,076	,432	,031	1	,861	,927
	D_Rec(2)	-,023	,444	,003	1	,959	,977
	D_Rec(3)	-,047	,441	,012	1	,914	,954
	D_Rec(4)	-,024	,386	,004	1	,950	,976
	Constant	,065	,478	,019	1	,891	1,067

a. Variable(s) entered on step 1: BF, BM, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	709,825[a]	,036	,048

a. Estimation terminated at iteration number 7 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	254	9	96,6
		1 IPO	159	104	39,5
	Overall Percentage				68,1

a. The cut value is ,500

Table D.24.F: Logit Regression for Eq. 4.2
testing differences in intangible intensities
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting (Intangibles+Goodwill)/Total Assets and (R&D+MRK&SGA)/Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BM	-,229	,348	,434	1	,510	,795
	BL	,000	,001	,086	1	,770	1,000
	D_Rec			,032	4	1,000	
	D_Rec(1)	-,039	,435	,008	1	,928	,962
	D_Rec(2)	-,049	,447	,012	1	,913	,952
	D_Rec(3)	-,071	,444	,025	1	,873	,932
	D_Rec(4)	-,033	,391	,007	1	,932	,967
	Constant	,267	,480	,310	1	,578	1,306

a. Variable(s) entered on step 1: BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	714,279[a]	,004	,006

a. Estimation terminated at iteration number 3 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
	Observed		0 MSC	1 IPO	
Step 1	IPO	0 MSC	37	217	14,6
		1 IPO	47	216	82,1
	Overall Percentage				48,9

a. The cut value is ,500

Table D.25: Definition of variables in Eq. 4.3
referring to Logit regression estimates in Tables D.26.A to D.26.C

Eq. 4.3

D_IPO = (Intangible Assets) + (Goodwill) + R&D + MRK&SGA + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AF	Intangible Assets
AG	Goodwill
BG	R&D
BH	MRK & SGA
BM	Leverage
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.26.A: Logit Regression for Eq. 4.3
testing differences in intangible investments
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AF	,000	,000	,742	1	,389	1,000
	AG	,000	,000	6,657	1	,010	1,000
	BG	,000	,000	4,765	1	,029	1,000
	BH	,000	,000	57,999	1	,000	1,000
	BM	-2,887	1,239	5,432	1	,020	,056
	BL	,145	,033	18,833	1	,000	1,156
	D_Rec			1,469	4	,832	
	D_Rec(1)	,588	,658	,799	1	,371	1,800
	D_Rec(2)	,601	,706	,726	1	,394	1,824
	D_Rec(3)	,670	,728	,848	1	,357	1,955
	D_Rec(4)	,310	,602	,266	1	,606	1,364
	Constant	4,220	1,310	10,372	1	,001	68,053

a. Variable(s) entered on step 1: AF, AG, BG, BH, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	330,368[a]	,526	,702

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	209	45	82,3
		1 IPO	16	247	93,9
	Overall Percentage				88,2

a. The cut value is ,500

(continued)

Table D.26.A: Logit Regression for Eq. 4.3 (continued)

Correlations

		AF T-1 IPO 5.1 B Intangibles	AG T-1 IPO 5.1 B Goodwill	BG T-1 IPO 5.3 B RD	BH T-1 IPO 5.3 B MRK	BM T-1 IPO 5.3 C Leverage	BL T-1 IPO 5.3 C Growth
AF T-1 IPO 5.1 B Intangibles	Pearson Correlation	1	,012	,042	,655	-,126	-,010
	Sig. (2-tailed)		,786	,336	,000	,004	,823
	N	526	526	526	526	526	517
AG T-1 IPO 5.1 B Goodwill	Pearson Correlation	,012	1	,213	,153	-,123	-,007
	Sig. (2-tailed)	,786		,000	,000	,005	,869
	N	526	526	526	526	526	517
BG T-1 IPO 5.3 B RD	Pearson Correlation	,042	,213	1	,311	,039	-,016
	Sig. (2-tailed)	,336	,000		,000	,373	,710
	N	526	526	526	526	526	517
BH T-1 IPO 5.3 B MRK	Pearson Correlation	,655	,153	,311	1	,006	-,016
	Sig. (2-tailed)	,000	,000	,000		,888	,721
	N	526	526	526	526	526	517
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,126	-,123	,039	,006	1	,022
	Sig. (2-tailed)	,004	,005	,373	,888		,610
	N	526	526	526	526	526	517
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,010	-,007	-,016	-,016	,022	1
	Sig. (2-tailed)	,823	,869	,710	,721	,610	
	N	517	517	517	517	517	517

