THE IMPACT OF INTERNATIONAL CROSS-LISTING ON THE COST OF CAPITAL

Submitted by

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* Parts of this chapter are based on Arauner and Levis (1996).

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Declaration

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Abstract

The question of international capital market integration or segmentation has become an important issue for international investors and for companies seeking to source their capital internationally. Previous research has suggested that international listing represents one effective way to mitigate the effects of international market segmentation. Segmentation is caused by various types of barriers to international investment as restrictions on portfolio investment, liquidity, and a poor institutional environment. Previous studies have shown that liquidity, the size of the investor base, and market segmentation influence the cost of capital. Hence, an international listing may reduce a firm's cost of capital, if it increases the size of the investor base, leads to an increase in the liquidity of a firm's stock, and reduces international market segmentation.

The objective of this study is to examine whether an international listing on the London Stock Exchange, NASDAQ, and the New York Stock Exchange (NYSE) has an impact on the cost of capital of firms. The main focus of this study is to investigate if the decision to raise equity capital with the listing affects liquidity and market integration. The purpose of the thesis is fourfold: (1) to investigate whether foreign firms that list on NYSE or NASDAQ experience more positive wealth effects in the pre-listing period and a stronger decline in expected returns in the post-listing period than London listings; (2) to compare changes in the liquidity of stocks when they become internationally listed on one of the three major global stock exchanges, the London Stock Exchange, the New York Stock Exchange (NYSE), and NASDAQ; (3) to examine the effect of alternative international equity offering methods on liquidity

and its subsequent impact on the cost of capital; (4) to investigate the transfer of pricing information for non-US companies that conducted a simultaneous initial public offering on the NYSE and on their domestic stock exchange.

We find that foreign firms that list on the New York Stock Exchange or NASDAQ experience positive abnormal returns prior to their US listing, and a decline in expected returns in the post-listing period. On the contrary, foreign firms that list on the London Stock Exchange do not experience any significant changes. This suggests that the benefits associated with a US listing are higher, since foreign firms make themselves more accessible for US investors by complying with the stringent disclosure requirements of the Securities and Exchange Commission (SEC). These benefits may even be higher for emerging market firms which use their ADR listing to raise equity capital. Although emerging market firms may try to time their issues to take advantage of some form of "emerging market sentiment", the evidence is only weak. The finding of substantial positive returns of the ADR price for firms that upgrade their previously OTC-traded ADR programme to a listing are rather an indication of the benefits experienced with a listing.

The results show that the liquidity of stocks which list on the London Stock Exchange, the New York Stock Exchange, and NASDAQ increases subsequent to the listing. However, firms listing on NYSE appear to experience the strongest abnormal volume effects. In addition to the persistent long-term impact on liquidity, we also document significant short-term trading volume effects of international listings. Our comparison of international listings and control firms matched by nationality, firm size, and industry confirms our finding that internationally listed firms experience an increase in liquidity. This study also provides evidence that 80 percent of our sample firms, which obtained a "full" ADR listing on NYSE or NASDAQ,

experience an increase in their total order flow. Moreover, the US order flow of NYSE-listed firms is higher than in their pre-listing domestic market for 83 percent of our sample firms.

The results provide evidence that non-US firms which conduct a public offerings in the US have lower bid-ask spreads than private placements. Our sample consists of 231 international equity offerings from 33 countries world-wide; 86 companies conducted a public offering on NYSE or NASDAQ, and 145 companies raised capital in the private placement market. We find that the decision between a public offering or a private placement under Rule 144 A has an impact on the cost of capital of a firm. Our cost-benefit analysis shows that the benefits of a public offering outweigh the cost advantage of private placements. We provide empirical evidence that the interaction between the domestic and the foreign stock market leads to lower bid-ask spreads for internationally listed firms. The investigation of the determinants of domestic and foreign trading volume indicates that international listing increases the total trading volume. Trading volume on the foreign stock exchange appears to be strongly influenced by the percentage of equity issued in the foreign market.

In contrast to previous studies that examine “normal” cross-listings, our results show that in many cases NYSE prices seem to lead domestic prices. This result is particularly pronounced for emerging market shares whose domestic markets often appear to be pure satellites of the NYSE market. Our results also show a higher speed of convergence between ADRs and underlying shares for developed market firms implying that arbitrage is undertaken more quickly. A comparative order flow analysis provides consistent evidence since a great number of firms experience a higher trading activity on the NYSE than on their domestic market. While previous evidence suggests that ADR IPOs are less underpriced than US IPOs, our results do

not indicate any differences. Moreover, initial returns of emerging market and developed market IPOs do not seem to differ.

1. Chapter: Introduction

Recent years have seen a strong trend towards globalisation of capital markets. The finance literature has suggested that international capital market integration is beneficial for companies and investors. Globalisation has taken the form of foreign portfolio or direct investment, mergers with foreign firms, and cross-listing on foreign stock exchanges. International listings enable investors to diversify their portfolios with foreign stocks. On the other hand they provide firms with the opportunity to source their capital globally, reduce their cost of capital, and increase shareholder value.

The cost of capital is influenced by a number of factors. In addition to the factors suggested by the CAPM, the literature has shown that liquidity, investor recognition, and international market segmentation influence the cost of capital of a firm. Since international listing may have an impact on these three factors, it may affect the cost of capital. If international listing leads to a reduction in the cost of capital, this may explain the decision of firms to obtain a listing on a foreign stock exchange with more stringent listing requirements than its home exchange. Similar to research on domestic exchange listings, previous literature has examined changes in expected returns and liquidity from the pre- to the post-listing period. Previous studies have also investigated certain features of internationally listed companies to shed more light on their motives.

Studies investigating whether international listing reduces international market segmentation, and hence expected returns, have examined the behaviour of stock returns in the pre- and the post-listing period. Their results, however, have not been

unanimous. Differences seem to exist across companies from different countries and between stock exchanges. Moreover, post-listing period returns appear to resemble the negative long-run performance of new issues and domestic exchange listings. While the international listing literature interprets this stock return behaviour as being consistent with a decline in expected returns, the new issues literature postulates investor sentiment as the causal factor. Hence, market conditions may also be of importance for international listings. In particular, when taking into account that a great number of firms have used their international listing to raise capital in recent years. Firms have tapped international markets to conduct initial public offerings (IPOs) and seasoned equity offerings alike which were structured as global equity offerings.

The importance of liquidity for pricing financial assets is backed up by a great number of empirical studies. The market microstructure literature examines the factors influencing liquidity in various contexts. These studies have shown that events as, for example, domestic exchange listings, changes in the index list, and derivatives trading have an impact on liquidity. Research that examines changes in liquidity from the pre- to the post-listing period for international listings provides more or less consistent results. Using different measures of liquidity as bid-ask spreads, trading volume, and depth, most studies find that international listing increases the liquidity of a stock. Although previous theoretical and empirical research has shown that international listing offers liquidity benefits for companies, differences across the three main stock exchanges for international listings - London, NASDAQ, and NYSE - have not been examined. Since a listing can also involve substantial costs for a company, the choice of a particular stock exchange bears important management

implications from a cost-benefit perspective. If one stock exchange offers higher liquidity benefits than other exchanges this could outweigh the higher costs of listing.

The growth of international investment in recent years has also raised questions concerning the linkage and dynamic interaction of international markets. Previous studies that examine the interdependence of international stock markets provide evidence that information shocks are transmitted rapidly between markets. The issue of price interactions is of particular importance for ADRs (American Depositary Receipts), which are the main vehicle to list foreign shares on an US exchange, and their underlying shares on the listing firm's home exchange. The possibility for investors to simultaneously trade almost identical assets in two different markets raises important questions concerning the degree of integration of internationally cross-listed stocks. Moreover, it bears managerial implications for the disclosure of information to the market and the communication with shareholders in multiple markets.

Therefore, there is a need to undertake empirical analysis that compares the impact of international listing on the London Stock Exchange, NASDAQ, and the New York Stock Exchange on the factors of the cost of capital as international market segmentation, investor recognition, and liquidity.

1.1 The objective of the study

Previous studies have shown the impact of international listing on market segmentation, investor recognition, and liquidity. It has often been argued that listing gives firms greater access to foreign capital markets, and thus enables them to raise capital more cheaply. However, the influence of institutional characteristics on the

above specified factors and the link to the capital raising activity of firms has not been examined. Therefore, the objective of this study is to examine whether an international listing on the London Stock Exchange, NASDAQ, or the New York Stock Exchange has an impact on the cost of capital of firms. In particular, we aim to investigate if the decision to raise equity capital with the listing affects liquidity and market integration. The general aim of the study is fourfold:

Firstly, to examine whether US listings experience more positive wealth effects in the pre-listing period and a stronger decline in expected returns in the post-listing period, since foreign firms face higher barriers to access the US market than the UK market. We investigate whether emerging market firms that raise equity capital with their listing experience stronger benefits than developed market firms because they are more segmented from the US market. Moreover, we also aim to assess if the performance of ADR listings is subject to market conditions.

Secondly, to compare the impact on liquidity for London, NASDAQ, and NYSE listings and to examine differences in the magnitude of this impact for public offerings and introductions. To shed more light on the motives of firms to obtain an international cross-listing, we compare our sample firms to control sample firms matched by nationality, industry, and size. We also examine whether an ADR listing on NYSE or NASDAQ increases the total order flow of internationally listed firms.

Thirdly, to investigate the effect of alternative international equity offering methods on liquidity and its subsequent implications for the cost of capital. We also aim to provide some evidence why public offerings have lower bid-ask spreads than private placements.

Fourthly, to test the effectiveness of the market in transferring information for emerging and developed market companies that conducted a simultaneous initial public offering on the NYSE and on their domestic stock exchange. We analyse the speed of adjustment between ADR prices and underlying share prices which allows important inferences concerning the integration of both markets. First day returns and issue day trading volume is also analysed.

The samples used for testing these four issues are different. In general, the sample of internationally listed firms comprises all foreign firms that obtained a listing on the London Stock Exchange, NASDAQ, and the NYSE during the period from January 1980 to December 1994. To construct a control sample, we match listed firms by nationality, size, and industry. The sample of international equity offerings includes all issues from non-US firms with an US tranche between 1984 and 1994. The global IPO sample comprises all firms that conducted an IPO of ADRs on the NYSE between 1991 and July 1994, and were not publicly traded in their home market prior to their offering. Information concerning a firm's listing status and their date of listing is provided by the London Stock Exchange, NASDAQ, and the New York Stock Exchange. Data on international equity offerings is obtained from two data sources: a) the ADR data base of The Bank of New York, and b) Omnibase, a data base for international securities issues from Security Data Company (SDC). Stock price and trading volume data is collected from Datastream.

1.2 Limitations of the study

A number of limitations may be identified in this empirical work:

1) The analysis of wealth effects of international listings in Chapter 6 uses the actual listing dates as the point of reference since the date of the listing announcement is not available.

2) Data unavailability has been one of the major problems of this study. Since this project has involved companies from many different international countries, it was found that very often not sufficient historical price data was available. Since many companies only listed in 1994, not all companies have data for the same length of time. Moreover, Datastream does not provide volume data for certain countries. In addition, the data on IPOs was limited since we lacked offering prices and the offering size in the domestic market. These problems have partly limited the sample size and the sample period used in this study.

The data unavailability has also caused some methodological limitations. Previous research has highlighted the importance of the book-to-market factor for asset pricing. A great number of studies measuring the long-run performance of new issues have taken account of this finding and attempted to control for it. However, this adjustment was not possible in Chapter 6 due to data limitations and the lack of comparability for international companies from different countries.

3) There has been no attempt to control for confounding effects that may have influenced the listing decision in one particular market. Companies could have listed in the US and the UK to assist their foreign business activities. These include, for example, to obtain a higher profile for the firm's products, to build up manufacturing facilities, to finance subsidiaries, or to facilitate acquisitions in the foreign country.

4) The fact that the analysis draws from the existence of institutional differences between the US and the UK market represents a potential limitation of the study.

Although these differences prevailed throughout the sample period, a question arises: would the findings be irrelevant if the SEC relaxed their stringent requirements? However, we believe the differences in the institutional framework are only one factor that determines differences in the wealth effect and liquidity across the US and UK market upon international listing. If the current regulations ceased to exist, this would even provide an opportunity to discriminate the "regulatory effect" from the pure "liquidity effect", due to differences in the trading systems, or from other market imperfections, as settlement problems or poor custodial services in emerging markets.

1.3 Overview of the study

Chapter 2 discusses the different types and methods of international listing. The discussion of the type of foreign shares explains the special characteristics of ADRs. Moreover, it also highlights the relevance of international listing by providing evidence on recent trends in the area of international listing.

Chapter 3 examines the structure of the international equities market. It explores differences in the institutional framework that governs the issuance and trading of foreign equities in the US and UK. While the UK approach of regulating foreign securities is based on mutual recognition, the US insists on national treatment for foreign firms. This represents a particular hurdle for foreign companies seeking to access the US capital market. This chapter also discusses the current state of the primary market and the secondary market. The key institutional issues provide important implications for our subsequent empirical analysis.

Chapter 4 reviews the existing literature that related to the effect of international listing on the cost of capital. Particular attention is paid to the factors of the cost of capital which have modified the original CAPM framework and have been shown to be of relevance for international listings. The link between international listing and the impact of international market segmentation on the cost of capital is investigated by examining the stock price behaviour of listings in the pre- and the post-listing period. Inferences are also made by reviewing the long-run performance literature of new issues and domestic exchange listings.

Chapter 5 discusses that stream of the literature related to the motivation of companies to list internationally. The most widely examined motive has been the liquidity proposition which arises from the literature investigating the factors of the cost of capital, as presented in the previous chapter. The review discusses the relationship between listing and liquidity in a wider context extending it to different forms of listing and liquidity-related factors. It also reviews a number of studies that explore the importance of financial disclosure levels on the listing decision and the size of the company. Important implications concerning the timing of listings arise from the equity issue literature. Other factors that have been put forward by previous research are foreign business activity and geographical proximity. It also summarises the implications of the previous literature, as discussed in this chapter and the previous chapter, for further research and identifies the areas that will be investigated in this study.

Chapter 6 provides empirical evidence on the impact of international market segmentation and market conditions on the stock price behaviour of listings. Event study methodology is used to examine the effects of the different institutional framework prevailing in the US and the UK on stock returns in the pre- and post-

listing period. It also explores differences in the price reaction for developed and emerging market firms. The benefits of a listing may be higher for emerging market firms because they face higher barriers in accessing the US market. Since a great number of studies have shown that the performance of new issues is subject to market conditions, we also examine timing-related explanations using two proxies for market conditions. The examination of listing day abnormal returns for firms that upgraded their OTC-traded ADR programme to a listing provides an indication of the benefits experienced with a listing.

Chapter 7 examines the implications of the decision to list on the London Stock Exchange, NASDAQ, and the NYSE and on the liquidity of listed firms. It tests the hypothesis that firms listing on an US exchange experience larger liquidity benefits than London listings. Moreover, it examines whether firms that conduct a public offering exhibit larger benefits than introductions. The comparison to nationality-, industry-, and size-matched firms verifies our results and provides evidence on the motives of firms to list internationally. The order flow effects of ADR listings are also discussed.

Further evidence of the impact of listing on liquidity is provided in Chapter 8. A number of alternative international equity offering methods are examined and evaluated in a cost-benefit framework. We measure differences in liquidity by comparing bid-ask spreads of public offerings and private placements of non-US firms whose international equity offering included an US tranche. Bid-ask spreads are calculated from transaction returns taking account of portfolio autocorrelation. Moreover, we control differences in bid-ask spreads for other factors influencing them. Using the framework provided by the liquidity literature, this chapter also analyses the liquidity impact on the cost of capital and quantifies the trade-offs.

Chapter 9 examines price interactions of cross-border initial public offerings (IPOs) for developed and emerging market firms. The review of previous literature has provided evidence of the linkage and dynamic interaction of various international markets. Studies on international cross-listings have shown that the domestic market exerts the price leadership. Since the prices of ADRs and underlying shares, which have been simultaneously offered on NYSE and in the domestic market, are expected to interact, we employ the theory of cointegration and the Garbade and Silber approach to test their relationship. The speed of price convergence between the ADR market and the underlying share market provides evidence on the degree of integration between the domestic market and the NYSE. It also allows inferences concerning differences in transaction costs between both markets. Similar to the IPO literature, first day returns and first day trading activity is investigated.

The final chapter presents the main conclusions derived from the previous analysis. It also provides suggestions for further research in the area of international listings.

2. Chapter: Aspects of international listing

The benefits of international diversification are now widely acknowledged by investors. The discussion has shifted to the issue of how to invest in foreign assets and to remove the remaining barriers still dividing financial markets. The integration of capital markets is of importance to international investors and to companies seeking to source their capital internationally. Previous research suggests that companies can reduce their cost of capital if existing barriers of investment are dismantled and diversification opportunities for foreign investors are increased.

The importance of international equity investment has substantially increased over time. The amount of US investment in foreign shares has constantly grown from US$100bn in 1991 to US$320bn in 1995[1]. The value of foreign shares traded on US exchanges has increased from US$80bn in 1991 to US$270bn in 1995[2], and the London Stock Exchange reports a turnover in foreign equities of £395bn in 1995[3]. The figures highlight two key issues that are of importance in the international equities area:

- Trading in international equities

- International equity offerings

International listing is suggested as one effective way to mitigate the effects of international market segmentation. The aim of this research is to assess the relevance of international listing for integrating capital markets and its implications for

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[1] These figures are taken from a Financial Times survey on "Accessing the US capital markets" which cites a study by Technimetrics.
[2] See Footnote 1.
[3] These figures are provided by the London Stock Exchange, Quality of Markets department Fact Service.

investors and companies. Our focus is on foreign companies listed on the London Stock Exchange, the New York Stock Exchange (NYSE), and the National Association of Securities Dealers Automated Quotation System (NASDAQ). In the following, the institutional background and the listing activity in recent years across the three major exchanges for foreign listings is compared.

The general term "international listing" describes the case of a company that officially lists its shares on a stock exchange not located in its country of incorporation. To examine the implications of international listings more profoundly, additional aspects have to be taken into consideration. International listings can be further categorised according to the type of listing and the method of listing. The type of listing takes account of the position of the individual stock exchange in the process of information disclosure, and possible interaction effects for securities traded simultaneously on a number of stock exchanges. The method of listing describes the way of accessing a foreign capital market which can be done with or without raising capital.

2.1 Types of international listing

In the "normal" case, a company has its primary listing on its domestic stock exchange and obtains a secondary or dual listing on a foreign stock exchange. This case can be referred to as an international dual listing[4] (or international cross-listing) and represents the major form of listing activity.

The case that a company is not listed on its domestic exchange but only on a foreign stock exchange is referred to as international primary listing. In this case, the

[4] Examples are a German or French company either listed on the London or the New York Stock Exchange. A further example would be a British company that is listed in London and on NYSE or NASDAQ.

company must comply with all the listing requirements of the foreign stock exchange as the foreign stock exchange is the primary listing location. A primary listing was obtained by 14 companies in London, 23 companies in New York, and 11 companies on NASDAQ during the period of 1980-1994.

The term "unlisted securities" applies to all securities that are only listed on their domestic exchange but not officially admitted to a foreign stock exchange. In this sense, foreign securities whose prices are quoted outside their domestic market on a trading system are "unlisted securities"[5]. The decisive distinction between a listing and a quotation is the active involvement of the company in the listing process. Whereas a quotation is initiated by market participants' desire to trade in a foreign stock, a listing reflects the company's intention to access a foreign capital market and to comply with the disclosure requirements.

2.2 Methods of international listing

An international listing can be carried out by bringing existing shares to listing (introduction) without raising any new capital or by offering new shares to the public (public offering). In the UK, an introduction does not involve the raising of new cash which corresponds to a public listing, or often referred to as Level-two programme[6], in the US. If the listing on the foreign stock exchange is linked with raising new capital we refer to a public offering[7], or also referred to as a Level-three programme in the case of ADRs. A further distinction can be made whether the shares were

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[5] This differentiation also implies that foreign companies quoted on SEAQ International, the quotation system of the London Stock Exchange, must be seen as unlisted although special provisions apply for companies to be included in SEAQ I. A further discussion of this issue will follow.

[6] The mechanics of ADRs will be described under 2.3.1. Depositary Receipts.

[7] The listing rules of the London Stock Exchange distinguish between different marketing methods of bringing new shares to listing: Introduction, placing, offer for sale or subscription or a combination of those methods. However, these distinction is of more importance for domestic offerings. Thus, we will only distinguish whether the listing involves raising new capital (public offering) or not (introduction).

listed in their home market prior to the international offering. If a company has not been listed previously in its domestic market or elsewhere this will be called an international IPO (initial public offering). Very often international IPOs are sold simultaneously in a number of different markets.

2.3 Types of foreign shares

With respect to the type of foreign shares firms have two options. They can either list ordinary shares or issue depositary receipts. Companies that listed in London have traditionally done so by using the same type of shares traded on their domestic exchange. This contrasts with the approach used by foreign companies listing on an US exchange which issue depositary receipts[8]. Since the beginning of the 90's a discussion has evolved what may be the most suitable market structure for trading foreign equities. Cochrane (1994) argues that side-by-side trading of ordinary shares (on the domestic exchange) and of ADRs may not be the right trading environment to guarantee a high degree of liquidity. However, it may be argued that depositary receipts, at least for the time being, have appeared to be the more successful tool for foreign investors. This may also be reflected in the decision of the London Stock Exchange in August 1994 to publish new rules for listing depositary receipts. Any new company listed on a recognised stock exchange in its own country is now allowed to have its depositary receipts traded in London[9]. Depositary receipts could previously only be listed if the underlying shares were also listed in London.

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[8] Velli (1994) argues (Panel I discussion of Symposium "Entering the US Securities Markets: Opportunities and Risks for Foreign Companies") that non-US companies do not really have a choice - they must use ADRs. There have only been a few foreign companies that listed their shares directly by using shell companies in Bermuda.

[9] For a more detailed discussion of this approach which distinguishes recognised and not recognised exchanges see 3.1.1.2

2.3.1 Depositary Receipts

Depositary receipts are negotiable certificates issued by an US commercial bank, the depositary. Nowadays, different terms are used for depositary receipts but there is no difference between a Global Depositary Receipt (GDR), an European Depositary Receipt, or an American Depositary Receipt (ADR). They all work in the same way. In the following "ADR" will be used instead of the other terms, since the first instruments were formally termed "American Depositary Receipts". The historical evolution of ADRs is described by Nanda, Owers, and Feng (1996) who argue that the introduction of these instruments was a response to the conditions of World War I. The problems of British property rights and physical hazards of transporting stock certificates to the US during the conflict led to arrangements whereby instruments would be issued in New York backed by a Trust in Europe.

ADRs are created by depositing the underlying shares with a branch or a correspondent of the depositary bank in the issuer's home country, known as the custodian bank. The custodian bank is also the record holder of the ADRs and performs a number of services such as collecting dividends in the paying currency and paying to ADR holders in dollars. ADR holders perform their rights through the depositary. Their rights include receiving dividends, voting, or exchanging ADRs for the underlying shares. Hence a mechanism for the flow of shares into and out of the US is provided. The depositary charges a fee for issuing and cancelling ADRs. This fee is the major source of income for the depositary bank which benefits from increased trading between the domestic market, where the underlying shares are traded, and the ADR market in the US. The fact that new ADRs can be issued by

depositing underlying shares or existing ADRs can be converted into underlying shares at any time helps to secure equal pricing in both markets[10].

The popularity of ADRs stems from certain technical advantages for US shareholders. ADRs are in registered form. This facilitates the transfer of ownership because it is done in accordance with US laws and procedures. In the event of the death of a shareholder the estate need not to go through probate in a foreign court system. Moreover, a lot of US pension funds and investment managers legally must invest in ADRs because they are not permitted in holding foreign securities. However, ADRs are seen as US securities under US law.

Velli (1994) names three major cost advantages from an US investor's viewpoint: Custody fees are avoided because the buying of ADRs is settled and cleared in the United States. Conversion of dividends is done by the depositary which usually gets a better rate for converting this large sum of money than retail investors would get for smaller amounts. The third advantage is "failed trade financing". The likelihood of a failed delivery on the settlement date, resulting in a failed trade, is substantially reduced because ADRs settle according to US principles. This saves a lot of money because investors do not have to finance this positions.

ADRs can also be distinguished in unsponsored and sponsored ADR programmes. The focal point is involvement of the company of the underlying shares in the issuing process. Unsponsored ADR programmes are initiated by broker-dealers or depositary banks if they perceive a sufficient market interest to trade in foreign equities. If the company does not object to establish an ADR programme it is requested by the initiators to ask for an exemption from registration under the 1934

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[10] According to Velli (1994), those types of transactions account for about ten to fifteen percent of the total trading volume in ADRs. This shows the significance of arbitraging between the different markets.

Act. In an unsponsored ADR programme the depositary files a registration statement on Form F-6. The depositary has no legal relationship with the company. However, unsponsored ADRs can only be traded in the so-called pink sheet market, an illiquid segment of the OTC-market. In the course of this study unsponsored ADR programmes will not be considered since the issuing company is not involved in the decision process. Moreover, they have become obsolete and only three new programmes have been established since 1983[11].

Sponsored ADR programmes are supported by the company. The company appoints a single depositary and enters into a deposit agreement with it. Sponsored ADRs must be registered on Form F-6 under the 1933 Act. The company is a signatory to the registration statement. If the ADR programme is established in connection with a public offering or a listing exactly the same registration rules apply as described above. ADRs registered with the SEC qualify as listed US securities for US pension funds. Thus, ADRs are the only vehicle available to a great number of US pension funds and investment managers to gain access to international capital markets. Many pension funds are forbidden by their charter to invest directly in foreign equities or are required to take physical possession of securities.

Three different types of sponsored ADR programmes exist. Level I ADRs cannot be listed on a stock exchange since they are not fully registered with the SEC. Level I ADRs represent the biggest category of ADRs with approximately 1450 ADRs trading in the US as of December, 1995 (see Nanda, Owers, and Feng, 1996). However, they will not be considered in our analysis since they are not listed ADRs. Level II ADRs are listed on an US stock exchange and are very similar to introductions in the UK market, since no capital is raised with the listing. In the case

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[11] See Velli (1994).

of Level III ADRs, companies decide to raise capital with their programme; they can be categorised into public offerings and private placements.

2.3.2 Ordinary shares

A company that decides to list ordinary shares on the foreign stock exchange lists exactly the same type of shares as listed on its domestic stock exchange on the foreign stock exchange. Only, the price of the shares is quoted in the currency of the foreign stock exchange.

2.4 Recent trends of international listing

Table 2.1. shows the number of listed foreign companies and their aggregated market capitalisation on the London Stock Exchange, NASDAQ, and the New York Stock Exchange. Moreover, the figures of each exchange are also compared to the number of listed domestic firms and their combined market capitalisation.

Table 2.1.

Comparison of foreign and domestic listings on the London Stock Exchange, NASDAQ, and the New York Stock Exchange[a]

This table shows the number of listed companies and their aggregated market capitalisation at 29.12.1995.

	Number of listed companies		Market capitalisation (£bn)	
Stock Exchange	**Foreign**	**Domestic**	**Foreign**	**Domestic**
London	525	2078	2357.00	900.33
NASDAQ	361	5122	46.70	793.88
New York	247	2675	165.02	3873.75

[a]Source: London Stock Exchange, Quality of Markets department Fact Service.

It can be seen that London (525 companies) lists more foreign firms than NYSE (247 companies) and NASDAQ (361 companies). This compares to 2078 UK firms on the London Stock Exchange, 2675 US firms on NYSE, and 5122 US firms on NASDAQ. Hence, London has a far higher percentage of foreign firms to domestic firms indicating the relative importance of the foreign equities market. The figures comparing the market capitalisation provide similar results. The aggregated market capitalisation of foreign firms in London is far higher than on NYSE and NASDAQ, and it also exceeds the combined market capitalisation of UK firms. However, these figures partly reflect the large number of listed US firms on the London Stock Exchange whose total market capitalisation is fully taken account of in the figures.

Nevertheless, these figures provide ample evidence of the size and the significance of the three markets under consideration.

Table 2.2.

Number of new listings on the London Stock Exchange, NASDAQ, and the New York Stock Exchange by year[a]

This table shows the number of new listings from 1984-1995 by year.

Year	London	NASDAQ[b]	New York
1984	75	4	4
1985	15	1	1
1986	26	2	6
1987	31	7	14
1988	20	1	10
1989	30	5	13
1990	19	2	8
1991	10	-	11
1992	6	8	15
1993	3	14	36
1994	12	27 (11[c])	52
1995	38	63 (10[c])	35

[a]Source: London Stock Exchange, Quality of Markets department Fact Service, London Stock Exchange Quarterly (1984-1994), NASDAQ, and New York Stock Exchange.
[b]The number of new listings from 1984-93 comprises only companies that listed ADRs. The years 1994 and 1995 show all new listings with the number of ADR listings in brackets.
[c]This figure only includes ADRs listed before September 1995.

Table 2.2. shows the number of new listings on the London Stock Exchange, NASDAQ, and NYSE over the period 1984-1995 for each year. It can be seen that approximately 60 percent of all foreign firms that decided to list on NYSE obtained their listing within the last five years. The evidence for NASDAQ provides a similar trend. However, these figures contrast with the figures for London listings where the listing activity seemed to have declined rapidly in the early 90's[12,13]. Only in 1995, the trend appears to have become reversed since the London Stock Exchange permitted the listing of Global Depositary Receipts (GDRs). The London Stock Exchange now

[12] The new listings peaked in 1984 when the London Stock Exchange announced to abolish the automatic acceptance of US companies listed on an US exchange. Many US companies were worried of a closed "fortress" Europe and decided to list their stocks before the changes became effective. This partly explains the high number of US companies listed on the London Stock Exchange.
[13] However, these figures also conceal the trend of a decreasing absolute number of foreign companies listed on the London Stock Exchange as the number of cancellations has exceeded the number of new listings. For more information, see publications of the London Stock Exchange.

includes GDRs in their number of new listings, although GDRs cannot be seen as a "full" listing. The listing process is very similar to that for eurobonds and warrants. According to figures of the London Stock Exchange 27 depositary receipts have been listed between August 1994 and December 1995[14]: 8 from India, 1 from Argentina, 3 from Taiwan, 8 from the Republic of South Korea, 3 from South Africa, 1 from the Czech Republic, 1 from Poland, and 2 from the Republic of Indonesia.

Table 2.3.

Number of new listings on the London Stock Exchange, NASDAQ, and the New York Stock Exchange by method of listing and year[a]

This table shows the number of new listings on the London Stock Exchange, NASDAQ, and the New York Stock Exchange from 1984-1994. This table splits new listings into two groups: introductions and public offerings. In an introduction the company does not raise new cash with its listing. In a public offering the company raises new funds with its listing.

	London		NASDAQ[b]		New York	
	Introduction	Public offering[c]	Introduction	Public offering	Introduction	Public offering
1984 - 1988	155	6 (6)	8	7	24	11
1989	28	2	3	2	7	6
1990	19	-	2	-	4	4
1991	9	- (1)	-	-	4	7
1992	6	-	3	5	3	12
1993	2	1	4	10	5	31
1994	6	5 (1)	6	5	15	37

[a]Source: London Stock Exchange, Quality of Markets department Fact Service, London Stock Exchange Quarterly (1984-1994), NASDAQ, New York Stock Exchange, and the ADR data base of the Bank of New York.
[b]The number of new listings on NASDAQ comprises only companies that listed ADRs.
[c]The figure in brackets shows the number of placings which are a special form of raising capital in the London market.

The trend towards an US listing, which occurred in the beginning of the 90's, is also corroborated when comparing the number of new listings by their method of listing (see Table 2.3.). While London listings accessed the market using an introduction, the majority of US listings raised capital with their listing (public offering). For

[14] See London Stock Exchange, Fact Book 1996.

example, 31 companies conducted a public offering on NYSE in 1993, and 37 companies in 1994. Table 2.4. reveals another difference between NYSE and London listings in recent years. A large number of new NYSE listings during the last five years has come from emerging markets (56 companies) while the majority of London listings during that period have been developed market firms. It also appears that emerging market firms opted for a NYSE listing instead of listing on NASDAQ since a NYSE listing may offer a higher prestige.

Table 2.4.

Number of new listings on the London Stock Exchange, NASDAQ, and the New York Stock Exchange from 1990-1994[a]

This table shows the number of new listings from emerging and developed markets over the period 1990-1994.

	London	NASDAQ[b]	New York
Emerging market firms[c]	7	5	56
Developed market firms	43	30	66

[a]Source: London Stock Exchange Quarterly (1984-1994), NASDAQ, and New York Stock Exchange.
[b]The number of new listings includes only companies that listed ADRs.
[c]Included are firms from Argentina, Brazil, Chile, China, Colombia, Ghana, India, Indonesia, Israel, Korea, Mexico, Peru, Philippines, South Africa, and Venezuela.

Table 2.5. provides the most recent evidence of trends in the area of international listings and highlights again the significance of international listing. Although the London Stock Exchange provides detailed comparative data only for 1995, other sources indicate that this trend (see Table 2.3.) could also be observed in the previous years. The main implications, however, are very similar as discussed previously. Although London lists 38 new companies raising £6.18bn, which exceeds the money raised by UK companies (£2.76bn), foreign companies raised more capital in the US. A comparison with the amount raised by US firms on NYSE (£19.49bn) and NASDAQ (£10.76bn) confirms the importance of global public

offerings, since foreign firms raised £41.65bn on NYSE and £16.10bn on NASDAQ. This shows that the new issue market for foreign firms has even become more significant than the US domestic market. The fact that US institutional investors have substantially increased their holdings in foreign equities over the last few years explains to some degree the large amounts raised in the US by foreign companies.

Table 2.5.

Comparison of foreign and domestic equity raising activity on the London Stock Exchange, NASDAQ, and the New York Stock Exchange in 1995[a]

This table shows the number of newly listed domestic and foreign companies and the aggregated amount of equity capital raised by them in 1995.

	Number of new companies		Total equity capital raised (£bn)	
Stock Exchange	**Foreign**	**Domestic**	**Foreign**	**Domestic**
London	38	190	6.18	2.76
NASDAQ	63	413	16.10	10.76
New York	35	140	41.65	19.49

[a]Source: London Stock Exchange, Quality of Markets department Fact Service.

3. Chapter: Structure of the international equities market

The structure of the market in international equities has been subject to significant changes in recent years. Several factors have contributed to the changes and a clear structure has not yet emerged. The development has mainly been influenced by the relaxation of regulatory barriers and technological innovation since the mid-1980s. The change was spurred by the emergence of faster communication systems which linked the then fragmented domestic markets and have created an almost global secondary market. The pace of change has been less rapid in transforming the primary market which is still more impeded by legal regulations. Nevertheless, the strong increase in international equity offerings, as documented above, has been fuelled by the wave of privatisations all over the world and a re-discovery of so called "emerging markets".

The structure of the international equities market is still determined by differing legal regulations across markets. In the following the US approach will be compared with the UK approach for regulating foreign securities. This will be followed by a discussion of the current state of the primary and secondary trading markets in foreign companies in the US and the UK.

3.1 Free market vs. regulatory approach

The approaches towards regulating activities in foreign securities differ substantially between the two major markets for foreign equities, the US and the UK.

The basic structure of securities regulation in the US is set by the Securities Act of 1933 (1933 Act) and the Securities Act of 1934 (1934 Act). The main principle of the US approach is the requirement for all foreign companies seeking to make use of the US capital market to register with the Securities and Exchange Commission (SEC).

The registration requirement contrasts with the UK regulatory environment as set out in the Financial Services Act of 1986 (FSA) which generally permits trading and marketing of listed and unlisted foreign securities. The FSA is based on the principle of mutual recognition derived from the EC legislative framework for securities markets operations. The principle of mutual recognition acknowledges the validity of other countries' laws, regulations, and standards as long as certain minimum standards are met. In the case of unlisted foreign securities, the FSA takes into account the company's compliance with the regulations on its place of primary listing, usually the company's domestic stock exchange.

The liberal UK approach is in stark contrast with US securities regulations which do not permit trading and marketing of unregistered securities. This has implications for US investors and foreign companies. While US investors are forced to buy foreign stocks abroad, foreign companies cannot access the US capital market unless they register with the SEC. But a SEC registration, which is a prerequisite for a listing on an US exchange, requires foreign companies to disclose the same detailed information as to be provided by US companies. Breeden (1994) argues that national treatment in the issue of regulating securities is the only way to maintain a high safety for US investors. The SEC's main argument against relaxing the regulations for foreign companies is that foreign companies would gain an advantage in raising capital compared to their US competitors.

Breeden (1994) also points out that lowering quality standards for information disclosure is only a policy in search for higher short term profits. The waiving of rules may induce more foreign companies to list their stock in the short term but harm the quality of the US capital market in the long run because a listing on an US exchange is seen as a high quality product. Thus, the insistence on stringent rules is more beneficial in the long run as more companies will eventually be willing to comply with the US regulations because the benefits are bigger.

Furthermore, the SEC believes that high standards of transparency in financial reporting enhance market efficiency[15]. Especially, the standard of financial statements presents a major problem for foreign companies which are subject to different accounting principles in their home countries.

3.1.1 UK regulatory framework

The Securities and Investment Board (SIB) which has the responsibility for implementing and supervising the provisions of the Financial Services Act can delegate power to develop rules to other organisations. The London Stock Exchange has been assigned two functions which shaped the structure of the London market in foreign equities.

Under Section 142 of the FSA (Financial Services Act 1986) the London Stock Exchange is the competent authority[16] for issuing and maintaining listing rules. However, it has also been given the function as a provider of a marketplace as an Recognised Investment Exchange (RIE) by the SIB. Therefore, it is responsible to

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[15] See also Breeden (1994), p. 88.

[16] See Atkinson (1992).

provide a proper and orderly market for investors. In its second function, the Stock Exchange is authorised to set up and alter its own rules as long as it satisfies the SIB that its rules and procedures promote the proper conduct of business, ensure the optimum price transparency, and develop liquidity in the market. This second function has especially influenced the market in unlisted foreign securities.

3.1.1.1 Admission to Stock Exchange Official List ("Listing")

Foreign companies that seek to obtain a listing on the London Stock Exchange have to provide a prospectus, known as listing particulars, and have to comply with the continuing obligations relating to foreign companies. The requirements for foreign companies have mainly been influenced by the EC Directives concerning listing standards throughout the community.

Impact of EC Directives on listing rules

Until 1984 the relationship between the Stock Exchange and companies applying for listing was a matter of private law. In 1985, however, more statutory listing rules were implemented by directly incorporating the three EC Directives (Admission to Listing Directive, Listing Particulars Directive and, Interim Reports Directive) into UK law. The three EC Directives were originally intended to produce standard listing requirements throughout Europe. The admission to one Member State exchange would have entitled a company to have the same securities listed on any other Member State exchange. However, this intention was abandoned and the directives were seen as a means of harmonising the minimum requirements for listing. The authorities of the Member States were left free to impose more stringent or additional requirements. In 1990, the Mutual Recognition of Listing Particulars Directive came

into effect in EC member states and was implemented in the UK in 1991. It states that listing particulars which have been approved in one member state must be recognised in another member state, only subject to some qualifications.

Listing particulars

Offers to the public of securities normally require a formally registered document containing information on the company. The regulations concerning listing particulars for overseas companies are directly derived from the EC Listing Particulars Directive, as described above.

While European companies can qualify for the EC Mutual Recognition Provisions, other overseas companies have to produce listing particulars as required from UK companies. However, the stock exchange takes account of companies' reporting and filing obligations in their country of primary listing. Therefore, the exchange may authorise the omission of certain information if the company is listed on an overseas exchange of internationally accepted standard.

The latest amendment of the EC Directive proposes to grant partial or complete exemption from the obligation to publish listing particulars for companies admitted to official stock exchange listing in another member state. These provisions are aimed at companies of high quality and international standing, of which information is widely circulated and available. The member exchanges are allowed to establish certain minimum quantitative criteria for companies but are also encouraged to grant similar treatment to smaller companies.

Continuing obligations

The provisions for continuing obligations relate to companies which have a primary listing on another recognised exchange. Companies must immediately release

material information which might affect the price and the market activity of the securities. The London Stock Exchange must be notified at the same time as the information is made available to the company's domestic exchange. Annual reports including financial statements must be sent to all UK shareholders within six months of the end of the financial year. The required standard of the financial information to be provided will be discussed below.

3.1.1.2 Unlisted securities

The term "unlisted securities" applies to all securities not admitted to the Official List of the Stock Exchange. Therefore, it also includes shares of international companies listed on a foreign stock exchange but not in London.

But the Financial Services Act 1986 introduces the concept of an approved exchange which is subsequently applied to security offerings and trading in foreign securities. Under Section 40 of the FSA, a foreign stock exchange can obtain a Designated Investment Exchange (DIE) status from the SIB. The DIE status indicates that securities listed on such an exchange are suitable for marketing to UK investors. The rules for DIEs correspond to the requirements of the SIB for Recognised Stock Exchanges (RIE) as stated in Schedule 4 of the Act.

Securities cannot be advertised unless a prospectus containing information about the securities has been delivered. The content and the form of such a prospectus are similar to the requirements of the listing particulars. A prospectus is required for primary and for secondary offers. However, a prospectus is not required for a secondary offer if a prospectus has been delivered for the same securities within the previous six months. The duty to prepare a prospectus derives from the fact whether

an advertisement is made for the offered securities. The term "advertisement" is broadly defined and covers circulars and announcements in all forms of advertising media. It also covers information shown on Reuters and other electronic screens. Several exemptions exist, in particular, where the advertisement is only directed to qualified business investors or firms authorised under the FSA. This means that private placements to selected business investors are completely unregulated. However, this does not apply for private offers to high net worth individuals.

Securities with DIE status

The prospectus rules are relaxed for companies listed on an approved exchange because companies only have to provide information as required by the approved exchange. Hence, the prospectus of a foreign company that is listed on a DIE must only comply with the domestic law of the issuing company. This allows foreign securities that are listed on an approved exchange to be quoted on SEAQ International without any specific UK documentation. An issuer can be exempt from having to prepare a prospectus if a similar document has been produced within the last 12 months and no significant changes have occurred since.

Securities without DIE status

Companies listed on a foreign stock exchange without DIE status have to comply with the full prospectus requirements as described above. They may have to produce two sets of documents satisfying their domestic and the UK requirements as no relaxation is granted to them. The provisions, however, are flexible enough to allow varying requirements according to the offer.

To cater for the increased demand in "emerging markets' " equities, the London Stock Exchange launched a "Developing Markets Sector" in September 1992[17].

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[17] See Davis (1994).

Securities, which would otherwise not be eligible, are approved on an individual basis by the London Stock Exchange. The companies have to satisfy three provisions:

Firstly, they must have a primary listing on a member or corresponding member stock exchange of the FIBV[18]. Secondly, two market makers must be willing to quote prices for a minimum period of three months. Thirdly, one member firm of the exchange must act as a contact between the London Stock Exchange and the issuing company. The member firm must also certify that the company has effective arrangements for the timely disclosure of company news.

Rules for depositary receipts

In August 1994, the London Stock Exchange published new rules to promote the listing of depositary receipts. They form an extension of the policy adopted by the London Stock Exchange. Listed depositary receipts are automatically eligible for SEAQ International if at least two market makers are willing to make quotes. The rules take account of the fact that the market is dominated by sophisticated institutional investors. The issuing firm has to appoint a listing agent who must be authorised by UK or European regulations to participate in securities issues. The listing agent forms the link between the exchange and the company. The financial information to be provided, however, does neither need to be prepared in accordance with international accounting standards nor to be consolidated.

[18] Federation Internationale des Bourses de Valeurs

3.1.2 Regulation of foreign securities in the US

The US securities regulations are designed to protect US investors by forcing companies, whose securities are offered publicly or traded in the securities markets, to disclose material facts. This so called "full disclosure" approach is administered by the Securities and Exchange Commission (SEC), an independent regulatory agency of the federal government. The basic structure of securities regulation is set by the Securities Act of 1933 (1933 Act) and the Securities Act of 1934 (1934 Act).

The 1933 Act regulates the distribution of securities and requires all securities to be offered or sold to register with the SEC. The 1934 Act regulates the secondary market. All securities which are traded on a national exchange or NASDAQ or are otherwise widely held in the US must register under the 1934 Act. The same principles of registration apply to securities issued as American Depositary Receipts (ADRs). The majority of foreign securities listed on an US exchange is in the form of ADRs since they facilitate to convert bearer shares into registered shares which is the typical form of holding shares in the US. However, to enable institutional investors to take part in private placements of foreign issues, the SEC amended its regulations and created a possibility for specially qualified investors to invest in unregistered foreign securities.

3.1.2.1 SEC registration of securities

In 1982, the SEC integrated the disclosure requirements under both acts because the information to be disclosed by foreign companies is almost identical. Therefore, it is possible to use information filed under the 1934 Act for the requirements under the

1933 Act because both acts refer to the same substantive requirements as set out in Regulation S-K[19] and Regulation S-X[20]. This integrated system leads to efficiencies[21] for companies having been in the system for some time and seeking to raise capital.

Regulation of Public Offerings: 1933 Act

The registration under the 1933 Act is accomplished by filing a registration statement, which is then declared effective by the SEC. These registration statements are called F-Forms and prescribe the form and the content of the information to be provided by a foreign issuer on an item by item basis. The required information is much more comprehensive than in other countries and home country documentation cannot be used. In general, the registration statement consists of two parts, the prospectus and other technical information.

The main problem for foreign issuers arises from the requirement to produce a prospectus according to US standards. While the London Stock Exchange is willing to accept listing particulars produced under a different legislative regime, subject to certain qualifications, the SEC regulations are more stringent. They effectively require foreign companies to produce a separate prospectus with even further-reaching consequences. Companies that intend to conduct a public offering must fully reconcile their financial statements to US GAAP. A full reconciliation includes full segment reporting, pension data, and various supplemental information as to be provided in US financial statements. In particular, segment reporting may be onerous for foreign companies since it may involve information not previously disclosed. The

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[19] Regulation S-K defines the form and content of the non-financial information which must be included in the registration statement.

[20] Regulation S-X defines the form and content of the financial statements to be provided by companies and may be of special relevance for a foreign company.

[21] As companies have to provide detailed information with their listing and on a half-yearly basis, this information can be used for a public offering at a later date.

implications for companies to provide reconciled financial statements will be discussed below.

Regulation of Securities Trading: 1934 Act

In principal, all companies whose equity securities are widely held within the US have to register with the SEC under the 1934 Act. This is, however, unreasonable for a foreign company with only a limited presence in the US securities markets. Thus, Rule 12g3-2(a) of the 1934 Act provides an exemption for foreign companies if they have less than 300 shareholders resident in the US, and do not have in effect a sponsored or unsponsored ADR programme.

Rule 12g3-2(b) exempts companies with more than 300 US shareholders. This exemption applies to companies with a sponsored or unsponsored ADR programme but without a listing or quotation on an US exchange, if they supply the SEC with some information. These information should include copies of all documents that the company is required to publish in its home country, to file with a stock exchange, or to distribute to its shareholders. These documents must be accompanied by a brief English language summary.

These exemptions do not apply to companies whose shares are listed on an US stock exchange or quoted on NASDAQ. Trading of listed or quoted securities is only permitted if they are registered under the 1934 Act. Foreign companies registering under the 1934 Act have to use Form 20-F. Form 20-F has a dual function for foreign companies because it serves as an initial registration statement for companies seeking a listing and as an annual reporting form which must be filed each year. Concerning the form and the content of the information to be filed under the 1934 Act, the same principles apply as discussed under the 1933 Act.

3.1.2.2 Rules for unregistered foreign securities

In 1990, the SEC amended the regulations for issuance and trading of securities which are not registered with the SEC. Under Rule 144A[22] the holders are now allowed to resell privately placed securities to other QIBs (Qualified Institutional Buyers). A QIB is defined as an investor acting on his own account and having assets invested in securities of more than $100 million. Banks, savings and loan associations, and broker-dealers can also qualify as QIBs. The seller must ensure that the buyer of the securities has QIB status.

Although these securities do not have to be registered with the SEC, foreign companies still have to comply with some conditions concerning the provision of information. The issuer must provide a very brief statement of the nature of its business, products, and services. It should also provide audited financial statements for the past two years but a reconciliation to US GAAP is not required.

The Rule 144A market has been used for the sale of tranches of Euro or global equity offerings from multinational companies since hardly any additional documentation is required. Foreign issuers using the 144 A market are protected by Regulation S, which introduces a “safe harbour rule” (securities are not subject to SEC registration), if they comply with the following provisions: The issuing company must not make any direct selling efforts in the US and the sale or the resale must be an offshore transaction on a designated offshore exchange. From a technical pint of view this rule now allows to underwrite public placements and to resell the issue to qualified institutional buyers or to the home market. The resale was not possible

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[22] See Jensen (1994).

under the private placement rules before 1990 since securities had to be held for a specified period of time.

Trading in 144 A securities takes place on the PORTAL[23] system which has been established by the NASD for trading unregistered securities. However, those foreign issues may have a limited liability since they trade over-the-counter (OTC) Electronic Bulletin Board market which has no volume reporting of real-time quotes.

3.1.3 Standard of financial statements

The standard of financial information to be provided by foreign companies presents one major regulatory barrier still dividing financial markets. The differences are due to varying generally accepted accounting principles (GAAP) across countries. Two distinct regulatory approaches regarding the appropriate standard of financial information, that is requested from a foreign company, can be observed in the international area.

One approach is pursued by the SEC which generally requires foreign companies to comply with US generally accepted accounting principles (GAAP). This means that a foreign issuer whose financial statements have been prepared according to non-US accounting principles must quantitatively reconcile its financial statement in all important particulars to US GAAP. This forces a foreign issuer to produce two sets of financial figures.

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[23] The PORTAL (Private Offerings, Resales and Trading through Automated Linkages) system is a screen-based marketplace for secondary trading of unregistered securities, which are exempt from the registration requirements of the Securities Act pursuant to Rule 144A.

The second approach is based on acceptance of home-country accounting principles. This policy is pursued by the London Stock Exchange which accepts international accounting standards or specific national accounting standards. National accounting standards are accepted if the London Stock Exchange is satisfied that the accounts have been prepared and independently audited to a standard appropriate for a company of international standing and repute. Companies that are listed on another approved overseas stock exchange (or DIE exchange, see 3.1.1.2) are exempted from the requirement to provide an independent accountants' report.

The following part discusses the implications of the requirement of a quantitative reconciliation to US GAAP. The NYSE listing of Daimler Benz provides an opportunity to highlight the relevant issues and to discuss the problems from the perspective of a company. The second point introduces potential avenues of compromise to accept foreign listing standards under certain conditions, and discusses its implications in the light of market efficiency.

3.1.3.1 A case of "full" reconciliation to US GAAP: Daimler Benz[24]

The NYSE listing of Daimler Benz presents the most prominent case to date, and its implications have been widely discussed in the international financial press and academic literature. For example, Harris (1993) compares the financial statement of Daimler Benz under US GAAP and German GAAP. Radebaugh, Gebhardt, and Gray (1995) provide a full case study of Daimler's listing. Their study comprises an examination of the process of listing on NYSE, the major factors of Daimler's

[24] Daimler Benz is a German industrial conglomerate that listed their shares in form of ADRs on the NYSE in October 1993.

decision, key differences between US and German GAAP, and the impact of US GAAP on Daimler's reported earnings and shareholders' equity.

The rules for a foreign company concerning the standard of the financial statements are virtually the same as for an US company. However, there are some concessions for companies whose financial statements have been prepared according to a comprehensive body of accounting principles in their home country. Their financial statements must be accompanied by a reconciliation to US GAAP. This requires that for each income statement net income must be reconciled to US GAAP and each material variation must be shown as a separate reconciling item. Material variations for balance sheet items must also be described and are usually shown as a reconciliation to US GAAP shareholders' equity. Form 20-F gives foreign companies an option concerning the reconciliation of net income and shareholders' equity to US GAAP.

In general, full and partial reconciliation of financial statements can be distinguished. However, this option does not exist for companies that conduct a public offering. They have to fully reconcile their financial statements to US GAAP. The implications of a full reconciliation to US GAAP for US investors are discussed by Harris (1993). Radebaugh, Gebhardt, and Gray (1995) show that the US GAAP income and the German GAAP income for Daimler Benz varied significantly. While the US GAAP income was lower in 1992 and 1993, it was higher in 1991. Another numeric example highlights the problems: for the first half of 1993 Daimler Benz reported an after-tax profit of DM168m under German accounting rules but according to US GAAP this turned into a loss of DM949m. Harris (1993) identifies some key differences between US and German GAAP: the accrual of all possible contingencies and business risks,

accounting for goodwill, pensions, revenue recognition for long-term contracts, foreign currency transactions and translation, and deferred taxation.

However, these differences between individual accounting items can only be understood by considering the background and purpose of the financial reporting systems in both countries. Harris (1993) remarks that US financial reporting is geared towards providing shareholders with information about the financial position and activity of the firm. German companies, however, have traditionally used other sources of capital than equity markets, with banks and employees as the major suppliers of capital. Moreover, big German banks still hold major stakes in industrial companies[25]. The overriding objective of the financial reporting system is to preserve the capital of the firm, and there also is a tradition of conformity between financial and tax reporting. Thus, German companies generally try to minimise distributable earnings and to build up hidden reserves. Very often this policy coincides with the interests of the major shareholders since the banks are also the main providers of debt financing, and hence are interested in capital maintenance.

3.1.3.2 Compromises of listing standards

The issue of listing standards has generated an intensive debate among practitioners and academics alike. In the US, the discussion has focused on the question whether it is necessary to maintain the stringent regulations of the SEC, which claim to protect retail investors. Critics, however, have argued that this policy harms investors' interests and the pre-eminence of the US securities markets.

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[25] Deutsche Bank used the US listing of Daimler Benz to reduce its stake of 28% to 24%. This was achieved via a secondary offering of Daimler Benz shares in the US market.

Cochrane (1994) argues that retail investors are not protected by the SEC policy since they can only invest in world-class foreign companies via the over-the-counter electronic bulletin where no financial information is provided to investors. On the other hand institutional investors are driven offshore which threatens the competitiveness of the US capital market. The main argument for waiving the need of a quantitative reconciliation is that the information about world-class issuers publicly available in their home countries is adequate to ensure efficient pricing and is fully impounded in their market price. Therefore, additional filings have no material impact on the price.

It is argued[26] that a quantitative reconciliation can convey an illusion of comparability which, in fact, does not exist. The diversity in GAAP is only one factor that differs across borders. A particular GAAP can only be understood in the context of other factors as tax policy, fiscal policy, regulatory objectives, managerial objectives, performance incentives, and other cultural aspects of the issuer's home country environment. To overcome these problems, three potential avenues of compromise have been discussed between experts of the SEC and the NYSE.

The first proposal establishes quantitative criteria to distinguish "world class" foreign companies. The criteria comprise three tests: (1) The market capitalisation should be at least $1bn. (2) The "investor following test" would require a listing on the London Stock Exchange or the Tokyo Stock Exchange in addition to its domestic listing. This test was designed to ensure wide market following beyond the home market and a wide dissemination of market information. (3) The "absence of US presence test" should show the absence of any large US investor following to alleviate any concern of unfairness to US companies. These "world class" companies would be allowed to

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[26] Longstreth (1992) quotes an unpublished study by Lessard.

file independently-audited home-country financial statements and a written explanation of material differences between home-country accounting principles and US GAAP instead of a quantitative reconciliation to US GAAP. Breeden[27] (1994) strongly opposes this proposal of the New York Stock Exchange and considers the pressure campaign for it as a mistake.

The second proposal considers the establishment of a separate market segment limited to qualified investors. Foreign companies could get a separate US listing with non-US financial disclosure but without access to retail investors.

The third proposal specifically focuses on accounting changes and develops four different paths. The first simply states that all foreign companies will change to US GAAP in the future and, hence, no change is needed. The second path proposes a relaxation of standards on a case-by-case basis on the ground of being "equivalent to" US GAAP. The third path is the mutual recognition of national accounting and disclosure statements based upon a certain minimum standard. At present only Canada and the US pursue the principle of mutual recognition since their accounting standards are very similar. The fourth path would be the recognition of the principles produced by the International Accounting Standards Committee ("IASC"). Although the SEC agreed in 1994 to accept cashflow statements drawn up in accordance with IASC rules[28], further concessions seem to be unlikely. Mr Levitt, the chairman of the SEC, is quoted[29]: "I am committed to international standards but make no mistake about it: any nation that is expecting a sudden change to less demanding standards is making an error, because that will not be the case".

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[27] Breeden is former chairman of the US Securities and Exchange Commission (SEC).
[28]The decision to allow foreign companies to present cashflow statements prepared in accordance with International Accounting Standard Number 7, rather than US standards was seen by the SEC as a "landmark step" (see also FT 21 April 1994).
[29]See Financial Times Survey, Accessing the US capital markets, 1 February 1996, p.34.

3.1.4 Summary of differences between US and UK

The major regulatory differences between the US and UK can be summarised as follows. Since UK regulation is based on the principle of mutual recognition, foreign companies can make full use of the UK capital market without specifically complying with UK law. In particular, the treatment of "unlisted foreign securities" is very flexible and tailored towards the needs of institutional market participants. This approach differs substantially from US regulations which are based on national treatment for foreign issuers. The compliance with US GAAP represents a particular hurdle for foreign companies to obtain a full listing on NYSE or NASDAQ. Although a discussion has started questioning the suitability of the regulations imposed by the SEC, significant changes still seem to be some time off.

3.2 Primary markets

Capital raising activity has increasingly become international in previous years. Many issues have included international tranches which took account of the increased interest of international investors to invest in foreign securities. Moreover, investment bankers have argued that global offerings improve the marketability of the offered shares leading to higher issuing prices.

3.2.1 Public offering or private placement

The issuer has to decide whether it accesses the foreign market with a public offering or a private placement. A public offering in the US market requires the issuing company to obtain a listing on an US stock exchange. While this implies that companies must comply with specific regulations of the targeted market[30], the requirements for private placements are less onerous. However, the benefits for companies making a public offering could exceed those for private placements because the company's profile is raised and its liquidity is increased.

The decision between a private placement and a public offering in the US also has cost implications. Although precise estimates of the cost of raising equity depend on company specific factors, we provide some comparative figures for the gross underwriting spread and other direct expenses which make up the two components of the total direct cost of raising capital[31]. Other direct expenses include registration fees and printing, legal, and auditing costs and can be anywhere between US$500,000 to US$1 million for a public offering, because the registration process with the SEC involves high legal and accounting costs (Velli, 1994). Listing on the NYSE involves an initial fee of US$100,000 and an annual fee based on the number of shares listed. But the maximum annual fee to be paid by a company is limited to US$500,000. The cost for a private placement under Rule 144A is lower and runs between US$250,000 to US$500,000 for accounting and legal fees. In order to obtain some comparative estimates for gross underwriting spreads, we carried out some limited investigations using data of 37 public offerings and 20 private placements. Our results indicate that the gross underwriting spread for private

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[30] As described above, companies making a public offering in the US have to register with the SEC under the 1934 Act.

[31] For more details concerning the components of the costs of raising capital see Lee, Lochhead, and Ritter (1995) who examine this issue for US corporations raising capital in the domestic markets.

placements is 4.10% while the equivalent average spread for public offerings is 4.62%.

An additional factor to be considered in the choice of the method for an international offering is the time required to conduct a public offering or a private placement. This time constraint can become a very important cost factor if the market conditions for issuing equity deteriorate, possibly leading to higher indirect costs of raising capital. The time required differs markedly between the methods: it takes between 6 to 8 months to conduct a public offerings but only 2 months to conduct a private placement.

3.2.2 Issuing technique for global offerings: book building

While in the UK new shares have traditionally been offered to the public at a fixed price, which is determined before the marketing period, international equity offerings have mainly been sold by "book-building". Stonham (1993) describes the book building technique for the Wellcome share offering which took place in 1992. Book building is based on the principle of setting the offer price according to the demand of the market. This information is collected from investors during an offer period where they can indicate the size and the price of their bids. The share price and the offer size are fixed at the end of this period. Stonham (1993) describes a number of advantages: (1) Price and offering size can be matched more accurately with demand; (2) Valuable information on the demand and the quality of each investor is obtained; (3) Price tension is created like in an auction; and (4) Pressure on the price in the after-market is reduced.

To control excess demand more effectively, a mechanism called overallotment option (or Greenshoe option) is used. Lee, Lochhead, Ritter, and Zhao (1995) describe the common practice of investment banks which typically presell 115 percent of the offering, and then stand ready to buy back the incremental 15 percent if demand is weak when some of the buyers immediately sell their shares. The advantage of such an option is that it can be used to satisfy excess demand in a rising market, or to reduce speculative demand in the market by buying back shares.

3.3 Secondary trading markets

The structure of the market in international equity trading has undergone dramatic changes since the mid 1980s and is still evolving. Fuelled by deregulation of capital markets around the world, privatisation, and technological innovation, recent years have seen a tremendous increase in cross-exchange trading[32]. The discussion of factors that influenced the development of foreign equity trading in London and the US is followed by highlighting the features of different trading systems. The last point discusses some statistical problems which inhibit the comparison of trading volume, and hence a benchmark of the "success" of stock exchanges in attracting trading in foreign equities.

[32] Howell and Cozzini (1991) distinguish cross-exchange trading and cross-border trading. Cross-exchange trading takes place when foreign securities are traded on a domestic exchange. Cross-border trading is when foreigners trade in domestic securities.

3.3.1 Development of international equities trading

Table 3.1. gives an indication concerning the growth in trading foreign equities on the London Stock Exchange and in ADRs on US exchanges. The figures, however, need to be treated with care since differences in trade reporting do not allow straightforward intermarket comparisons of trading volume data (for a discussion, see 3.3.2).

Table 3.1.

Trading activity in foreign equities (London Stock Exchange) and in ADRs (NASDAQ and NYSE combined)[a] from 1991-1995.

This table shows the trading volume by value from 1991-1995 for foreign equities on the London Stock Exchange and the combined volume in ADRs on NYSE and NASDAQ.

	Trading volume (£bn)	Trading volume (US$bn)
Year	London	ADRs on US exchanges
1991	142	80
1992	165	125
1993	290	200
1994	359	250
1995	395	270

[a]Source: London Stock Exchange, Quality of Markets department Fact Service, and FT Survey (1 February 1996).

According to Table 3.1., trading volume in London and in the US has increased substantially in the last five years. The trend appears to be similar for London, where the volume increased from £142bn in 1991 to £395bn in 1995, and for ADRs which increased from US$80bn in 1991 to US$270bn in 1995. Since the volume figures for London also include the turnover of foreign "unlisted securities" (see above), which are traded on SEAQ International[33], London appears to handle a far higher trading volume than the US exchanges. Nevertheless, trading in foreign equities is a very

[33] The Economist (23 July 1994) writes that the trading volume as reported for SEAQ International may be vastly overstated.

important issue. Table 3.2. compares the size of the trading activity in foreign and in domestic shares on the London Stock Exchange, NASDAQ, and NYSE. In contrast to the US exchanges, the market in foreign equities in London exceeds the trading activity in UK stocks.

Table 3.2.

Foreign and domestic trading activity on the London Stock Exchange, NASDAQ, and the New York Stock Exchange in 1995[a].

This table shows the trading volume by value in 1995 for domestic and foreign companies.

	Trading volume (£bn)	
Stock Exchange	**Foreign**	**Domestic**
London	395.39	323.17
NASDAQ	65.18	1436.20
New York	168.48	1817.29

[a]Source: London Stock Exchange, Quality of Markets department Fact Service.

The position of London as a place for trading foreign equities had been a continuation of the process which started during the late 1960's with the development of the eurodollar business. This enabled London to build up an infrastructure as an international capital market and attracted many foreign commercial banks, investment banks, and securities houses to come to London. At a time when many (European) domestic securities markets were inefficient or regulated, while the London Stock Exchange permitted trading in "unlisted securities" (as described above), SEAQ International the screen-based trading system for foreign equities was launched one year prior to Big Bang. According to figures of Worthington (1991), in the late 80's and beginning of 90's London had become the biggest foreign equity market in the world. It attracted a high percentage of home country domestic turnover of mainly European equity markets. In 1990, turnover on London's foreign equity market relative to the home exchange(s) averaged 54% for

Swedish shares, 51% for Dutch shares, 26% for French shares, around 20% for Italian and Spanish shares, 29% for permanently traded Swiss shares, and 12% for German shares. Trading in individual stocks on SEAQ International often exceeded trading on the home exchange[34]. However, this trend has been reversed since many European markets overhauled their trading systems and managed to win back market share in their own domestic equities.

The development of NYSE and NASDAQ as a trading centre for international equities is a more recent one. Although in 1978 approximately 390 companies had ADRs in the US, most of them were unsponsored (see Nanda, Owers, and Feng (1996)) and traded OTC. The growth in trading activity only started in the early 90's when demand for foreign equities increased, and companies subsequently decided to list their stock on a regulated exchange as NYSE or NASDAQ.

3.3.2 Trading systems

Technological progress has substantially contributed to the growth in international equity trading since the mid-1980s. The emergence of different trading systems has altered the market configuration and has given investors a choice to trade the same stock on alternative systems. The acknowledgement of liquidity as an important feature of financial assets has shifted the attention to the issue whether some trading systems provide better liquidity services than others.

In general, trading systems are assessed by comparing their liquidity, transparency, and immediacy. A market is said to be more liquid than another if it achieves a better

[34] However, as discussed previously the comparison of trading figures had always been difficult, and a point of contention between exchanges.

price for a given size of trade, or a larger trade for a given price. Immediacy indicates the need to execute a trade within a given time period. Transparency is defined as the degree to which the current order flow is visible to the competing market professionals involved in setting prices[35]. A market can have delayed or immediate trade reporting, and the order flow can be reported on an individual or an aggregate basis.

Generally, three alternative trading systems can be distinguished: a batch auction, a continuos auction, and a dealer market[36]. In a batch auction, orders are accumulated and transacted in batches when the stocks are called. All trades are executed at a common market clearing price. A batch auction is suitable for inactive securities because it minimises transaction and settlement costs[37]. Traditionally, batch auction systems have dominated as price-setting mechanisms and are still used in many markets for trading stocks of smaller companies. Examples are the daily batch auctions in Paris, New York, Tokyo, Milan and Madrid.

However, actively traded securities require a continuos market which allows for immediate transactions and continuos price information throughout operating hours. In an electronic continuos auction, agents submit orders to a centralised system displaying investors' limit orders. Incoming market orders are automatically executed against the best limit orders. Transaction price and quantity are displayed on the screen.

In a dealer market, designated market makers quote two-way prices at which they are willing to buy or sell. Trading takes place when a counterparty accepts the quote of the market maker. There are two major differences between a dealer (or quote-

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[35] See Pagano and Roell (1996).
[36] See Pagano and Roell (1992).
[37] See Huang and Stoll (1992).

driven) market and an auction (or order-driven) market. In auction markets, public trade orders are directly matched against one another whereas the execution of orders in dealer markets always involves at least one market maker. Dealers in dealer markets do not know the price, size, and direction of orders executed by other dealers until these are reported to a central authority and displayed.

In recent years, a great amount of research has been undertaken to examine the differences and the interaction between order-driven and quote-driven systems[38]. The understanding of the differences has become an important issue from an economic and a regulatory perspective. However, conclusive evidence is not so easy to come by as the distinct trading mechanisms prevent a straightforward comparison of trading costs, trading volumes, or immediacy. In the following, the trading systems used by the London Stock Exchange, the NYSE, and NASDAQ will be described briefly.

London

SEAQ International is designed as a quote-driven system. Market-makers set bid and ask quotes via a screen-based system. Each stock has at least two or more designated market-makers which display prices continuously over a prescribed period of the day (the "mandatory quote period"). The quoted prices must be valid at least for a stated order size ("minimum marketable quantity") which is set by the London Stock Exchange for each country sector on SEAQ International. The execution of orders is done via the telephone whereby market-makers are obliged to execute incoming orders at the displayed prices. SEAQ International allows market-makers to change quotes and to report transactions. However, in contrast to SEAQ's

[38] Some results of previous empirical studies examining this issue are discussed in 5.1.1.

rules for domestic stocks[39], SEAQ International does not require market makers to publish price and volume on individual trades.

NYSE

Similar to many other markets in the world, the NYSE operates a hybrid system which combines an auction and a dealer market[40]. It opens with an auction or batch market, and then switches to a dealer market. It is possible for members of the stock exchange to trade directly with each other (as in an auction market). However, they can also trade with the specialist who sets a bid-ask spread for the security since he acts as a dealer. The members on the NYSE can be categorised into four groups: (1) commission-house brokers who primarily handle public orders that originate off the exchange; (2) specialists who act as dealers, brokers, and auctioneers; (3) independent floor brokers who execute trades for other members and firms; and (4) registered competitive traders that primarily trade for their own account.

In particular, the specialist can assume three roles: auctioneer, dealer, or broker. As an auctioneer he sets a fair opening price. As a dealer the specialist buys and sells for his own account. In his function as a broker he can commission orders.

NASDAQ

NASDAQ is also like SEAQ International a quote-driven system. However, Franks and Schaefer (1995) discuss some differences in the transparency between NASDAQ and SEAQ. On NASDAQ publication of trades typically occurs within 90 seconds of the transaction taking place. However, a larger proportion of deals on NASDAQ are matched than on SEAQ[41]. Franks and Schaefer (1995) also examine a

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[39] For more details on the price impact of different publication rules, see Gemmill (1996).
[40] See, for example, Lindsey and Schaede (1992) and Madhavan (1992).
[41] In a matched trade, the market maker finds the counterparty to a buy or sell order before the order is completed. In an inventoried deal, the market maker meets a buy or a sell order by adjusting his inventory.

sample of block trades of non-UK securities that trade on SEAQ International and NASDAQ. They find that the median share traded is ten times as much on SEAQ International than on NASDAQ.

3.3.3 Statistical problems of trade reporting

Turnover as measured by value is often used as a proxy for liquidity. Hence, liquidity of different markets in foreign equities could be compared by using trading volume. However, this approach is flawed as turnover data is influenced by trade reporting procedures and trade reporting is not homogenous across markets[42]. The differences in trade reporting across markets are due to the following factors:

The first factor is that some exchanges allow trading in listed and unlisted securities (as the London Stock Exchange) while others do not permit trading in unlisted securities (e.g. the US stock exchanges). Therefore, comparing the trading volume in foreign equities on the London Stock Exchange with the US exchanges is difficult.

Secondly, two categories of stock exchanges can be distinguished according to the scope of transactions included in their markets. The "Trading System View" markets only include transactions that take place on the exchange's trading floor or through its trading system. The "Regulated Environment View" markets include all transactions that are subject to supervision by the stock exchange authority. This means that statistics include all securities business done by regulated members. Thus, one and the same transaction could also be reported in another market. "Regulated Environment View" markets, e.g. as London, will always report higher

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[42] Wells (1994) presents the results of a comparative study of differences in turnover statistics and trade reporting across European exchanges which was carried out by the "Economics and Statistics Sub-committee of the Federation of European Stock Exchanges".

trading volumes than "Trading System View" markets. London also has the largest number of foreign member firms of any market in the world.

Thirdly, technical factors may cause differences in the recording of transactions. Some stock exchanges count both the sale and the purchase while others only count the sale or the purchase.

3.4 Key issues and its implications for research

The importance of investment in foreign securities has grown substantially in recent years. In particular, US investors have become more interested to diversify their portfolios with international equities. The internationalisation of US fund managers' portfolios is expected to continue in the years to come. While US funds have currently invested approximately 6 percent of their holdings in foreign equities, market sources forecast an increase to 20 percent over the next 10 years. On the other hand, this should generate sufficient interest from US investors to meet the demand of foreign firms for equity capital. A number of factors are expected to contribute to the continuing growth in international equity-financing:

1. Privatisations have not been completed in many countries. For example, the initial public offering of German Telekom, which will be one of the biggest ever, will take place this November and will be followed by the sale of additional tranches in the future. Governments from Eastern Europe are expected to sell off more of their still state-owned assets.

2. A strong increase is also predicted for European companies, in particular from countries whose domestic stock market capitalisation still appears to be low in

comparison to the size of the economy. Countries like France, Germany, Italy, and Spain are currently undergoing fundamental changes in attitude and embracing Anglo-Saxon concepts of "shareholder value". In the past, companies from these countries were reluctant to provide information to shareholders and banks were their major providers of funds. This trend will also be assisted by the special structure of firms in these countries, which are still traditional family businesses. To mitigate problems of succession, floating the company is increasingly seen as a resolution.

3. Companies from emerging markets are expected to continue their capital raising activities. Strong demand may originate from South-East Asian companies and from Latin American companies.

Taking into account the size and the future potential of the international primary market, questions arise concerning the importance of international listing for companies to raise equity capital. It also raises the question whether a listing on the London Stock Exchange, NASDAQ, or on the NYSE gives the greatest access to international investors. The listing decision of a firm may also be influenced by the trading system of a stock exchange. This issue is of importance since some trading systems may offer better liquidity services than others. The choice of firms, however, is also influenced by the regulatory approach of each host market. The more stringent approach of the SEC in the US, which forces foreign firms to comply with US standards, may impose additional costs for foreign firms. To enable more foreign firms to obtain a listing on the NYSE, the NYSE has discussed several potential avenues of compromise with the SEC. Although the SEC has recently granted some concessions, it still appears to be adamant in requiring US treatment for foreign firms. However, future concessions for foreign issuers do not seem impossible any longer.

The battle of stock exchanges in attracting listings of foreign companies has intensified in recent years. This trend is likely to continue in the future with even some more players entering the competition. There are several projects to set up a pan-European market for smaller technology-oriented companies similar to NASDAQ. Some European stock exchanges have recently launched special markets for smaller companies (for example, AIM in the UK and Le Nouveau Marche in France) and others will follow soon (Belgian New Market in 1997 and Frankfurt (Germany) Neuer Markt in 1997). Moreover, in order to target foreign institutional investors, the "New Markets" of Belgium, France, and Germany plan to link up to form the nucleus of a pan-European exchange called "Euro.NM". To make the market more attractive for foreign investors, they plan to set up more stringent listing requirements than in the main market. For example, a German firm would be required to produce quarterly reports in German and English. This "Euro.NM" will be competing with EASDAQ (European Association of Securities Dealers), another pan-European project. EASDAQ is expected to open trading by late September this year and is modelled on NASDAQ. The exchange will be a quote-driven market but will also include an in-built periodic order-machting facility. The capital for EASDAQ is provided by approximately 40 shareholders which include insurance companies, pension funds, and banks.

The interest of a number of European and US companies in obtaining a listing on EASDAQ confirms the trend towards international listings. This trend is likely to be motivated by the desire of firms to trade on a liquid market and to have an international shareholder base. However, the continuing growth in international listings will also raise many new questions whose answer is beyond the scope of this thesis: what are appropriate listing standards for smaller start-up firms?; what are

appropriate ways to regulate information disclosure across different markets?; how do different market structures interact?

4. Chapter: The effect of international listing on the cost of capital

The discussion of the current structure of the international equities market has suggested that markets are not fully integrated, yet. This may create incentives for companies to overcome these barriers, and benefit from a reduction in market segmentation. Previous research on international market integration in general, and on international listing in particular, has argued that there is a link between international integration and the cost of capital of a firm. The review of the literature in this chapter is structured as follows. Section one outlines the framework for the cost of capital determination, while section two and three review the stream of the cross-listing literature which has tried to directly test the proposed implications on risk and return. Section four summarises the main implications of previous research.

4.1 Determinants of the cost of capital

4.1.1 The CAPM framework

Since its origins (see, for example, the papers of Sharpe (1964), Lintner (1965)), the Capital Asset Pricing Model (CAPM) has been the subject of much elaboration and extension. The CAPM states that the expected return on any asset is linearly related to its systematic risk (or beta) measured relative to the market portfolio of invested wealth. The most general implication of the equilibrium pricing model is that the market portfolio is ex-ante mean-variance efficient in the sense of Markowitz (1959).

4.1.2 Liquidity

Amihud and Mendelson (1986) examine the role of liquidity for asset pricing. They argue that illiquidity can be measured by the cost of immediate execution. Hence, an investor faces a trade-off: if he wants to transact he can either wait or trade immediately at the current bid or ask price. The spread between the quoted bid (purchase) and ask (offer) reflects the magnitude of the transaction costs faced by an investor. They examine stock returns, relative risk (β), and bid-ask spreads of NYSE stocks over the period 1961-1980. Their results show that stocks with higher expected returns have higher bid-ask spreads and higher relative risk. Moreover, there is a clientele effect. This means that investors with longer holding periods select assets with higher spreads. They continue their analysis by taking account of firm size, however, their results are not altered.

Amihud and Mendelson (1989) test an extension of the CAPM, as proposed by Merton (1987). He suggested that returns are an increasing function of their beta risk, residual risk, and size and a decreasing function of the public availability of information. The results confirm the A-M hypothesis that risk and illiquidity, as measured by the bid-ask spread, are the principal factors. The link between the bid-ask spread and Merton's (1987) model is formed by the number of investors which reflects the public availability of information about an asset.

The relevance of the liquidity proposition for international listings is embedded in the studies of Amihud and Mendelson (1986, 1988, 1989) that listing on organised exchanges can be viewed as a liquidity-increasing investment. The costs of such an investment can be balanced against the added value produced by the higher liquidity of its securities.

4.1.3 Investor recognition

Merton (1987) develops a two-period model of capital market equilibrium with incomplete information across investors. He adopts most of the standard CAPM-assumptions but relaxes the assumption of equal information across investors. Each investor only knows about a subset of the available securities and these subsets differ across investors. Thus, investors can only invest in securities of which they are aware. Merton's behavioural assumptions are based on the fact that investors' (individual and institutional) portfolios contain only a fraction of all world-wide traded securities. Also other factors such as market segmentation, taxes, transaction costs, and liquidity contribute to this observed behaviour. Further assumptions underlying the model include the standard frictionless-market conditions[43] and risk averse investors which select their portfolios according to the Markowitz-Tobin mean-variance criterion applied to end-of-period wealth.