Table D.26.B: Logit Regression for Eq. 4.3
testing differences in intangible investments
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting Intangible Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AG	,000	,000	9,136	1	,003	1,000
	BG	,000	,000	4,030	1	,045	1,000
	BH	,000	,000	61,329	1	,000	1,000
	BM	-3,412	1,118	9,323	1	,002	,033
	BL	,142	,033	18,554	1	,000	1,152
	D_Rec			1,631	4	,803	
	D_Rec(1)	,562	,657	,731	1	,393	1,754
	D_Rec(2)	,629	,709	,786	1	,375	1,875
	D_Rec(3)	,691	,730	,895	1	,344	1,995
	D_Rec(4)	,283	,603	,220	1	,639	1,327
	Constant	4,702	1,223	14,793	1	,000	110,202

a. Variable(s) entered on step 1: AG, BG, BH, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	331,060[a]	,526	,701

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

			Predicted		
			IPO		Percentage Correct
	Observed		0 MSC	1 IPO	
Step 1	IPO	0 MSC	209	45	82,3
		1 IPO	16	247	93,9
	Overall Percentage				88,2

a. The cut value is ,500

Table D.26.C: Logit Regression for Eq. 4.3
testing differences in intangible investments
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting MRK&SGA due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AF	,000	,000	11,966	1	,001	1,000
	AG	,000	,000	29,565	1	,000	1,000
	BG	,000	,000	25,667	1	,000	1,000
	BM	-5,298	1,218	18,929	1	,000	,005
	BL	,150	,043	11,869	1	,001	1,162
	D_Rec			5,835	4	,212	
	D_Rec(1)	,146	,551	,070	1	,792	1,157
	D_Rec(2)	,643	,602	1,143	1	,285	1,903
	D_Rec(3)	-,018	,579	,001	1	,975	,982
	D_Rec(4)	,702	,527	1,778	1	,182	2,018
	Constant	5,450	1,270	18,417	1	,000	232,777

a. Variable(s) entered on step 1: AF, AG, BG, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	444,565[a]	,409	,546

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	176	78	69,3
		1 IPO	28	235	89,4
	Overall Percentage				79,5

a. The cut value is ,500

Table D.27: Definition of variables in Eq. 4.4 referring to Logit regression estimates in Table D.28.A

Eq. 4.4

D_IPO = (Intangible Assets + Goodwill) + (R&D + MRK&SGA) + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AH	(Intangible Assets + Goodwill)
BI	(R&D+MRK&SGA)
BM	Leverage
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.28.A: Logit Regression for Eq. 4.4 testing differences in intangible investments between IPOs and matching seasoned companies (MSC) *in the 1999-2000 interval*

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AH	,000	,000	1,531	1	,216	1,000
	BI	,000	,000	70,983	1	,000	1,000
	BM	-2,306	1,106	4,348	1	,037	,100
	BL	,132	,031	17,983	1	,000	1,141
	D_Rec			1,328	4	,857	
	D_Rec(1)	,625	,623	1,008	1	,315	1,869
	D_Rec(2)	,674	,671	1,007	1	,316	1,961
	D_Rec(3)	,657	,691	,904	1	,342	1,930
	D_Rec(4)	,495	,560	,782	1	,377	1,641
	Constant	3,520	1,182	8,870	1	,003	33,779

a. Variable(s) entered on step 1: AH, BI, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	343,519[a]	,514	,685

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Predicted Percentage Correct
Step 1	IPO	0 MSC	206	48	81,1
		1 IPO	18	245	93,2
	Overall Percentage				87,2

a. The cut value is ,500

(continued)

Table D.28.A: Logit Regression for Eq. 4.4 (continued)

Correlations

		AH T-1 IPO 5.1 B Total	BI T-1 IPO 5.3 B Total	BM T-1 IPO 5.3 C Leverage	BL T-1 IPO 5.3 C Growth
AH T-1 IPO 5.1 B Total	Pearson Correlation	1	,330	-,151	-,010
	Sig. (2-tailed)		,000	,001	,829
	N	526	526	526	517
BI T-1 IPO 5.3 B Total	Pearson Correlation	,330	1	,012	-,017
	Sig. (2-tailed)	,000		,786	,694
	N	526	526	526	517
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,151	,012	1	,022
	Sig. (2-tailed)	,001	,786		,610
	N	526	526	526	517
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,010	-,017	,022	1
	Sig. (2-tailed)	,829	,694	,610	
	N	517	517	517	517

Table D.29: Definition of variables in Eq. 4.5
referring to Logit regression estimates in Tables D.30.A to D.30.C

Eq. 4.5

D_IPO = Total Assets + Sales + Leverage + Sales Growth + D_INDUSTRY

Definition of variables in estimation output

D_IPO	Dependant Variable, taking the value of 1 for IPOs
AI	Total Assets
BJ	Sales
BM	Leverage
BL	Sales Growth
D_Rec (1)	Dummy [1]: CYC – consumer cyclical companies
D_Rec (2)	Dummy [1]: IDU – industrial companies
D_Rec (3)	Dummy [1]: NCY – non-consumer cyclical companies
D_Rec (4)	Dummy [1]: TEC – technology companies
Constant	All other industry companies

Table D.30.A: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AI	,000	,000	4,347	1	,037	1,000
	BJ	,000	,000	17,061	1	,000	1,000
	BM	-1,223	,745	2,694	1	,101	,294
	BL	,259	,081	10,244	1	,001	1,296
	D_Rec			4,081	4	,395	
	D_Rec(1)	,147	,697	,045	1	,833	1,159
	D_Rec(2)	,545	,755	,522	1	,470	1,725
	D_Rec(3)	,102	,740	,019	1	,890	1,108
	D_Rec(4)	-,285	,627	,206	1	,650	,752
	Constant	2,535	,915	7,667	1	,006	12,613

a. Variable(s) entered on step 1: AI, BJ, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	355,409[a]	,503	,670

a. Estimation terminated at iteration number 12 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted: IPO 0 MSC	Predicted: IPO 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	207	47	81,5
		1 IPO	12	251	95,4
	Overall Percentage				88,6

a. The cut value is ,500

(continued)

Table D.30.A: Logit Regression for Eq. 4.5 (continued)

Correlations

		AI T-1 IPO 5.1 C Total Assets	BJ T-1 IPO 5.3 C Sales(0)	BM T-1 IPO 5.3 C Leverage	BL T-1 IPO 5.3 C Growth
AI T-1 IPO 5.1 C Total Assets	Pearson Correlation	1	,853	-,016	-,014
	Sig. (2-tailed)		,000	,719	,744
	N	526	526	526	517
BJ T-1 IPO 5.3 C Sales(0)	Pearson Correlation	,853	1	,011	-,016
	Sig. (2-tailed)	,000		,806	,715
	N	526	526	526	517
BM T-1 IPO 5.3 C Leverage	Pearson Correlation	-,016	,011	1	,022
	Sig. (2-tailed)	,719	,806		,610
	N	526	526	526	517
BL T-1 IPO 5.3 C Growth	Pearson Correlation	-,014	-,016	,022	1
	Sig. (2-tailed)	,744	,715	,610	
	N	517	517	517	517

Table D.30.B: Logit Regression for Eq. 4.5 testing differences in Total Assets and Sales between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting Total Assets due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	BJ	,000	,000	66,215	1	,000	1,000
	BM	-1,118	,723	2,391	1	,122	,327
	BL	,249	,077	10,456	1	,001	1,283
	D_Rec			5,678	4	,224	
	D_Rec(1)	,741	,610	1,479	1	,224	2,099
	D_Rec(2)	1,137	,675	2,840	1	,092	3,119
	D_Rec(3)	,565	,669	,712	1	,399	1,759
	D_Rec(4)	,221	,536	,170	1	,680	1,247
	Constant	1,868	,823	5,148	1	,023	6,473

a. Variable(s) entered on step 1: BJ, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	362,314[a]	,496	,661

a. Estimation terminated at iteration number 12 because parameter estimates changed by less than ,001.

Classification Table[a]

	Observed		Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Predicted: Percentage Correct
Step 1	IPO	0 MSC	204	50	80,3
		1 IPO	14	249	94,7
	Overall Percentage				87,6

a. The cut value is ,500

Table D.30.C: Logit Regression for Eq. 4.5
testing differences in Total Assets and Sales
between IPOs and matching seasoned companies (MSC)
in the 1999-2000 interval
(omitting Sales due to multicollinearity)

Variables in the Equation

		B	S.E.	Wald	df	Sig.	Exp(B)
Step 1[a]	AI	,000	,000	83,049	1	,000	1,000
	BM	-1,480	,748	3,918	1	,048	,228
	BL	,119	,030	15,553	1	,000	1,127
	D_Rec			3,619	4	,460	
	D_Rec(1)	-,643	,730	,775	1	,379	,526
	D_Rec(2)	-,156	,784	,039	1	,843	,856
	D_Rec(3)	-,466	,777	,359	1	,549	,628
	D_Rec(4)	-,829	,686	1,462	1	,227	,436
	Constant	3,428	,954	12,922	1	,000	30,820

a. Variable(s) entered on step 1: AI, BM, BL, D_Rec.

B: regression coefficient
SE: standard error
Wald: Wald-statistic
df: degrees of freedom
Sig: p-value

Model Summary

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	380,848[a]	,478	,637

a. Estimation terminated at iteration number 11 because parameter estimates changed by less than ,001.