However, the emphasis of this model is on the difference in the breadth of investor cognisance[44]. Hence, this model involves a special type of cost - the cost of making investors aware of the firm. Investors must pay a "set up" cost before they can receive information released by the firm[45].

Merton's model is consistent with the Arbel-Carvell-Strebel theory[46] of "generic or neglected" stocks which assumes that equilibrium expected returns on neglected

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[43] These are no taxes, no transaction costs, and borrowing and shortselling without restriction.
[44] This model assumes that the quality of information is the same for all securities but the information is distributed differently across investors. Other differential-information models (Klein and Bawa (1977) and Barry and Brown (1984, 1985)), however, focus on the price effects of differences in the quality of information across investors.
[45] Usually, investors only follow a subset of the traded securities. Therefore, they are not able to receive public announcements of the firm unless they have set up a mechanism to receive information. This sources of information include stock market advisory services, brokerage houses, and professional portfolio managers.
[46] Arbel, Carvell and Strebel (1983) assume that the quality of information increases with the quantity of investors following the stock.

stocks are larger than on widely followed stocks because the quality of information is relatively low.

Merton examines the effects of incomplete information on equilibrium asset prices and expected returns by aggregating the optimal portfolio choices for individual investors[47]. All investors face a "shadow cost" of not knowing about security *k* and this shadow cost Δ_k is measured in units of expected return. The equilibrium expected return on security *k* can be written as:

$$R_k = R + b_k\delta + \Delta_k \quad [48] \qquad (3.1)$$

where R is the equilibrium expected return on a security for the complete information case, δ is the coefficient of aggregate risk aversion, and b_k the exposure level of the common factor. The shadow cost of information Δ_k can also be written as:

$$\Delta_k = \frac{\delta \sigma_k^2 x_k}{q_k} \qquad (3.2)$$

where σ_k^2 is the firm-specific component of security *k*'s return, x_k is the value of firm *k* relative to the aggregate market value of traded securities, and q_k is the size of firm *k*'s investor base relative to the total number of investors. Equation (3.2) shows that the shadow cost of information decreases when the investor base increases.

Merton uses comparative statics to further analyse cross-sectional differences among expected returns. Equations (3.1) and (3.2) show that four parameters cause differences in equilibrium expected returns: b_k the exposure level of the common factor; x_k the relative size of the firm; σ_k^2 the firm-specific component of the firm's

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[47] The optimal portfolio choice is formulated as the solution to a constrained maximisation problem representing the fact that not all investors can invest in security *k*.

[48] All investors choose the same exposure to a common-factor b_k and have identical risk preferences δ. Δ_k is the shadow cost of information.

return variance; and q_k, the relative size of the investor base (i.e., degree of "investor recognition") for security *k*. Expected returns increase with larger common-factor exposure, larger firm-specific variance, and larger relative size and decrease with the relative size of the firm's investor base.

Merton continues his analysis and examines the investment behaviour of an individual firm and the role of the firm in determining the size of its investor base. He assumes that the firm makes its decisions in the best interests of the current shareholders what is achieved by maximising the current market value of the firm. Therefore, if an increase in the relative size of the firm's investor base reduces the cost of capital, managers have an incentive to expand the investor base. This can be done by using expenditures to increase the visibility of the firm in the investment community[49]. Moreover, investors can also be ruled out to invest in some securities by prudent-investing laws and traditions as well as other regulatory constraints. Merton argues that these effects are captured by the model because investors act as they did not know about the firm. But managers can spend resources on expanding the firm's shareholder base and thus making the firm an eligible investment for these investors. Listing on a stock exchange represents one way to do so. Furthermore, he argues that if a company seeks to raise capital for new investments the benefits of a public offering exceed those of simply selling new shares to existing shareholders.

[49] Merton points out that standard financial-equilibrium models are based on the assumption that only new and meaningful information leads to a change in investor evaluation of the firm. However, this model provides a rationale for stock price reactions to widely-circulated reports about a firm which do not provide any new substantive reaction.

4.1.4 The influence of international market segmentation

Segmentation of international capital markets is caused by various types of institutional trading barriers. Hartmann and Khambata (1993) examine 20 emerging stock markets and identify several barriers to ESM (emerging stock market) investment. These barriers include restrictions on portfolio investment (as limitations on access, repatriation restrictions, and withholding taxes), liquidity, and a poor institutional environment. They argue that the liquidity problem is especially acute in the case of large institutional investors which carry out block trades. Issues which are of particular importance concerning the institutional environment are unreliable and inaccurate accounting and market information.

In order to mitigate these negative effects, firms can adopt corporate financial policies which undo the barriers faced by investors. Stapelton and Subrahmanyam (1977) suggest the following financial policies: (1) Foreign portfolio/ direct investment by firms; (2) Mergers with foreign firms; (3) Dual listing of the securities of the firm on foreign capital markets.

While the approach of the theoretical models of Stapelton and Subrahmanyam (1977), Errunza and Losq (1985), Alexander, Eun, Janakiramanan (1987) differs, their implications are very similar. Stapelton and Subrahmanyam (1977) use numerical analysis to consider a situation in which capital markets were completely segmented before an international listing took place. Alexander, Eun, Janakiramanan (1987) derive a closed-form solution for asset pricing in this type of market. Errunza and Losq (1985) construct an analytical model of international asset pricing to represent the reality of a mildly segmented market but do not specifically address international listings. They all conclude that international market segmentation

depresses security prices and increases expected returns. Hence, if capital markets are not fully integrated one would expect stock prices to react to international listings because listings should result in structural changes in the equilibrium asset pricing relationship. Urias (1995) extends these findings and provides empirical evidence of the effects for emerging market firms.

Stapelton and Subrahmanyam (1977) model an eight firm and twenty investor economy. All firms generate the same return at the end of a single period with an expected value μ_j of US$100,000[50]. The eight firms are assigned to four different risk classes according to their standard deviation. (σ_{j1}= 25,000; σ_{j2}= 30,000; σ_{j3}= 18,000; σ_{j4}= 22,000.) Each risk class represents one industry and comprises two firms. Firms (1;5), (2;6), (3;7) and (4;8) are each in the same industry and are correlated 0.9. Firms (1;2;5;6) and (3;4;7;8) can be viewed as being in the same sector of the economy and therefore have a correlation coefficient of 0.7. The correlation coefficient of the other firms is 0.1. The investors are assumed to have constant absolute risk aversion utility functions. Each investor has an initial wealth of US$17,000 and the market rate of interest is 8%.

They proceed in providing numerical solutions for equilibrium security prices by modelling the tatonnement process towards equilibrium. Their analysis illustrates standard results[51] of corporate finance for given perfect capital markets. In a next step, they investigate the effects on prices of various types of segmentation now assuming that four firms and ten investors are in one country (UK) and the remaining firms and investors in another (US). They distinguish four cases of market segmentation:

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[50]Returns can be interpreted as cash flows in a single period world, or as exogenously given market values plus dividends at the end of the period.

[51]They calculate security prices, betas, expected rate of returns for different cases (merger, leverage).

(1) Complete segmentation - but not very realistic.

(2) A restriction on the amount of investment in foreign securities allowed for each individual.

(3) A percentage premium or tax levied on investment in foreign securities.

(4) A restriction on the aggregate amount of investment by one country's nationals in the other country. This aggregate restriction gives rise to a "dollar premium" of the type which UK investors have to pay on foreign portfolio investments.

They obtain different results for the four cases of segmentation and for US and UK companies[52]: Total segmentation as assumed in case (1) decreases all stock prices but in particular those in the UK. The cost of capital rises substantially[53] although betas within the market are hardly affected. Partial segmentation is assumed in case (2) where each UK investor is restricted to a US$5,000 investment in US stocks. This decreases the prices for the US stocks (down from US$84.34 to US$80.67) while UK stocks remain unaffected. Case (3) models the effect of a 10% tax on foreign investment by UK investors and shows similar results as case (2). Case (4) represents the case of UK foreign exchange restrictions on overseas investment which produces the dollar premium. The results are similar but a bit more extreme than in case (3). Another scenario assumes total segmentation of both markets. One US stock is allowed to list on an UK exchange. This leads to an increase in the price of that stock because the demand for this stock is now the sum of the demand from both markets. UK stocks remain depressed due to the covariance effect in the expanded market because the equilibrium prices reflect the covariance structure. The prices of the other US stocks increase, too.

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[52]The UK is assumed to have the riskiest stocks and the most risk averse investors.
[53]Their analysis provides rates of return between 18-29% without segmentation but 61-82% with total segmentation.

To summarise their findings, they show that segmentation depresses security prices and increases expected returns. International listing increases the demand for and the price of the listed stock. The unlisted stocks remain depressed due to the covariance effect in the expanded market.

Errunza and Losq (1985) develop a model with unequal access to equities[54]. The unrestricted investors can trade in all securities available while the restricted investors can only trade in a subset of securities. This creates two classes of securities: eligible and ineligible securities. In the case of the two-country capital market, where country 1 investors are restricted, country 2 investors are unrestricted, country 1 securities are eligible and country 2 securities are ineligible (for country 1 investors). Errunza and Losq (1985) derive two propositions from their model in a mildly segmented market under certain conditions[55].

Proposition 1:

a) The eligible securities are priced as if the market was not segmented.

b) The ineligible securities command a super risk premium which is proportional to the conditional market risk[56].

c) The restricted investors cannot hold the ineligible securities and thus diversify their portfolio. Therefore, they hold the market portfolio of eligible securities plus a proxy of the market portfolio of ineligible securities which is supplied by the unrestricted investors[57].

The magnitude of the super risk premium depends on the risk aversion coefficients of the unrestricted investors compared to the aggregate population of investors. The

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[54]But they do not address the issue of foreign listing in particular.
[55]Unequal access to securities, perfect and frictionless capital markets, mean variance and normality.
[56]The conditional market risk is defined as the conditional covariance between its return and the return on the market portfolio of all ineligible securities.
[57]The unrestricted investors act as financial intermediaries and provide diversification services.

risk premium is assumed to increase as the risk aversion of the unrestricted investors increases. For equilibrium to prevail the super risk premium must exist, as an inducement for unrestricted investors to hold the ineligible securities and supply them to the restricted investors as a diversification portfolio.

Proposition 2:

The unconditional market risk of any security is proportional to its beta coefficient and the conditional market risk of any ineligible security is a linear function of β and γ coefficients.

According to their model, restricted securities should command a super risk premium proportional to the differential risk aversion and the conditional market risk. The required return of unrestricted securities should not be affected by the incidence of mild segmentation. Their cross-sectional tests result in some tentative support for their expectations of a mildly segmented market[58].

In order to capture the effects of a firm's listing decision on a segmented capital market, Alexander, Eun, and Janakiramanan (1987) derive a closed-form solution for this asset-pricing problem analytically. Their model assumes two countries, the domestic country and the foreign country. The capital markets are completely segmented with the exception of one domestic security that is dually listed in the foreign country[59]. While the aggregate demand for the pure domestic securities is determined by summing demand from domestic investors, the aggregate demand of the dually listed security is determined by the demand from investors of both

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[58]A more recent study by Errunza, Losq, and Padmanabhan (1992) investigating a group of emerging markets confirms this findings.

[59]Other assumptions are: Perfect capital markets in both countries, investors with constant absolute risk aversion, allowance of short sales, normally distributed security returns and a fixed exchange rate.

countries. The demand for the dually listed security depends on the covariance of its return with the returns of all pure foreign securities.

The fact that all investors hold the dually listed security is reflected in the return structure. The expected return on the dually listed security depends on the covariance of its return with the returns on both the domestic and foreign market portfolios. The pricing of the pure domestic securities is influenced by an "externality effect" because the domestic market becomes indirectly integrated with the foreign market via the dual listing. The expected return on a pure domestic security depends now on its covariance with the return on the domestic market portfolio, its indirect covariance with the return on the domestic market portfolio and its indirect covariance with the return on the foreign market portfolio. However, the magnitude of this effect differs among different domestic securities depending on their correlation with the dually listed security. In the case of a perfect negative or positive correlation, the domestic security is a perfect substitute for the dually listed security and is priced as if it were dually listed itself. They use comparative statics to obtain further insights how dual listing affects asset pricing. They find out that the change in the expected rate of return upon dual listing depends on the relative values of the aggregate risk aversion coefficients, the market value coefficients in the two countries, and the covariance of the dually listed security with the domestic and foreign market portfolios.

Since securities are assumed to be less positively correlated between countries than within a country, the required rate of return for a dually listed security should be lower than for a segmented security. Thus non-dually listed securities should have a higher expected return.

Urias (1995) constructs a model of security cross-listing for emerging market firms and incorporates the features of the American Depositary Receipt (ADR) market. This model extends the work by Alexander, Eun, and Janakiramanan (1988). It is based on a two-market world (the emerging capital market and the US market) where foreign (US) investors can only invest in cross-listed securities but are prohibited from holding other domestic equities of the restricted emerging market. Hence, cross-listed securities are priced by foreign (US) and domestic (emerging market) investors, while pure domestic shares are only priced by domestic investors. Moreover, the model allows for the four different types of cross-listed securities as found in the ADR market[60].

Urias's (1995) model tests for liberalisation and spillover effects of Chilean and Venezuelan stocks. Since emerging market firms face pronounced barriers to investment before the listing, they become "liberalised" upon the listing. "Liberalisation" refers to the impact of a stock's dual listing on its stock market risk. It measures the change in the stock's sensitivity to the market upon the cross-listing. This means if a Chilean stock becomes less sensitive to changes in the Chilean market and more sensitive to changes in the US market, and the required return in the US market is less than in the Chilean market, the firm's cost of capital will decline. "Spillover" refers to the impact which Chilean ADR programmes may have on other purely domestic Chilean stocks and the Chilean stock market in general. The results imply that the sensitivity of Chilean stocks to the US market has increased, while the exposure to the Chilean market has declined.

In summary, the theoretical models predict that international listing will reduce the expected return of a security if capital markets are segmented. The magnitude of the

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[60] For a detailed description of the ADR market, see 2.3.1.

reduction in expected returns depends on the degree of segmentation between the domestic and the foreign market. They also predict that the domestic and foreign risk exposure of an internationally listed firm changes. It is expected that the influence of the foreign market on the listed firm's return will increase and the influence of the domestic market will decrease. Since it is also likely that two segmented markets are not perfectly correlated, a diversification effect should lead to a reduction in standard deviation of stock returns.

4.2 Stock price behaviour of listings

Empirical research has tried to test the theoretical propositions, which arise from international market segmentation models, by investigating the stock price behaviour of listings. Similar to research on domestic exchange listing, research has focused on examining the stock price effects around the time of listing. In contrast to domestic exchange listings, however, previous empirical research provides mixed evidence concerning the valuation impact of international listing. While some studies provide evidence of significant listing effects, others suggest that an international listing on its own has no significant wealth effects. It should be noted, however, that the assessment of wealth effects is complicated by the difficulty to pinpoint the announcement date of a firm's decision to list abroad. Therefore, studies generally use the actual listing date as the event date which clearly weakens the power of the tests. In accordance with previous studies, price effects associated with international listings can be split into pre-listing and post-listing period effects.

4.2.1 Pre-listing period effects of international listings

a) Negative abnormal returns

Howe and Kelm (1987) were among the first to examine the effect of an overseas listing on shareholder wealth. They employ a sample of 112 US firms which have 165 listings (67 listings on the Basle Stock Exchange; 60, Frankfurt; 31, Paris; and 7, Tokyo). The firms obtained their listing between 1962-85. They use the market model to estimate abnormal returns over the 90 day pre-listing period (t=-90 to t=0) and the 40-day post-listing period (t=+1 to t=+40)[61]. Howe and Kelm (1987) find significantly negative abnormal returns for US firms listing on the Basle and Frankfurt Stock Exchanges and negative abnormal returns for the Paris Stock Exchange. These negative returns especially occur in the pre-listing period whereas the post-listing period does not seem to be consistently associated with negative abnormal returns. They explain these wealth losses are due to the arising regulatory uncertainty which is an important cost for companies listed abroad.

b) No valuation effects

Lee (1991) investigates a sample of 141 US companies that listed on the London Stock Exchange (119 companies) and on the Toronto Stock Exchange (22 companies) between 1962-86. They compute average daily residuals and cumulative average residuals over the 131-day test period (t= -90 to t= +40). The CARs for both exchanges are not statistically significant. That indicates that overseas listings do not harm shareholders' wealth as opposed to Howe and Kelm's results.

Lee (1992) reports similar results for 16 UK companies listing on the Tokyo Stock Exchange between 1986-88, and 9 Japanese companies listing on the London Stock

[61]The parameters of the market model are estimated from the 100-day period ending prior to the event period.

Exchange between 1983-89. They examine abnormal returns and cumulative abnormal returns over a 17-week period (12 weeks before, 4 weeks after the listing) using the market model[62]. Their results are consistent with Lee (1991) as they do not observe any significant price movements before or after the listing.

Fry, Lee, and Choi (1994) examine the valuation effects of overseas listings using a sample of 71 US firms that listed on the Tokyo Stock Exchange between 1973 and 1989. Their investigation spans a period of 121-days (pre-listing period from t=-100 to t=0; post-listing period from t=+1 to t=+20), and utilises the market model[63] to calculate abnormal returns. Their results are consistent with those reported above and thus, indicating no significant wealth effects for shareholders.

c) Positive abnormal returns

Two other studies which examine the US listing of non-US firms find positive abnormal returns in the pre-listing period. The results of Alexander, Eun, and Janakiramanan (1988) and Foerster and Karolyi (1993) show that international listings experience positive CARs in the pre-listing period. While Alexander, Eun, and Janakiramanan (1988) examine monthly abnormal returns over a 36-month pre-listing period, Foerster and Karolyi (1993) investigate daily abnormal returns over a 103-day pre-listing window. Since both studies are more concerned with detecting structural changes in the pricing parameters in the post-listing period, they will be discussed in more detail in the following section (see 4.2.2.).

Jayaraman, Shastri, and Tandon (1993) examine the underlying shares of a sample of foreign firms that set up an ADR (American Depositary Receipt) programme in the

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[62]Parameters are estimated using 48 weeks of return data, ending on week-13 prior to the actual listing week.
[63]Parameters are estimated over the 180 day period ending one day prior to the beginning of the test period.

US market and find positive abnormal returns on the listing day (for more details see 4.3.).

Lau, Diltz, and Apilado (1994) examine 346 US firm stock listings on ten different stock exchanges in the period from 1962 to 1990. For a reduced number of sample firms, they use three different event dates: (1) the date of application for listing (42 firms); (2) the date of acceptance of the application (153 firms); and (3) the first trading day on the stock exchange (346 firms). Their results show that firms experience positive abnormal returns around the date of acceptance (1.25 percent for CAR (-5, +4) but negative returns on the first day of trading (-0.36 percent).

4.2.2 Post-listing period effects of international listings

Alexander, Eun and Janakiramanan (1988) are among the first to test the theoretical propositions (see 4.1.4.) empirically. According to their hypothesis, expected returns should be at a lower level after the listing. Their research design tries to consider possible liquidity and signalling effects as well as selection bias[64], therefore choosing a 36-month period (from t=-72 months to t=-36) to estimate the expected return before the listing. Thus, they avoid getting an upwardly biased estimate[65]. They argue that using residual analysis[66] in this way allows them to detect changes in expected returns following the event of international listing. Persistent abnormal

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[64] They argue that both liquidity and signalling effects, if they exist, may cause a firm's stock price to rise abnormally around the announcement date of the listing. In order to test for any announcement effects, they utilise the following Capital Asset Pricing Model-based return-generating process: $R_{it} - r_t = \alpha_i + (R_{mt} - r_t)\,\beta_i + e_{it}$. OLS are applied to estimate α_i and β_i. The α value should not be significantly different from zero if announcement effects are absent in the estimation period. But their results indicate the presence of some selection bias in the estimation period.

[65] If an estimation period very close prior to the announcement date is used the chance of making Type I errors increases.

[66] For more information on the Mean Adjusted Returns technique, see Brown and Warner (1980).

returns in the post-listing period combined with the assumption of efficient markets may indicate a change in the expected return upon international listing.

Their sample comprises 34 non-US companies which listed on an US stock exchange over the period 1969-1982. Furthermore, they split the sample into two subsamples of 13 Canadian and 21 non-Canadian firms to detect any differences of the integration among national capital markets. They also hypothesise that non-Canadian firms should have a larger decline in expected returns than Canadian firms because their capital markets are less integrated with the US-market[67].

Their results indicate a persistent decline of CARs in the post-listing period. This decline starts two months before the listing date and is statistically significant for the overall sample and the non-Canadian subsample. Their tests on the paired differences of mean returns also show significantly lower mean returns for the post-listing period in comparison to the pre-listing period for the overall sample and the non-Canadian subsample.

In their view, the empirical results support their hypothesis that a listing is accompanied by a reduction in expected returns, especially for non-Canadian stocks if markets were either "mildly" or completely segmented beforehand. This decline in expected returns was stronger and statistically significant for non-Canadian companies. They suggest that non-Canadian stock markets are more segmented from the US market than the Canadian stock market. Alternatively, they suggest that the Canadian market is as segmented from the US market as the other stock markets but has a higher covariance with the US market.

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[67] Jorion and Schwartz (1986) reject an integration between the Canadian and the US market due to legal barriers linked to the country of origin of listed securities.

A more recent study by Foerster and Karolyi (1993) re-addresses this issue in examining pre-and post-listing returns for a sample of 49 Canadian firms which listed on US stock-exchanges between 1981-1990. They compute market-adjusted returns for each day over a period from t=-103 days to t=+103. In order to examine pre- to post-listing differences in expected returns, they compute cumulative average returns for the pre-listing period (t=-103 to t=-4) and for the post-listing period (t=+4 to t=+103). They perform tests on whether "pre" returns are significantly greater than "post" returns. Although they reverse the findings of Alexander, Eun and Janakiramanan (1998) regarding the integration of Canadian firms, they reaffirm the propositions of the theoretical models. They conclude that expected returns are significantly lower after the listing which supports their hypothesis of segmentation between the Canadian and the US markets.

Foerster and Karolyi (1993) also provide empirical evidence of different price reactions due to industry effects. They base their examination on the assumption that the extent of integration and segmentation of financial markets is determined by the industry to which a firm belongs. Roll (1992) shows that the correlation between national stock markets is mainly explained by the industrial composition of a country. Countries with similar industrial composition are more highly correlated. Thus, companies from industries being more segmented from the foreign market experience a different stock price reaction upon listing. According to the results of Foerster and Karolyi (1993), non-resource based firms experience cumulative excess returns in the pre-listing period but drop in the post-listing while the pre- versus post-listing difference for resource based companies is insignificant. They infer that Canadian resource firms are not as segmented from US markets as non-resource firms. One possible explanation could be the segmentation effect of

Canada's dividend tax credit[68] as non-resource companies tend to pay higher dividends than resource-based companies. This induces segmentation between US and Canadian markets.

Damodaran, Liu, and Harlow (1993) investigate a sample of 276 NYSE stocks that listed on the Tokyo and London stock exchanges between 1965 and 1990. They find some evidence of lower mean returns[69] after the listing. However, they do not find any price effects in the listing period starting 10 days before and ending 10 days after the listing date.

Varela and Lee (1993a) examine their hypothesis that the integrating effect of the listing decreases the expected rate of return. Their sample is comprised of 68 US firms listing on the London Stock Exchange between 1984-87 and 43 US firms listing on the Tokyo Stock Exchange between 1973-87. They observe a significant decrease in the SML's intercept. Their results support the theoretical implications in that international listings lead to a decrease in expected returns.

Varela and Lee (1993b) also report significantly negative deviations from expected returns for a sample of US firms listing on the London Stock Exchange between 1965-1987. Intertemporal comparisons yield significantly negative deviations for the 1965-1975, the 1984 and the 1984-1987 listings group while the deviation from expected returns for the 1975-1983 group is negative but not statistically significant.

Varela and Lee (1993b) perform inter beta-comparisons for their sample of US companies, listed on the London Stock Exchange. They base their investigation on

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[68]Canadian investors pay less tax on dividends received from domestic versus foreign stocks. Thus Canadian investors receive a premium on dividend-paying Canadian stocks what leads to a higher cost of capital for firms.
[69] They compare raw and excess returns in the pre- and post-listing period using 500 days of returns before and after the listing.

Stehle's (1977) finding[70] that low beta firms tend to have a higher non-domestic systematic risk because of a higher degree of international operations and are larger in size than high beta firms. In order to determine the pre-listing return, Varela and Lee (1993b) use Black's modified asset pricing model in which barriers to international investment are represented by a proportional tax on holdings of foreign assets. The post-listing return is represented by the SL model. The difference between both equations results in $u_{i,}$,which may be defined as the difference between the listed firm's true required return and the required return corresponding to the pre-listing relationship. The expected value of u across firms should be zero if no segmentation exists between the domestic and the foreign markets. But the theoretical models, as described above, suggest a negative value for u assumed that the "super" risk premium for the segmented security vanishes upon dual listing. The cumulative value for u is estimated by employing a matrix format. A significant value for u would indicate a downward drift in returns in the post-listing period.

Their empirical tests employ a sample of 168 US firms that listed on the London Stock Exchange between 1965-87. They perform intertemporal[71] and inter-beta comparisons for their sample. Their testing period is from 0 to 30 days after the listing. They assign dummy variables to high beta securities (defined as $\beta>1$) to test their hypothesis that low beta stocks experience a larger decline in expected returns upon listing. This would be reflected by a negative deviation of the value of u.

The findings of Varela and Lee (1993b) show significant negative deviations for the pre-84 and the post-84 groups for low beta stocks. High beta stocks have generally negative but insignificant deviations. These deviations may be due to changes in the

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[70]Stehle (1977) shows that returns for only low beta are underestimated when the simple SL model is used with a segmented capital markets assumption.
[71]The split their sample into two groups: Pre-84 group (1965-84) and post-84 group (1985-87).

pricing parameters of those firms as proposed by Black (1974) and Stulz (1981). The results of the pre-84 group are consistent with their hypothesis of a fall of the intercept and a rise in the slope. This suggests that low beta firms experienced significant integration effects in the 1965-83 period through a listing on the London Stock Exchange. But the results for the 1985-87 group do not show significant parameter changes although significant negative deviations exist. They conclude that some other unknown factors cause this deviation but see their results generally in support with the theoretical propositions. Their findings show significant negative deviations for low beta stocks but they are not able to explain the differing results in comparison towards high beta stocks.

A very recent paper by Sundaram and Logue (1996) examines valuation effects of companies that list ADRs on the NYSE and the American Stock Exchange. To measure valuation effects associated with international listings, they employ price-to-book, price-to-cash-earnings, and price-to-earnings valuation ratios. Although their approach differs from previous studies, their findings are consistent with the implications of the models of international market segmentation.

4.2.3 The price behaviour of new issues and domestic exchange listings

Listings on domestic exchanges have received much attention in the literature. A great number of US studies investigates the behaviour of stock returns from firms which changed their trading location or simultaneously trade on more than one stock exchange. But in contrast to research on international listings most studies report similar results: they observe positive abnormal returns in the pre-listing period[72] and

[72]All studies use the actual listing date as date of reference.

a persistent decline of returns in the post-listing period. Since these post-listing period results are similar to the pattern observed for new issues, this body of literature will also be discussed.

Ying, Lewellen, Schlarbaum, and Lease[73] (1977) conclude that listing seems to have some value for the companies examined. It might serve as a signal of managers' confidence in the future prospects of the firm.

Sanger and McConell (1986) investigate the behaviour of stock returns of US companies that moved from the OTC market to the NYSE between 1966 and 1977. They divide their sample into a pre-NASDAQ and a post-NASDAQ period in order to examine the impact of the introduction of NASDAQ. Consistent with earlier studies they find positive abnormal returns in the pre-listing period before the introduction of NASDAQ. However, this pattern changes in the post-NASDAQ period because they only find a reduced and statistically insignificant reaction to the same event. These results support their hypothesis that the increase in value associated with exchange listings is attributed to the "superior liquidity" of the new market. They define superior liquidity as following: "... a market is said to provide superior liquidity services if the cost of immediately trading a given quantity of a security in that market is lower than the comparison market." However, this advantage of superior liquidity has been substantially reduced through the introduction of the new NASDAQ system[74] which is demonstrated by the change in the return pattern in the post-NASDAQ period.

McConnell and Sanger (1987) examine several explanations for the observed negative post-listing return behaviour but none of them gives a sufficient answer. Explanations related to data peculiarities, as (a) negative returns are due to a few

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[73]They examine a sample of 248 US companies that listed on the NYSE or AMEX between 1966-68.
[74]Ho and Stoll (1983) develop a model of the interaction among competing dealers and provide empirical support for the advantages of such a market.

peculiar subperiods; (b) negative returns are due to a few outlier observations; and (c) negative returns are due to biases in the first trading price, do not provide an answer. They also name a number of other explanations: (a) Negative post-listing stock returns are due to the loss of market-maker support. This explanation is based on the difference in the market structure between the NYSE and NASDAQ[75]. (b) Negative post-listing stock returns are due to peculiarities of the NYSE[76]. (c) Negative stock returns are due to new stock issues shortly after the listing. (d) Negative stock returns are due to insiders dumping the stock. Insiders postpone their sales of large blocks until listing occurs. They hope to get a better price in the supposedly more liquid market than in the relatively illiquid market before the listing. This excess supply creates downward pressure on the stock price. (e) Negative stock returns are due to a "correction" of an initial market "overreaction".

For the purpose of this study, only their test of the new issue explanation will be discussed briefly. McConnell and Sanger (1987) classify the companies into two subsamples, one for companies having issues within the following 12 months and those not having issues. However, only 10% of all companies had issues within the following 12 months and they experience positive abnormal returns compared to those without new issues which experience significantly negative returns. Thus, their evidence is strongly contrary to the conjecture that new issues of common stock explain the negative post-listing performance in stock returns.

Baker, Khan, and Edelman (1994) investigate 87 NYSE and AMEX stocks that became dually listed on the Pacific Stock Exchange (PSE) between 1984 and 1990. Their results show that CARs decline (-3.29 percent) during a 20-day period

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[75]Whereas one single specialist handles the trades on the NYSE, an unlimited number of brokers and dealers act as market makers on the NASDAQ.

[76]But they do not further specify what these peculiarities might be.

following the day of listing but it does not persist for the 100-day period. The findings also indicate that low liquidity stocks, as measured by the Amivest liquidity ratio, perform worse than high liquidity stocks. This suggests that market fragmentation (see also 5.1.3.) has a greater negative effect on low liquidity stocks.

Kadlec and McConnell (1994) examine the stock price reaction of 273 US-domiciled OTC firms that listed their stock on the NYSE between August 1980 and December 1989. Their findings are consistent with previous studies of domestic exchange listings. They report statistically significant positive abnormal returns from four weeks prior to the listing week through to the listing week. They continue their analysis by investigating the potential sources of value from exchange listings such as liquidity benefits and an increase in the shareholder base. Therefore, they jointly test Merton's (1987) investor recognition factor[77] and Amihud and Mendelson's (1986) liquidity factor[78] by regressing the specified proxies for the asset-pricing factors on the listing period abnormal returns. Their results indicate that post-listing relative and absolute bid-ask spreads[79] are lower than pre-listing spreads[80]. The change in the bid-ask spread for each security is examined further by controlling for the change in Merton's Δ_k [81] and regressing both proxies on the listing period abnormal returns to test for differences across securities. They find that firms experiencing a reduction in their bid-ask spreads exhibit higher positive abnormal returns. However, their results provide even stronger support for Merton's (1987) model as firms experiencing the greatest increase in shareholders exhibit the highest abnormal returns.

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[77] The proxy for Merton's (1987) asset pricing factor is described above (see 4.1.3).
[78] Amihud and Mendelson (1986) suggest that expected returns are an increasing and concave function of liquidity, as measured by the relative bid-ask spread. The implications of their model will be described in more detail in section 4.1.2.
[79] Absolute and relative bid-ask spreads are computed from end-of-day quotes over the month prior and subsequent to listing.
[80] Kadlec and McConnell report that ca. 60% of the sample firms experience a decline in their spreads. The fact that ca. 40% of the sample firms appear to experience an increase in their spreads may be partly explained by the use of the "market spread" (highest bid price and lowest ask price among all NASDAQ dealers) for the pre-listing period and the specialist quote for the post-listing period on the NYSE.
[81] The shadow cost of information - see 4.1.3.

Dharan and Ikenberry (1995) examine the post-listing behaviour of 2889 US exchange listings which moved from the NASDAQ to either the ASE or NYSE, or from the ASE to the NYSE between July 1962 and December 1990. They find that CARs of domestic exchange listings are significantly negative during a 36-month period subsequent to the listing. The post-listing drift is persistent for different sub-periods and industries. However, it varies over time across the three types of exchange listings. CARs of firms moving from NASDAQ to ASE show the most pronounced negative reaction, followed by NASDAQ to NYSE movers, and ASE to NYSE exchange listings. Although the magnitude of the post-listing drift is reduced, the results do not change when adjusted for size and book-to-market effects.

Dharan and Ikenberry (1995) continue their analysis by examining the impact of equity offerings on the post-listing performance. While the presence of IPOs[82] does not account for the post-listing drift, the presence of seasoned equity offerings explains some portion of the poor performance following the listing. Although particularly firms that offered equity prior to changing their listing location from NASDAQ to NYSE performed badly, the "equity issuance puzzle" does not fully explain the negative post-listing behaviour. They proceed their analysis and examine a "timing"-related explanation. Their results show that the post-listing drift is more severe for smaller firms and firms with relatively low institutional holdings. Since these firms have generally more volatile earnings, they are more constrained by the listing requirements. Hence, they have to list at opportune times when they qualify for a listing.

Several studies have shown that new issues underperform in subsequent periods. While Ritter (1991) examines 1526 US initial public offerings (IPOs) which went

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[82] They repeat their examination of the post-listing performance after excluding listing firms whose initial public offering was less than two years prior to the listing.

public between 1975 and 1984, Levis (1993) investigates 712 IPOs which came to the market between 1980-1988. Their results are very similar, since both studies find a poor aftermarket performance of IPOs. However, they also show that there is substantial variation in underperformance across industries and time periods. Ritter (1991) finds that firms which issued in high-volume years have the worst performance.

Loughran and Ritter (1995) and Spiess and Affleck-Graves (1995) provide similar evidence for seasoned equity offerings. Spiess and Affleck-Graves (1995) examine the five-year post-offering performance of 1247 US equity offerings during 1975-1989. Their results show long-run underperformance of equity issuing firms when adjusting for size (-39.36 percent), industry- and size (-31.24 percent), and book-to-market (-30.99 percent). The underperformance also persists after controlling for trading system, offer size, and firm age.

The evidence suggests that there are a number of different factors influencing the price behaviour in the pre- and the post-listing period. However, listing and in particular foreign listing does not appear to be an uniform event across companies and stock exchanges. Hence, a research design must also consider other factors as institutional characteristics and capital raising activity of a firm.

4.3 Listing and variance of stock returns

Another line of research examines the risk implications of international listings. The assumption of perfectly segmented markets implies that the risk of an asset is only measured relative to the systematic factors present in that market. The theoretical models of international asset pricing (see 4.1.4) predict that international listing

should lead to a decline in the risk characteristics if listing is an effective integration mechanism. However, the model of Freedman (1991) implies that cross-listing leads to an increase in the variance of returns.

In order to detect changes between pre-and post-listing periods for 68 US companies which listed in Germany, France, Japan and Switzerland, Howe and Madura (1990) utilise different related measures of risk. None of these measures (as domestic beta, foreign beta, standard deviation, other measures) provides significant evidence of changes in the risk characteristics. They interpret their results as being consistent with already integrated markets. However, a few words of caution are necessary because the majority of their sample consists of US corporations that listed in Germany or in Switzerland. Since the US market is much bigger in size and trading volume and the volume of foreign equities in both countries is only a fraction of the total trading activity, no changes in the risk characteristics should be expected.

Jayaraman, Shastri, and Tandon (1993) examine the impact of the listing of 95 ADRs on an US stock exchange on the risk of the underlying stock. Basing their investigation on several theoretical models[83] which examine the linkage between information arrival, trading volume and the variance of return on a security, they hypothesise that international cross-listing should result in an increase in the variance. According to the Freedman model, they assume that international cross-listing allows informed traders to optimally allocate their trading of dually listed stock between two separate markets to take advantage of information differentials in the markets. Informed traders are provided additional opportunities to trade on and profit

[83]Kyle (1985) models a market with three types of traders - informed, random liquidity, and the specialist. Admati and Pfleiderer (1988) include a fourth class of traders called discretionary liquidity traders. Freedman (1991) extends Kyle's model in allowing traders to allocate their trades between separate markets.

from their long-lived information[84]. Thus, cross-listing leads to an increase in the revelation of information which causes the variance of the stock price to increase.

The empirical analysis of Jayaraman et al. (1993) compares pre- and post-listing variances of returns on the underlying stock. They compute pre-and post-listing variances from daily close-to-close returns on the underlying security. The pre-listing period starts 150 days and ends 26 days before the listing, while the post-listing period starts 26 days and ends 150 days after the listing date of the ADR. They report a 55.7% increase in the variance for their sample of ADRs. A breakdown into subsamples shows that the magnitude of the variance change differs with the nationality of the companies. UK firms experience a significant change of 98.8% while the variance of Japanese stocks only changes 34.6%.

Their results are consistent with the Freedman-hypothesis but inconsistent with noise trading[85] because they do not observe changes in the autocorrelation structure after the listing. The increase in volatility is also inconsistent with the hypothesis of a change in the return generating process after the listing[86]. Their results support the proposition that the increased trading time associated with the cross-listing allows for more revelation of information.

Makhija and Nachtmann (1990) examine the variance-effects of 37 NYSE stocks which listed on the Tokyo Stock Exchange between 1973-1988. They compare pre-listing to post-listing daily variances for various windows. However, the change in the

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[84]The Freedman model (see also 5.1.2) differs as it allows for a long-lived information structure (assuming a life of two periods) whereas the model of Admati and Pfleiderer assumes that private information becomes useless after one period.

[85]Black (1986) assumes that an increase in trading time causes the variance to increase due to the overreaction of traders to each others trades. If the noise trading hypothesis is correct, one would observe negatively autocorrelated returns since these overreactions are corrected over longer periods.

[86]They estimate domestic and foreign betas utilising a two-factor model of returns before and after the listing. But their results do not provide evidence of changes in the return-generating process.

variance is not significant for the 50, 100 and 200 day periods[87]. But they report significant increases in the variance when using different windows after dropping 100 trading days before and after the listing date. They conclude that the variance of NYSE stocks increased after their Tokyo listing. Their results, however, need to be treated with some caution because 50% of the companies in their sample listed in 1986. After dropping 100 trading days the reported values of their post-listing periods are probably strongly influenced by the occurrence of the crash in October 1987. This might explain their findings that the variance increases as the period is extended away from the listing date[88]. Makhija and Nachtmann (1990) interpret their results as being consistent with the private information theory. This states that the flow of information is increased when exchange hours are extended.