Classification Table[a]

Observed			Predicted IPO: 0 MSC	Predicted IPO: 1 IPO	Percentage Correct
Step 1	IPO	0 MSC	200	54	78,7
		1 IPO	12	251	95,4
	Overall Percentage				87,2

a. The cut value is ,500

10.5 APPENDIX E (Chapter 6 - Hypothesis 3)

Coefficients of the Ohlson Model - Correlation between respective Regression Variables

Effect of Earnings and R&D Capital on Market Value – Correlation between respective Regression Variables

Table E.1: Coefficients of the Ohlson Model – Reported on Balance and Income Statement or Adjusted for 6 and 10 year Capitalization and Amortization (Cases with high R^2 value) – 1995-2000 Sample

Capitalization and Amortization		Ohlson (1995) Model				Ohlson (1995) Model including dummy variables Eq [5.6]							
		a_0	a_1	a_2	R^2	a_3	a_4	a_5	a_6	a_7	a_8	a_9	R^2
		t statistic				*t statistic*							
R&D	MRK SGA	$MV_t = a_0 + a_1 BV_t + a_2 E_t$				$MV_t = a_3 + a_4 D\_BV_t + a_5 D\_BV_t BV_t + a_6 BV_t + a_7 D\_E_t + a_8 D\_E_t E_t + a_9 E_t$							
						Negative Earnings Coefficients : $a_{8+}a_9$ / Negative Book Value : $a_{5+}a_6$							
IPOs / 1995 – 2000 Sample													
Dependent Variable: MV Offer Price													
Reported	Reported	188953	1.92	-2.66	**0.33**	54530	19435	-3.59	1.62	42374	-20.04	14.86	**0.37**
t statistic		*1.53*	*1.23*	*-1.78*		*0.90*	*1.25*	*-1.83*	*0.96*	*0.44*	*-2.10*	*1.69*	
6 yr	Reported	224463	1.49	1.27	**0.75**	20932	119022	-6.31	1.24	221334	-15.03	14.51	**0.79**
t statistic		*6.47*	*6.59*	*0.56*		*0.59*	*1.11*	*-7.15*	*4.69*	*2.32*	*-4.22*	*3.05*	
10 yr	Reported	248963	1.22	1.54	**0.77**	75537	20840	-6.21	0.27	212240	-18.28	15.14	**0.84**
t statistic		*6.64*	*5.04*	*0.66*		*2.88*	*0.20*	*-5.62*	*0.97*	*3.60*	*-4.88*	*4.30*	
Dependent Variable: MV First Day Close													
Reported	Reported	444380	2.60	-6.00	**0.25**	125037	529371	-2.06	2.15	229844	-34.33	24.90	**0.30**
t statistic		*2.99*	*1.41*	*-2.37*		*1.54*	*1.65*	*-0.64*	*1.09*	*1.54*	*-2.66*	*2.28*	
6 yr	Reported	524613	1.86	-1.67	**0.39**	147869	624526	-1.97	1.42	420163	-25.74	21.29	**0.43**
t statistic		*8.43*	*7.72*	*-0.58*		*2.29*	*1.33*	*-0.42*	*5.20*	*2.86*	*-4.14*	*3.07*	
10 yr	Reported	537999	1.69	-1.77	**0.39**	288498	498875	-2.93	0.59	324742	-20.80	14.13	**0.43**
t statistic		*7.87*	*4.98*	*-0.54*		*4.36*	*1.08*	*-0.48*	*1.11*	*2.42*	*-2.61*	*2.08*	
Seasoned Companies / 1995 – 2000 Sample													
Dependent Variable: MV Price for Seasoned Companies													
Reported	Reported	18775	0.23	0.17	**0.72**	18632	19397	-0.14	0.17	-5596.95	-0.64	0.53	**0.76**
t statistic		*2.86*	*5.86*	*1.30*		*2.93*	*0.93*	*-1.28*	*3.54*	*-0.77*	*-2.28*	*2.27*	
6 yr (Lag5)	Reported	18434	0.15	0.25	**0.77**	18850	32404	-0.01	0.11	-6970	-0.49	0.49	**0.78**
t statistic		*4.08*	*7.56*	*2.57*		*3.79*	*1.28*	*-0.07*	*3.48*	*-1.11*	*-1.58*	*2.20*	
10 yr (Lag 9)	Reported	20370	0.12	0.29	**0.77**	19425	15812	-0.30	0.09	-5408	-0.50	0.50	**0.79**
t statistic		*5.07*	*7.31*	*2.89*		*4.13*	*0.37*	*-0.37*	*3.85*	*-0.83*	*-1.77*	*2.63*	

Table E.2: Correlation between the Regression Independent Variables (see Table E.1)

IPOs / 1995 – 2000 Sample						
As reported	D BV	D BV*BV	BV	D E	D E*E	E
D_BV	1.00	-0.46	-0.13	0.09	0.04	0.03
D_BV*BV	-0.46	1.00	0.10	-0.04	0.03	0.03
BV	-0.13	0.10	1.00	0.06	-0.50	-0.42
D_E	0.09	-0.04	0.06	1.00	-0.41	-0.48
D_E*E	0.04	0.03	-0.50	-0.41	1.00	0.97
E	0.03	0.03	-0.42	-0.48	0.97	1.00
6 yr Amort/Capital	D_BV_L5	D_BV_L5*BV_L5	BV_L5	D_E_L5	D_E_L5*E_L5	E_L5
D BV L5	1	-0.58	-0.06	0.09	0	-0.03
D BV L5*BV L5	-0.58	1	0.04	-0.05	0.01	0.02
BV L5	-0.06	0.04	1	-0.02	-0.15	0.11
D E L5	0.09	-0.05	-0.02	1	-0.43	-0.52
D E L5*E L5	0	0.01	-0.15	-0.43	1	0.91
E_L5	-0.03	0.02	0.11	-0.52	0.91	1
10 yr Amort/Capital	D BV L9	D BV L9*BV L9	BV L9	D E L9	D E L9*E L9	E L9
D_BV_L9	1.00	-0.60	-0.05	0.09	0.00	-0.03
D_BV_L9*BV_L9	-0.60	1.00	0.04	-0.05	0.00	0.01
BV_L9	-0.05	0.04	1.00	-0.02	-0.13	0.62
D_E_L9	0.09	-0.05	-0.02	1.00	-0.43	-0.40
D_E_L9*E_L9	0.00	0.00	-0.13	-0.43	1.00	0.65
E_L9	-0.03	0.01	0.62	-0.40	0.65	1.00
Seasoned Companies / 1995 –2000 Sample						
As reported	D BV	D BV*BV	BV	D E	D E*E	E
D_BV	1.00	-0.72	-0.11	0.10	-0.20	-0.14
D_BV*BV	-0.72	1.00	0.10	-0.01	0.14	0.10
BV	-0.11	0.10	1.00	-0.18	-0.06	0.61
D_E	0.10	-0.01	-0.18	1.00	-0.30	-0.34
D_E*E	-0.20	0.14	-0.06	-0.30	1.00	0.60
E	-0.14	0.10	0.61	-0.34	0.60	1.00
6 yr Amort/Capital	D_BV_L5	D_BV_L5*BV_L5	BV_L5	D_E_L5	D_E_L5*E_L5	E_L5
D BV L5	1.00	-0.81	-0.07	0.03	-0.08	-0.06
D BV L5*BV L5	-0.81	1.00	0.06	0.01	0.00	0.02
BV L5	-0.07	0.06	1.00	-0.14	-0.17	0.57
D E L5	0.03	0.01	-0.14	1.00	-0.31	-0.34
D E L5*E L5	-0.08	0.00	-0.17	-0.31	1.00	0.57
E L5	-0.06	0.02	0.57	-0.34	0.57	1.00
10 yr Amort/Capital	D BV L9	D BV L9*BV L9	BV L9	D E L9	D E L9*E L9	E L9
D_BV_L9	1.00	-0.87	-0.05	0.06	-0.10	-0.07
D_BV_L9*BV_L9	-0.87	1.00	0.05	0.00	0.00	0.02
BV_L9	-0.05	0.05	1.00	-0.11	-0.17	0.61
D_E_L9	0.06	0.00	-0.11	1.00	-0.32	-0.33
D_E_L9*E_L9	-0.10	0.00	-0.17	-0.32	1.00	0.51
E_L9	-0.07	0.02	0.61	-0.33	0.51	1.00

Table E.3: Coefficients of the Ohlson Model – Reported on Balance and Income Statement or Adjusted for 6 and 10 year Capitalization and Amortization (Cases with high R^2 value) – 1995-1998 Sample