Makhija and Nachtmann's (1990) results, however, are in contrast to Barclay, Litzenberger and Warner's (1990) findings which indicate no changes in the overall level of return variance for dually listed US stocks on the Tokyo Stock Exchange. They perform time-series and matched pair tests to examine the ratios of open-to-close to close-to-close variances. They match 21 internationally listed US firms with 21 only domestically traded US companies on the basis of size and industry but find no differences in their ratio of variances. Their average ratio of within-day (open-to-close) to 24 hour (close-to-close) return variance is almost identical and shows that approximately 80% of the 24 hour variance occurs during the trading day in the domestic market. Furthermore, they compare the variance ratio of 16 listed stocks before and after the listing. The results do not show any changes and indicate again that the stock-return variance is more closely related to the level of normal trading

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[87]They test the percentage change in daily variance for three different windows: 50-day window (-50, +50), 100-day window (-100, +100) and 200-day window (-200, +200) comparing the means for the two periods.

[88]They perform the same tests for the same window but drop 100 days before and after the listing, so that their 50-day window comprises now the days (-150 to -100 and +100 to +150) and so forth. They report an increase of 39.7% for the 50-day window, 40,4% (100-day), and 88% (200-day).

volume than to the number of trading hours. The Admati and Pfleiderer model suggests that the volume will be lower in the foreign than in the domestic market. Thus, the variance only increases if the international listing increases the trading volume.

4.4 Conclusion

The review of the theoretical literature which examines the determinants of the cost of capital has shown that liquidity, investor recognition, and international market segmentation have an impact on the cost of capital of firms. This implies that firms can reduce their cost of capital if they find ways to improve the liquidity of their stocks and increase their shareholder base. Since the literature suggests that firms can invest in "liquidity-enhancing projects", international listing may be one of them. Moreover, such a project may also increase the shareholder base because the firm spends resources to make itself an eligible investment for international investors. This idea forms the link to the models of international market segmentation. They are based on the assumption that foreign firms are ineligible investments for domestic investors because of the existing barriers to international investment as transaction costs, information costs, or legal restrictions on portfolio investment. All these models conclude that a reduction or removal of these barriers should lead to structural changes in the equilibrium asset pricing relationship. Hence, one should observe an increase in the share price prior to the listing and a decline in expected returns once these stocks become internationally listed.

While studies which examine pre-listing period abnormal returns provide different results, post-listing period results appear to be more unanimous. They report

persistently negative abnormal returns in the post-listing period which is interpreted as being consistent with a decline in expected returns once these stocks obtain an international listing. However, an increasing body of literature provides empirical evidence that initial public offerings and domestic exchange listings of US firms exihit a similar negative return pattern. Several studies have shown that new issues underperform in subsequent periods. Other papers that examine domestic exchange listings of US firms observe a negative post-listing drift in stock returns. Very often it is argued that firms try to time their issues to take advantage of overoptimistic investors. However, this misvaluation is gradually corrected in subsequent periods leading to negative abnormal returns. These competing interpretations of negative post-event returns raise questions for international listings.

5. Chapter: Determinants of the international listing decision

The results of the previous chapter, which reviewed the literature on the determinants of the cost of capital, have highlighted the importance of liquidity and international market segmentation for asset pricing. This chapter presents a more in-depth analysis of different aspects of liquidity. It also examines the relevance of international listing for raising equity and the effect of market conditions on equity issuance. Moreover, it reviews other motives of listing which have been suggested by previous research. The last part summarises the implications that arise from the review of the literature in this chapter.

5.1 Listing and market microstructure effects

The relationship of liquidity and expected returns has been discussed in the previous chapter. The literature provides a wide body of evidence which examines liquidity in various contexts. Previous research does not only focus on bid-ask spreads but extends the investigation to different measures of liquidity and liquidity-related factors. This stream of the literature is often called market-microstructure literature, since it examines the effect of different trading systems and market structures on asset prices.

5.1.1 Cross-sectional variation in liquidity

In the literature, liquidity has generally been proxied by three different measures: (1) bid-ask spreads, (2) volume, and (3) depth[89]. Previous research has shown that there is a relationship between these different measures of liquidity and some other microstructure related variables.

Benston and Hagerman (1974), Stoll (1978), and Barclay and Smith (1988) provide evidence that price level, return volatility, and volume explain a significant fraction of the cross-sectional variation in bid-ask spreads. Jegadeesh and Subrahmanyam (1993) confirm these findings by examining the change in bid-ask spreads of the underlying shares after the introduction of the S&P 500 index futures contract, and control for price, return volatility, and volume. It is usually argued that a higher volume should result in lower spreads because it offers market makers greater flexibility to offset inventory imbalances. Larger volatility should lead to higher spreads because it implies higher inventory risk. The inverse relationship between price level and spreads is due to a lower fixed-cost component. For a given number of shares per trade, fixed costs can be spread across more dollars in high priced stocks.

Many previous papers have attempted to model the cost components of the quoted spread. In general, three components are distinguished: (1) order processing costs (Tinic, 1972); (2) inventory holding costs (Amihud and Mendelson (1980) and Ho and Stoll (1981)); and adverse selection costs (Copeland and Galai (1983), Glosten and Milgrom (1985), and Kyle (1985)). George, Kaul, and Nimalendran (1991) develop a new approach to estimate bid-ask spreads and its components. Their findings show

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[89] Kyle (1985) defines depth as the size of an order flow innovation that is required to change prices at a given amount. This means that in a highly liquid market almost any amount of stock could be bought or sold immediately without moving the current market price.

that order processing costs are the predominant component of quoted spreads. While adverse selection costs comprise a significant component of the spread, they do not find evidence of an inventory cost component. Snell and Tonks (1995) develop a model that measures the impact of inventory control, adverse selection, and anticipated liquidity trade effects on price quote revisions of market makers on the London Stock Exchange. Their dataset allows for stronger tests of inventory control effects since all trades on the London Stock Exchange must pass through the market makers' inventory and can be unambiguously classified as buys or sells. They find that market makers set their price quotes to maintain their inventory around a desired level. Although there is some evidence of adverse selection, they conclude that asymmetric information is not very widespread in highly liquid stocks.

The models of Chowdry and Nanda (1991) and Freedman (1991) examine the effect of multiple trading locations on the liquidity of assets (for more details see 5.1.2). Both models predict that multiple market trading increases liquidity. Neal (1987) develops a model of bid-ask spreads based on the theory of contestable markets to examine the effect of multiple-listed options on spreads. This model relates the bid-ask spread to trading volume, price, volatility, and competition and predicts lower spreads for a market with potential competition. The competition variable is constructed as a multiple listing dummy variable which is zero if the option is listed on a single exchange and one for multiple-listed options. Their results show that multiple-listed options have lower bid-ask spreads than options which are listed on a single exchange.

Since a great body of literature has investigated the impact of the trading system on liquidity, it appears to be crucial to understand their role. However, the remarks of Pagano and Roell (1996) show the inherent difficulties: "The substantive differences

between the different securities trading systems currently operating around the world are not easy to understand. The trading systems differ across many different dimensions. Many details concerning rules and practices are not available in published form or even understood by anyone except the direct participants in the trading process. And opinions differ as to the relative importance of many aspects of dealing regulations."

Two alternative trading systems[90] can be distinguished (see also 3.3.2), as described by Pagano and Roell (1992): Whereas in an auction market (or often referred to as order-driven system) all outstanding orders are transacted at a single price via a centralised mechanism, in a dealership market (or referred to as quote-driven market) they are placed with individual dealers, who execute them at pre-set prices[91].

Some empirical studies address this question by comparing trading costs of foreign equities on SEAQ International to their domestic markets. The London Stock Exchange (1992)[92] splits total costs into explicit and implicit costs. Explicit costs include commissions, fees, and turnover taxes and implicit costs are measured by the bid-ask spread. Their results show that explicit costs are significantly lower on SEAQ International than in the domestic markets. Implicit costs appear to be significantly lower in the home markets but the estimation procedure depends on the trading system and makes an exact comparison very difficult.

Wagner and Edwards (1993) remark that execution costs vary depending on the manager's style of investment decision making. Their study investigating institutional

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[90] However, there are a number of hybrid market structures because some markets run different systems depending on the trading activity of a particular stock or the time of the day.
[91] Market makers quote bid and ask prices at which they are willing to buy and sell shares up to a specified size.
[92] The study compares trading costs of four markets: London, Paris, Milan, and Frankfurt.

trades splits execution costs into the four components commissions, price impact, timing cost, and opportunity cost. Their findings are consistent with a study investigating the trading in German equities on SEAQ International. Fund managers and traders asked to list the key factors used in selecting a broker or market maker cited quality of research, execution skills, long-term relationships, and readiness to handle large orders amidst other factors. Institutions also expressed the view that the preference for immediacy or order building influences the choice between a quote-driven (e.g. SEAQ) or an order-driven (e.g. IBIS) market mechanism.

Pagano and Roell (1991) investigate trading in Italian stocks. They provide further empirical evidence that the trading volume on a specific exchange is not only due to cost factors but also to other characteristics, as greater market depth, immediacy, location, and other typical features of dealership markets. Their results show an overall increase in trading volume after the start of the Italian market sector on SEAQ International[93]. De Jong, Nijman, and Roell (1993) find lower spreads for the Paris Bourse but conclude that the London market provides more liquidity at larger sizes. Size appears to be one key factor because the trading systems differ in the execution of large "block" trades. While other trading systems require pre-negotiations, block trading on SEAQ International is facilitated by limiting disclosure on block trades.

Based on Amihud and Mendelson's (1986) findings, Reinganum (1990) investigates market-microstructure effects in asset pricing after controlling for size and potential liquidity-related variables[94] by comparing NYSE with NASDAQ listed firms. A Fama-

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[93]A further increase in aggregate trading volume is reported when Milan reformed its market. See London Stock Exchange (1993).

[94]Previous research generally finds that trading volume is negatively related to spreads (the greater the volume, the smaller the spread). Applying this results to Amihud and Mendelson means that stocks with lower volume will have higher average returns.

Mac Beth pooled time-series, cross-sectional regression[95] framework is utilised to calculate an adjusted differential liquidity premium. The exchange dummy is a proxy for the market microstructure in which the securities are traded. Reinganum (1990) finds that differences in average monthly returns persist after controlling for risk and some liquidity-related variables. This suggests that the exchange dummy is a proxy for omitted liquidity effects. But this liquidity advantages seem to depend on individual firm characteristics.

5.1.2 Trading model for internationally cross-listed stocks

Freedman (1991) develops a theoretical trading model which examines the impact of international cross-listing on the variability of prices, the volume of trading, the informativeness of prices, and the costs of trading for different types of traders. She assumes that the foreign and the domestic market do not operate simultaneously[96] and trading on the foreign market precedes trading on the domestic market. Her model has three different types of traders:

1) "Informed traders" who trade on their long-lived private information[97] about the value of the stock. This value becomes public information at the end of period 2. There are several informed traders who compete with each other. Since this information is long-lived, information traders must decide how to optimally allocate their trading between the domestic and the foreign market.

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[95]Following variables are included: Exchange dummy, Roll's implicit spread, aggregated-coefficient beta, stock-market capitalisation, number of shares outstanding, price per share, variance ratio, and stock return during the prior 12-month period.

[96] Chowdhry and Nanda (1991) develop a theoretical model which is based on the assumption of simultaneous trading of one asset in multiple locations. In this model informed traders can exploit their short-lived private information in multiple markets.

[97] Freedman assumes a life of two periods for the information. In this sense her model is based on Kyle's (1985) multi-period model but Kyle's model applies only to the case of one informed trader. Admati and Pfleiderer (1988) develop a model with more than one informed trader but that private information is only useful for one period.

2) "Uninformed liquidity traders" who trade randomly. She further assumes that most of the liquidity traders prefer to trade on the domestic stock exchange, however, without modelling traders' preference for the domestic market.

3) The "market maker" receives submitted orders from liquidity and informed traders and sets prices so that his expected profits of the given order flow are zero.

Freedman examines the effects of international cross-listing on trading costs, price variance, informativeness of prices, and trading volume in the domestic and the foreign market under different scenarios[98] by comparing the results of a dually listed stock with a singly listed stock.

Freedman measures trading costs using the market depth parameter λ which is an inverse measure of market depth. Trading costs for liquidity traders on the domestic market are a decreasing function of the number of informed traders in the case of a dually-listed stock as well as for a singly-listed stock. However, the decline in trading costs is stronger for the dually-listed stock as long as there is more than one informed trader. An increasing number of informed traders causes more competition in the earlier round of trading in the foreign market, thereby forcing traders to reveal more information. Therefore, informed traders make less profit in the second round of trading in the domestic market, thus lowering the cost of liquidity trading in the domestic market. Liquidity traders who are assumed to prefer trading on the foreign market always face higher trading costs. But this result has to be treated with some caution as the assumed benefits for trading earlier are not modelled. The expected profits of the informed traders equal the costs of the liquidity traders since the market makers' profits are expected to be zero. This implies that dual listing can increase

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[98] Freedman varies the number of informed traders N, and the variance of liquidity trading on the domestic and the foreign stock exchange.

informed traders' profits because they have more opportunity to trade upon their inside information, however, provided the number of informed traders is relatively small.

The results show that the variance on the domestic exchange increases after the dual listing because traders are provided with more opportunities to trade. This leads to an increase in the revelation of information by the time the price is set on the domestic exchange.

The informativeness of prices Q[99] measures to what extent the price P at which market makers are willing to trade a certain quantity, that is necessary to clear the market, reveal the value of an asset F. The expected value of an asset reflects all the private information about it. The informativeness of prices increases with the number of informed traders. The increased competition among informed traders forces them to reveal more private information in earlier rounds and, thus, increases the informativeness of prices.

Total trading volume (domestic + foreign exchange) increases when the stock becomes dually listed. The magnitude of increase is an increasing function of the number of informed traders which are given more opportunities to trade. However, the domestic exchange loses some trading volume to the foreign exchange.

Chowdhry and Nanda (1991) utilise the framework of the theoretical models of Kyle (1985) and Admati and Pfleiderer (1988) to investigate the effects of multiple trading locations on trading volume. They model a market with different participants who have different strategies. "Small" liquidity traders are assumed to execute all their trades in one market. "Large" liquidity traders split their trades across markets to

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[99] Q = var (F| P)

minimise costs. The informed traders' and the large traders' order sizes are perfectly correlated across different markets. Therefore, an increasing proportion of liquidity trading leads to an increase in the total trading volume. If trading costs differ between markets the cost-minimising liquidity trader is forced to concentrate his trading in the cheapest market. This will also attract the information traders because their profitability of trading on the information is maximised in the most liquid market. Furthermore, the presence of "small" liquidity traders implies that the aggregate size of a typical trade becomes smaller if there is only a single market. However, informed traders need liquid markets which enable them to camouflage their trades.

5.1.3 International listing and changes in liquidity

While Freedman's model predicts an increase in liquidity for internationally cross-listed stocks, other studies have suggested that an additional trading location may lead to a decline in the liquidity of a stock. Three different hypotheses concerning the effect of an additional trading location on the market quality of the primary market (or domestic market) have been suggested by previous literature: fragmentation, competition, or segmentation.

"Fragmentation"[100] assumes that international listing diverts order flow away from the domestic market, thus resulting in less efficient pricing and lower market quality. "Competition" assumes that international listing increases the number of traders. This increased competition enhances the liquidity and the efficiency of the market. "Segmentation" presents an intermediate view combining aspects of both theories. Segmentation assumes that the effect on liquidity depends on the structure of the

[100] For details on fragmentation see also Hamilton (1979).

local market, especially if there is segmentation between domestic and foreign customers. Therefore, segmentation may lead to narrower bid-ask spreads, however, accompanied by a lower depth[101].

Empirical studies on international listing examine these theoretical predictions in a number of ways and for different markets. While Foerster and Karolyi (1993) examine changes in trading volume from the pre- to the post-listing period for Canadian stocks listing in the US, Noronha, Sarin, and Saudagaran (1996) investigate changes in bid-ask spreads and depth for US firms. Domowitz, Glen, and Madhavan (1995) are the first to examine changes in liquidity for ADR listings of Mexican companies. Kleidon and Werner (1994) use a different approach to examine the liquidty effect of international cross-listing. They compare the intraday pattern of cross-listed firms with other firms which are not cross-listed.

Improvements in liquidity once a stock becomes internationally listed appear to be an important motivation for managers to obtain a listing. Mittoo (1992) uses a survey approach to address the question of managerial perceptions of the net benefits of foreign listings. His sample consists of 78 Canadian companies[102] which are listed in the US and UK. The results show that managers' perceptions of benefits from foreign listings are associated with the increased liquidity of their firms' stock[103]. A further examination utilising univariate tests between the perceived net benefits and the percentage of a firm's stock trading on the foreign stock exchange[104] supports this relationship. Multivariate tests that control for other variables such as percentage of

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[101]This phenomena is described in more detail in Madhavan (1995).
[102]A mail questionnaire was used to obtain information. 190 Canadian companies listed on stock exchanges in the US or UK were identified. 78 companies replied (response rate of 41%). The survey was anonymous and the companies were not identified.
[103]Firms' managers were asked to select and rank their potential reasons for an overseas listing from a list constructed from the literature. A second question requested their perceived benefits of the listing.
[104]The percentage of a stock' s trading volume is obtained through the survey by requesting the respondent to check one of the five categories.

sales in foreign countries, percentage of equity issued, size of the firm, and listing location[105] indicate that the trading volume on foreign exchanges is the only factor that influences the perceived net benefits significantly. These results show that managerial perceptions of net benefits from foreign listings are strongly linked to the level of trading activity in their firm's shares on foreign stock exchanges.

Mittoo (1992) points out that the importance of trading volume is corroborated by analysing answers of firms which delisted from foreign exchanges voluntarily[106]. They all cited a lack of trading activity for their main reason of delisting. This trend is consistent with recently reported delistings of mainly US companies from the Tokyo Stock Exchange where the trading volume of foreign stocks declined substantially[107]. He also examines the question why trading activity differs across companies. He estimates another multiple regression model to explore the relationship between the trading volume and some firm specific factors. Three of the specified variables have a significant impact on the foreign trading volume. The main factor appears to be the percentage of equity issued in foreign markets. He concludes that firms conducting most of their business abroad are likely to have a greater appeal to foreign investors. However, he also points out that an increase in liquidity may not be relevant in the case of US firms that list abroad because US firms already enjoy a high liquidity in their domestic market.

Foerster and Karolyi (1993) base their analysis on the framework of Admati and Pfleiderer (1988). They hypothesise that dual listing should lead to an increase in the overall trading volume if there are different costs of trading stocks between the Canadian and the US market. They compare the monthly average security trading

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[105]US studies try to examine different effects of a NYSE or a NASDAQ listing.
[106]An additional questionnaire was mailed out to companies which delisted voluntarily from foreign exchanges. Although the response rate was very low it gives a good indication of the motives of a foreign listing.
[107]The average daily trading in foreign stocks declined from a peak of Y11,235 bn in 1989 to Y410bn in 1993. See also Aponte (1994).

volume of dually listed Canadian stocks in the pre-listing period[108] to the post-listing period[109]. Their results show an increase in the aggregate trading volume, and thus support the findings of Chowdhry and Nanda (1991) and Freedman (1991) that dual listing is associated with increased liquidity. However, they do not give any information on differing transaction costs in the Canadian and US market as hypothesised.

Kleidon and Werner (1994) compare the intraday pattern of volatility of prices, trading volume, and bid-ask spreads of a sample of UK firms[110] that are cross-listed on the NYSE or AMEX to FT-SE 100 firms[111] which are not cross-listed and S&P 100 firms[112]. Firstly, they estimate time-of-day-effects using regression analysis for the S&P 100 firms. Their results show a U-shaped pattern of volatility with significantly higher variances in the first hour of trading. Trading volume is also U-shaped since it is significantly higher at the open and at the close. Bid-ask spreads are also U-shaped being significantly higher from the open up to 11:00 and rising again above the mid-day-level during the last 35 minutes of trading. This observed intraday pattern is generally explained by Admati and Pfleiderer's (1988) model which focuses on asymmetric information between traders. Informed traders choose to trade in periods of high volume because this enables them to disguise their trades. Competition among informed traders reveals sufficient information to the market to induce liquidity traders to trade at the same time because their trading costs are lowest when volume is heavy. Therefore, informed and uninformed traders trade simultaneously. The higher volatility during that period is due to the revelation of

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[108]Volume transacted on the Toronto Stock Exchange in particular stock.
[109]Volume includes now the transactions on the US and the Canadian exchange.
[110] Their sample comprises 23 companies which are listed in form of ADRs. The time period is from January 1, 1991, through December, 31 1991..
[111] This subsample consists of 76 UK firms. Transactions data spans the period from October 1, 1991, through March 10, 1992.
[112] 98 US firms are in the subsample and the time period is from January 1, 1991, through December, 31 1991.

private information to the market by informed traders. The results for spreads are consistent with Bagehot's (1971) argument that highest spreads coincide with periods of highest informed trading.

The results for FT-SE 100 firms show a different intraday pattern of return variance and volume than S&P 100 firms. Although volatility of transactions returns is generally U-shaped, it is the largest at the end of the day. The volatility of mid-point quote returns are also generally U-shaped, however, early morning returns are more volatile than afternoon returns. The pattern for trading volume has a two-hump-shape with spikes at 10:00 and at 12:00. Trading volume is significantly higher at the end of the day between 14:40 and 16:30. Spreads are seen to be U-shaped but they fall and rise much faster to and from their mid-day level than those of the S&P 100 firms. Moreover, they are virtually flat throughout the day.

The volatility pattern for UK cross-listed securities in the UK is similar to the results for FT-SE 100 firms. The volume pattern is also similar, however, volume is significantly higher between 14:40 and 16:30. Spreads also show the same intraday behaviour but they generally decline between 15:30 and 16:25. This might be an indication of increased competition at a time when the US market and SEAQ simultaneously operate. The results for UK cross-listed securities in the US are generally similar to those of S&P 100 firms. Trading volume shows a U-shaped pattern and is significantly higher in the morning. However, spreads are not U-shaped and are significantly higher in the morning and significantly lower in the last hour of trading.

Kleidon and Werner (1994) conclude that their results suggest some degree of segmentation between the two markets. Furthermore, the results indicate distinct intraday patterns in prices and volumes for different market structures.

Noronha, Sarin and Saudagaran (1996) investigate liquidity effects of internationally listed US companies[113] using intraday data. Comparing changes in bid-ask spreads and depth from the pre- to the post-listing period[114] their results show no change in bid-ask spreads but an increase in depth after the listing. The increase in depth is around 10%, and is statistically and economically significant. They also report an increase in daily trading volume. They proceed their analysis by regressing other microstructure related variables such as price, trading volume, daily return variance, and a dummy variable indicating spread changes on bid-ask spreads and depth. Their results for the spreads are consistent with earlier findings[115]: raw spreads should be higher for higher priced stocks, larger volatility implies higher spreads, and a higher trading volume leads to lower spreads. Return variance and volume have the opposite effect on depth than on spreads. The effects of the price on depth are the same as for spreads. These results indicate that all changes in depth can be explained by changes in other microstructure variables.

Noronha, Sarin and Saudagaran (1996) further analyse the impact of international listing on informed trading. Their results suggest that trades in the underlying stock become more informative after the listing. This is consistent with Freedman (1991) who argues that more informed traders are attracted to the market after the listing because they can trade for extended hours and with a greater degree of anonymity. They argue that this increase in informed trading is responsible for the lack of improvement in spreads in spite of increased competition among traders. The cost of

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[113] Their sample consists of 126 US companies which were listed on the London and Tokyo Stock Exchange between 1983 and 1989.
[114] The pre-listing period starts 125 days prior and ends 26 days prior to the date of listing. The post-listing period is from day +26 to +125. Daily weighted average bid-ask spreads are calculated by using quote-by-quote data where the weight for each quotation is the seconds for which that quotation is outstanding divided by the number of seconds in the trading day. The use the same weighting scheme for the depth measure.
[115] See Demsetz (1968) and Stoll (1978).

providing liquidity increases because marketmakers try to compensate themselves against the increased risk of trading with investors with superior information.

Domowitz, Glen and Madhavan (1995) examine the impact of Mexican companies' ADR listing in the US on the market quality of their primary Mexican stock market[116]. They argue that inferences about market quality can be made by examining underlying market liquidity and base level volatility. In a market where transitory order imbalances generate price movements, price volatility and volume are positively correlated. They develop an econometric model to examine the effects of ADRs on price volatility and liquidity. Price volatility consists of two elements. The first component arises from changes in fundamentals and imperfect information signals. The second component is due to order flow shocks that arise from non-information based trading. The volatility induced by order flow shocks increases with greater risk aversion, greater variance in public beliefs, and fewer market participants. The second component can also be expressed as the product of volume and a market liquidity parameter[117]. This implies that liquidity increases with the number of traders, and decreases with greater risk aversion and a greater variance in public beliefs.

Their empirical results show an increase in the base level of volatility and an increased sensitivity of price variability to volume. They argue that their results are consistent with the fragmentation hypothesis. Their test of changes in spreads reveal a decrease in 17 of their 23 series. This indicates that there may have been a trade-off between depth and spreads which is consistent with the segmentation hypothesis. However, their analysis of average ADR and domestic market returns

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[116]Their sample includes 16 Mexican firms that listed ADRs between September 1989 through July 1993. The data is comprised of 26 different time series.

[117]In this case the variance of price changes can be written as follows: $\sigma^2(\Delta p) = \omega_t + \lambda V^2$ where ω_t is the base level of volatility, λ, the market liquidity parameter which is an inverse measure of market liquidity, and V , the volume.

suggests that there is sufficient arbitrage between both markets. Although they find that the ADR market has diverted some order flow[118] away from the Mexican market, the overall volume seems to have increased.

The results of the empirical studies appear to be largely consistent showing that international cross-listing leads to an increase in liquidity. However, the studies have also shown that the impact of international cross-listing on liquidity is influenced by different market structures. Although liquidity seems to be an important motivation for managers to obtain a listing, the results have highlighted the importance of understanding different markets before making a choice.

5.1.4 Evidence of domestic listing and liquidity changes

Previous research has investigated the issue of listing and liquidity for the domestic US market in various contexts. Research, for example, includes studies that examine market microstructure effects of domestic exchange listings (e.g. Sanger and McConnell (1986), Cooper, Groth, and Avera (1985), Edelman and Baker (1990), Cowan, Carter, Dark, and Singh (1992), and Kadlec and McConnell (1994)), changes in the index list (e.g. Harris and Gurel (1986) and Beneish and Gardner (1995)), and derivatives trading (e.g. Neal (1987) and Jegadeesh and Subrahmanyam (1993)).

Sanger and McConnell (1986) and Kadlec and McConnell (1994) provide empirical evidence that a major stock exchange listing improves liquidity[119]. These findings contrast with earlier evidence by Cooper, Groth, and Avera (1985) who examine the

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[118] Order flow is calculated similar to Foerster and Karolyi (1994). It is calculated as the ratio of average daily dollar volume of the ADR market to average daily dollar volume of the Mexican market.
[119] For more details see 4.2.3.

relationship of liquidity to exchange listing and price behaviour during major up and down movements. They compare the liquidity ratio and "up- and down betas" of 1515 NYSE, 801 AMEX, and 964 OTC stocks. Their study centers around the idea that smaller stocks, and hence less liquid stocks, are affected by institutional buying and selling behaviour if swings in the market take place[120]. Their results suggest that security performance becomes more sensitive to downward movements in the market as liquidity decreases, and less sensitive to market upswings as liquidity increases. Moreover, OTC stocks appear to be more liquid than AMEX stocks of the same size which suggests that exchange listing is of little benefit to companies.

The findings of Cowan, Carter, Dark, and Singh (1992) investigating US firms' domestic listing choices support the idea that firms list their stock on other exchanges in search of a more liquid market[121]. This would reduce transaction costs for their potential shareholders. They emphasise, however, that this potential cost-reducing benefits are not uniform across all firms. Moreover, they argue only those firms list on an exchange whose characteristics offer the greatest probability of reducing their spread by doing so. In a first step, they compare a number of microstructure-related characteristics of listing firms to the matched control portfolios[122]. Their microstructure-related variables include book value of assets, market value of equity, ratio of market to book value of equity, number of shareholders, shares outstanding, average volume, average trade size, market makers, relative bid-ask spread, return variance, beta, years qualified for listing, fraction of sample with dual classes of shares, fraction of sample listed on

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[120] They suggest that institutional investors "probably buy big stocks first and sell small stocks first".
[121] They compare a sample of 277 US firms that list on the NYSE in the period 1973-1990 to a control sample of firms that are eligible but remain on the NASDAQ.
[122] They match listing with non-listing control firms on the basis of two-digit SIC code industry classification and compare listing firm data with control firm data for the same year.

NASDAQ/NMS, and growth in pre-tax profit. Their results suggest that listing choices depend on stock liquidity characteristics and thus, the potential benefits of a listing.

According to results of other studies[123], the reduction of bid-ask spreads is a likely motive for exchange listing. Cowan, Carter, Dark, and Singh (1992) proceed in their investigation and examine the relationship of a number of independent liquidity-related variables of the bid-ask spread. Their results indicate that the bid-ask spread is especially influenced by the volume of a stock, the bid price, and the number of market makers. In a next step, they examine the impact of a number of trading characteristics on the listing decision. They observe several variables which appear to influence a firm's listing decision. Firms are more likely to list when their spreads are larger than other market microstructure characteristics would predict. Furthermore, they suggest that the reduction of estimation risk[124] could be a motive for a listing.

While Harris and Gurrel (1986) investigate price and volume effects of S&P 500 list changes, Beneish and Gardner (1995) examine stock price and trading volume effects of changes in the composition of the Dow Jones Industrial Average (DJIA). The sample of Beneish and Gardner (1995) consists of 37 listings and 31 delistings between 1929 and 1988. They find that the inclusion of stocks in the DJIA does not affect their stock price and volume behaviour. However, delistings experience negative abnormal returns and a decrease in their trading activity. These findings are consistent with an information cost/ liquidity explanation. Information cost models (e.g. Arbel and Strebel (1982), Barry and Brown (1984), and Amihud and Mendelson

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[123]Grammmatikos and Papaioannou (1986a) suggest that a listing on the NYSE reduces the bid-ask spread and find that companies benefit the more the greater the bid-ask spread in the pre-listing market for the stock. This is demonstrated by positive abnormal returns at the announcement of the listing.

[124]Other studies find that the betas of newly NYSE listed firms decline during the first year of trading on the exchange. Clarkson and Thompson (1990) argue that the reduction in beta is the result of a decreasing estimation risk as more information is generated about listed firms. Dhaliwal (1983) presents empirical evidence that more financial information is collected and disseminated on firms listed on the NYSE or AMEX.

(1986)) predict that investors demand higher returns for stocks with less available information. Since bid-ask spreads (see 5.1.1.) decrease with trading volume, the decline in trading volume for delisted stocks is consistent with an increase in transaction costs and a reduction in information for these stocks.

5.1.5 Price transmission dynamics and efficiency of the ADR market

The issue of linkage and dynamic interaction of markets has been examined in various contexts. Previous studies, for example, have investigated the interdependence between national stock markets (Arshanapalli and Doukas (1993), Eun and Shim (1989), Kasa (1992), Malliaris and Urrutia (1992), and Taylor and Tonks (1989)), the price discovery in futures and cash markets (Fleming, Ostdiek, and Whaley (1996), Garbade and Silber (1983), Quan (1992), and Wahab and Lasghari (1993)), the efficiency of foreign exchange markets (Hakkio and Rush (1989), and Sephton and Larsen (1991)), and price interactions of cross-listed stocks (Ben-Zion, Hauser, and Lieberman (1996) and Eun and Jang (1996)). A great number of these studies make use of developments in the theory of cointegration to test for market efficiency and linkages among markets.

Since the flow of international investment has rapidly grown in recent years, studies on international stock market linkages provide information on how shocks in one market are transmitted to other markets. The majority of these studies use stock market indices and find that the US market leads other international equity markets. Eun and Shim (1989) investigate the international transmission mechanism of stock market movements for 9 different markets. Their vector autoregressive analysis (VAR) shows that a substantial amount of multi-lateral interaction between these

markets exists. While movements in the US market are rapidly transmitted to other markets, no foreign market can significantly explain movements in the US market. Taylor and Tonks (1989) use Granger-causality tests to examine the integration of UK and other stock markets. They find that the UK stock exchange has become cointegrated with the German, Dutch, and the Japanese market. Arshanapalli and Doukas (1993) conduct cointegration and error-correction tests to examine the dynamic interaction between the US, French, German, Japanese, and UK markets. Their findings show that the three major European markets (UK, France, and Germany) have become strongly cointegrated with the US market after the 1987 crash. Kasa (1992) uses Johansen's multivariate cointegration tests and finds that a common stochastic trend drives equity markets of the US, Japan, UK, Germany, and Canada. Most studies draw similar conclusions arguing that in the long run there appear to be no gains from international portfolio diversification since markets have become closely correlated.

Karolyi and Stulz (1996) and Lau and Diltz (1994) use NYSE-listed Japanese ADRs and their underlying shares to investigate the impact of information shocks on the comovement of US and Japanese returns. The results of Karolyi and Stulz (1996) show that large shocks to broad-based market indices have a positive impact on the magnitude and persistence of return correlations. Lau and Diltz (1994) show that the transmission of pricing information for Japanese firms with listed ADRs runs from the Tokyo Stock Exchange to the NYSE. However, they argue this result is not surprising since these firms are headquartered in Tokyo.

Other ADR studies are mainly concerned with the efficiency of the ADR market. Rosenthal (1983) finds that ADR prices are fairly consistent with weak-form efficiency since abnormal returns could not be earned from any price dependence.

Kato, Linn, and Schallheim (1991) investigate the underlying share and ADR prices of 8 Australian, 7 English, and 8 Japanese firms. Their findings show no significant differences between the prices, and thus no arbitrage opportunities seem to exist. Rosenthal and Young (1990) examine two Anglo-Dutch groups (Unilever and Royal/Dutch Shell) which trade on the London Stock Exchange, on the Amsterdam Stock Exchange, and as ADRs on the NYSE. Although they report persistent deviations from the theoretical pricing relationships, the direction and the magnitude of the mispricing is not sufficiently large enough to formulate profitable intra- or intermarket trading rules. Kim, Mathur, and Szakmary (1995) examine 21 Japanese, 21 British, 5 Dutch, 5 Swedish, and 4 Australian companies which trade as ADRs in the US. To investigate informational efficiency and the dynamics of information transmission of ADRs and underlying shares, they perform multivariate cointegration tests and a vector autoregressive analysis (VAR). Their results show that ADRs respond to unexpected movements in the underlying shares, the S&P 500 index, the domestic index, and the exchange rate, implying that ADR markets are informationally efficient. Moreover, their findings show that currency shocks have become a more important factor for pricing ADRs in recent years.

To explore the transmission of pricing information for identical assets trading in different markets, Garbade and Silber (1979) develop a model that examines short-run price relationships for dually-traded securities on the NYSE, the Midwest Stock Exchange (MSE), and the Pacific Stock Exchange (PSE). Their results indicate that regional market prices always adjust to NYSE prices. Hence, the NYSE is the dominant market while the regional stock exchanges are satellites of the NYSE. The "Garbade and Silber approach" is also used by Pagano and Roell (1991) to

investigate whether the London market for Italian equities[125] and the Milan Stock Exchange are integrated. Their examination of the direction of information flows between both markets shows that a mutual feedback relationship over time between prices exists but in most cases Milan seems to lead London.

Quan (1992) examines the price discovery of crude oil and futures markets. They find that the spot price and one- and three-month-ahead futures prices are cointegrated which suggests there is a long-run relationship between the spot and futures price. The results of an error correction model, which is used to study the dynamics of the relationship between futures and spot prices, show that the spot price leads the futures price.

Wahab and Lasghari (1993) examine the daily price change relation between stock index and stock index futures markets for the Standard and Poor 500 (S&P 500) and the Financial Times-Stock Exchange 100 share index (FT-SE 100). To test the causal relationship between time series, they employ the theory of cointegration, as developed by Engle and Granger (1987). The estimation procedure consists of two steps. In a first step, a levels regression is performed to generate residuals which may be thought of as equilibrium pricing errors. These residuals are then subjected to a variety of tests for cointegration. In the second step, the lagged values of the residuals enter into the error correction model as the last period equilibrium error. The error correction coefficients serve to purposes: they help to identify the direction of causal relation between two time series and show the speed with which departures from the equilibrium are corrected in the short run.

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[125]Italian equities are traded on SEAQ International which is a screen-based price quotation system for trading non-UK shares. However, to be traded on SEAQ International does not require an "official" listing (for more details on SEAQ I, see 3.3.2). For details on Pagano and Roell (1991) see also 5.1.1.

The results from Wahab and Lasghari (1993) indicate that a feedback relationship between spot and futures markets seems to exist. Similar to previous studies the spot appears to lead the futures market. The equilibrium adjustments are not fully completed within one day. They argue, however, that the presence of causal linkages is consistent with a variety of market imperfections and realities that prohibit market participants from responding to every single deviation between both markets. Fleming, Ostdiek, and Whaley (1996) also argue that in practice frictions exist and trading costs differ across markets. Hence, price discovery will tend to occur first in the lowest cost market, as information-based trades are executed where they produce the highest net profit. Their empirical results show that the S&P 500 index futures and S&P 100 index options appear to lead the S&P 500 stock index and the underlying S&P 100 index respectively since trading in index futures and index options is cheaper than trading an equivalent stock portfolio. This trading pattern, however, is reversed for individual stocks since the stock market offers lower trading costs and is deeper than any particular option price series.

Following the price discovery studies of cash and futures markets, Eun and Jang (1996) and Ben-Zion, Hauser, and Lieberman (1996) use an error correction approach to examine the price behaviour of international cross-listed stocks. Their results are similar showing that the domestic market leads the foreign market which is consistent with the “home market leadership hypothesis”. This can be explained by a number of reasons. It is likely that the home country produces most information concerning the domestic stock and home country investors have immediate access to these news. Moreover, the home market is often the place where most transactions are carried out which reinforces the role of the home market as the price leader in the global market.

While Eun and Jang (1996) construct portfolios of firms that are cross-listed on three major markets (New York, London, and Tokyo), Ben-Zion, Hauser, and Lieberman (1996) investigate 5 New York-listed Israeli firms. The sample of Eun and Jang (1996) is comprised of 29 US, 9 UK, and 18 Japanese firms which are simultaneously listed on the New York, London, and Tokyo Stock Exchange. Using daily price series they construct three portfolios (US portfolio, UK portfolio, and Japanese portfolio) to examine the pattern of international price transmission. They find that the home market returns always cause the foreign market returns. While the New York market provides significant feedback for the UK and Japanese portfolios to their domestic markets, it does not receive feedback from both markets for US stocks. The study of Ben-Zion, Hauser, and Lieberman (1996) takes account of the different trading days in Israel and in the US since trading in Israel takes place from Sunday through to Thursday. While the domestic market emerges as the dominant market, they find, as expected, a different pattern for middle of the week days and beginning/ end of the week days. Only in one case a feedback relationship seems to exist. They argue, however, this is not surprising since this company is a large international company.