Capitalization and Amortization		Ohlson (1995) Model				Ohlson (1995) Model including dummy variables Eq [5.6]							
		a_0	a_1	a_2	R^2	a_3	a_4	a_5	a_6	a_7	a_8	a_9	R^2
		t statistic				*t statistic*							
R&D	MRK SGA	$MV_t = a_0 + a_1 BV_t + a_2 E_t$				$MV_t = a_3 + a_4 D\ BV_t + a_5 D\ BV_t BV_t + a_6 BV_t + a_7 D\ E_t + a_8 D\ E_t E_t + a_9 E_t$							
						Negative Earnings Coefficients : a_8+a_9 / Negative Book Value : a_5-a_6							
IPOs / 1995 – 1998 Sample													
Dependent Variable: MV Offer Price													
Reported	Reported	-55189	5.43	-5.40	**0.92**	-57668	378906	-9.93	5.30	-125725	-3.47	-4.43	**0.94**
t statistic		*-2.19*	*14.53*	*-2.40*		*-2.02*	*2.52*	*-3.08*	*11.47*	*-2.51*	*-0.48*	*-0.83*	
6 yr	Reported	89674	1.41	9.50	**0.95**	20112	-18226	-8.97	1.51	39194	-11.35	9.02	**0.96**
t statistic		*-0.45*	*3.35*	*1.07*		*1.23*	*-0.39*	*-3.03*	*30.81*	*1.54*	*-4.25*	*3.57*	
10 yr	Reported	120177	1.50	4.98	**0.95**	47169	-54663	-7.71	0.54	57247	-15.05	11.76	**0.96**
t statistic		*7.42*	*6.00*	*2.15*		*2.89*	*-1.14*	*-2.59*	*2.31*	*1.83*	*-4.32*	*3.80*	
Dependent Variable: MV First Day Close													
Reported	Reported	-19855	6.29	-5.16	**0.90**	-49883	329972	-16.83	6.01	-95196	-7.26	-1.72	**0.92**
t statistic		*-0.65*	*13.62*	*-1.68*		*-1.13*	*2.23*	*-2.48*	*10.99*	*-1.38*	*-0.77*	*-0.23*	
6 yr	Reported	146824	1.78	6.83	**0.93**	41082	-152095	-20.87	1.66	64129	-16.74	12.97	**0.94**
t statistic		*6.52*	*29.22*	*2.29*		*1.21*	*-1.19*	*-2.70*	*21.35*	*1.34*	*-3.90*	*3.15*	
10 yr	Reported	185734	1.11	6.73	**0.92**	79712	-198467	-19.98	0.40	84580	-21.27	16.22	**0.94**
t statistic		*7.57*	*4.21*	*1.92*		*2.58*	*-1.58*	*-2.79*	*1.11*	*1.54*	*-4.04*	*3.42*	
Seasoned Companies / 1995 – 1998 Sample													
Dependent Variable: MV Price for Seasoned Companies													
Reported	Reported	1254	0.21	0.42	**0.94**	153	-22944	-0.51	0.13	5602	-0.95	0.84	**0.95**
t statistic		*0.45*	*5.90*	*2.61*		*0.04*	*-0.77*	*-1.33*	*1.97*	*1.70*	*-2.44*	*2.90*	
6 yr (Lag5)	Reported	2690	0.13	0.43	**0.97**	1132	N/A	-0.07	0.09	2893.42	-1	0.71	**0.97**
t statistic		*1.06*	*6.05*	*2.82*		*0.44*		*-0.82*	*2.45*	*1.46*	*-2.29*	*2.79*	
10 yr (Lag 9)	Reported	4233	0.10	0.48	**0.97**	2135	N/A	-0.04	0.08	2180	-0.64	0.63	**0.97**
t statistic		*1.93*	*6.31*	*3.69*		*1.03*		*-0.58*	*3.70*	*1.10*	*-2.72*	*3.51*	

Table E.4: Correlation between the Regression Independent Variables (see Table E.3)

IPOs / 1995 – 1998 Sample						
As reported	D_BV	D_BV*BV	BV	D_E	D_E*E	E
D_BV	1.00	-0.60	-0.11	0.04	0.04	0.02
D_BV*BV	-0.60	1.00	0.09	0.03	-0.02	-0.03
BV	-0.11	0.09	1.00	0.04	-0.74	-0.48
D_E	0.04	0.03	0.04	1.00	-0.36	-0.45
D_E*E	0.04	-0.02	-0.74	-0.36	1.00	0.88
E	0.02	-0.03	-0.48	-0.45	0.88	1.00
6 yr AmortCapital	D_BV_L5	D_BV_L5*BV_L5	BV_L5	D_E_L5	D_E_L5*E_L5	E_L5
D_BV_L5	1.00	-0.76	-0.03	-0.01	0.01	-0.02
D_BV_L5*BV_L5	-0.76	1.00	0.03	0.03	-0.02	-0.01
BV_L5	-0.03	0.03	1.00	-0.05	0.02	0.57
D_E_L5	-0.01	0.03	-0.05	1.00	-0.55	-0.45
D_E_L5*E_L5	0.01	-0.02	0.02	-0.55	1.00	0.54
E_L5	-0.02	-0.01	0.57	-0.45	0.54	1.00
10 yr Amort/Capit	D_BV_L9	D_BV_L9*BV_L9	BV_L9	D_E_L9	D_E_L9*E_L9	E_L9
D_BV_L9	1.00	-0.73	-0.03	-0.01	0.01	-0.02
D_BV_L9*BV_L9	-0.73	1.00	0.02	0.03	-0.02	0
BV_L9	-0.03	0.02	1.00	-0.05	0.02	0.96
D_E_L9	-0.01	0.03	-0.05	1.00	-0.53	-0.21
D_E_L9*E_L9	0.01	-0.02	0.02	-0.53	1.00	0.23
E_L9	-0.02	0	0.96	-0.21	0.23	1.00
Seasoned Companies / 1995 – 1998 Sample						
As reported	D_BV	D_BV*BV	BV	D_E	D_E*E	E
D_BV	1.00	-0.94	-0.05	0.03	-0.39	-0.09
D_BV*BV	-0.94	1.00	0.05	0.01	0.23	0.06
BV	-0.05	0.05	1.00	-0.17	0.04	0.96
D_E	-0.03	0.01	-0.17	1.00	-0.40	-0.24
D_E*E	-0.39	0.23	0.04	-0.40	1.00	0.24
E	-0.09	0.06	0.96	-0.24	0.24	1.00
6 yr Amort/Capital	D_BV_L5	D_BV_L5*BV_L5	BV_L5	D_E_L5	D_E_L5*E_L5	E_L5
D_BV_L5	N/A	N/A	N/A	N/A	N/A	N/A
D_BV_L5*BV_L5	N/A	1.00	0.03	-0.11	-0.01	0.02
BV_L5	N/A	0.03	1.00	-0.13	0.02	0.97
D_E_L5	N/A	-0.11	-0.13	1.00	-0.42	0.23
D_E_L5*E_L5	N/A	-0.01	0.02	-0.42	1.00	0.20
E_L5	N/A	0.02	0.97	-0.23	0.20	1.00
10 yr Amort/Capital	D_BV_L9	D_BV_L9*BV_L9	BV_L9	D_E_L9	D_E_L9*E_L9	E_L9
D_BV_L9	N/A	N/A	N/A	N/A	N/A	N/A
D_BV_L9*BV_L9	N/A	1.00	0.03	-0.13	0.01	0.02
BV_L9	N/A	0.03	1.00	-0.12	0.02	0.96
D_E_L9	N/A	-0.13	-0.12	1.00	-0.45	-0.21
D_E_L9*E_L9	N/A	0.01	0.02	-0.45	1.00	0.18
E_L9	N/A	0.02	0.96	-021	0.18	1.00

Table E.5: Coefficients of the Ohlson Model – Reported on Balance and Income Statement or Adjusted for 4 and 6 year Capitalization and Amortization (Cases with high R^2 value) – 1999-2000 Sample

Capitalization and Amortization		Ohlson (1995) Model				Ohlson (1995) Model including dummy variables Eq [5.6]							
		a_0	a_1	a_2	**R^2**	a_3	a_4	a_5	a_6	a_7	a_8	a_9	**R^2**
		t statistic				*t statistic*							
R&D	MRK SGA	$MV_t = a_0 + a_1 BV_t + a_2 E_t$				$MV_t = a_3 + a_4 D\ BV_t + a_5 D\ BV_t BV_t + a_6 BV_t + a_7 D\ E_t + a_8 D\ E_t E_t + a_9 E_t$							
						Negative Earnings Coefficients : a_8+a_9 / Negative Book Value : a_5+a_6							
IPOs / 1999 – 2000 Sample													
Dependent Variable: MV Offer Price													
Reported	Reported	424491	0.18	-2.08	**0.07**	302496	-3898	-1.95	0.01	42077	-25.33	21.68	**0.21**
t statistic		*9.43*	*0.60*	*-2.08*		*4.23*	*-0.03*	*-3.19*	*0.05*	*0.49*	*-4.07*	*3.64*	
4 yr	Reported	432670	0.29	-1.54	**0.07**	262276	-8969	-3.86	0.10	94776	-21.38	17.99	**0.21**
t statistic		*8.72*	*0.84*	*-1.41*		*4.24*	*-0.06*	*-5.28*	*0.32*	*1.23*	*-4.97*	*4.66*	
6 yr	Reported	434083	0.33	-1.27	**0.07**	250613	-21002	-5.04	0.11	114112	-20.32	17.11	**0.20**
t statistic		*8.48*	*0.93*	*-1.23*		*4.28*	*-0.15*	*-5.71*	*0.38*	*1.54*	*-5.04*	*4.78*	
Dependent Variable: MV First Day Close													
Reported	Reported	949743	0.87	-3.85	**0.04**	644596	546996	1.61	0.55	93995	-53.19	45.90	**0.09**
t statistic		*6.93*	*1.01*	*-1.46*		*3.39*	*1.12*	*0.73*	*0.67*	*0.38*	*-4.15*	*3.83*	
4 yr	Reported	980150	1.16	-1.35	**0.04**	606610	575735	1.04	0.80	190339	-42.80	37.74	**0.08**
t statistic		*6.76*	*1.24*	*-0.67*		*3.18*	*0.95*	*0.30*	*0.91*	*0.81*	*-3.41*	*3.14*	
6 yr	Reported	980425	1.19	-1.04	**0.04**	581535	554938	0.30	0.79	231000	-40.37	35.51	**0.08**
t statistic		*6.70*	*1.29*	*-0.52*		*3.15*	*0.93*	*0.07*	*0.92*	*0.99*	*-3.30*	*3.06*	
Seasoned Companies / 1999 – 2000 Sample													
Dependent Variable: MV Price for Seasoned Companies													
Reported	Reported	1254	0.21	0.42	**0.94**	153	-22944	-0.51	0.13	5602	-0.95	0.84	**0.95**
t statistic		*0.45*	*5.90*	*2.61*		*0.04*	*-0.77*	*-1.33*	*1.97*	*1.70*	*-2.44*	*2.90*	
6 yr (Lag5)	Reported	2690	0.13	0.43	**0.97**	1132	N/A	-0.07	0.09	2893.42	-1	0.71	**0.97**
t statistic		*1.06*	*6.05*	*2.82*		*0.44*		*-0.82*	*2.45*	*1.46*	*-2.29*	*2.79*	
10 yr (Lag 9)	Reported	4233	0.10	0.48	**0.97**	2135	N/A	-0.04	0.08	2180	-0.64	0.63	**0.97**
t statistic		*1.93*	*6.31*	*3.69*		*1.03*		*-0.58*	*3.70*	*1.10*	*-2.72*	*3.51*	