5.2 Financial disclosure levels and the exchange choice

The financial disclosure level is an important issue for companies considering an international listing since it imposes a potential cost for companies. This cost is expected to be higher for companies whose domestic listing requirements differ substantially from the host stock exchange. In particular, different accounting standards across countries represent one major hurdle for foreign companies (for more details, see also 3.1.3).

Biddle and Saudagaran (1989) hypothesise that firms are less likely to list on foreign stock exchanges with higher disclosure levels than their domestic exchange. They interpret "financial disclosure" very broadly including mandated (accounting, listing and regulatory requirements) and voluntary disclosures (as expected by market participants). In order to determine the disclosure level ranks of individual countries, they construct an index of disclosure levels which is based on previous studies. These studies (see Lafferty and Cairns (1980), Choi and Bavishi (1982) and Cairns, Lafferty and Mantle (1984)) have reached similar conclusions about the comprehensiveness of financial disclosures among different countries. They rate financial disclosures of companies from the US, UK and Canada among the most comprehensive and those from Germany, Switzerland and France among the least comprehensive.

Gray (1980) suggests a possible explanation for differences in disclosure levels across countries. According to their findings, disclosure levels are influenced by user demands. While countries such as the US, UK and Canada have a widespread ownership of securities, they display a greater equity investor orientation in their disclosure requirements. In Germany and France, banks are the dominant shareholders as well as the major suppliers of debt capital for many listed companies[126]. Thus they are less interested in wider disclosure of information.

These findings imply that companies from countries with lower disclosure levels face higher financial reporting costs when seeking a foreign listing in a country with high disclosure levels. Cooke (1993) reports that Japanese companies have traditionally avoided a quotation in the US in favour of the more liberal European capital markets.

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[126] See also 3.1.3.1.

Biddle and Saudagaran (1989) investigate the listing choices of 207 internationally traded firms. However, their results give only weak support to their hypothesis that firms are more (less) likely to list on foreign exchanges with disclosure levels less (more) stringent than their domestic levels. They also control for other factors as industry, geographic location, exports of firms' goods to the exchange market, and firm size relative to the domestic capital market. They observe some evidence that firms appear less likely to list their shares on a foreign stock exchange with higher disclosure levels than those of their domiciles.

However, their results fail to explain firms' choices for some exchanges and the case of London illustrates that very well. Their index of disclosure levels rates London as the second most stringent exchange. This gives rise to the assumption that their disclosure index is not an exact representation of the reality. This argument is corroborated by a more recent study by Meek and Gray (1989) which investigates the extent to which Continental European companies listed on the London Stock Exchange comply with the minimum standards of the exchange. They find out that the London Stock Exchange's disclosure requirements appear to be relatively minimal for Continental European companies. Their disclosure standard (mandated domestic standard or voluntary disclosure) must exceed those minimum standards in order to compete successfully in international capital markets. Moreover, the environment has changed in recent years and listing requirements for overseas companies have been relaxed since. This is also documented in the recognition of SEAQ International as a "regulated market" in the Investment Services Directive[127]. This means that companies are required to disclose information voluntarily rather

[127]For a moor detailed discussion of the ISD, see also Steill (1994) and Hawawini and Schill (1992).

than through mandated standards because a quotation is due to market participants' desire to trade in a stock[128].

As argued in chapter 3, disclosure levels are certainly of great importance to companies considering a listing abroad. They influence a firm's decision in such that the possible benefits of a foreign listing must exceed the high costs associated with a listing on a stock exchange with stringent disclosure requirements. Thus, a different stock price reaction is expected upon listing from companies with a lower disclosure level than the foreign stock exchange. The decision of a company to comply with stringent disclosure requirements may be seen as a signal to the investment community. Especially, Continental European companies which mainly relied on debt financing in the past may signal a change to a policy of equity investors' culture. This may even be more important for emerging markets companies, since their move to a stringent exchange serves to build up investors' confidence in their stock[129].

5.3 International listing and equity issuance

Many previous studies have identified the importance of access to foreign capital markets as one of the prime reasons to obtain a listing on foreign stock exchanges. However, empirical evidence which tests this proposition and examines the use of international listing for raising new capital remains very scarce. Although ADRs have developed into an important instrument to raise capital internationally, research on international equity offerings with ADR tranches hardly exists. Research on IPOs (initial public offerings) has generated a large international literature. However, IPOs

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[128]Rule 535.4 of the "Rules and Regulations of the London Stock Exchange" permits its members to deal in foreign equities if they are issued by a company which is listed or quoted on an recognised investment exchange.
[129]Lucas (1994) reports about Chinese companies' factors influencing their listing decision. Some of them perceive that a listing in New York carries a higher prestige than a listing in Hong Kong because this proves their ability to comply with more stringent disclosure rules.

which are offered simultaneously in a number of different markets have been largely overlooked.

Loughran, Ritter, and Rydqvist (1994) summarise the findings of IPO studies from 25 different countries. Their evidence shows that the phenomenon of positive first day returns exists in every country, although the degree of underpricing varies from country to country. Explanations for this phenomenon focus on the relationship between uncertainty and initial returns. Several proxy variables have been suggested to measure value uncertainty. For example, issue size, annual sales volume, age of company, gross proceeds, asset value, and price at issue have been tested to explain underpricing. Overall these uncertainty characteristics seem to be positively related to initial returns, and hence consistent with the empirical implications derived from Rock's (1986) and Benveniste and Spindt's (1989) models. Miller and Reilly (1987) argue that the level of trading activity may signify the extent to which investors disagree about the value of a security. Miller and Reilly (1987) and Barry and Jennings (1993) also show that many shares experience a high level of trading activity during their first day of trading.

Explanations for the "underpricing" anomaly are summarised by Ibbotson, Sindelar, and Ritter (1994) but these theories are not mutually exclusive. The various theories put forward by the IPO literature focus on the relations between investors, issuers, and investment banks. While the "winner's curse" explanation focuses on an information asymmetry between informed and uninformed investors (see Rock's (1986) model), other models concentrate on the relation between the issuing firm and the investment bank (see, for example, Baron and Holmstrom (1980), Baron (1982), and Tonks (1996)). Empirical evidence for the "winner's curse" explanation is provided by Koh and Walter (1989) for Singapore and by Levis (1990) for the UK.

Tonks (1996) shows that positive first day returns can be explained by the sequential equilibrium in the bargaining game between the issuing firm and the investment bank. This allows the investment bank to underprice the issue to reduce its marketing efforts.

Doukas and Yung (1992) examine 39 foreign firms that issued ADR-IPOs in the US market from 1977 to 1989 and a control sample of US-IPOs from 1982 to 1989. They report an insignificant first day return of 0.96 percent, and hence argue that ADR-IPOs are not underpriced. Moreover, their regression results show that underpricing of ADR initial offerings is statistically smaller than the underpricing of domestic initial offerings. US investors may possess less private information about foreign companies than about domestic firms. This explains the lack of underpricing for foreign IPOs. This also suggests that foreign capital markets are not completely integrated with US markets. They argue this is consistent with Rock's (1986) model since US investors are likely to be less informed about foreign firms than US firms.

Mittoo's (1992) results[130] show that an increased ability to raise equity is perceived as the main benefit of foreign listing by corporate managers. Radebaugh, Gebhardt, and Gray (1995) examine the factors that influenced Daimler-Benz to list on the NYSE. They provide evidence that Daimler Benz conducted a rights issue seven month after the listing. Moreover, they argue that without the NYSE listing the size of the rights issue would have exceeded the capacity of the German market to absorb the offering.

Glen and Pinto (1994) investigate the use of international capital markets as a source of external financing for emerging market firms after their economic liberalisation. They show that cross-border equity and cross-border debt issues have

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[130] For more details see 5.1.3.

increased substantially in recent years. They discuss the financing options that are available for emerging market firms, however, argue that the marginal cost of listing on a major exchange may still outweigh the advantages generated by it. Moreover, Glen and Pinto (1994) apply the pecking order theory to an Indonesian firm which would look as follows: (1) Use of internal funds; (2) state bank loans; (3) private and foreign bank loans; (4) domestic floatation; (5) international issues.

5.4 Effect of market conditions on raising equity capital

The new issues literature has shown that market conditions play an important role for firms seeking to raise equity capital. Timing considerations could also be important for companies that access international capital markets to issue equity. Additional factors may influence the decision of firms since international capital markets may offer certain "international windows of opportunity". This is also suggested by Marr, Trimble, and Varma (1991) who compare 32 Euroequity[131] and 196 domestic equity offerings of US companies between 1985-1988. They find that Euroequity offerings experience higher positive abnormal returns in the pre-announcement period, but only insignificantly negative returns in the post-announcement period. Their results show that the issue size has a significant influence on the choice of corporations between a Euroequity or domestic-equity offering. This implies that a company increases the issue size above their actual needs if it perceives favourable market conditions overseas. These bargains can also be caused by currency revaluations or changes in investors' perception. To examine firms' choice of Euroequity and

[131]Euroequity is a registered new issue of stock by an American corporation that is sold simultaneously in two tranches. The domestic tranche is sold in the home market. The foreign tranche is sold abroad and its legal structure tries to take advantage of the needs of foreign investors. The foreign tranche is issued as a bearer instrument to foreign investors who desire anonymity.

domestic-equity offerings in more depth, they perform further tests. If samples were random a test would regress the issue and issuer characteristics and the percentage of the issue sold offshore, and the tranche on announcement returns. But substantially larger issue sizes and issuer capitalisations of Euroequities indicate self-selection bias by issuers[132]. Another problem occurs as the size of the offshore tranche may be endogenous[133]. Their analysis includes two steps:

Firstly, they estimate the probability of a firm choosing Euroequity financing which is a function of issue size and the size and the ownership structure of the issuing firm. This estimation procedure provides selection bias W which controls for the self-selection bias that may occur if Euroequity issuers actually have a comparative advantage in issuing offshore. Secondly, they regress the following independent variables on the abnormal returns for domestic-equity and Euroequity issues: the firm's beta coefficient, the size and the ownership structure variables, the selection bias variable W and the tranche (percentage of the issue in the offshore). Their results indicate that the abnormal return is influenced by selection bias, institutional holdings and tranche. The value for tranche suggests that Euroequity issuer experience a smaller decrease in their market value.

This finding is consistent with the theoretical propositions by Stapelton and Subrahmanyam (1977) and Alexander, Eun, Janakiramanan (1987) that companies can reduce their cost of capital if they dismantle barriers of investment and increase diversification opportunities for foreign investors. Since these results also suggest that foreign capital markets may not be completely integrated with the US capital market, they conclude that companies try to capitalise on financing bargains

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[132]They suggest that many variables would have to be included in such a regression: Any characteristics of companies that appeal to foreign investors, established names overseas, location of overseas operations, etc.
[133]The percentage of stock sold offshore depends on the likelihood of reduction of the cost of equity.

overseas. Doukas and Yung (1992) also argue that the incomplete integration between the US market and foreign capital markets may be an incentive for foreign companies to list their stock abroad and take advantage of favourable market conditions in the targeted market.

The listing decision may also be related to the performance of a stock market over a particular time period. Companies may hope that the strong demand for domestic stocks might also affect the demand for foreign shares. For example, the percentage[134] of US shares traded on the Tokyo Stock Exchange increased from 0.5% in 1980 to 9% in 1986. This coincided with an increase in the overall trading volume in Japanese shares and a rising Japanese stock market. The trading volume and the number of listings of foreign stocks on the Tokyo Stock Exchange increased substantially[135] throughout this period.

The new issue literature provides substantial evidence that market conditions influence the timing of equity issues. A number of studies show that prior stock market increases are positively related to the frequency of equity issues (e.g. Taggart (1977), Marsh (1982), and Choe, Masulis, and Nanda (1993)).

Choe, Masulis, and Nanda (1993) provide empirical evidence that a large number of firms issue equity in expansionary phases of the business cycle. They argue that this phenomenon is consistent with firms issuing equity when the face lower "adverse selection" costs. Such a period occurs when firms are more optimistic about future business conditions. Hence, the widely documented equity announcement effect is less pronounced in such periods. Bayless and Chaplinsky's (1996) findings support

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[134]Average volume of US stocks on the Tokyo Stock Exchange as a percentage of their volume on the NYSE.
[135]The Tokyo Stock Exchange 1993 Fact Book reports significant increases in the trading volume in foreign stocks peaking in 1989. About 90% of US companies listed throughout the period of 1986-1990 on the Tokyo Stock Exchange. A similar picture is obtained from other foreign companies.

the existence of windows of opportunity for equity issues. Their results show that the equity announcement effect is lower in periods with high equity issue volume (hot markets) than in low equity issue volume (cold markets). This suggests that firms face lower adverse selection costs in periods with high issuing activity.

Ritter (1991) argues that firms try to time their issues when the market is willing to pay high multiples. These 'windows of opportunity' arise when investors are overoptimistic about the future prospects of certain industries. In this case, a poor long-run performance should be observed because investors correct this misvaluation in subsequent periods.

Ljungqvist (1996)[136], however, refutes this "sentiment timing" proposition. To conclude that investor sentiment causes long-run underperformance, he argues, firms floated in buoyant market conditions should perform worse than those issued in a bearish market. He uses three different proxies to distinguish whether IPOs were floated in bullish or in bearish markets: (1) observable index returns prior to the issue; (2) price-earnings ratios; and (3) market-to-book market. His results show that firms issued in bullish markets perform better than bearish market IPOs. This evidence is inconsistent with sentiment timing which proposes that long-run underperformance is caused by the correction of a misvaluation of periodically overoptimistic investors.

5.5 Other factors of the listing decision

Previous research has also suggested that the listing decision is influenced by a number of other factors. It may simply be the case that bigger firms are more likely to

[136] Ljungqvist (1993) examines 145 German IPOs which were floated between 1970 and 1990.

list or their choice is motivated by business activities in the host country, or solely by geographical proximity.

5.5.1 Listing decision and the size of the company

To examine the firm size proposition, Saudagaran (1988) uses market capitalisation concentration ratios[137] to examine this hypothesis. He suggests that large companies from small markets outgrow their domestic capital market. In order to compete with other multinational companies, they need to go to a market which mitigates these financial disadvantages. Using univariate and multivariate tests they find out that the relative size of a company seems to have a significant influence on the listing decision of corporations.

While Biddle and Saudagaran (1989) especially examine the effects of financial disclosure levels on firms' choices among alternative foreign listings they include the relative size of a company as a control variable in their multivariate regression equation. But the relative size is only significant for companies' listing decision on the Paris and Zurich stock exchanges. Since a further examination of the sample reveals that in the case of the Paris Stock Exchange about 60% of the companies are from the US, the results have only a limited explanatory power. There are also some indications that companies with smaller domestic capital markets perceive the highest net benefits[138].

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[137]It is calculated as follows: Market value of the outstanding common shares of a firm at year-end divided by the market value of the outstanding common shares of all domestic firms listed on the stock exchange at year-end.
[138]Eitemann and Stonehill (1989) examine in a case study the experience of the Danish pharmaceutical firm, Novo, which listed on the NYSE. They conclude that Novo could lower its cost of capital substantially through a number of successive share issues in the US market. Because the Danish market would not have been big enough to absorb this volume.

5.5.2 Listing and foreign business activity

Firms may list their stock to assist their foreign business activities in the country of listing. Several motives are suggested by the literature. The foreign market may be of importance for the company's products or as a manufacturing facility. A listing may also facilitate acquisitions or the financing of subsidiaries in the foreign country.

Saudagaran (1988) and Biddle and Saudagaran (1989) examine the importance of the market for a firm's goods and services in the location country of the foreign stock exchange. A listing may enhance the company's visibility and the name recognition in that country. This may be seen as "free" advertising and be particularly beneficial for producers of consumer and industrial products. However, both studies face problems in measuring this factor precisely because companies do not disclose country-by-country breakdown of revenues. Saudagaran (1988) uses the ratio of the firm's total sales to its world-wide sales. Biddle and Saudagaran (1989) use the proportion of exports from a given industry and domicile to a given foreign exchange country[139]. Saudagaran's (1988) findings[140] show that companies with a greater degree of revenues abroad are more likely to list on a foreign stock exchange. This might explain a firm's willingness to list in countries with a smaller capital market than their own. Mittoo's (1992) results do not support the hypothesis that the listing decision is influenced by the location of the company's manufacturing facilities.

Saudagaran (1988) points out that companies have become more dependent on foreign labour, and hence they give more attention to labour relations in foreign affiliates. Therefore, they have introduced employee stock-ownership plans (ESOP's)

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[139]But this estimation weakens the power of the tests because it does not account for the different position of each individual company.

[140]Fry, Lee, and Choi (1994) find that a business presence in Japan prior to the listing on the Tokyo Stock Exchange is not of any advantage for US companies.

for their personnel. But this programs are more meaningful to foreign employees if the parent's company is listed on the local stock exchange. However, he does not explicitly investigate the use of ESOP's by foreign listed companies[141]. He uses a matched pair sample of listed and non-listed companies to compare the relative level of foreign employment for both groups. His results indicate that foreign listed firms have a higher level of foreign employment than only domestically listed companies. However, the use of a multivariate regression to explain firms' listing decision on the level of foreign employment fails to perform well.

Fatemi and Rad (1996) explore the motives of 40 Dutch firms to obtain an international cross-listing. They find that financial considerations and the desire to build up a profile as an international firm influence their decision to cross-list internationally.

Dugan (1989) describes different uses of ADR programs. A listing in a foreign market enables a company to use an equity offer as a method of payment for their acquisition[142]. Further examples are UK companies with US subsidiaries that have dollar-funding requirements. Companies may float part of their foreign subsidiaries because these may be able to raise equity capital more cheaply than their parents[143].

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[141]Statistics released by the London Stock Exchange (Quality of Markets Review, Spring Edition 1993, Summer Edition 1993, Autumn Edition 1993) include under "Money Raised by Further Issues from Overseas Companies" the category "Employee Shares". Figures for January-March 1993 show an amount of £1140.7m, for April-June 1993 £311.9m and for July-September 1993 £141.8m.

[142]This may be cheaper for a company. But an equity offer might not be possible without a listing because some investment funds (especially in the US) are prohibited by their charter to hold foreign equities (e.g. ADRs have the status of domestic equities).

[143]The Economist (January 1994) gives an example of a Japanese company which floated their Hong Kong subsidiary on the Hong Kong Stock Exchange. The public share offering was heavily oversubscribed because investors viewed that subsidiary as a "Chinese" company.

5.5.3 Geography and listing

Firms are more likely to list in neighbour countries with which they have close cultural and economic links. Foerster and Karolyi (1993) expect more interlistings within trading bloc countries (as the EU or NAFTA). Also Biddle and Saudagaran (1989) provide some evidence that European firms are more likely to list in European countries. Cultural and economic ties might also explain the great number of companies from the US, Canada, or South Africa which have been listed on the London Stock Exchange for a long time.

5.6 Summary and conclusions

The aim of the last two chapters has been to provide a critical review of past studies, that have examined international listings and related literature, and identify some of the key issues that require further investigation. Apart from examining the motivation of firms to list abroad, previous literature has highlighted the importance of the impact of listing on liquidity and international market segmentation. While there is ample evidence of the significance of liquidity for pricing assets and liquidity effects of domestic exchange listings, there is still very little evidence on the liquidity and stock return differences across international stock exchanges. These differences may arise from differences in the institutional framework that govern the issuance and trading of foreign equities in the two markets under investigation (US and UK). The examination whether one stock exchange offers larger liquidity benefits than

others may also shed further light on the motives of firms to list on a particular stock exchange.

Since it appears to be harder for foreign firms to obtain a listing in the US, the potential benefits may be larger. The barriers to access the US market may even be higher for emerging market firms. While previous research has mainly examined listings of US firms in other markets, it has not investigated whether foreign firms listing in the US experience larger wealth effects and liquidity benefits than firms listing in London. Moreover, research has also not compared the impact of international listing for emerging market and developed market firms.

Previous literature provides extensive evidence on initial public offerings (IPOs) and seasoned equity offerings (SEOs) in various contexts. While a number of previous studies emphasise the significance of international listing to gain access to foreign capital markets, the link between international listing and capital raising activity has not been investigated empirically. This area appears to be of particular importance since the amounts raised in global equity offerings, as shown in Chapter 2 and 3, have constantly increased in recent years. The decision to raise equity with the listing and the choice of the offering method may also affect the liquidity and the investor base of firms.

The new issues literature provides substantial evidence that market conditions influence the timing of equity issues. A number of studies show that prior stock market increases are positively related to the frequency of equity issues. Previous research has argued that firms try to time their issues when the market is willing to pay high multiples. These 'windows of opportunity' arise when investors are overoptimistic about the future prospects of certain industries. Similar evidence has been provided for domestic exchange listings. While timing considerations may affect

the decision to list internationally, existing literature to date has not investigated this issue.

The trading of internationally cross-listed stocks has also raised questions concerning the linkage and dynamic interaction between markets. Empirical research has shown that the ADR market and the underlying share market appear to be efficient since one market responds to innovations in the other market. Previous studies examining seasoned firms support the 'home market leadership hypothesis'. While in recent years an increasing number of equity issues has been structured as global offerings, this issue has not been examined for global IPOs which are sold simultaneously in different markets.

6. Chapter: The impact of international market segmentation and market conditions on the stock price behavior of listings

The review of the literature in Chapter 4 has shown that studies which examine listings of US firms on European and Asian stock exchanges find negative abnormal returns, or no evidence of any significant price movements in the pre-listing period. However, non-US firms that list in the US experience positive abnormal returns.

Studies that examine the post-listing performance of internationally listed firms appear to provide more unanimous results, since they report persistently negative abnormal returns in the post-listing period. Previous literature interprets this result as being consistent with a decline in expected returns once these stocks become internationally listed. These results seem to support the theoretical implications of several models which conclude that an international listing should result in structural changes in the equilibrium asset pricing relationship if markets are segmented. However, empirical studies examining new issues and domestic exchange listings of US firms report a similar negative return pattern. Very often it is argued that firms try to time their issues to take advantage of overoptimistic investors. However, this misvaluation is gradually corrected in subsequent periods leading to negative abnormal returns.

The remainder of this chapter is organised as follows. Section 1 presents the hypotheses to be tested. Section 2 describes the sample. Section 3 discusses different performance measurement methodologies. The empirical findings are presented in Section 4. The first part examines the influence of institutional characteristics on the price reaction of international listings. The second part

provides evidence on the return behaviour of emerging market and developed market firms. The third part analyses timing-related explanations of ADR listings. The fourth part examines the price reaction of ADRs and underlying shares jointly. Section 5 concludes the article.

6.1 Hypotheses tested

The mixed evidence of previous research regarding the valuation impact of international listing raises questions to what extent the stock price reaction is influenced by institutional factors. Since the institutional framework which governs trading and issuance of foreign equities differs markedly between the US and UK, it is reasonable to expect differences in the stock price reaction upon an US or UK listing of foreign stocks. Unless foreign firms register with the Securities and Exchange Commission (SEC) of the United States, their stocks cannot be traded on a regulated exchange or even marketed to US investors within the US. This is in stark contrast to the UK approach which does not restrict trading and marketing of unlisted foreign equities. Hence, it is likely that the dismantling of investment barriers is stronger in the case of foreign firms listing in the US, since US investors may face higher transaction and information costs in the pre-listing period. In particular, high information costs, which are caused by different accounting rules, are of great importance[144].

Although previous literature has shown that emerging market firms face higher barriers to investment, none of the studies has examined differences in the price

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[144] Cooper and Kaplanis (1994) argue that the home bias in equity portfolios is caused by costs of international equity ownership. One important component is costs associated with acquiring and interpreting information about foreign companies.

reaction for emerging market firms and developed market firms that list ADRs on the NYSE. Moreover, previous research has not taken account of differences in the method of listing (introduction or public offering). Approximately 35 percent of all NYSE listings, and in particular 90 percent of all emerging market firms, raised new capital with their international listing. Hence, these differences may also affect the price reaction of international listings.

The existing literature to date has not investigated whether ADR listings are also subject to market conditions. A timing related explanation could also apply to international firms which have experienced an increase in their stock price prior to the listing period and, hence, decide to take advantage of this "international window of opportunity". This study attempts to explore whether the "industry-argument[145]" could be applied to an international context. Listings of emerging market firms could be due to an "emerging market sentiment" of international investors which are unduly overoptimistic of the future growth prospects of emerging market firms.

If international listing reduces market segmentation, returns of ADRs and their underlying stocks should not differ. To our knowledge, none of the previous papers has jointly examined the price behaviour of ADRs and their underlying shares surrounding the listing date and their subsequent investment performance. If previously OTC-traded ADRs experience a positive price reaction once they become fully listed, this may indicate the integration benefits of international listings.

[145] The new issues literature has shown that there are variations in post-issuing returns across industries (for more details see 4.2.3 and 5.3.2).

Hypotheses:

1.) International listing increases the public availability of information (or investor recognition) and reduces information costs to investors. This increase in information about the firm is expected to be more significant for foreign companies listing on an US exchange. Therefore, companies listing on an US exchange should experience more positive abnormal returns in the pre-listing period and more negative abnormal returns in the post-listing period than companies listing in London.

2.) The magnitude of the price reaction is expected to be more pronounced for emerging market firms since they face higher investment barriers. Hence, they should experience more positive abnormal returns in the pre-listing period and more negative abnormal returns in the post-listing period than developed market returns.

3.) Companies that raise new capital with their listing experience a bigger increase in their investor base. Hence, they should have higher positive abnormal returns in the pre-listing period and more negative abnormal returns in the post-listing period.

4.) OTC-traded ADRs experience integration benefits once they become "fully" listed. This should be reflected in positive abnormal returns on the listing day. Subsequent to the listing, the returns of ADRs and underlying shares should be very similar if they are priced in an integrated market.

6.2 Sample selection

Our initial sample consists of all foreign firms that obtained a listing on the London Stock Exchange, the New Stock Exchange (NYSE), and on NASDAQ during the period from January 1980 to December 1994. We identify 185 firms on the London Stock Exchange, 177 firms on NYSE, and 61 firms that listed ADRs on NASDAQ[146]. Information concerning the listed companies and their listing date is obtained from the respective stock exchanges. A special criterion is applied to NASDAQ firms which must be sponsored ADRs. This eliminates 5 unsponsored ADRs which were granted an exemption from Rule 12g3-2(b)[147]. We require that all internationally listed firms are also listed in their country of origin because we only consider international cross-listings for most of our analysis. This criterion eliminates 48 companies (14 London, 23 NYSE, and 11 NASDAQ listings) from our sample. Firms with less than 104 weeks of stock return data prior to the listing date are subsequently deleted resulting in a sample of 118 companies for London, 84 companies for New York, and 31 companies for NASDAQ (see Table 6.1.). The high rate of exclusion is due to two main reasons. Firstly, a high percentage of internationally listed firms are initial public offerings (IPOs). However, we will include 34 international IPOs in our investigation of the impact of market conditions. Shares of these firms were offered simultaneously in their domestic market and in the US market in form of ADRs. 31 firms are listed on the NYSE and 3 on NASDAQ. Secondly, many internationally listed firms are from emerging markets which often lack sufficient historical data.

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[146] We exclude approximately 140 Canadian firms that are listed on NASDAQ since they are not listed in the form of ADRs.

[147] Rule 12g3-2(b) requires OTC securities to register with the SEC but foreign companies were exempted until October 1983. In October 1983 the SEC abolished this exemption for foreign securities but gave already-listed securities a "grandfather" exemption.

Table 6.1.
Frequency of international cross-listings and location of sample firms, 1980 - 1994.

The sample consists of 233 international listings which listed their stock over the period from 1980 to 1994. All firms are listed on their domestic stock exchange. 118 firms are listed on the London Stock Exchange, 31 firms are listed on NASDAQ, and 84 firms are listed the New York Stock Exchange (NYSE). NASDAQ listings only include ADR listings.

Year of Listing	London	NASDAQ	New York
1980	7		1
1981	7	1	1
1982	3		2
1983	7		2
1984	19	4	2
1985	2		0
1986	12	1	5
1987	12	6	11
1988	4	1	4
1989	20	3	7
1990	11	1	5
1991	4		8
1992	4	4	6
1993	2	7	10
1994	4	3	20
TOTAL	118	31	84

Table 6.2. provides a distribution of the sample firms by exchange and domestic country showing that the majority of London-listed foreign firms are US companies (58) and Japanese companies (26). The NYSE shows a different geographical distribution of foreign-listed companies which are spread over more different countries although approximately 45% of foreign listings are UK (21) or Canadian companies (18). UK companies (10) make up the biggest group on NASDAQ because our NASDAQ sample only includes companies that list shares in the form of ADRs. However, Canadian firms are by far the biggest group on NASDAQ comprising approximately 50% of all foreign listed firms. The major difference between NYSE and the other two exchanges, however, is the number of companies from so called "emerging markets" listed on NYSE.

Table 6.2.
Distribution of sample firms by exchange and domestic country.

The sample consists of 233 international listings and consists of firms from 25 different countries. All firms are listed on their domestic stock exchange. 118 firms are listed on the London Stock Exchange, 31 firms are listed on NASDAQ, and 84 firms are listed the New York Stock Exchange (NYSE). NASDAQ listings only include ADR listings.

Domestic country	London	NASDAQ	New York
Australia	7	7	8
Belgium	1		
Bermuda	1		
Canada	3		17
Chile			8
Denmark	2		2
Finland			1
France	2	2	3
Germany	6		1
India	2		
Ireland		3	1
Italy			3
Japan	26	1	4
Netherlands	1	2	4
New Zealand			1
Mexico			5
Norway			2
Philippines			1
South Africa	3		
South Korea	1	1	2
Sweden	4	5	
Switzerland	1		
UK		10	21
United States	58		
TOTAL	118	31	84

6.3 Performance measurement methodology

To examine the stock price behavior of international listings in the pre- and the post-listing period, a variety of approaches are available. In general two approaches can be distinguished, which are then applied in a number of variations. The fundamental difference between cumulative average adjusted returns (CARs) and holding period

returns lies in the assumption concerning the portfolio rebalancing for each interval. While weekly CARs approximate the returns on a portfolio with weekly portfolio rebalancing, holding period returns represent a buy and hold portfolio strategy. Conrad and Kaul (1993) argue that cumulative performance measures suffer from a methodological and a conceptual drawback leading to a bias in the "market overreaction" studies[148].

A very recent paper by Kothari and Warner (1996) questions the validity of long-horizon abnormal return studies around firm specific events. They show that long-horizon tests have a severe tendency to indicate abnormal performance when none is present. They use four commonly-employed models to estimate abnormal returns (market-adjusted model, market model, CAPM, and Fama-French empiricial CAPM) and find their results hold irrespective of the model employed. Their testing procedure uses samples of randomly selected NYSE/AMEX securities and simulated event dates to examine the specification of tests for long-horizon abnormal return studies. They argue this is a direct way to study the sources of misspecification in more depth. In particular, they focus on the components of the test statistics, the sample mean cumulative abnormal return and its estimated standard deviation, which may both be biased. These biases may be mainly caused by selection biases and survival-related shifts in the variance, and arise very often from event study data requirements. Although they conclude that the interpretation of long-horizon tests requires extreme caution, they do not provide clear guidelines for better tests. They argue potential improvements could be achieved by using nonparametric procedures, as bootstrap procedures or sign tests, but emphasise the importance of further research in this area.

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[148] The bias is caused by cumulating single-period returns over long periods. Moreover, it not only cumulates true returns but also measurement errors (for example bid-ask effects). The cumulation process also implicitly amounts to rebalancing the portfolios to equal weights each period.

To document the return pattern surrounding the listing date, we calculate abnormal returns and holding period returns for the pre-listing period (from 52 weeks prior to the week of listing to the listing week) and the post-listing period (from the listing week to 104 weeks after the listing week). Similar to previous research on domestic exchange listings (Sanger and McConnell (1986) and Kadlec and McConnell (1994)), we use weekly returns. Kadlec and McConnell (1994) argue that the results of earlier studies indicate that price effects associated with listings take place over an interval longer than a day or even a week. While long-run performance studies of IPOs and seasoned equity offerings report three year post-issue results, international listing and domestic exchange listing studies generally examine shorter post-listing periods[149]. This study tries to extend the post-listing period but faces some practical problems since many firms obtained a listing in 1993 and 1994. Hence, there is not have sufficient data available to examine a three year post-listing period.

6.3.1 Cumulative average adjusted returns (CARs)

We employ standard event-study methodology to compute abnormal returns for the sample of internationally listed stocks[150] with the week of listing as event week. Individual securities returns are calculated from Datastream. They are based on weekly closing prices, include dividend payments, and are adjusted for scrip and rights issues. The market return is calculated from the closing prices of the respective domestic market index. We use "Datastream Global Indices" which are provided by Datastream for each country. They are calculated from a representative

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[149] For domestic exchange listings a 52-week post-listing period seems to be the convention. However, in the case of international listings no uniform event period appears to exist. Studies use monthly, weekly, or daily returns alike and event windows range from 36 months to only 10 days around the listing date.

[150] Brown and Warner (1985) compare the properties of excess returns in event studies under alternative measures of excess returns. Brown and Warner show that market-adjusted returns have similar properties to Ordinary Least Squares (OLS) market model excess returns.

list of stocks for each market, which are value-weighted, and include aggregate annualised dividends. The representative sample of stocks aims to cover approximately 80% of each market and the suitability for inclusion is determined by market value and availability of data. In the few instances where the IFC indices (India and South Korea) provide a longer history, we use them instead.

A number of long-run performance studies (e.g. Levis (1993) and Ritter (1991)) use raw returns. However, continously compounded returns appear to be more appropriate because they offer distributional advantages. Moreover, our results show no material differences between raw and continously compounded returns[151].

Most long-run performance studies that examine initial public offerings (IPOs) and equity offerings calculate adjusted returns by using several different benchmarks. Common approaches are adjustments for size, book-to-market ratios, and industry, as well as the use of different stock market indices. Dimson and March (1986) show that long-run performance measurement can be subject to biases if the size composition of the sample firms differs from the chosen benchmark. Fama and French (1992, 1993) and Lakonishok, Shleifer, and Vishny (1994) find that size and book-to market ratios are important determinants of stock returns. However, the simulations of Kothari and Warner (1996) show that the Fama-French empirical CAPM does not provide better results than the other models employed. They suggest an alternative could be a matched-portfolio approach, similiar to Ikenberry, Lakonishok, and Vermaelen (1995). However, since the majority of our sample firms are relatively large firms in their domestic market, a size-adjustment does not appear to be necessary. Although a book-to-market adjustment appears desirable, the application suffers from two practical problems. Firstly, Datastream only provides

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[151] See Appendix for a comparison between log and raw returns.

book-to-market ratios for a limited number of companies. This could even introduce a more severe selection bias into our results. Secondly, book-to-market ratios are not strictly comparable across different countries. The calculation of book values is not consistent across countries since different accounting standards prevail.

6.3.1.1 Market-adjusted returns

The abnormal return ar_{it} for stock *i* at time *t* is calculated as follows:

$$ar_{it} = R_{it} - R_{mt} \qquad (6.1.)$$

where r_{it} is the realised return on each stock *i* in week *t* and r_{mt} is the respective market return for the corresponding week.

To gauge the overall reaction of the firms in the sample, we calculate the equally weighted arithmetic average of the market-adjusted abnormal returns:

$$AR_t = 1/n \sum ar_{it} \qquad (6.2.)$$

where *n* is the number of listed firms in the portfolio in week *t*.

The cumulative average abnormal return on event week *T* is the sum of the weekly adjusted abnormal returns from event week *K* through to event week *T*:

$$CAR_K = \sum^{K}_{t=T} AR_t \qquad (6.3.)$$

For the pre-listing period *T* is set equal to -52 (i.e. 52 weeks prior to the listing week) and *K* is zero (listing week). For the post-listing period *T* equals one (one week after the listing week) and *K* is 104 (104 weeks after the listing week).

To assess the statistical significance of CARs, the following formula is used:

$$t\,(CAR_{T,K}) = (n_t)^{1/2} / [t * var + 2 * (t - 1) * cov]^{1/2} \qquad (6.4.)$$

where *n* is the number of listings in the sample, *t* is the event week, *var* is the average cross-sectional variance, and *cov* is the first-order auto-covariance of the AR_t series. This approach takes account of the lack of independence of the AR series (Ritter,1991).

6.3.1.2 Risk-adjusted returns

The market model is implemented by computing ex post abnormal returns for each security as follows:

$$ar_{it} = R_{it} - (\alpha_i + \beta_i R_{mt}) \qquad (6.5.)$$

where R_{jt} and R_{mt} are the observed returns for security j and the market portfolio. The security specific parameters α_j and β_j are computed from Ordinary Least Squares (OLS) regressions. We choose an estimation period of 100 weeks using weekly returns from week t= -104 to week t= -4 relative to the listing week ("week 0"). Average abnormal returns across all firms are computed as

$$AR_t = \sum ar_{it} / n \qquad (6.6)$$

where *n* is the number of firms in the sample in week *t*. Cumulative abnormal average returns (CARs) and signficance tests are calculated in the same way as shown for market-adjusted abnormal returns (see 6.3.1.1.)

However, throughout the remainder of this study market-adjusted abnormal returns are used for the follow-up analysis since market model returns suffer from a host of well-known problems. For example, Dharan and Ikenberry (1995) point out that the nature of pre-listing period returns makes this procedure subject to bias. In particular, the market model assumes that returns in the (pre-listing) estimation period respond only to systematic market forces. However, they argue that listing firms cannot be described as having mean-zero idiosyncratic components in their pre-listing returns because self-selection bias is likely to be present (see also Sanger and McConnell, 1986)[152]. Alexander, Eun, and Janakiramanan (1988) argue that liquidity and signalling effects may cause a firm's stock price to rise in the pre-listing period. If this is the case the intercept of such stocks will be biased upwards.

6.3.2 Holding period returns

Since CARs assume that the portfolio is weekly rebalanced, we also calculate buy and hold returns. In the case of the pre-listing period returns, the stock is bought 52 weeks prior to the listing week and held until the listing week. Post-listing period returns are calculated from buying the stock in the listing week and holding it either until 104 weeks after the listing week or the week data is available. Holding period returns are calculated as

$$HR_i = \prod (1 + R_{it}) - 1 \qquad (6.7.)$$

where R_{it} is the raw return on firm *i* in event week *t*. The performance for a group of internationally listed firms is measured by the arithmetic average of the holding

[152] We examine the distributions of weekly raw returns in the pre- and post-listing period (weeks -52 to -1 and +1 to +104 respectively). The findings are similar to Sanger and McConnell (1986), which examine weeks -52 to -1 and +1 to +52, showing that pre-listing period returns are more positively skewed.

period returns, or by the wealth relative (WR). The wealth relative is the ratio of one plus the mean holding period return divided by the mean holding period return for the corresponding index (over the same truncated return interval):

$$WR = (1 + \text{average } HR_{\text{international listings}}) / (1 + \text{average } HR_{\text{indices}}) \qquad (6.8.)$$

6.4 Empirical Results

6.4.1 Influence of institutional factors on price reaction of international listings

Previous research has argued that an international listing may result in structural changes in equilibrium asset pricing relationships. Moreover, institutional differences between the US and UK market should also be reflected in the price reaction for companies listing on the LSE, NYSE or on NASDAQ. Table 6.3. shows a comparison of CARs for London, NYSE, and NASDAQ listings. NYSE listings experience positive CARs in the pre-listing period reaching a peak of 11.37 percent by week -1. CARs of London listings are also positive in the pre-listing period but are lower and insignificant. NASDAQ listings experience a price reaction of similar magnitude as NYSE listings but the results are not significant at the 95% level. The results for the NYSE and NASDAQ listings are similar to the evidence of Foerster and Karolyi (1993) who find pre-listing CARs of 5.06 percent (NYSE and AMEX) and 10.59 percent (NASDAQ) over 100 days for Canadian firms. Alexander, Eun, and Janakiramanan (1988) report pre-listing CARs of 34.65 percent for non-Canadian over a 24 month period.

This pattern changes in the post-listing period. NYSE listings start a decline from the listing week onwards. CARs of NASDAQ firms, however, increase in the immediate post-listing period and reach 5.02 percent ($t = 2.85$) in week 5. The post-listing decline in NASDAQ CARs only starts in week 64 and is not statistically significant. The finding that the decline for NASDAQ listings is less than for NYSE listings is consistent with Foerster and Karolyi's (1993) evidence. In contrast, London listings do not experience any change in the post-listing period. Their CARs remain at the same level throughout the 2-year post-listing period. These return patterns are

consistent with previous empirical and theoretical research. Alexander, Eun, and Janakiramanan (1988), Foerster and Karolyi (1993), and Varela and Lee (1993) report a decline in expected returns in the post-listing period.

Table 6.3.

Market-adjusted cumulative abnormal returns (CARs) for London, NYSE and NASDAQ listings

The Table shows weekly cumulative average returns (CARs) for international listings on the London Stock Exchange, on NYSE, and on NASDAQ. CARs are calculated from domestic prices using market-adjusted returns. t-statistics are adjusted for autocorrelation and for firms dropping out of the sample with increasing weeks of seasoning.

	London (N=118)		NYSE (N=84)		NASDAQ (N=31)	
Event week	**CARs %**	**t-statistic**	**CARs %**	**t-statistic**	**CARs %**	**t-statistic**
	Pre-listing period					
-52	0.08	0.20	0.70	1.36	-0.26	-0.33
-30	1.92	0.94	6.05	2.46	3.67	0.97
-20	3.18	1.29	8.30	2.82	6.73	1.49
-10	4.27	1.52	9.09	2.71	8.57	1.66
-5	4.88	1.65	9.86	2.78	8.33	1.53
-1	5.16	1.67	11.37	3.08	10.10	1.78
0	4.66	1.50	10.29	2.76	10.67	1.86
	Post-listing period					
1	0.64	1.49	0.17	0.34	-0.07	-0.09
2	0.00	0.00	-0.10	-0.14	0.88	0.79
3	-0.08	-0.11	-0.84	-0.94	1.54	1.13
4	-0.18	-0.20	-0.75	-0.73	4.32	2.74
5	0.21	0.21	-0.78	-0.68	5.02	2.85
10	0.98	0.72	-2.01	-1.24	4.80	1.93
25	-0.24	-0.11	-2.14	-0.84	0.74	0.19
52	0.19	0.06	-7.06	-1.75	0.98	0.17
80	-0.63	-0.16	-15.04	-2.93	-3.90	-0.53
104	0.87	0.20	-18.63	-3.09	-7.61	-0.90

Table 6.4. shows the results for the same analysis using market model abnormal returns. Although the results for the pre-listing period seem to differ from the market-adjusted results, the order between the three exchanges remains the same. While NYSE (0.22 percent in the listing week) and NASDAQ (2.83 percent in the listing week) listings experience positive CARs in the pre-listing period, London listings (-3.46 percent in the listing week) experience negative CARs. Although these results are not statistically significant at any conventional level, the findings indicate that firms listing in the US experience a different price reaction than firms listing on the

London Stock Exchange. The difference between market-adjusted and market model CARs may be caused by an upward-biased intercept as described above (see 6.3.1.2.) which leads to a downward bias in abnormal returns. Table 6.4. also shows that NYSE CARs reach a peak of 2.16 percent in week -20, which is, however, not statistically significant (t=0.74). This is probably due to the price run-up before the announcement of equity offerings, since a number of firms raised equity with their NYSE listing[153].

The comparison of market model calculated post-listing period results to market-adjusted CARs provides a similar picture as discussed for the pre-listing period. While the CARs of London, NYSE, and NASDAQ listings are significantly negative, the decline is far more pronounced for NYSE (-36.09 percent) and NASDAQ (-19.85 percent) listings than for London listings (-12.83 percent) over the 104-week post-listing period. Similar to the findings above, NASDAQ CARs increase in the immediate post-listing period and reach 4.22 percent (t=2.42) in week 5. The finding that NYSE listings experience the biggest decline is consistent with our findings above and the implications of previous theoretical and empirical research. The stronger decline using a risk-adjusted methodology may even be an indication of the severity of the decline in expected returns for internationally listed firms[154].

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[153] For a more detailed discussion of the stock price behavior of public offerings, see 6.4.2.

[154] To examine whether the strong decline for NYSE listings is due to a change in beta, we also estimate post-listing betas over a period from weeks +4 to +104. However, our results do not show any change in betas. The average beta is 1.02 for the pre-listing period and 1.01 for the post-listing period.

Table 6.4.

Risk-adjusted cumulative abnormal returns (CARs) for London, NYSE and NASDAQ listings

The Table shows weekly cumulative average returns (CARs) for international listings on the London Stock Exchange, on NYSE, and on NASDAQ. CARs are calculated from domestic prices using market model-adjusted returns. t-statistics are adjusted for autocorrelation and for firms dropping out of the sample with increasing weeks of seasoning.

	London (N=118)		NYSE (N=84)		NASDAQ (N=31)	
Event week	**CARs %**	**t-statistic**	**CARs %**	**t-statistic**	**CARs %**	**t-statistic**
	Pre-listing period					
-52	-0.28	-0.65	0.58	1.14	-0.29	-0.37
-30	-2.56	-1.24	2.12	0.86	0.93	0.25
-20	-2.56	-1.03	2.16	0.74	1.56	0.35
-10	-2.92	-1.03	0.60	0.20	1.79	0.35
-5	-3.02	-1.01	0.46	0.14	1.33	0.24
-1	-2.88	-0.74	1.47	0.40	2.69	0.48
0	-3.46	-1.10	0.22	0.06	2.83	0.50
	Post-listing period					
1	0.31	0.73	0.02	0.04	-0.25	-0.32
2	-0.19	-0.31	-0.4	-0.63	0.70	0.63
3	-0.38	-0.52	-1.38	-1.55	0.94	0.69
4	-0.71	-0.82	-1.46	-1.42	3.58	2.29
5	-0.62	-0.65	-1.76	-1.54	4.22	2.42
10	-0.80	-0.59	-4.29	-2.64	3.24	1.31
25	-3.82	-1.77	-7.92	-3.09	-1.97	-0.50
52	-7.37	-2.34	-18.36	-4.43	-3.30	-0.58
80	-11.71	-2.99	-28.88	-5.46	-11.94	-1.71
104	-12.83	-2.87	-36.09	-5.69	-19.85	-2.49

Table 6.5. compares holding period returns for London, NYSE, and NASDAQ listings. The median pre-listing holding period return for London listings is 16.75 percent and the average holding period return is 28.93 percent. This compares to an average return of 18.73 percent for the stock market index. The median pre-listing holding period return for NASDAQ listings is 30.51 percent and the average return is 36.57 percent. The corresponding average return of the stock market index is 16.25 percent. NYSE listings have a median holding period return of 31.90 percent and an average holding period return of 48.35 percent. The average return for the market index is 25.46 percent. The wealth relatives (WR) confirm our previous findings:

London listings (WR=1.09) have a lower pre-listing period performance than NYSE listings (WR=1.18) and NASDAQ listings (WR=1.17).

Table 6.5.

Holding period returns of London, NYSE, and NASDAQ listings for the pre- and post-listing period

This Table shows holding period returns for international listings calculated from domestic prices. It reports the median holding period return, the average holding period return, the mean holding period return of the market index, and the wealth relative for the 52-week pre-listing period and the 104-week post-listing period. All returns are reported in percent.

Stock exchange	Number of companies	Median listing firms	Mean listing firms	Mean market indices	Wealth relative
		Pre-listing Period			
London	118	16.75	28.93	18.73	1.09
NASDAQ	31	30.51	36.57	16.25	1.17
NYSE	84	31.90	48.35	25.46	1.18
		Post-listing period			
London	118	3.85	22.49	15.15	1.06
NASDAQ	31	18.36	37.00	32.31	1.04
NYSE	84	7.21	7.33	19.74	0.90

The post-listing holding period returns are similar to the market-adjusted and the risk-adjusted results. The median returns are 3.85 percent for London listings, 18.36 percent for NASDAQ listings, and 7.21 percent for NYSE listings. The average returns are 22.49 percent (London), 37.00 percent (NASDAQ), and 7.33 percent (NYSE). The respective average holding period returns for the market index are 15.15 percent (London), 32.31 percent (NASDAQ), and 19.74 percent (NYSE). The wealth relative is 1.06 for London listings, 1.04 for NASDAQ listings, and 0.90 for NYSE listings. Although London and NASDAQ listings have positive wealth relatives compared to negative CARs for NASDAQ listings (using market-adjusted and risk-adjusted methods) and London listings (using risk-adjusted returns), the median holding period returns indicate that the results for London and NASDAQ listings are skewed. However, the order between the three exchanges is not changed.

The findings show that the place of listing influences the price reaction. These results appear consistent with different information costs and regulatory barriers for US and London investors. The dismantling of investment barriers is stronger for foreign companies that decide to list in the US than for companies listing in London. This is due to the distinct approach towards regulating foreign securities in the US and the UK. Moreover, companies that list in the US experience a bigger increase in their shareholder base because a number of institutional investors are only permitted to invest in foreign stocks that meet the rigorous disclosure and reporting requirements of the SEC.

6.4.2 ADR listing and emerging markets

Alexander, Eun, and Janakiramanan (1988) suggest that the "international listing effect" depends on the nationality of a firm. They argue that the magnitude of the price reaction is influenced by the degree of market segmentation between different countries. Table 6.6. (market-adjusted returns) and Table 6.7. (risk-adjusted returns) show CARs of all NYSE listings which are broken down into a subsample of developed market firms, and a subsample of emerging market firms. The results show that emerging market firms experience higher abnormal returns prior to the listing week than developed market firms. Market-adjusted CARs of emerging market firms are 14.19 percent and of developed market firms are 9.37 percent in week -1 (see Table 6). Risk-adjusted returns are 3.86 percent for emerging market firms and 0.91 percent for developed market firms (see Table 6.7.).

Table 6.6.

Market-adjusted cumulative abnormal returns (CARs) for NYSE listings

The Table shows weekly cumulative average returns (CARs) for international listings on NYSE and are categorised on the basis of being from a developed or a emerging market. CARs are calculated from domestic prices using market-adjusted returns. t-statistics are adjusted for autocorrelation and for firms dropping out of the sample with increasing weeks of seasoning.

	Developed market firms (N=68)		Emerging market firms (N=16)	
Event week	**CARs %**	**t-statistic**	**CARs %**	**t-statistic**
		Pre-listing period		
-52	0.99	1.85	-0.56	-0.37
-30	6.31	2.46	4.94	0.68
-20	7.31	2.38	12.48	1.44
-18	6.89	2.18	17.66	1.98
-10	7.92	2.26	14.04	1.42
-1	10.57	2.74	14.79	1.36
0	9.37	2.41	14.19	1.29
t-test of differences in mean for pre-listing period (CAR at week 0): 0.37				
		Post-listing period		
1	0.58	0.77	-1.58	-1.04
2	0.51	0.55	-2.70	-1.26
3	0.45	0.42	-6.32	-2.41
4	0.59	0.50	-6.46	-2.14
5	0.60	0.46	-6.61	-1.96
10	-1.23	-0.73	-4.84	-1.01
20	-1.19	-0.50	-3.82	-0.57
25	-0.81	-0.30	-6.42	-0.85
52	-4.41	-1.06	-12.88	-0.89
80	-12.72	-2.46	-34.23	-1.55
104	-14.77	-2.45	-61.17	-1.99
t-test of differences in mean for post-listing period (CAR at week 104): -1.23				

Table 6.6. and 6.7. also show that emerging market firms' and developed market firms' CARs decline in the post-listing period. According to Alexander, Eun, and Janakiramanan (1988), this persistence of abnormal returns in the post-listing period is an indication of a change in expected returns following the event of international listings. This decline is much more severe for emerging market firms than for developed market firms. Whereas market-adjusted CARs of emerging market firms

decline to -34.23 percent at week 80 and -61.17 percent at week 104[155], CARs of developed market firms reach -12.72 percent at week 80 and -14.77 percent at week 104 (see Table 6.6.). Using risk-adjusted CARs the decline is even more pronounced. At week 104 the CARs are -81.14 percent for emerging market firms and -31.03 percent for developed market firms (see Table 6.7.).

Table 6.7.

Risk-adjusted cumulative abnormal returns (CARs) for NYSE listings

The Table shows weekly cumulative average returns (CARs) for international listings on NYSE and are categorised on the basis of being from a developed or a emerging market. CARs are calculated from domestic prices using risk-adjusted returns. t-statistics are adjusted for autocorrelation and for firms dropping out of the sample with increasing weeks of seasoning.

	Developed market firms (N=68)		**Emerging market firms (N=16)**	
Event week	**CARs %**	**t-statistic**	**CARs %**	**t-statistic**
	Pre-listing period			
-52	0.90	1.66	-0.76	-0.53
-30	2.42	0.93	0.84	0.12
-20	1.18	0.38	6.35	0.78
-18	0.15	0.05	10.72	1.24
-10	-0.33	-0.09	4.56	0.47
-1	0.91	0.23	3.86	0.37
0	-0.46	-0.12	3.11	0.29
	Post-listing period			
1	0.39	0.72	-1.58	-1.07
2	0.09	0.12	-2.88	-1.39
3	-0.14	-0.15	-6.72	-2.64
4	-0.15	-0.14	-7.15	-2.44
5	-0.31	-0.26	-7.93	-2.42
10	-3.31	-1.94	-8.49	-1.83
25	-6.22	-2.30	-15.93	-2.18
52	-14.97	-3.81	-34.37	-2.44
80	-25.15	-5.00	-64.31	-3.01
104	-31.03	-5.15	-81.14	-2.35

Although the difference in post-listing period CARs for emerging market and developed market firms is consistent with our expectations and previous theoretical implications, our conclusions remain tentative. Since the decline in post-listing CARs of emerging market firms appears to be very strong, we cannot rule out other explanations. Emerging market CARs reach a peak of 17.66 percent (t = 1.98) at

[155] The sample comprises only 3 companies at week 104 since many emerging market firms listed after mid 1994.

week -18. This is an indication of the widely documented price run-up before equity offerings because 15 of the 16 emerging market firms raised equity capital with their listing. The peak at week -18 probably occurs at the time when the offering is announced: The time which elapses between the announcement of an international offering and the listing date is approximately similar to the time reported by Stonham (1993). Hence, the strong decline in the post-listing period may be due to the well-documented underperformance in long-run stock returns following seasoned equity offerings (e.g. Loughran and Ritter (1995), and Spiess and Affleck-Graves (1995)).

Table 6.8. and 6.9. show CARs of all companies that listed ADRs on the NYSE or NASDAQ with respect to the method of listing. 62 companies listed their stock using an introduction and 37 companies raised new equity capital via a public offering. CARs peak at week -14 reaching 12.40 percent (t = 2.39) using a market-adjustment and 5.08 percent (t = 1.03) using the market model. However, our methodology does not measure the exact magnitude of the price run-up in stock prices and the drop in stock prices on the announcement date[156]. Since we are interested in changes in the equilibrium pricing relationships, we do not pinpoint the announcement date of the international equity offering. Although CARs decline following the likely offering announcement period, they increase again towards the listing date indicating that the market associates value with a listing. Introductions also experience positive abnormal returns of similar magnitude in the pre-listing period reaching a peak of 11.50 percent (t = 2.82), if market-adjusted, and 4.72 percent (t = 1.04), if risk-adjusted, at week -1.

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[156] See Asquith and Mullins (1986), Mikkelson and Partch (1986), Masulis and Korwar (1986) for domestic equity offerings and Marr, Tremble, and Varma (1991) for Euroequity offerings.

Table 6.8.

Market-adjusted cumulative abnormal returns (CARs) for different methods of listing ADRs

The Table shows weekly cumulative average returns (CARs) for firms that list ADRs on NYSE or NASDAQ. They are categorised by their method of listing. 61 firms were listed in an introduction and 37 firms conducted a public offering with their listing. CARs are calculated from domestic prices using market-adjusted returns. t-statistics are adjusted for autocorrelation and for firms dropping out of the sample with increasing weeks of seasoning.

	Introductions (N=61)		**Public offerings (N=37)**	
NYSE	34		33	
NASDAQ	27		4	
Event week	**CARs %**	**t-statistic**	**CARs %**	**t-statistic**
	Pre-listing period			
-30	4.54	1.69	6.75	1.70
-20	6.39	1.98	9.27	1.95
-14	8.02	2.29	12.40	2.39
-10	8.23	2.24	10.23	1.88
-5	9.57	2.46	10.26	1.78
-1	11.50	2.84	12.02	2.01
0	11.33	2.78	11.09	1.84
	Post-listing period			
1	0.31	0.56	-0.65	-0.81
2	0.43	0.54	-1.05	-0.91
3	0.20	0.21	-1.85	-1.30
4	1.59	1.42	-2.47	-1.50
5	1.47	1.17	-1.31	-0.71
10	0.64	0.36	-1.82	-0.70
20	-1.98	-0.79	-0.91	-0.24
30	-3.64	-1.19	-3.00	-0.66
52	-1.99	-0.48	-8.74	-1.22
80	-7.45	-1.40	-15.33	-1.63
104	-10.88	-1.76	-18.01	-1.56

Table 6.8. also shows that the decline in CARs of public offerings is by far not as severe as the decline of emerging market firms (see above). Moreover, they are not significantly different from zero for introductions (t = -1.76) as well as for public offerings (t = -1.56) using market-adjusted returns. Similar to our previously reported results, market-model CARs are more negative than market-adjusted CARs. Table 6.9. shows that the CARs are -23.76 percent for introductions (t = -3.90) and -36.94 percent for public offerings (t = -3.21).

Table 6.9.

Risk-adjusted cumulative abnormal returns (CARs) for different methods of listing ADRs

The Table shows weekly cumulative average returns (CARs) for firms that list ADRs on NYSE or NASDAQ. They are categorised by their method of listing. 61 firms were listed in an introduction and 37 firms conducted a public offering with their listing. CARs are calculated from domestic prices using risk-adjusted returns. t-statistics are adjusted for autocorrelation and for firms dropping out of the sample with increasing weeks of seasoning.

	Introductions (N=61)		**Public offerings (N=37)**	
NYSE	34		33	
NASDAQ	27		4	
Event week	**CARs %**	**t-statistic**	**CARs %**	**t-statistic**
	Pre-listing period			
-30	2.05	0.76	2.81	0.74
-20	1.74	0.54	3.31	0.73
-14	2.17	0.62	5.08	1.03
-10	2.10	0.57	2.18	0.42
-5	2.91	0.75	1.71	0.31
-1	4.72	1.16	2.63	0.46
0	4.27	1.04	1.40	0.24
	Post-listing period			
1	0.19	0.33	-0.77	-0.97
2	0.29	0.36	-1.40	-1.26
3	-0.16	-0.16	-2.38	-1.74
4	1.07	0.94	-3.16	-2.01
5	0.81	0.64	-2.36	-1.34
10	-0.93	-0.52	-4.26	-1.71
20	-5.00	-1.97	-6.64	-1.88
30	-7.30	-2.35	-11.74	-2.72
52	-7.16	-1.71	-22.93	-3.25
80	-16.40	-3.12	-33.26	-3.47
104	-23.76	-3.90	-36.94	-3.21

Table 6.10. summarises holding period returns for emerging and developed market firms as well as for introductions and public offerings. Median (95.92 percent) and average (92.91 percent) holding period returns of emerging market firms experience a stronger increase in the pre-listing period than developed market firms (Median: 26.27 percent; mean: 39.51 percent). The wealth relative is 1.24 for emerging market firms and 1.18 for developed market firms. Public offerings (Median: 39.94 percent; mean: 52.69 percent) experience a stronger increase than introductions (Median:

29.69 percent; mean: 41.34 percent) in the pre-listing period. Public offerings have a wealth relative of 1.15 and introductions have a wealth relative of 1.19.

Table 6.10.

Holding period returns of NYSE listings and ADR listings for the pre- and the post-listing period. NYSE listings are categorised into emerging and developed market firms. ADR listings are split into public offerings and introductions.

This Table shows holding period returns for international listings calculated from domestic prices. It reports the median holding period return, the average holding period return, the mean holding period return of the market index, and the wealth relative for the 52-week pre-listing period and the 104-week post-listing period. All returns are reported in percent.

	Number of companies	Median listing firms	Mean listing firms	Mean market indices	Wealth relative
Pre-listing period					
NYSE					
- Emerging	16	95.92	92.91	55.07	1.244
- Developed	68	26.27	39.51	18.45	1.178
ADR listings					
- Introductions	61	29.69	41.34	18.30	1.194
- Public offerings	37	39.94	52.69	32.83	1.149
Post-listing period					
NYSE					
- Emerging	16	3.62	0.06	32.23	0.757
- Developed	68	8.24	8.64	18.57	0.916
ADR listings					
- Introductions	61	8.76	20.33	24.26	0.968
- Public offerings	37	8.90	11.04	26.47	0.877

The post-listing period results using holding period returns are consistent with the results of the previously reported performance measures. The wealth relative of emerging market firms (WR=0.76) is lower than for developed market firms (WR=0.92). The median (3.62 percent) and the average holding period return (0.06 percent) of emerging market firms indicate that the difference between developed and emerging market firms is caused to a great degree by a stronger positive movement of emerging stock markets. While the median returns are very similar for introductions (8.76 percent) and for public offerings (8.90 percent), the average holding period returns differ. They are 20.33 percent for introductions and 11.04 percent for public offerings. The wealth relative of introductions (WR=0.97) is higher than of public offerings (WR=0.88).

The combined evidence of holding period returns and CARs indicates that the strong decline in emerging market firm' CARs is not only due to the "equity offering effect" and gives rise to the assumption that the decline is caused by some other factors. Hence, we also examine timing explanations as suggested by the IPO literature.

6.4.3 Market conditions and the performance of ADR listings

The review of the new issues literature has shown that market conditions influence the decision of firms to raise equity capital. Since the post-listing performance of our sample firms resembles the pattern reported for new issues, this section examines the effect of market conditions on the post-listing performance of companies that listed ADRs on NYSE or NASDAQ. To investigate the effect of market conditions on international listings in more detail, we also include 34 international IPOs in our sample. We partition our sample of all international cross-listings and IPOs in the US on domestic market conditions. To gauge investor sentiment, Ljungqvist (1996) uses a market conditions proxy which measures whether the market as a whole traded at a historically high price-earnings ratio when IPO prices were fixed. We divide the domestic market's average PE ratio in every listing week by its 52-week moving average and obtain the market condition variable PE-RATIO. If PE-RATIO is above unity we assign it to the "high PE" category, and if PE-RATIO is below unity it is assigned to the "low PE" category. The second variable measures the condition of the stock market and is based on the increase in the respective stock market index 26 weeks prior to the listing week[157]. We use a longer window than Choe, Masulis, and Nanda (1993), who calculate the market return over the 75-day period prior to the announcement, to account for the time that is necessary to prepare an

[157] See Choe, Masulis, and Nanda (1993).

international listing. If the market return was positive during this period we assign it to the "buoyant market" category, if it was negative it is assigned to the "sluggish market" category.

Table 6.11. categorises all ADR listings and those that raised capital with it according to our first market condition proxy. Panel A shows average CARs, average holding period returns, average market holding period returns, and wealth relatives of the underlying shares of ADR listings conditioned on whether the shares were listed in a "high PE" or in a "low PE" market. The fact that approximately 62% of all firms listed in a "high PE" market may be an indication that firms try to time their listings to take advantage of some potential "window of opportunity" for foreign firms in the US market. Although "high PE" firms (-14.97 percent) have stronger negative CARs than "low PE" firms (-10.29 percent) the difference is not statistically significant (t=0.47). This difference is even reversed when wealth relatives are compared. The wealth relative of "low PE" firms (0.92) is slightly higher than of "high PE" firms (0.89). To investigate the effect of market conditions on the performance of firms that raised capital with their ADR listing, we repeat the same analysis but exclude introductions from our sample. Panel B of Table 11 shows that "low PE" firms (-22.83 percent) perform worse than "high PE" firms (-16.93 percent), although the difference is not statistically significant (t=0.37). A comparison of the respective wealth relatives confirms these findings, since they are almost identical for "high PE" firms (0.84) and for "low PE" firms (0.85).

Table 6.11.

Impact of market conditions (PE-ratio) on performance of ADR listings

The Table examines the impact of market conditions on the post-listing period (104-weeks) performance of ADR listings. Panel A distinguishes all ADR listings for which PE-data on their respective country index is available whether they listed in a "high PE" or in a "low PE" period. A "high PE" period is defined when the market's PE-ratio in the listing week is above its 52-week moving average. A "low PE" period is defined when the market's PE-ratio in the listing week is above its 52-week moving average. Panel B only examines firms which raised capital with their listing. t-statistics are performed as a paired t-test of the difference in the estimates of each group.

	High PE	Low PE	t-test of difference in means
Panel A: All ADR listings			
Number of ADR listings	79	49	
Average CAR %	-14.97	-10.29	0.47
Average holding period return %	6.58	18.92	-1.45
Average market holding period return %	19.39	29.35	-1.64
Wealth relative	0.89	0.92	
Panel B: Capital raising firms			
Number of capital raising firms	43	25	
Average CAR %	-16.93	-22.83	0.37
Average holding period return	-0.67	10.24	-1.17
Average market holding period return	18.16	29.35	-1.20
Wealth relative	0.84	0.85	

Table 6.12. conditions the firms on the market return. It reports a similar trend as observed in Table 6.11., since approximately 75% of all firms listed after a "buoyant market" period. The results in Panel A show that "buoyant market" firms (-9.91 percent) have less negative CARs than "sluggish market" firms (-22.12 percent)[158] but the difference is not statistically significant (t=0.97). The wealth relative is 0.90 for "buoyant market" firms and 0.91 for "sluggish market" firms, and hence very similar to the wealth relatives observed when conditioned on PE-ratios. Panel B repeats the analysis for capital raising firms. CARs of "sluggish market" firms (-53.77 percent)

[158] Our data show that the number of firms varies considerably by the year of listing. Hence, we also test for "hot issue"-effects, as widely documented in the IPO literature. But our results do not provide evidence that firms which listed in years with high activity (e.g. in 1993 and 1994) perform worse than in other years.

are far more negative than of "buoyant market" firms (-8.81 percent) and the difference is statistically significant (t=2.23). The wealth relative for "sluggish market" firms (WR=0.81) is also lower than for "buoyant market" firms (WR=0.86). These results provide some evidence that market timing seems to matter for capital raising firms. It may be an indication that successful market timing influences the post-issue performance of capital raising firms. However, since these results are similar to Ljungqvist's (1995) findings, they are inconsistent with sentiment timing. He argues that sentiment timing can only be infered if firms perform worse when they raised capital in a "buoyant" rather than a "sluggish" market. Moreover, our results seem to indicate that the negative post-listing performance is not simply due to an "equity offering effect" or to irrational overoptimism which is then corrected in subsequent periods.

Table 6.12.
Impact of market conditions (price run-up of stock market index) on performance of ADR listings

The Table examines the impact of market conditions on the post-listing period (104-weeks) performance of ADR listings. Panel A distinguishes all ADR listings whether they listed in a "buoyant market" or in a "sluggish market". A "buoyant market" is defined when the weekly average market return during the 26-week period prior to the listing week is positive. A "sluggish market" is defined when the weekly average market return during the 26-week period prior to the listing week is negative. Panel B examines only firms that raised capital with their listing. t-statistics are performed as a paired t-test of the difference in the estimates of each group.

	Buoyant	Sluggish	t-test of difference in means
Panel A: All ADR listings			
Number of ADR listings	99	32	
Average CAR %	-9.91	-22.12	0.97
Average holding period return %	9.28	14.79	-0.59
Average market holding period return %	21.55	25.44	-0.66
Wealth relative	0.90	0.91	
Panel B: Capital raising firms			
Number of capital raising firms	56	15	
Average CAR %	-8.81	-53.77	2.23
Average holding period return	4.95	-6.98	1.21
Average market holding period return	22.75	14.50	1.08
Wealth relative	0.86	0.81	

Since we have shown above that emerging market firms experience the strongest decline in the post-listing period, we examine their performance separately. Panel A of Table 6.13. compares CARs of emerging market firms (-37.86 percent) and developed market firms (-5.15 percent). These results corroborate our earlier findings (see Table 6.6, 6.7, and 6.10) of a more severe decline of emerging market firms and are statistically significant (t=-2.41) at the 5% level. The wealth relative for emerging market firms (WR=0.77) is also lower than for developed market firms (WR=0.94). While the average market holding period return does not differ for emerging and developed market firms, the average holding period return shows

significant differences. It is positive (16.71 percent) for developed market firms but negative (-9.00 percent) for emerging market firms (t=-3.26). This indicates that the performance of emerging market firms may be driven by different factors than developed market firms.

Panel B and C examine the post-listing performance of emerging market firms partitioned on market conditions. The results are very similar for both proxies and are consistent with our previous evidence. "High PE" firms (-28.50 percent) have less negative CARs than "low PE" firms (-70.07 percent) and "buoyant market" firms (-24.12 percent) perform better than "sluggish market" firms (-77.34 percent). The wealth relatives are 0.80 for emerging market firms and 0.69 for developed market firms, when conditioned on the PE-proxy, and 0.77 for emerging and developed market firms, when using the market return proxy. These results are similar to our previous findings. However, these results also suggest a different form of the "sentiment timing" proposition. Since "emerging markets" have very much become the topic of the 90's for international investors, there may have been a lot of overoptimism about their growth prospects at the time of the listing. This apparent misvaluation could have then been corrected in the post-listing period leading to this strongly negative post-listing performance.

Table 6.13.

Market conditions and their impact on performance of emerging market and developed market firms

The Table examines the impact of market conditions on the post-listing period (104-weeks) performance. Panel A distinguishes emerging market and developed market firms. Panel B categorises emerging market for which PE-data on their respective country index is available whether they listed in a "high PE" or in a "low PE" period. A "high PE" period is defined when the market's PE-ratio in the listing week is above its 52-week moving average. A "low PE" period is defined when the market's PE-ratio in the listing week is above its 52-week moving average. Panel C distinguishes firms whether they listed in a "buoyant market" or in a "sluggish market". A "buoyant market" is defined when the weekly average market return during the 26-week period prior to the listing week is positive. A "sluggish market" is defined when the weekly average market return during the 26-week period prior to the listing week is negative. t-statistics are performed as a paired t-test of the difference in the estimates of each group.

	Panel A: All ADR listings		**t-test of difference in means**
	Emerging market firms	**Developed market firms**	
Number of firms	31	100	
Average CAR %	-37.86	-5.15	-2.41
Average holding period return %	-9.00	16.71	-3.26
Average market holding period return %	18.44	23.76	-0.64
Wealth relative	0.77	0.94	
Panel B: Emerging market firms			
	High PE	**Low PE**	
Number of firms	19	9	
Average CAR %	-28.50	-70.07	1.23
Average holding period return %	-6.47	-11.27	0.29
Average market holding period return %	17.60	28.91	-0.49
Wealth relative	0.80	0.69	
Panel C: Emerging market firms			
	Buoyant	**Sluggish**	
Number of firms	23	8	
Average CAR %	-24.12	-77.34	1.50
Average holding period return %	-4.67	-21.44	1.28
Average market holding period return %	24.10	2.16	1.67
Wealth relative	0.77	0.77	

To examine the impact of market conditions and some other factors on the post-listing performance of ADRs, we also regress post-listing CARs on the following variables:

PE-RATIO — a dummy variable which is one if the firm was listed when the domestic market's PE ratio was above its 52-week moving average and 0 otherwise.

INDEXRET — the weekly average domestic market return during the 26-week period prior to the listing week.

EMERGING — a dummy variable which is one for firms from emerging markets.

LNSIZE — the natural logarithm of the market capitalisation of the listed firm.

The regression results in Table 6.14. confirm our previous findings. The emerging market dummy variable is the only statistically significant variable (t=-3.23). The proxies for market conditions are not significant. Previous research has generally shown that underperformance is partly explained by firm size. A very recent paper by Dharan and Ikenberry (1995) provides some evidence that the negative post-listing drift is more severe for smaller firms. To account for this possibility, firm size is also included in the cross-sectional regression. However, our results show that performance is not influenced by firm size, since LNSIZE is insignificant (t=0.56). Even if size had appeared to be of significance, we would have had to be very careful in interpreting it. Performance is measured against the respective local market index and most of our sample firms are relatively large firms in their domestic market. However, especially many emerging market firms are relatively small firms compared to developed market firms. Hence, a size-adjustment appears to be less meaningful for a study comparing firms from different international markets.

The results change, however, when we repeat the regression only for capital raising firms (Level III ADR programmes). The emerging market dummy variable is still highly statistically signficant (t=-2.81) indicating that emerging market firms may have timed their listings for periods of investor over-optimism. The significantly (t=2.60) positive coefficient for INDEXRET clearly refutes the "sentiment timing" proposition, since it shows that capital raising firms experience a more positive post-listing performance if issued in a "buoyant market" period. If we believed in "investor sentiment" for capital raising firms, we would expect a much stronger price correction for "high PE" and "buoyant market" firms than for "low PE" and "sluggish market" firms.

Table 6.14.
Impact of market conditions, firm size, equity offerings, and emerging market sentiment on performance of international listings

The Table below gives the OLS estimates of the following equation:
$CAR_i = B_0 + B_1$ PE-RATIO$_i + B_2$ INDEXRET$_i + B_3$ EMERGING$_i + B_4$ LNSIZE$_i$
The dependent variable is the individual cumulative abnormal return (CAR_i) for the post-listing period. The independent variables are: PE-RATIO$_i$, a dummy variable which is one if the firm was listed in a "high PE" market, and 0 if the firm was listed in "low PE" market; INDEXRET$_i$, the weekly average return during the 26-week period prior to the listing week; EMERGING$_i$, a dummy variable which is one for emerging market firms, and zero for developed market firms; LNSIZE$_i$, the natural logarithm of the market value. The t-statistics for each coefficient are in brackets.

	All ADR listings	**Level III ADR programmes**
Independent variable	Estimated coefficient	Estimated coefficient
Intercept	-0.1199	-0.3541
	(-1.29)	(-2.21)
PE-RATIO	-0.1047	-0.1061
	(-0.99)	(-0.75)
INDEXRET	0.1609	0.4280
	(1.37)	(2.60)
EMERGING	-0.3461	-0.3745
	(-3.23)	(-2.81)
LNSIZE	0.0000	0.0001
	(0.56)	(0.73)
Adjusted R^2	0.08	0.22

6.4.4 Price reaction of ADRs

Previous sections have examined the impact of international listing on domestic share prices. Since the vast majority of foreign companies list their shares in form of ADRs on US stock exchanges, we are provided with an opportunity to examine the return behaviour of ADRs and their underlying shares. The comparison of the corresponding ADR returns and underlying share returns is important because it allows inferences concerning the integration of both markets. If internationally listed stocks are priced in an integrated market subsequent to the listing, we should not observe discernible differences between ADR returns and underlying share returns. ADR returns are measured against the S&P 500 index and underlying share returns are measured against their domestic stock market index (as described above). Table 6.15. confirms our expectations that ADR returns are very similar to underlying share returns. This suggests, as argued by Domowitz, Glen, and Madhavan (1995) in the case of Mexcian ADRs, there is efficient arbitrage across markets[159]. Table 6.15. also shows again that NYSE listings experience a stronger decline than NASDAQ listings.

[159] We also compare the equality of average weekly ADR and underlying share returns. Although they are not identical, their differences are not statistically significant. This reaffirms our findings of sufficient cross-arbitrage between the US market and the domestic market. Domowitz, Glen and Madhavan (1995) provide two possible reasons for this result: This could reflect non-synchronous trading or the effect of currency movements.

Table 6.15

Post-listing Cumulative Abnormal Returns (CARs) of ADRs and their underlying shares
The Table shows weekly cumulative average returns (CARs) for ADRs and their underlying shares categorised into NYSE or NASDAQ listings. CARs are calculated using market-adjusted returns. t-statistics are adjusted for autocorrelation and for firms dropping out of the sample with increasing weeks of seasoning.

	NYSE				NASDAQ			
	ADRs		Underlying shares		ADRs		Underlying shares	
Event week	CARs	t-stat.	CARs	t-stat.	CARs	t-stat.	CARs	t-stat.
2	-0.0014	-0.15	-0.0094	-1.09	0.0233	1.19	0.0131	1.60
5	-0.0017	-0.11	-0.0202	-1.66	0.1025	3.32	0.0532	3.25
10	0.0021	0.10	-0.0349	-1.91	0.0804	1.84	0.0502	2.04
20	-0.0027	-0.77	-0.0336	-1.26	0.0827	1.34	0.0185	0.52
30	-0.0589	-1.62	-0.0602	-1.84	0.0455	0.60	0.0190	0.43
52	-0.0669	-1.40	-0.0673	-1.37	0.1103	1.11	0.0195	0.33
80	-0.1992	-2.99	-0.1391	-2.17	0.0855	0.66	-0.0216	-0.28
104	-0.2469	-3.18	-0.1780	-2.32	0.0089	0.06	-0.0578	-0.66

So far we have argued that international listing lowers expected returns since it reduces barriers to investment as transaction or information costs. The structure of the ADR market[160] provides us with an unique opportunity to conduct a more direct test of potential benefits of ADR listings. Some of the sample firms had in place an unsponsored or a sponsored Level I programme before they decided to upgrade their ADR programme to a listing. Since pre-listing price data is available for these ADRs, we can now test the magnitude of benefits that US investors experience when ADRs start trading on a regulated and potentially more liquid marketplace. Table 6.16. provides striking evidence of the positive effect on the ADR price. ADRs experience an abnormal return of 12.18% on the day of listing which is highly significant (t=18.17)[161]. It shows that previously OTC-traded ADRs were segmented from the underlying share market. Subsequent to the upgrading, the ADR price becomes integrated with the underlying share price. The magnitude of this

[160] See Velli (1994).
[161] Even after removing one outlier, which experienced an increase of 200%, the average abnormal return is 6.8% and highly significant (t=8.23).

integration effect is reflected in the strong price reaction of the ADRs upon upgrading. This finding may be explained by the positive effect on liquidity that upgradings experience. Moreover, the strength of this strongly positive liquidity effect could help to explain the observed reduction in expected returns in the post-listing period.