Table E.6: Correlation between the Regression Independent Variables (see Table E.5)

IPOs / 1999 – 2000 Sample						
As reported	D_BV	D_BV*BV	BV	D_E	D_E*E	E
D_BV	1.00	-0.44	-0.16	0.11	0.08	0.06
D_BV*BV	-0.44	1.00	0.12	-0.05	0.02	0.02
BV	-0.16	0.12	1.00	-0.01	-0.43	-0.39
D_E	0.11	-0.05	-0.01	1.00	-0.32	-0.39
D_E*E	0.08	0.02	-0.43	-0.32	1.00	0.99
E	0.06	0.02	-0.39	-0.39	0.99	1.00
4 yr Amort/Capital	D_BV_L3	D_BV_L3*BV_L3	BV_L3	D_E_L3	D_E_L3*E_L3	E_L3
D_BV_L3	1.00	-0.50	-0.14	0.07	0.04	0.02
D_BV_L3*BV_L3	-0.50	1.00	0.10	-0.05	0.01	0.02
BV_L3	-0.14	0.10	1.00	0.01	-0.40	-0.35
D_E_L3	0.07	-0.05	0.01	1.00	-0.34	-0.44
D_E_L3*E_L3	0.04	0.01	-0.40	-0.34	1.00	0.98
E_L3	0.02	0.02	-0.35	-0.44	0.98	1.00
6 yr Amort/Capital	D_BV_L5	D_BV_L5*BV_L5	BV_L5	D_E_L5	D_E_L5*E_L5	E_L5
D_BV_L5	1.00	-0.52	-0.14	0.08	0.04	0.02
D_BV_L5*BV_L5	-0.52	1.00	0.10	-0.06	0.00	0.01
BV_L5	-0.14	0.10	1.00	0.01	-0.41	-0.34
D_E_L5	0.08	-0.06	0.01	1.00	-0.35	-0.45
D_E_L5*E_L5	0.04	0.00	-0.41	-0.35	1.00	0.97
E_L5	0.02	0.01	-0.34	-0.45	0.97	1.00
Seasoned Companies / 1999 – 2000 Sample						
As reported	D_BV	D_BV*BV	BV	D_E	D_E*E	E
D_BV	1.00	-0.72	-0.18	0.17	-0.18	-0.16
D_BV*BV	-0.72	1.00	0.16	-0.03	0.13	0.11
BV	-0.18	0.16	1.00	-0.17	-0.05	0.48
D_E	0.17	-0.03	-0.17	1.00	-0.41	-0.43
D_E*E	-0.18	0.13	-0.05	-041	1.00	0.68
E	-0.16	0.11	0.48	-0.43	0.68	1.00
6 yr Amort/Capital	D_BV_L5	D_BV_L5*BV_L5	BV_L5	D_E_L5	D_E_L5*E_L5	E_L5
D_BV_L5	1.00	-0.78	-0.11	-0.01	-0.07	-0.07
D_BV_L5*BV_L5	-0.78	1.00	0.09	0.05	-0.01	0.02
BV_L5	-0.11	0.09	1.00	-0.13	-0.19	0.39
D_E_L5	-0.01	0.05	-0.13	1.00	-0.41	-0.43
D_E_L5*E_L5	-0.07	-0.01	-0.19	-0.41	1.00	0.66
E_L5	-0.07	0.02	0.39	-0.43	0.66	1.00
10 yr Amort/Capital	D_BV_L9	D_BV_L9*BV_L9	BV_L9	D_E_L9	D_E_L9*E_L9	E_L9
D_BV_L9	1.00	-0.84	-0.09	0.03	-0.11	-0.09
D_BV_L9*BV_L9	-0.84	1.00	0.08	-0.05	0	0.02
BV_L9	-0.09	0.08	1.00	-0.11	-0.20	0.43
D_E_L9	0.03	0.05	-0.11	1.00	-0.41	-0.42
D_E_L9*E_L9	-0.11	0	-0.20	-0.41	1.00	0.60
E_L9	-0.09	0.02	0.43	-0.42	0.60	1.00

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