Table 6.16.

Daily abnormal returns (ARs) of companies upgrading their Level I ADR programme to a listing

This Table shows daily abnormal returns of ADRs and their underlying shares for firms that upgraded their Level I ADR programme to a listing.

	ADRs		Underlying shares	
Event day	**AR**	**t-statistic**	**AR**	**t-statistic**
-1	0.0080	1.20	0.0038	0.56
0	0.1218	18.17	0.0015	0.22

6.5 Conclusion

This paper shows that foreign firms listing on NYSE or NASDAQ experience positive abnormal returns in the pre-listing period and negative abnormal returns in the post-listing period. This contrasts with foreign firms that list on the London Stock Exchange which do no not experience any significant changes in the pre- and the post-listing period. This finding is attributed to the institutional differences in regulating foreign equities across both markets. Since foreign firms face higher hurdles to gain access to the US capital market, the benefits of reducing these barriers to investment appear to be higher. Emerging market firms, as suggested by theoretical research, seem to experience the biggest integration effects. Although we cannot fully rule out the presence of an "emerging market sentiment" of international investors, our evidence is weak. This chapter also shows that negative post-listing returns are not concentrated among capital raising ADR-listings, as suggested by the

existing equity issuance literature, which lends further support to the "decline in expected returns"-explanation. Moreover, we also demonstrate that the underlying share price becomes aligned to the ADR price after the listing. The substantial positive abnormal return of 12.18% on the listing day for firms that upgrade their OTC-traded ADR programme to a "fully" listed ADR programme provides strong support for the benefits associated with listings.

7. Chapter: The international cross-listing decision and its impact on liquidity

Previous studies have investigated the motives of companies that decide to list their stock on an exchange outside their country of origin and the benefits associated with it. They suggest that international listing is perceived by managers to increase the liquidity of their stock, provide better access to foreign capital markets, increase the exposure for the products of the firm, and lead to a growth in the shareholder base (Mittoo, 1992). The listing decision of international firms may also be related to the proportion of exports to the host country and the size of the firm. However, the most prominent explanation throughout the literature is the idea that companies have the desire to increase the liquidity of their stock.

The review of previous literature has shown that international listing and domestic exchange listing increases the liquidity of a stock. International listing increases the total trading volume and the informativeness of prices. Explanations for the sources of liquidity improvement are still tentative. Some theoretical models of multiple trading locations have shown that the improvement in liquidity may be explained by the increased competition among traders. The increased competition also forces informed traders to reveal more private information which increases the informativeness of prices. However, other studies have argued that trading on an alternative market could have a negative impact on the liquidity of the primary market since marketplace fragmentation reduces trading volume and pricing efficiency. This suggests that the impact of foreign listing on the liquidity of a stock in its domestic market may be influenced by the structure and interaction of both markets. Previous

studies, however, have not investigated whether the impact of international cross-listing on the liquidity of the domestic market varies across stock exchanges.

The remainder of this chapter is organised as follows. Section 1 presents the hypotheses to be tested. Section 2 describes the sample and the methodology. In particular, the matching process between sample and control firms is described and the estimation of abnormal trading volume is discussed. The empirical findings are presented in Section 3. While the first part examines the effect of different stock exchanges, the second part investigates the impact of the method of listing. Part three examines differences in microstructure-related characteristics between listed and control firms. Part four investigates order flow effects of ADR listings.

7.1 Hypotheses tested

The purpose of this chapter is to examine whether the effect of international cross-listing on the trading volume of the domestic market differs for firms listing on the London Stock Exchange, NASDAQ, and NYSE. An US listing may lead to a larger increase in trading volume from the pre- to the post-listing period since it increases the total number of traders. An increase in the number of traders is generally associated with an increase in competition and pricing efficiency. While it is assumed that trading costs are typically low in the US market, this may provide even stronger competition for traders in the firm's domestic market. However, it may still be cheaper for many traders to trade in the domestic market. Hence, we expect that US listings should experience stronger positive volume effetcs in the post-listing period in their domestic market. The increase in the trading volume in the firm's

domestic market stems from the increased trading by liquidity traders who concentrate their trading activity in the market with the lowest tranasction costs.

Previous research has also not examined whether the liquidity impact varies for different methods of listing. Companies that raise capital with their listing may experience stronger positive volume effects in the post-listing period. Companies that conduct a public offering in the US market offer a higher percentage of their total number of shares outstanding to US investors. Hence, the increase in the shareholder base is larger for public offerings than for introductions. Since there is a link between the size of the shareholder base and liquidity, a bigger US shareholder base is expected to create a more active US secondary market in this foreign stock. At the same time, an increased trading activity in the US market provides stronger competition for domestic traders, as described above, leading to an increase in trading activity in the domestic market.

Previous studies examining changes in trading activity from the pre- to the post-listing period have not taken account of market-wide or industry-related fluctuations in volume. Our study adjusts for changes in the market volume and matches control firms by nationality, firm size, and industry. This comparison between listed and control firms, which appear to qualify for a listing but do not list their stock internationally, could also shed some light on the motives of companies obtaining an international cross-listing. If a listing on one exchange leads to a stronger increase in the trading volume than on other exchanges, this may explain the listing decision of firms.

Earlier studies examining ADR listings have not distinguished between listing ADRs on an OTC-market or on a regulated stock exchange, as NYSE and NASDAQ. This chapter also investigates the impact of a regulated ADR listing on the order flow of a

stock. If international listing is consistent with an increased competition among traders we would expect an increase in the total order flow of a stock (domestic + foreign volume). A high number of firms should experience an increase in their domestic order flow. However, this does not preclude a significant foreign order flow because it may be beneficial for some market participants to trade in the foreign market. Moreover, cross-market arbitrage should generate additional trading volume in both markets.

Hypotheses:

1.) The market attaches a liquidity benefit to internationally listed companies. While all firms experience positive short-term volume effects in the immediate pre-listing period in their domestic market, US listings experience positive long-term abnormal volume effects in the post-listing period in their domestic market .

2.) The method of listing influences the impact on the domestic trading volume. Public offerings bear larger liquidity benefits than introductions because they lead to a stronger increase in the shareholder base of a firm.

7.2 Sample and methodology

7.2.1 Listed companies

Our initial sample consists of all foreign firms that are listed on the London Stock Exchange or the New York Stock Exchange (NYSE), and foreign firms which have listed ADRs on NASDAQ. We identify 185 firms on the London Stock Exchange, 177 firms on NYSE, and 61 on NASDAQ, that obtained a listing between 1980 and 1994. Information concerning the listed companies and their listing date is obtained from the respective stock exchanges through private communication. A special criterion is applied to NASDAQ firms which must be sponsored ADRs. This eliminates 5 unsponsored ADRs which were granted an exemption from Rule 12g3-2(b)[162]. We require that all internationally listed firms are also listed in their country of origin because we only consider international cross-listings. This criterion eliminates 48 companies (14 London, 23 NYSE, and 11 NASDAQ listings) from our sample.

Since we are interested in changes in trading volume from the pre- to the post-listing period, we have to estimate "normal" trading volume over a certain period prior to the listing. We choose a 52-week estimation period from week t=-78 to t=-26 prior to the listing week[163]. This imposes an additional constraint on our sample selection because we have to delete firms with less than 78 weeks of stock price data prior to the listing. This leaves us with a preliminary sample of 118 companies on the London Stock Exchange, 84 companies on the New York Stock Exchange, and 31 companies on NASDAQ. The high rate of exclusion is due to two main reasons. Firstly, a high percentage of internationally listed firms are initial public offerings

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[162] Rule 12g3-2(b) requires OTC securities to register with the SEC but foreign companies were exempted until October 1983. In October 1983 the SEC abolished this exemption for foreign securities but gave already-listed securities a "grandfather" exemption.

[163] For more details see 3.3. Estimation of abnormal trading volume.

(IPOs). Secondly, many internationally listed firms are from emerging markets which often lack sufficient historical data.

Table 7.1.

Sample selection

This table shows the various steps of the sample selection procedure. Only international cross-listings with sufficient historical data are considered.

	NYSE	London	NASDAQ[a]
Total number of firms that listed between 1980-1994	177	185	61
Unsponsored ADRs			5
Primary listings	23	14	11
Companies with less than 78 weeks of price data	70	53	14
Subtotal: Companies with price data	**84**	**118**	**31**
Companies without trading volume data	25	38	15
Number of companies in sample	**59**	**80**	**16**
Firms without matched control firms	25	19	7
Number of companies with matched control firms	**34**	**61**	**9**

[a] Only firms that listed ADRs are considered.

Since we are interested to what extent an international listing influences the liquidity of a stock, we have to exclude firms with less than 78 weeks of trading volume data on their domestic exchange prior to the listing date. However, in many instances sufficient historical volume is not available on Datastream[164]. The high rate of exclusion is mainly due to Japanese and UK companies. Datastream only reports trading volume from October 1986 onwards for UK companies and from mid 1990 onwards for Japanese companies. Hence, we have to exclude 27 Japanese companies (22 in London, 2 on NYSE, and 1 on NASDAQ) and 18 UK companies (11 on NYSE and 7 on NASDAQ). Moreover, an additional 24 companies from various countries have to be excluded because no volume data is available prior to their listing date. This results in a sample of 80 companies on the London Stock

[164] Although price data was available for these sample firms, Datastream does not report volume for the following countries: Finland, Ireland, New Zealand, and South Africa. This eliminates 9 firms from our sample (3 in London, 3 on NYSE, and 3 on NASDAQ).

Exchange, 59 companies on the NYSE, and 16 companies on NASDAQ (see Table 7.1.).

7.2.2 Control firms

To examine possible changes in trading volume, we also generate a sample of not internationally listed control firms on the basis of nationality, size, and industry. Saudagaran (1988) uses firms' assets, sales[165], and market value as surrogate measures for size. Since market value is related to bid-ask spreads, market value appears to be the most appropriate measure for size. Nationality proxies for a number of other factors as financial reporting and listing requirements, size of the domestic capital market, and the trading system of the domestic stock exchange. Industry is used as a third factor. According to Saudagaran (1988), industry may proxy for a number of variables as size, level of technology, and capital intensity.

This part describes the procedure used to choose control firms for the sample firms. In a first step, we search Datastream country lists for each particular domestic country to identify firms that have the same industry code as the internationally listed firm. For each firm in the sample, the firm with the market capitalisation closest to and, if possible, larger than that of the sample firm on its listing date is chosen as the control firm. While size is positively related to liquidity, choosing larger firms ensures that we do not introduce a size bias in our results. However, we observe a similar pattern in many countries. Firms that are larger than our sample firm have been internationally listed for years. Very often the largest firm in one particular industry

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[165] Some studies suggest that companies list their stock abroad to market their products. In order to take account of this factor, we would have to match companies by their foreign sales in the listing country. However, many companies do not provide a country-by-country breakdown of revenues.

lists first. This indicates that the listing decision of firms is partly influenced by the relative size of a firm in its domestic market or industry. We also include in the control sample firms that eventually list on the foreign stock exchange. If we only used firms that are known to have never listed internationally, we would introduce an ex post selection bias into the tests (see Cowan, Carter, Dark, and Singh, 1992). However, their listing has to occur at least one year after the listing of the sample firm to avoid using overlapping data. A firm that is listed on another foreign stock exchange (e.g. London Stock Exchange) can be included in our control sample (e.g. for NYSE-listings) as long as the listing date does not fall within our observation period.

Table 7.2.
Distribution of international cross-listings on the New York Stock Exchange, London Stock Exchange, and on NASDAQ by domestic country.

The sample consists of 155 international listings from 16 different countries. All firms are listed on their domestic stock exchange. 59 firms are listed on the New York Stock Exchange (NYSE), 80 firms are listed on the London Stock Exchange, and 16 firms are listed on NASDAQ. NASDAQ listings only include ADR listings. The number in brackets shows the number of internationally listed firms which could be matched with a control firm. The matched sample consists of 104 matched pairs from 12 different countries.

Domestic country	New York	London	NASDAQ	Total
Australia	8 (2)	8 (6)	6 (4)	22 (12)
Belgium		1 (1)		1 (1)
Canada	16 (14)	3 (2)		19 (16)
Chile	8 (6)			8 (6)
Denmark	1			1
Germany	1 (1)	3 (3)		4 (4)
Hong Kong			1 (1)	1
Italy	1			1
Japan	2 (1)	2 (2)		4 (3)
Mexico	6 (1)			6 (1)
Netherlands	4 (2)	1 (1)	1	6 (3)
Norway	1	1		2
Philippines	1			1
Sweden		5 (1)	5 (2)	10 (3)
UK	10 (7)		3 (2)	13 (9)
US		56 (45)		56 (45)
TOTAL	**59 (34)**	**80 (61)**	**16 (9)**	**155 (104)**

Due to the problems, as described above, our final sample of control firms includes 104 companies that can be matched with their corresponding listing firms. Table 7.2. shows that 34 control firms are matched with a NYSE-listed firm, 61 control firms are matched with a London-listed firm, and 9 are matched with a NASDAQ-listed firm.

Data on prices and market microstructure-related variables used in this study were collected from Datastream. It includes weekly observations of domestic trading volume, variance of returns, and closing prices during the pre- and the post-listing period, and market values in the listing week. Domestic trading volume is calculated

from the weekly closing price, converted into US dollar, times the weekly number of shares traded. Variances are calculated from weekly returns. To obtain the weekly trading volume of the total market, we use "Datastream Global Indices" which are provided by Datastream for each country. They are calculated from a representative list of stocks for each market and are value-weighted.

7.2.3 Estimation of abnormal trading volume

Our interest is to examine the influence of international listing on liquidity. Liquidity can potentially be proxied by a number of different variables. Commonly used measures are (1) trading volume (2) the bid-ask spread and (3) market depth. Since quoted bid-ask spreads are not available for a large number of sample firms, we examine trading volume effects associated with international listings. Moreover, volume has been shown to explain a significant fraction of the cross-sectional variation in bid-ask spreads. To assess whether trading activity on the domestic stock exchange changes when a stock becomes internationally listed, we analyse trading volume in event time. Similar to Beneish and Gardner (1995), we measure abnormal trading volume, using a mean adjustment model and a market volume adjustment.

The mean adjustment model is defined by

$$AV_{it} = V_{it} - V_i \,, \qquad (7.1.)$$

The market volume adjustment model is given by

$$VR_{it} = V_{it}/V_{mt} * V_m/V_i \qquad (7.2.)$$

where V_{it} is the ratio of shares of security *i* traded in week *t* to firm i's shares outstanding (turnover), V_i is the mean V_{it} in the estimation period prior to the listing, V_{mt} is the weekly trading volume of the total domestic stock market, and V_m is the average trading volume of the total market in the estimation period. Harris and Gurel (1986) propose the volume ratio VR_{it}, which is a standardised measure of period *t* trading volume in security *i* adjusted for market variation. It takes account of changes in market conditions which can be caused by structural events as the 1987 Crash or volume changes due to derivatives trading (Kabir and Vermaelen, 1993).

To ensure that our estimated parameters are not biased by high trading activity in the immediate pre-listing period, we choose a 52-week estimation period from week t= -78 to t= -26 prior to the listing date. Although the choice is arbitrary, it is partly influenced by the findings in Chapter 6 that international listings experience a run-up in their prices approximately 35 weeks prior to the listing week. This gives rise to the assumption that trading activity may be abnormally high during this period. Moreover, it is important to note that our estimation period partly overlaps with our observation period since for a number of firms there is not sufficient pre-listing volume data available (see Table 7.1.). However, using a shorter estimation period (e.g. from t=-78 to t=-52) would result in less robust estimates[166].

While the volume ratio (VR_{it}) has an expected value of one if there is no change in volume during the event-period *t*, the expected value of the abnormal volume (AV_{it}) is 0. Test statistics for the volume ratio are based on a t-test which examines whether the average VR of the sample is different from one. For the abnormal

[166] Our results show that this would lead to even stronger positive volume effects, especially for NYSE listings. Hence, this would overstate the findings.

volume (AV_{it}) the test statistic is calculated as in Ajinkya and Jain (1989) which adjusts for autocorrelation in trading volume[167].

7.3 Empirical results

7.3.1 Change in liquidity and the effect of the foreign stock exchange

The results in Table 7.3. and Table 7.4. show that international listings are associated with abnormal trading volume effects. These effects can be split into long-term volume effects of international listings and short-term abnormal trading activity around the listing week.

Table 7.3. compares trading volume effects of NYSE, NASDAQ, and London listings. Panel A shows average (AV) and cumulative average abnormal volume (CAV) effects around the time of listing. All listings experience positive CAVs in the post-listing period with London (t=4.62) and NYSE (t=3.17) listings highly significant. However, the pre-listing period results of London (0.0430) and NASDAQ (0.0507) listings are also positive and significant. This may be an indication that other effects, for example a strong increase in the trading volume of the market, have influenced the results. Hence, Panel B adjusts trading volume effects for changes in the trading volume of the market. It shows the mean and the median volume ratio (VR) for the 52-week pre-listing and post-listing periods. To examine whether the VR is different from 1 in each subperiod, standard t-tests and Wilcoxon-Mann-Whitney tests are performed.

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[167] Ajinkya and Jain (1989) argue that autocorrelation in trading volume could arise because some investors adjust their holdings later than others. This could be the case because they come to know this information later or they choose to trade periodically to minimise transaction costs.

Table 7.3.

Trading volume effects of international listings around the time of listing

This Table shows abnormal trading volume effects of international listings around their time of listing. Panel A compares the cumulative average (CAV) abnormal weekly trading volume in the pre-listing period and the post-listing for NYSE, London, and NASDAQ listings. It also shows abnormal volume (AV) effects in the listing week. Cumulative average abnormal volume (CAV) is calculated by summing the abnormal volume of each week over the 52-week pre- and post-listing period. t-statistics are given in brackets and are adjusted for autocorrelation. Panel B compares market-adjusted volume effects of NYSE, London, and NASDAQ listings between the pre- and post-listing period. It shows the mean and the median of the volume ratio (VR_{it}) which is a standardised measure of security *i* trading in period t. Under the null hypothesis of no change its expected value is 1. t-tests are performed whether the mean of the volume ratio is different from 1. Wilcoxon-Mann-Whitney tests are performed to test whether the median is different from 1 with p-values shown in brackets.

Panel A: Average (AV) and cumulative average (CAV) abnormal weekly trading volume			
Event period (in weeks)	NYSE	London	NASDAQ
-52 to -1	0.0107	0.0430	0.0507
	(1.23)	(2.67)	(2.15)
0	0.0039	0.0004	0.0028
	(2.75)	(0.24)	(0.48)
1 to 52	0.0342	0.0965	0.0431
	(3.17)	(4.62)	(1.88)

Panel B: Weekly market-adjusted volume effects

	NYSE		London		NASDAQ	
	Mean	Median	Mean	Median	Mean	Median
-52 to -1	1.14	1.09	1.06	1.07	1.01	0.91
	(3.33)	(0.006)	(5.02)	(0.000)	(0.16)	(0.004)
1 to 52	1.32	1.27	1.01	1.00	0.89	0.82
	(8.89)	(0.000)	(0.70)	(0.591)	(-2.56)	(0.000)

The average volume ratio (VR) for NYSE listings increases from 1.14 (t=3.33) in the pre-listing period to 1.32 (t=8.89) in the post-listing period. The respective medians are 1.09 (p=0.006) and 1.27 (p=0.000). The results show that the VR of London and NASDAQ listings is lower in the post-listing period than in the pre-listing period. While the median (1.07) and the mean (1.06) volume ratio for London listings in the pre-listing period is significantly different from 1, the post-listing period does not seem to be associated with abnormal volume effects. NASDAQ listings appear to have lower volume ratios in the post-listing period.

To investigate whether our long-term trading volume results are biased by abnormal short-term trading activity around the time of listing, we examine the listing week, and the 16-week period before and after the listing. Table 7.4. shows that NYSE listings experience high abnormal trading volume in the listing week (mean VR=1.79 and median VR=1.45) which is statistically significant (t=2.75 and p=0.001). But the VR for London and NASDAQ listings is not statistically different from 1. NYSE listings (mean VR=1.34 and median VR=1.33) and London listings (VR=1.13 and median VR=1.12) experience significantly positive abnormal volume effects in the 16-week period preceding the listing week. The mean VR for NASDAQ listings is 0.89 but not significantly from 1 (t=-1.52). However, the median VR is 0.76 with a p-value of 0.028.

Table 7.4.

Market-adjusted short-term trading volume effects of international listings

This Table shows market-adjusted short-term trading volume effects of NYSE London, and NASDAQ listings. It shows the volume ratio (VR_{it}) which is a standardised measure of security *i* trading in period *t*. t-statistics are calculate whether the observed ratio differs from its expected ratio, which is 1. Wilcoxon Mann-Whitney tests are performed to test whether the median is different from 1 with p-values shown in brackets.

	NYSE listings		London listings		NASDAQ listings	
Event period (in weeks)	Mean	Median	Mean	Median	Mean	Median
-16 to -1	1.34	1.33	1.13	1.12	0.89	0.76
	(7.03)	(0.000)	(7.81)	(0.000)	(-1.52)	(0.028)
0	1.79	1.45	1.00	0.98	1.17	1.10
	(2.75)	(0.001)	(-0.04)	(0.723)	(0.51)	(0.045)
+1 to +16	1.62	1.55	0.98	1.00	1.05	0.91
	(8.49)	(0.000)	(-0.96)	(0.754)	(0.56)	(0.118)

The positive abnormal volume effects for NYSE and London listings may be an indication that domestic investors sell off part of their holdings in the pre-listing period when the listing decision is announced. The sold-off shares are taken up by the sponsor to sell them in the foreign market when trading starts in the listing week. This process is exemplified for ADRs. In order to create ADRs, underlying shares

must be deposited with a depository bank, or the depository's custodian bank in the issuer's home country. The depository then issues depository receipts to the US investors. These transactions, which involve some portfolio rebalancing from previous domestic shareholders to the sponsoring investment bank, create additional trading volume in the pre-listing period. Table 7.4. also shows differences between NYSE, NASDAQ, and London listings for the 16-week period following the listing week. While NYSE listings experience significantly positive abnormal volume effects (mean VR=1.46 and median VR=1.38), the results for London and NASDAQ listings are not significantly different from 1. Possible explanations for these differences will be examined in the following section.

7.3.2 Impact of the method of listing on liquidity

Our previous results showed different abnormal volume effects of NYSE-listed, London-listed, and NASDAQ-listed companies. Since a number of companies raised capital with their NYSE listing, we partition our sample of NYSE-listings into two subsamples according to their method of listing. Table 7.5. shows distinctively different results for companies that conducted a public offering with their listing and firms that accessed the US market without raising new capital (introductions). The VR for introductions in the pre-listing period is 1.22 (median VR=1.17) but only 1.09 (median VR=1.07) for public offerings. While introductions exhibit a moderate increase in the trading volume in the post-listing period (mean VR=1.33 and median VR=1.29), the VR of public offerings increases to 1.75 (median VR=1.45). The mean and median volume ratios for the post-listing period are highly significant. This is an indication that public offerings also have a stronger long-term impact on the liquidity

of a stock. The differences between public offerings and introductions partly help to explain the differences between London-listed and NYSE-listed companies.

Table 7.5.

Market-adjusted trading volume effects of different methods of listing on NYSE

This Table compares market-adjusted volume effects of different methods of listing on the NYSE. It shows the volume ratio (VR_{it}) which is a standardised measure of security *i* trading in period *t*. Under the null hypothesis of no change its expected value is 1. Panel A shows the changes in the VR from the pre- to the post-listing period for introductions and public offerings. Panel B shows the VR for the 16-week period around the listing week for introductions and public offerings. t-statistics are calculated whether the observed ratio differs from its expected value, which is 1. Wilcoxon-Mann-Whitney tests are performed to test whether the median is different from 1 with p-values shown in brackets.

Event period (in weeks)	Introductions		Public offerings	
	Mean	Median	Mean	Median
Panel A: Trading volume effects				
-52 to -1	1.22	1.17	1.09	1.07
	(7.33)	(0.000)	(2.03)	(0.362)
+1 to +52	1.33	1.29	1.75	1.45
	(7.58)	(0.000)	(6.38)	(0.000)
Panel B: Short-term trading volume effects of different methods of listing				
-16 to -1	1.45	1.40	1.12	1.21
	(9.39)	(0.000)	(1.54)	(0.118)
+1 to +16	1.50	1.52	1.86	1.73
	(10.91)	(0.000)	(5.31)	(0.000)

Panel B examines the immediate periods around the listing week. While introductions experience a highly significant abnormal trading activity (mean VR=1.45 and median VR=1.40) in the pre-listing period (t=-16 to -1), the VR of public offerings is 1.12 (median VR=1.21) and is not significantly different from one (t=1.54 and p=0.118). The difference can be explained by the fact that no pre-listing buying activity takes place in the case of public offerings because the expected demand for foreign shares is met by issuing new shares instead of converting part of the existing underlying shares into ADRs. Consistent with our expectations public offerings experience much higher abnormal volume effects in the post-listing period. The high mean VR of 1.86 (t=5.31) and median VR of 1.73 (p=0.000) in the immediate period following the listing can be partly explained by probable market stabilisation during

the 4-6 weeks following the listing week. However, the VR of introductions in the post-listing period (t=1 to 16) is still 1.50 (median VR=1.52) and highly significant (t=10.91 and p=0.000).

7.3.3 Microstructure-related characteristics of listed and control firms

To investigate whether our results are merely a reflection of a grown volume effect[168] over time, as pointed out by Harris and Gurel (1986), we match our listed firms with a sample of control firms. Table 7.6. compares some microstructure-related characteristics of listed sample firms and control firms. In general internationally listed firms are bigger, on average, than control firms in the same industry. The mean market capitalisation of NYSE listings, as measured in the listing week, is US$ 3,515 million while the mean market capitalisation of the control firms is US$ 2,245 million. However, the difference is not significant (t=1.94) at the 5 percent level. The mean market value of London listings is US$ 5,534 million while the market value of control firms is US$ 2,862 million. NASDAQ-listed firms are smaller than London and NYSE listings, as expected, and their mean market capitalisation is US$ 867 million. The market value of their control firms is US$ 781 million but the difference is not statistically significant (t=0.20).

The differences in size between listing and control firms is mainly due to the problem, as described above, that in a number of cases we cannot find a control firm in the same industry which is approximately similar in size. However, this fact also explains to some degree the listing decision of companies which have "outgrown" their domestic capital market. This finding is consistent with Saudagaran (1988) who

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[168] Harris and Gurel (1986) note that total trading volume has increased over time.

suggests that multinational companies from smaller domestic markets need to go international because this mitigates their disadvantage in raising capital compared to their international competitors.

Listed firms and control firms, on average, have the same variance of return. The results for listed and control firms are not significantly different across all three exchanges. An international listing does not seem to have an effect on the variance of return as the variance of return remains unchanged in the pre- and post-listing period. There are also no statistically significant differences in the price per share, as measured by weekly closing prices, between listed and control firms for any of the three stock exchanges in the pre- and post-listing period.

Table 7.6.

Sample statistics for international listings and control firms. Weekly closing price (in US$) and weekly return variance. Market value, domestic trading volume, and foreign trading volume (all in US$ million).

The Table shows summary statistics of NYSE-, London- and, NASDAQ- listed firms and their respective control firms. Market values are reported in US$ million and are those of the listing week. Weekly return variances are reported in percent. Weekly closing prices are reported in US$. Weekly trading volume is reported in US$ million. t-statistics are reported for a standard t-test of equality in means for international listings and their control firms.

	NYSE listings			**London**			**NASDAQ**		
	Listed firms	Control firms	t-test of differences	Listed firms	Control firms	t-test of differences	Listed firms	Control firms	t-test of differences
Sample size	34	34		61	61		9	9	
Market value (in US$ m)	3515.24	2245.59	1.94	5534.55	2862.05	2.27	867.10	781.56	0.20
Panel A: Pre-listing period									
Variance of weekly return	0.0023	0.0020	1.01	0.0020	0.0020	-0.15	0.0027	0.0020	0.89
Weekly closing price	20.27	17.18	0.52	49.64	82.67	-0.63	4.73	5.60	-0.29
Weekly trading volume (in US$ m) on domestic stock exchange	69.75	37.52	1.39	76.62	30.46	1.88	8.11	9.31	-0.22
Panel B: Post-listing period									
Variance of weekly return	0.0023	0.0022	0.14	0.0020	0.0020	0.05	0.0031	0.0026	0.46
Weekly closing price	23.71	22.59	-0.16	52.32	88.84	0.62	5.95	6.73	-0.22
Weekly trading volume (in US$ m) on domestic stock exchange	84.76	46.31	-1.29	87.77	30.32	2.06	10.70	13.16	-0.33

Internationally listed firms, on average, have a higher trading volume on the domestic stock exchange than control firms. The weekly mean trading volume for NYSE listed companies is US$ 69.75 million in the pre-listing period and US$ 84.76 million in the post-listing period. The respective values for control firms are US$ 37.52 million and US$ 46.31 million. But the t-statistics reveal that the difference in the mean values of listed and control firms is not statistically significant indicating that the mean volume for listed firms is biased upwards by a few companies with very high trading volume. The weekly mean trading volume for London listings is US$ 79.62 million in the pre-listing period and US$ 87.77 million in the post-listing period. Control firms have a trading volume of US$ 30.46 million in the pre-listing period and US$ 30.32 million in the post-listing period. The weekly average trading volume in the pre-listing period for NASDAQ listings is US$ 8.11 million compared to US $9.31 million for control firms, however, the difference is not statistically significant (t=-0.22). NASDAQ control firms also have a higher trading volume in the post-listing period (US$ 13.16 million) than listed firms (US$ 10.70 million) but the difference is not significant (t=-0.33).

Table 7.7. reports the abnormal volume results for listing firms which could be matched with a control firm. While the results for the listing firms are qualitatively very similar to those reported in Tables 7.3. and 7.4., the results for the control firms show some remarkable differences. In general the VR for the control firms oscillates around 1, as expected. Since the pre-listing period may be biased by short-term abnormal volume effects of the period prior to the listing week, we split the pre-listing period into two sub-periods. Panel A shows that the VR of London listings (mean VR=1.04) is not significantly different from the VR for control firms (VR=1.01) in the early pre-listing period (t=-52 to -17 weeks). While the VR increases for listed firms

(mean VR=1.18 and median VR=1.16) in the immediate pre-listing period (t=-16 to -1 week), the VR drops for control firms (mean VR=0.83 and median VR=0.81). This gives rise to the assumption that in the immediate pre-listing period prospective listing firms obtain more attention at the expense of other firms in the same industry. Although the VR of London listings (mean VR=1.02 and median VR=1.00) is lower in the post-listing than in the pre-listing period, it is still larger than the VR for control firms (mean VR=0.77 and median VR=0.80). The differences between listed firms and control firms are highly statistically significant when performing a paired t-test for the means (t=12.41) and a Wilcoxon-Mann-Whitney test for the medians (t=8.39).

Panel B reports similar results for NYSE listings. However, the magnitude of the difference between listed and control firms is far more pronounced. NYSE listed firms also show positive abnormal volume effects in the early pre-listing period. This may be an indication that listed firms receive more attention than control firms and then try to take advantage of some “windows of opportunity”, as put forward by the timing literature. This effect is magnified in the immediate pre-listing period, where the VR for listed firms (mean VR=1.43 and median VR=1.39) is highly significantly different from control firms (mean VR=1.00 and median VR=1.02). Listing appears to have a strong long-term impact on liquidity since the VR for NYSE firms (mean VR=1.39 and median VR=1.28) is significantly higher than for control firms (mean VR=1.04 and median VR=0.99).

Table 7.7.

Abnormal volume effects of listed and control firms

This Table compares abnormal volume effects of internationally listed and control firms around the time of the listing. It shows the volume ratio (VR_{it}) which is a standardised measure of security *i* trading in period *t*. Under the null hypothesis of no change its expected value is 1. t-statistics are performed as a paired t-test of differences between the estimates of listed firms and its control firms for each particular subperiod. Wilcoxon-Mann-Whitney tests are performed to test whether there is a difference in the medians of the control and the listed firms. Panel A shows the results for London listings and their control firms. Panel B shows the results for NYSE listings and their control firms. Panel C shows the results for NASDAQ listings and their control firms.

	Listed firms		**Control firms**		**Difference tests**	
Event period (in weeks)	Mean	Median	Mean	Median	Paired t test	WMW
Panel A: London listed firms and corresponding control firms						
-52 to -17	1.04	1.04	1.01	1.01	1.48	0.74
-16 to -1	1.18	1.16	0.83	0.81	14.05	4.98
1 to 52	1.02	1.00	0.77	0.80	12.41	8.39
Panel B: NYSE listed firms and corresponding control firms						
-52 to -17	1.12	1.07	0.97	0.91	3.43	3.19
-16 to -1	1.43	1.39	1.00	1.02	5.96	4.49
1 to 52	1.39	1.28	1.04	0.99	5.16	6.10
Panel C: NASDAQ listed firms and corresponding control firms						
-52 to -17	1.12	1.07	0.97	0.79	1.05	3.34
-16 to -1	0.98	0.89	0.87	0.80	0.97	1.53
1 to 52	0.93	0.85	0.93	0.89	0.03	-0.42

The results reported in Panel C for NASDAQ listings differ from previous results since there is no difference between listed and control firms for any of the subperiods. The VR for listed firms is 1.12 compared to 0.97 for control firms in the early pre-listing period (t=-52 to -17) but the difference is not statistically significant (t=1.05). However, there appears to be a significant difference when comparing the medians. In contrast to NYSE and London listings, we do not find an increase in trading activity in the immediate pre-listing period (t=-16 to -1 week). The values are 0.98 (median VR=0.89) for listings and 0.87 (median VR=0.80) for control firms. Moreover, there is also no difference in the post-listing period between listings and control firms with the mean VR being 0.93 for both groups.

7.3.4 Order flow effects of ADR listings

Since we are also interested how trading on the domestic and the foreign stock exchange are related, we conduct an order flow analysis. Following Foerster and Karolyi (1994), we examine the gains in domestic and total order flow, and the US order flow. The percentage gain in domestic order flow is calculated as the ratio of average weekly post-listing dollar volume to weekly pre-listing dollar volume, less one. US order flow shows the relative size of the pre-listing domestic market to the ADR market in the US. It is calculated as the ratio of the average weekly ADR dollar volume to the average weekly domestic volume, less one. Total order flow is calculated as the ratio of the sum of the weekly post-listing domestic dollar volume and the weekly ADR dollar volume to the pre-listing domestic dollar volume, less one.

Table 7.8. shows that 68.29 percent of all firms that listed ADRs experienced an increase in their domestic order flow. This effect is slightly stronger on NASDAQ where 73.33 percent of the listing firms show a gain in their domestic order flow. This compares to 65.38 percent of all NYSE firms. The figures for the US order flow show that for 29.27 percent of all firms the foreign market is larger than their pre-listing domestic market. These figures are similar to the findings of Domowitz, Glen, and Madhavan (1995) who show that the ADR market of Mexican firms is relatively large compared to their pre-listing domestic market. Our results show, that in particular NYSE listings have a very active foreign market because 38.46 percent trade in higher volumes abroad. This compares to only 13.33 percent of NASDAQ firms. The total order flow has increased for 82.93 percent of all firms. The results for NYSE

and NASDAQ listings are very similar. These findings are also consistent with a conjecture that international listing increases liquidity.

Table 7.8.
Change in order flow after an ADR listing

This Table reports changes in order flow for companies that listed ADRs on NYSE or NASDAQ. The column domestic order flow contains the number of firms, and the percentage of firms, that experienced an increase in their domestic order flow after their listing. The domestic order flow is calculated as the ratio of the average weekly post-listing dollar volume to the average dollar volume in the pre-listing period, less one. The column US flow contains the number of firms, and the percentage of firms, that trade in a higher volume on NYSE or NASDAQ than they experienced in their domestic market in the pre-listing period. The US flow is calculated as the ratio of the average weekly ADR dollar volume to the average domestic dollar volume in the pre-listing period, less one. The column total order flow contains the number of firms, and the percentage of firms, that experienced an increase in their total order flow after their listing. The total order flow is calculated as the ratio of the sum of the post-listing period domestic dollar volume and the ADR dollar volume to the pre-listing domestic dollar volume, less one.

	Number of firms	Domestic order flow	US flow	Total order flow
All firms	41	28	12	34
% of increase		68.29	29.27	82.92
NYSE	26	17	10	22
% of increase		65.38	38.46	84.62
NASDAQ	15	11	2	12
% of increase		73.33	13.33	80.00

7.4 Conclusion

This chapter shows that firms experience an increase in liquidity once they become internationally listed. While the results for NYSE listings are very robust, when we adjust for market-wide changes in volume, the evidence for NASDAQ and London listings is less clear. However, a comparison of trading volume effects for internationally listed firms and control firms matched by nationality, size, and industry shows that NYSE and London listings experience persistent positive volume effects. NASDAQ listings do not experience any significantly different volume effects than their matched control firms. We also find highly significant short-term trading effects for London and NYSE listings. These effects are much stronger in the pre-listing period for firms which list their stock using an introduction. Our comparison of

microstructure-related characteristics of internationally listed and control firms indicates that the listing decision on NYSE and on the London Stock Exchange is influenced to some degree by the size of the firm. Moreover, listing firms also appear to have been more liquid in the pre-listing period. An order flow analysis confirms our findings that international listing leads to an increase in liquidity. It shows that the total order flow increases for approximately 83 percent of our sample firms. Moreover, 38 percent of NYSE listings have a larger order flow on the NYSE than they had in their domestic market prior to the international listing.

8. Chapter: Alternative international equity offering methods and their impact on liquidity*

Although ADRs have developed into an important instrument to raise capital internationally, existing research remains limited. Previous research has mainly looked at the efficiency of the ADR market, and the integration effects of international equity offerings. The international cross-listing literature as well as the domestic exchange listing literature provides evidence on changes in liquidity upon listing. Differences in liquidity across financial assets can arise because of differences in the market-microstructure in which securities are traded. Previous studies[169] have shown that the bid-ask spread of a company is related to the number of shareholders holding the asset which reflects the public availability of information about the asset. This forms the link between Merton's (1987) model, in which expected returns increase with systematic risk, firm specific risk, and relative market value and decrease with the relative size of the firm's investor base[170] (or as characterised by Merton "the degree of investor recognition"), and Amihud and Mendelson's (1989) spread effect.

However, the relevance of liquidity aspects for the capital raising decision has been overlooked by previous studies. The purpose of this study is to provide further empirical evidence of the impact of international listings on liquidity, and hence on the cost of capital. It is implicitly assumed that the decision to raise equity capital in the US market is motivated by a desire to lower financing costs. To examine the

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* Parts of this chapter are based on Arauner and Levis (1996).

[169] Bagehot (1971) and Copeland and Galai (1983).

[170] The relative size of a firm's investor base can be expressed by dividing the effective number of shareholders of a firm by the aggregate number of investors in the market as a whole.

impact on the cost of capital requires an evaluation of private placements and public offerings in a cost-benefit framework and an analysis of the trade-offs involved.

Previous research analysing domestic exchange listings and international cross-listings only examines changes in the liquidity from the pre-listing period to the post-listing period. Our approach to assess the liquidity impact of international listings is different from previous research. We choose a three-year data period (from January 1992 to December 1994) for all international equity offerings to calculate bid/ask-spreads based on the method of George, Kaul, and Nimalendran (1991).

The remainder of the chapter is organised as follows. Section 1 presents the hypotheses to be tested. Section 2 describes the sample and the methodology. This section is split into three parts explaining the sample selection procedure, the data period, and the estimation of bid-ask spreads. Our empirical findings are presented in Section 3. The first part of this section explains the estimation of the autocorrelation coefficient which is used to estimate bid-ask spreads. The second part provides evidence of differences in bid-ask spreads for listed and internationally unlisted firms. The third part examines the factors influencing bid-ask spreads. Part 4 evaluates the trade-off between the costs and benefits associated with each offering method. Part 5 investigates the determinants of foreign and domestic trading volume. Section 6 concludes the article.

8.1 Hypotheses tested

Foreign issuers can use two alternative methods to raise equity capital in the US market (as discussed in 3.2.1.). The decision between a public offering and a private placement under Rule 144A bears important policy implications since it affects the

investor base, liquidity, and disclosure requirements of the company. Such changes may have a direct effect on the value of the firm and its cost of capital.

The issuing firm must also consider the possible trade-off between the costs and the benefits of a public offering. Public offerings involve higher initial costs because the SEC does not recognise a company's compliance with the regulations of its domestic stock exchange[171]. The "full disclosure" approach often forces foreign companies to disclose more comprehensive information than required under their home country regulations. Therefore, monitoring and transaction costs for investors may be lower since a listed company is treated under US law as any other US company and trading takes place on an organised stock exchange which provides more active trading and superior trade reporting.

Hypothesis:

Companies offering equity internationally experience bigger liquidity benefits if they are listed on a foreign stock exchange. The decision to conduct a public offering instead of a private placement leads to a reduction in the cost of capital.

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[171] This approach towards regulating foreign securities is in contrast to the principle of mutual recognition, pursued by the London Stock Exchange, which acknowledges the validity of other countries' laws, regulations, and standards as long as certain minimum standards are met (see 3.1.).

8.2 Sample and Methodology

8.2.1 Sample selection

To identify international equity offerings from non-US companies which included a US tranche, we search two data sources: a) the ADR data base of The Bank of New York, and b) Omnibase, a data base for international securities issues from Security Data Company (SDC). We obtain an initial sample of 465 international companies that made an international equity offering between 1984 and 1994. In a next step we split our preliminary sample of international equity offerings into two subsamples:

1.) Internationally listed firms;

2.) Internationally unlisted firms.

To be included in the sample of internationally listed firms, a company had to be listed on the NYSE or the NASDAQ by December 1994. Information concerning a firm's listing status and their date of listing is obtained from the NYSE and NASDAQ. We obtain an initial sample of 187 internationally listed firms (115 NYSE and 72 NASDAQ listings) and 278 internationally unlisted firms. We require for all international equity offerings that at least 50 historical daily closing prices are available on Datastream and that trading volume is not zero for two consecutive weeks which are part of the sample period[172]. These criteria eliminate 54 internationally listed companies[173] and 133 not internationally listed firms from our sample. This high rate of exclusion for not internationally listed firms is mainly due to non-availability of daily stock price data of companies from emerging markets (e.g.

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[172] Since we calculate spreads from transaction prices, this selection criterion is necessary to avoid obtaining downward biased spread estimates which are caused by "zero" transaction returns due to non trading.
[173] The elimination of 54 companies appears to be a very high percentage of the total population. However, this can be explained by the fact that ca. 25 companies obtained a listing on the NYSE only in the last quarter of 1994 and could therefore not be considered.

23 Chinese companies, 28 Indian companies, 19 Indonesian companies, 16 Israeli companies, and 10 Hungarian companies). This leaves us with a final sub-sample of 145 internationally unlisted companies.

Our preliminary sample of 133 internationally listed firms (84 NYSE and 49 NASDAQ listings) is reduced further because we only consider international cross-listings. This particular criterion, which requires an internationally listed firm to be also listed in its country of origin (or as referred to in the following on its "domestic stock exchange"), eliminates 47 companies (18 on the NYSE and 29 on NASDAQ). Thus, our final sub-sample of internationally listed firms includes 86 companies.

Table 8.1. shows the distribution of our final total sample of 231 companies that issued equity internationally between 1984 and 1994 by country of origin. The wide geographic distribution across 33 countries has been driven by two main factors. The first factor is privatisations that have taken place all over the world from the mid-80's onwards. The second wave of international offerings has been fuelled by companies from emerging markets which have been assisted by international institutions, such as the IFC (International Finance Corporation) for example, to tap international markets. The subsample of internationally listed companies comprises 66 listed on the NYSE and 20 listed on NASDAQ. This subsample is compared to our subsample of internationally unlisted equity offerings which consists of 145 companies.

Table 8.1. also reports the average offering size of the US tranche which is US$143.10m for the total sample. But the offering size of internationally listed companies is larger (US$230.12m), on average, than of private placements (US$106.10m). The larger offering size of public offerings is due to the offering size of NYSE-listed companies (US$280.54m) compared to NASDAQ-listings (US$58.69m).

Table 8.1.

Distribution of sample firms that issued equity internationally between 1984-1994 by country of origin and offering size of US tranche: Internationally listed vs. internationally unlisted companies

The sample consists of 231 international equity offerings from 33 countries world-wide. All 231 international equity offerings are from non-US companies but included a US tranche. All firms are listed on their domestic stock exchange. 86 companies from 21 different countries are listed on a US stock exchange whereby 20 companies are listed on NASDAQ and 66 on NYSE. The sample of internationally unlisted firms consists of 145 companies from 28 different countries. The last row of the table reports the average size of the US tranche in US$ million.

Country of origin	Internationally listed firms			Internationally unlisted firms	Total sample
	All listings	NYSE	NASDAQ		
Argentina	4	3	1	5	9
Australia	2	1	1	5	7
Austria				1	1
Belgium				2	2
Brazil	1	1			1
Canada	7	3	4	7	14
Chile	8	8		2	10
Columbia	1	1			1
Denmark	3	3		1	4
Finland	2	1	1	7	9
France	5	4	1	13	18
Germany	1	1		4	5
Greece				2	2
Hong Kong	1	1		6	7
Indonesia				7	7
Ireland	2	1	1		2
Italy	2	2		4	6
Japan	4	4			4
Korea	2	2		7	9
Mexico	8	8		5	13
Netherlands				2	2
New Zealand	1	1			1
Norway	3	2	1	7	10
Philippines				7	7
Singapore				3	3
Spain	6	6		5	11
Sweden	3		3	11	14
Switzerland				2	2
Taiwan				7	7
Thailand				7	7
Turkey				1	1
UK	20	13	7	14	34
Venezuela				1	1
Total	**86**	**66**	**20**	**145**	**231**
Average offering size (in US$ m)					
Mean	**230.12**	**280.54**	**58.69**	**106.40**	**143.10**
Median	**114.05**	**157.25**	**50.75**	**48.80**	**65.12**

8.2.2 Data period

For all international equity offerings, our data covers the period between January 1992 and December 1994. The choice of our data period to calculate spreads and their related variables is influenced by two considerations. Firstly, our aim is to provide recent evidence of how the choice of the offering method influences the liquidity of the stock in its domestic market. Our two subsamples differ in that 40 percent of the internationally listed firms were listed before 1991 but none of the internationally unlisted equity offerings in our sample took place before mid-1990[174]. Hence, we believe that an alternative approach investigating bid/ask-spreads for a subsequent period (e.g. 1 or 2 years) after the respective listing or offering date could bias the results. This is due to the fact that many markets have improved their trading systems since the beginning of the 90s, and thus possibly increased the liquidity of their market. But Barry and Brown (1984) find an association between the period of listing and security returns. Since the period of listing could also influence bid-ask spreads, we test the robustness of our results taking account of the period of listing. However, we find that the differences in the period since listing or since offering equity (for internationally unlisted firms) between our two samples do not bias our results[175]. Secondly, this approach enables us to include international initial public offerings (IPOs)[176] in our sample for which no pre-listing period data is available.

All our calculations for companies listing (listed sample) or offering equity (internationally unlisted sample) before the beginning of our data period (January

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[174] This is mainly a reflection of the introduction of Rule 144A in 1990 as described in the institutional aspects (see 3.1.2.).
[175] See Table 8.5. for more details.
[176] Approximately, 25 companies of our NYSE-listed companies and 80 of our not internationally listed offerings are IPOs.

1992) are based on 3-years data. Due to our approach to use only post-listing data, as explained above, the calculations for companies that were listed between 1992 and 1994 are based on data from their listing date onwards through to the end of 1994. This exclusion of pre-listing period data ensures that we do not bias our results if an international cross-listing changes the market-microstructure of a stock as suggested by Freedman (1991). The calculations for internationally unlisted companies that raised equity between 1992 and 1994 are based on the same principles as applied to internationally listed companies. Hence, we only use data from their offering date onwards through to the end of 1994 (the post-offering period) because an international equity offering, although unlisted, is expected to have an effect on the microstructure of a stock.

The data on prices and microstructure-related variables used in this study were collected from Datastream. Our data consists of daily observations on stock prices, which are used to calculate bid-ask spreads, and weekly observations on domestic trading volume, foreign trading volume, variance of returns, and closing prices. Domestic trading volume is calculated from the weekly closing price times the weekly number of shares traded, and then converted into US dollar at the corresponding weekly exchange rate. Foreign trading volume is calculated by multiplying the number of foreign shares traded and the weekly price (in US$). Weekly closing prices are converted into US dollar at the corresponding exchange rate. In order to avoid the problem of a positive spurious correlation between the spread and volatility, as pointed out by Neal (1987), we use variances calculated from weekly returns. Data on the amount of equity issued in the foreign market and the gross-underwriting spread were obtained from the ADR data base of The Bank of New York.

8.2.3 Estimation of bid-ask spreads

Since our sample[177] includes a large number of stocks which are traded under an auction market system in their domestic market, and therefore quoted bid/ask spreads cannot be observed, we need to employ a method estimating bid/ask spreads from transaction returns.

Roll (1984) derives a simple measure of the spread which is based on two main assumptions: (i) that markets are informationally efficient; (ii) that the probability distribution of observed price changes is stationary. Roll (1984) also assumes for simplicity that all transactions are with the market maker and that the spread is held constant over time. The intuition behind Roll's spread measure is that price changes will only occur if unanticipated information is received by market participants. If no new information arrives it is reasonable to assume that successive transactions are equally likely to be purchases or sales as traders arrive randomly on both sides of the market. However, if the last transaction is at the bid (ask) price, the next price change cannot be negative (positive) because there is no new information. Therefore, the observed price changes are no longer independent and the effective individual spread s_i can be inferred from the first-order serial covariance of price changes

$$s_i = 200 * \sqrt{-Cov(R_{iTt}, R_{iTt-1})} \qquad (8.1.)$$

where R_{iTt} is the difference in daily log prices $\ln(P_t/P_{t-1})$.

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[177] Approximately 70% of our sample firms are traded in auction markets or a hybrid version of an auction market. Only UK companies (ca. 14% of our sample firms) and Chilean companies (ca. 4% of our sample firms) are traded in a "pure" dealership market. For further details, see Euromoney (1994).

Previous papers, however, have argued that Roll's estimator provides downward biased spread estimates because it only measures the order processing costs. Order processing costs reflect the market makers' compensation for handling the transaction. Glosten (1987) and Stoll (1989) show that adverse selection and/ or inventory costs are two potential sources of a downward bias in Roll's spread estimates. Adverse selection costs arise from the presence of asymmetric information between the market maker and his counterparties. Inventory holding costs are due to the risk of price fluctuations faced by the market maker if he holds a high level of inventory.

George, Kaul, and Nimalendran (1991) show that time variation in expected returns may lead to an additional downward bias in spread estimates and propose two alternative estimators. Their estimators are based on the findings of Conrad and Kaul (1988, 1989) who show that expected returns of portfolios of stocks vary through time and are positively autocorrelated. Moreover, Conrad, Kaul, and Nimalendran (1991) find that individual security returns contain a positively expected return component, although they are negatively autocorrelated. This positive autocovariance will lead to a downward bias in the spread estimates. In order to take account of time variation in expected returns, George, Kaul, and Nimalendran (1991) propose the following estimator

$$s_i = 200 * \sqrt{-Cov(E_{iTi}, E_{iTt-1})} \qquad (8.2.)$$

where E_t is the (time varying) expected return. Kofman and Moser (1995) use this estimator which employs a model for the conditional expectation of E_t. Based on the evidence in Conrad and Kaul (1988) they impose a first order autoregressive process to estimate the expected return from the transaction price series

$$E_t = R_t - \rho_p * R_{t-1} \qquad (8.3.)$$

where ρ_p is the first-order autocorrelation coefficient, which reflects the portfolio component in individual returns. In order to estimate the autocorrelation coefficient, we employ a similar technique as Kofman and Moser (1995)[178]. All the spread estimates are calculated using the autocorrelation coefficient obtained from our preliminary analysis.

[178] They use LIFFE (London International Financial Futures Exchange) data, for which bid/ask quotes are available, to make inferences for the DTB (Deutsche Terminboerse) where only transaction data is available.

8.3 Empirical results

8.3.1 Estimation of autocorrelation coefficient

To adjust for the bias in Roll's estimator, requires an estimate of the autocorrelation coefficient. We construct an equally-weighted "market portfolio" to calculate daily portfolio returns from bid quotes for the 1990 to 1994 period. According to George, Kaul, and Nimalendran (1991) returns based on bid-to-bid prices reflect the effects of time varying expected returns. Our "market portfolio" is comprised of 100 randomly selected UK companies, drawn from the FTSE-350 list, because bid quotes are only available for UK companies. These "market portfolio" returns are used to estimate the first-order autocorrelation coefficient. Our results show that the assumption of an AR(1) process for expected returns appears to describe the behaviour of portfolio returns very well. We obtain an estimate of the autocorrelation coefficient of 0.28[179] and assume that this is the same for all the stocks in our sample. Hence, all our spread estimates are calculated using an autocorrelation coefficient equally to 0.28.

8.3.2 Relation of bid-ask spreads and market value

Table 8.2. reports average daily estimates of the bid-ask spread for listed companies and unlisted companies. Each spread estimate is calculated for individual firms during the observation period and then averaged across firms. Since spreads are negatively related to firm size, we split each subsample into four portfolios based on market value. This enables us to verify the validity of our spread estimates and to

[179] This result is consistent with previous studies examining portfolio return autocorrelations across different international markets. Reinganum (1981) finds daily autocorrelations in the magnitude of 0.37 for the highest market value portfolio of US stocks and Keim (1983) reports 0.35. Poon and Taylor (1992) find similar results for the Financial Times All Share Index (0.19).

compare our resulting estimates across different size classes. The average estimates are all positive and range between 1.36 percent for portfolio 1 (largest) of the listed firms and 2.77 percent for portfolio 4 (smallest) of the internationally unlisted firms. The fact that we obtain positive average estimates[180], even for the largest firms (portfolio 1), indicates that our adjustment for positive autocorrelation in portfolio returns reduces the downward bias in spread estimates substantially.

Table 8.2.
Spread estimates of internationally listed vs. internationally unlisted equity offerings

The Table below shows the average spread estimates of the sample of internationally listed firms and the sample of internationally unlisted firms. Each sample is split into four portfolios based on market value. The test-statistics (t-stat.) are performed as a paired t-test of the difference in the estimates for each group. The spread estimates are calculated using a variant of the GKN-estimator which adjusts for autocorrelation in portfolio returns. A percentage spread is calculated as $s_i = 200 * \sqrt{-Cov(E_{iTi}, E_{iTt-1})}$ where E_t is the (time varying) expected return.

	Internationally listed companies			Internationally unlisted companies			
Portfolio	Sample size	Average market value (in US$ million)	Bid/ask spread	Sample size	Average market value (in US$ million)	Bid/ask spread	t-stat.
1 (largest)	21	17151.28	1.36	37	16640.09	1.77	-3.06
2	22	4956.17	1.46	36	1962.96	1.62	-0.98
3	22	1484.58	1.62	36	644.28	1.96	-1.64
4 (smallest)	21	376.98	2.22	36	219.92	2.77	-1.97
All firms	86	5927.79	1.65	145	4927.56	2.02	-2.35

Our results show that listed companies have significantly lower bid-ask spreads (1.65 percent) than unlisted companies (2.03 percent). This is verified by performing a paired t-test of the difference in the two estimates. A t-value of -2.35 indicates that the spread estimates for listed companies are significantly lower than for unlisted equity offerings. Table 8.2. also shows that this finding is robust when we split each subsample into four equal size-based portfolios[181] and compare the means of the corresponding portfolios (see column 4 for internationally listed companies and

[180] Roll (1984) finds that about 50 percent of his individual firm spread estimates are negative. We obtain even higher numbers of negative spread estimates. In order to test for the robustness of our estimates, we estimate spreads using arbitrary values for the autocorrelation coefficient (between 0 and 0.28). Although the magnitude of the individual estimates declines, the difference between internationally listed and unlisted estimates remains the same.

[181] Using a different procedure to size-match the portfolios does not alter the magnitude in the differences between listed and unlisted companies for each portfolio.

column 8 for unlisted companies). In addition Table 8.2. confirms the negative relationship between size and bid-ask spreads, as found by previous studies, showing that bid-ask spreads increase from portfolio 1 to 4 for listed companies (1.36 percent vs. 2.22 percent) as well as for internationally unlisted firms (1.77 percent vs. 2.77 percent).

To further examine the relationship between firm size and bid-ask spread and the influence of a listing on the liquidity of international equity offerings, we regress the estimated bid-ask spread of each company ($SPREAD_i$) on the log of size (as measured by the market value) of each individual company ($LNSIZE_i$), and on a listing dummy variable ($DLIST_i$) which is assigned a value of one in the case of an internationally listed company and a value of zero for not internationally listed equity offerings. The t-statistics are adjusted for heteroskedasticity of the residuals by White's (1978) consistent covariance estimator.

Our regression results in Table 8.3. corroborate our previous findings. The coefficient for LNSIZEi is negative (-0.2045) and highly significant (t = -5.01) confirming the strong negative relationship between firm size and bid-ask spread found in previous studies. The coefficient for ($DLIST_i$) is negative (-0.2358) and significant (t = -2.07) indicating that listed firm have lower bid-ask spreads than unlisted companies after controlling for firm size.

Table 8.3.

Impact of international listing on liquidity of international equity offerings

The Table below gives the OLS estimates of the following equation:

$SPREAD_i = B_0 + B_1 LNSIZE_i + B_2 DLIST_i$

The dependent variable is the individual spread estimate ($SPREAD_i$). The independent variables are: $LNSIZE_i$, the natural logarithm of the market value; $DLIST_i$, a dummy variable which is 1 if a company is internationally listed and 0 otherwise. t-statistics for OLS regressions are adjusted for heteroscedasticity of the residuals by White's consistent covariance estimator.

Variable	Estimated Coefficient	t-statistic
Intercept	3.4704	11.38
$LNSIZE_i$	-0.2045	-5.01
$DLIST_i$	-0.2358	-2.07
Adjusted-R^2	0.19	

8.3.3 Factors influencing bid-ask spreads

Table 8.4. presents summary statistics[182] of the variables which are assumed to influence bid-ask spreads. Whereas the price level and variance do not differ substantially between listed and unlisted companies, the former group has on average a much higher trading volume. Although the difference between the mean and the median values for the weekly trading volume on the domestic stock exchange suggest the presence of positive skewness, the differences between the two groups remain sizeable.

[182] The summary statistics only comprise companies for which volume data is available. This eliminates 20 companies in the internationally listed sample for which no foreign and/or domestic volume is available, and 9 companies in the not internationally listed sample for which no domestic volume is available.

Table 8.4.

Sample statistics. Bid/ask spread, weekly closing price (in US$), and weekly return variance. Market value, domestic trading volume, and foreign trading volume (all in US$million).

The Table below shows summary statistics of all our sample firms for which data on trading volume (domestic and/or foreign trading volume) were available. Bid-ask spreads are reported in percent. Market value, domestic trading volume, and foreign trading volume are reported in US$ million. Weekly closing prices are reported in US$. Weekly return variances are reported in percent. The test statistics (t-statistics) are reported for a standard t-test for equality in means for the internationally listed sample and the internationally unlisted sample.

Variables	Combined sample	Internationally listed sample	Internationally unlisted sample	t-stat.
Sample size	202	66	136	
Bid/ask spread				
Mean	1.89	1.60	2.03	-3.60
Median	1.73	1.46	1.94	
Market value (in US$m)				
Mean	5713.39	6755.19	5207.82	0.90
Median	1678.65	3309.73	1367.95	
Weekly closing price (in US$)				
Mean	64.10	56.83	67.63	-0.27
Median	9.49	10.30	8.98	
Weekly return variance				
Mean	0.002660	0.002575	0.002702	-0.32
Median	0.001947	0.001841	0.002026	
Weekly trading volume (in US$m) on domestic stock exchange				
Mean	58.37	91.58	42.25	1.60
Median	14.05	29.05	12.68	
Average weekly trading volume (in US$m) on foreign stock exchange				
Mean		31.18		
Median		9.82		

Internationally listed stocks are also traded in substantial amounts on the foreign stock exchange. The weekly average volume traded on the foreign stock exchange is US$31.18 million compared to US$91.58 million on the domestic stock exchange, and therefore reaches about 33 percent of the domestic volume. These results, the substantially higher domestic trading volume and the additional high foreign volume

for internationally listed firms, are consistent with Freedman's (1991) model which predicts an increase in total trading volume (foreign + domestic volume) for internationally listed stocks. The increase in total trading could also be due to arbitrage opportunities between the domestic and foreign stock exchange. Kim, Mathur, and Szakmary (1995) find that changes in the exchange rate have become more important as a pricing factor for ADRs in recent years.

To examine the impact of foreign trading volume on bid-ask spreads, we have to control for a number of factors that are assumed to influence bid-ask spreads. We use a similar specification to Neal (1987), which relates the bid-ask spread to trading volume, price level, volatility, and competition. Our competition variable, however, is constructed as an interactive listing dummy which consists of a dummy variable ($DLIST_i$) for internationally listed companies multiplied by their trading volume on the foreign stock exchange ($LNFVOL_i$). We omit firm size (see Table 8.3.) from our specification since trading volume and variance proxy for firm size. Hence, an inclusion of firm size would lead to severe multicolinearity problems in our model specification. This results to the following regression:

$$SPREAD_i = B_0 + B_1 LNVAR_i + B_2 LNVOL_i + B_3 LNPRICE_i + B_4 LNFVOL_i * DLIST_i \quad (8.4.)$$

Symbol	Definition
$SPREAD_i$	Estimated bid-ask spread for each company
$LNVAR_i$	Natural logarithm of the weekly return variance
$LNVOL_i$	Natural logarithm of the weekly trading volume on the respective domestic stock exchange
$LNPRICE_i$	Natural logarithm of the weekly closing price
$LNFVOL_i$	Natural logarithm of the weekly trading volume on the foreign stock exchange (NYSE or NASDAQ)
$DLIST_i$	Listing dummy which is assigned a value of 1 for listed and a value of 0 for internationally unlisted companies

Table 8.5. shows the estimated coefficients of our regression model. The signs of the coefficients for variance ($LNVAR_i$), volume ($LNVOL_i$), and price ($LNPRICE_i$) are consistent with previous studies. Variance ($LNVAR_i$) has a very strong positive

relationship with bid-ask spreads (t = 7.89). The high level of significance of the coefficient of the variance ($LNVAR_i$) is consistent with the findings of Jegadeesh and Subrahmanyam (1993)[183]. Trading volume on the domestic stock exchange ($LNVOL_i$) has a negative effect on bid-ask spreads (t = -1.77). The price level ($LNPRICE_i$) also has a negative effect on bid-ask spreads, as predicted by theory but the t-statistics (t = -0.62) indicate that the price level does not have the same strong influence on bid-ask spreads as found in previous papers. This is probably due to very large differences in the average price level across countries irrespective of their liquidity characteristics[184]. The coefficient for the interactive listing dummy ($DLIST_i$ * $LNFVOL_i$) is negative and significant (t = -2.20). The negative sign is consistent with our expectation suggesting that an increased volume on the foreign stock exchange for internationally listed stocks lowers bid-ask spreads on the domestic stock exchange. The trading on the foreign stock exchange represents potential competition to market makers on the domestic stock exchange leading to an improvement in the liquidity of internationally listed stocks.

To take account of a potential bias imposed by the differences in the period of listing (see 8.2.2. Data period), we perform an additional test. We include a period of listing dummy variable ($DPERL_i$) into regression (8.4.) which is 1 for companies listing before 1991 and 0 for companies listing after 1991.

$$SPREAD_i = B_0 + B_1 LNVAR_i + B_2 LNVOL_i + B_3 LNPRICE_i + B_4 LNFVOL_i * DLIST_i + B_5 DPERL_i \quad (8.5.)$$

Table 8.5., column 3 shows that the listing dummy variable for the period of listing ($DPERL_i$) is not significant (t = 1.44) at the five-percent level. The estimated

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[183]With respect to Amihud and Mendelson (1987) who point out that the return variance is itself a function of the bid-ask spread and thus a biased estimator of the "true" variance we calculate return variances from weekly returns. Conroy, Harris, and Benet (1990) note that using weekly instead of daily returns diminishes the role of spreads because bid-ask spreads become less influential as the length of the holding period increases.

[184] In our sample German and Swiss stocks have very high price levels (US$500-4000) and Hong Kong, Singaporian, and Chilean stocks have price levels below one US$.

coefficients for the other variables are virtually the same as for regression (8.4.) showing that our results are not biased by comparing samples of different life cycles as international companies.

Table 8.5.
Effect of international listing on liquidity of international equity offerings adjusted for price, volume and variance

The Table below gives the OLS estimates of the following equation:

$SPREAD_i = B_0 + B_1 LNVAR_i + B_2 LNVOL_i + B_3 LNPRICE_i + B_4 LNFVOL_i * DLIST_i$ (column 2)

$SPREAD_i = B_0 + B_1 LNVAR_i + B_2 LNVOL_i + B_3 LNPRICE_i + B_4 LNFVOL_i * DLIST_i + B_5 DPERL_i$ (column 3)

The dependent variable is the individual spread estimate ($SPREAD_i$). The independent variables are: $LNVAR_i$, the natural logarithm of the weekly return variance; $LNVOL_i$, the natural logarithm of the weekly trading volume on the domestic stock exchange; $LNPRICE_i$, the natural logarithm of the weekly closing price; $LNFVOL_i$, the natural logarithm of the weekly trading volume on the foreign stock exchange (NYSE or NASDAQ); $DLIST_i$, a listing dummy which is 1 for internationally listed and 0 for internationally unlisted companies; DPERLi is a dummy variable for the period of listing which is 1 for companies offering equity before 1991 and 0 for companies offering equity after 1991. Column 2 shows the results for our total sample. Column 3 tests the robustness of our results for the period after 1991. The t-statistics for each coefficient are in brackets. t-statistics for OLS regressions are adjusted for heteroscedasticity of the residuals by White's consistent covariance estimator.

Independent variable	**Estimated coefficient**	**Estimated coefficient**
Intercept	6.9724	7.0440
	(12.00)	(11.92)
LNPRICE	-0.0176	-0.0144
	(-0.62)	(-0.50)
LNVAR	0.7839	0.7956
	(7.89)	(7.88)
LNVOL	-0.0617	-0.0678
	(-1.77)	(-1.89)
LNFVOL* DLIST	-0.0675	-0.0768
	(-2.20)	(-2.34)
DPERL		0.1362
		(1.44)
Adjusted R^2	0.44	0.44

8.3.4 Cost-benefit analysis of different offering methods

In this section we present a quantitative evaluation of the costs and benefits of a public offering and a private placement based on the methodology of Amihud and Mendelson (1986). Using the size-adjusted difference in bid/ask spreads of 0.24% (see Table 8.3.) the weekly saving in transaction costs for trading the average weekly volume of US$58.37 million[185] would amount to US$140,112 (0.24% x US$58.37 million). The present value of this weekly saving, assuming a 10% discount rate (or a weekly rate of 0.183%), is equal to a perpetuity

US$140,112 million / 0.00183 = US$76.56 million.

The costs for a NYSE-listed firm consist of the gross-underwriting spread, the other total expenses, the initial listing fee on the NYSE, and the annual fees for a NYSE-listing (for details, see 3.2.1.). Taking the average gross-underwriting spread for a public offering of 4.62%, which we estimated, the commission paid to the investment bank amounts to US$6.61 million assuming an average offering size of US$143.10 million (see Table 8.1.). The other direct expenses are US$1 million and the initial listing fee is US$100,000. Discounting the annual fee of US$500,000 for a NYSE-listing at 10% provides us with a present value of U$5m. Hence, the total costs are:

US$6.61m + US$1m + US$0.1m + US$5m = US$12.71m.

Subtracting the total costs from the total benefits provides a net present value of US$63.85 million for a public offering. We proceed in calculating the reduction in the cost of capital. Amihud and Mendelson (1986) calculate the reduction in the cost of capital by the following equation:

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[185] See Table 8.4. The volume figure used for our calculations is based on "sell-side-only" volume.

$$NPV = (E/R) * (\Delta R/R) \quad (8.6.)$$

where NPV is the net present value of the public offering, (E/R) the present value of the firm's cash flow without the liquidity-enhancing project (or simply the market value of the firm), and $\Delta R = R - R_1$ the change in the cost of capital. We assume, as above, that R, the old discount rate, is 10%. Hence, the reduction in the cost of capital for our average sample firm which has a market value of US$5713.39 million (see Table 8.4.) is equal to

(US$63.85m * 10%)/ US$5713.39m = 0.11% (or 11 basis pionts).

The reduction in the cost of capital, however, could be even bigger if we included the trading volume on the foreign stock exchange into our calculations.

8.3.5 Determinants of domestic and foreign trading volume

As shown in Table 8.4. internationally listed stocks have a much higher domestic trading volume than internationally unlisted stocks. If the interaction between the foreign stock exchange and the domestic stock exchange creates new volume we would expect the foreign trading volume to have an effect on the domestic trading volume. To examine the interaction between the foreign and the domestic volume in more depth we estimate the following regression:

$$LNVOL_i = B_0 + B_1\, LNVAR_i + B_2\, LNPRICE_i + B_3\, LNFVOL_i * DLIST_i \quad (8.7.)$$

Table 8.6. reports the determinants of domestic trading volume ($LNVOL_i$) for the total sample (internationally listed and internationally unlisted companies) in column 2 and 3 and for the internationally listed firms in column 4 and 5. The coefficients for the

variance ($LNVAR_i$) and the price level ($LNPRICE_i$) are significant and their signs are consistent with our expectations.

Table 8.6.
Determinants of domestic trading volume

The Table below gives the OLS estimates of the following equation:
$LNVOL_i = B_0 + B_1 LNVAR_i + B_2 LNPRICE_i + B_3 LNFVOL_i * DLIST_i$
The dependent variable is the natural logarithm of the weekly trading volume on the domestic stock exchange ($LNVOL_i$). The independent variables are: $LNVAR_i$, the natural logarithm of the weekly return variance.; $LNPRICE_i$, the natural logarithm of the weekly closing price; $LNFVOL_i$, the natural logarithm of the weekly trading volume on the foreign stock exchange (NYSE or NASDAQ); $DLIST_i$ is a listing dummy which is 1 for internationally listed and 0 for internationally unlisted companies. The t-statistics for each coefficient are in brackets.

	Total Sample		**Internationally listed firms**	
Independent variable	**Estimated coefficient**	**Estimated coefficient**	**Estimated coefficient**	**Estimated coefficient**
Intercept	-1.6391	-1.8949	-6.2731	-7.1235
	(-1.46)	(-1.74)	(-3.70)	(-4.46)
LNPRICE	0.1455	0.1137	0.2385	0.2023
	(1.97)	(1.61)	(1.93)	(1.75)
LNVAR	-0.6445	-0.6622	-1.4196	-1.4631
	(-3.39)	(-3.61)	(-5.22)	(-5.78)
LNFVOL*		0.3161		0.3231
DLIST		(3.89)		(3.29)
Adjusted R^2	0.10	0.16	0.33	0.42

The comparison of the results of the total sample in column 2 and 3 shows that the inclusion of the interactive listing dummy variable ($LNFVOL_i * DLIST_i$) in our regression improves the explanatory power of our model. The coefficient for the interactive listing dummy variable ($LNFVOL_i * DLIST_i$) has the expected positive sign and is highly significant (t = 3.89) suggesting that foreign trading volume generates additional trading volume on the domestic exchange. The results in column 4 and 5 for the internationally listed companies also show that the inclusion of the interactive listing dummy variable ($LNFVOL_i * DLIST_i$) improves our adjusted R^2 from 33 percent to 42 percent. The increased negative relationship between domestic volume and variance for internationally listed firms explains the increase in the adjusted R^2 from 10 percent (column 2) to 33 percent (column 4) and from 16 percent (column 3) to 42 percent (column 5).

The analysis of the determinants of the foreign trading volume should take account of an additional factor, the percentage of equity issued ($FOREQ_i$) by each company in the foreign market, as pointed out by Mittoo (1992). The percentage of equity issued ($FOREQ_i$) is calculated by summing up the amount raised by each company in the first offering and in subsequent offerings[186] and then dividing it by the market value of the company. In order to gauge the effect of the percentage of equity issued in the foreign market on the foreign trading volume, we estimate the following regression:

$$LNFVOL_i = B_0 + B_1\, LNVAR_i + B_2\, LNPRICE_i + B_3\, LNVOL_i + B_4\, FOREQ_i \qquad (8.7.)$$

Table 8.7. shows that the determinants of the foreign trading volume differ from the determinants of the domestic trading volume. The coefficient of the percentage of equity issued ($FOREQ_i$) in the foreign market is significant and the positive sign is consistent with our hypothesis. Firms that issued more equity in the foreign market have a much higher trading volume on the foreign stock exchange. The price level ($LNPRICE_i$) appears to have no impact on the foreign volume. The usual price volume relationship may not hold because our price level is calculated from the underlying stock in the domestic market. But the price level of the foreign stock differs from its underlying stock as the price level of the foreign stocks is adjusted upon listing to conform to a price level which is similar to US stocks[187] in the same industry.

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[186] Most companies only make one equity offering. However, some companies make several subsequent equity offerings.

[187] Most ADRs represent either a multiple or a fraction of one underlying share. A 1:1 conversion hardly exists. According to Citibank (1995) current ADRs have ratios ranging from 100000:1 to 1:100 (underlying shares to depositary shares).

Table 8.7.
Determinants of foreign trading volume

The Table below gives the OLS estimates of the following equation: $LNFVOL_i = B_0 + B_1 LNVAR_i + B_2 LNPRICE_i + B_3 LNVOL_i + B_4 FOREQ_i$ The dependent variable is the natural logarithm of the weekly trading volume ($LNFVOL_i$) on the foreign stock exchange (NYSE or NASDAQ). The independent variables are: $LNVAR_i$, the natural logarithm of the weekly return variance; $LNVOL_i$, the natural logarithm of the weekly trading volume on the domestic stock exchange; $LNPRICE_i$, the natural logarithm of the weekly closing price; $FOREQ_i$, the percentage of equity issued in the foreign market. The t-statistics for each coefficient are in brackets.

Independent variable	**Estimated coefficient**	**Estimated coefficient**
Intercept	5.5617	3.7359
	(2.66)	(1.66)
LNPRICE	6.97E-04	-0.0709
	(0.01)	-0.49
LNVAR	0.7977	0.5235
	(2.19)	(1.37)
LNVOL	0.4670	0.4811
	(3.29)	(3.47)
FOREQ		2.0378
		(1.96)
Adjusted R^2	0.12	0.16

Some interesting results emerge for the relationship between the variance ($LNVAR_i$) and foreign trading volume ($LNFVOL_i$). In contrast to the negative relationship between the domestic trading volume and the variance, foreign trading volume ($LNFVOL_i$) and variance ($LNVAR_i$) are positively related, suggesting that companies with a higher variance have a higher trading volume in the foreign market. This could be an indication that prices of stocks with a relatively large shareholder base in the US are more driven by US market factors than others. Therefore, a change in the exchange rate has a stronger impact on the domestic stock price leading to a higher variance. However, a change in the exchange rate may also create arbitrage opportunities between the foreign and the domestic stock price. In order to exploit these arbitrage opportunities, transactions have to be undertaken on the foreign and the domestic stock exchange generating additional trading volume. Thus, the positive relationship between the foreign trading volume and the variance reflects a

higher dependence from US market factors because of a bigger US shareholder base. However, in order to investigate this issue further a time-series analysis would be necessary examining the sensitivity of domestic and foreign trading volume to currency fluctuations.

8.4 Conclusion

Using a sample of 231 international equity offerings from 1984-1994, this study documents that internationally listed firms have a liquidity advantage over firms that choose a private placement in the US instead of a full listing on NASDAQ or NYSE. Results indicate that companies which choose to comply with the stringent registration requirements of the SEC, and thus incur the substantial costs associated with this procedure, are "rewarded" by having lower bid-ask spreads. This result holds when comparing bid-ask spreads corrected for size effects. The lower bid-ask spread is explained by a larger potential shareholder base and by the permission to be traded on a recognised stock exchange. Trading on a regulated marketplace provides timely trade reporting and increases market efficiency. We show that the benefits generated by lower bid-ask spreads for internationally listed firms outweigh the higher costs of a public offering leading to a 0.11% reduction in the cost of capital. This study also contributes to the microstructure literature as it shows that bid-ask spreads of internationally listed stocks are influenced by the competition of an additional trading location. Consistent with previous theoretical implications, we provide evidence that listing on a foreign stock exchange generates additional trading volume. The percentage of equity issued in the foreign market appears to be one of the main determinants of foreign trading volume. The increase in total trading volume could be due to increased arbitrage between the underlying stock and the

ADR, caused by currency fluctuations. In order to shed further light on the interaction of currency fluctuations, underlying stock prices, ADR prices, and trading volume effects, a time-series analysis examining the effect of changes in the exchange rate on trading volume and prices would be required.

9. Chapter: Price interactions of cross-border IPOs

As discussed in Chapter 2, in recent years an increasing number of equity issues has been structured as global offerings whereby ADRs and underlying shares were offered simultaneously. Global offerings have been used to sell initial public offerings (IPOs) and seasoned equity offerings alike. Although research on IPOs has generated a large international literature and ADRs have developed into an important instrument to raise capital internationally, evidence on global IPOs hardly exists.

While the results of Doukas and Yung (1992) and Marr, Trimble, and Varma (1991) suggest that foreign capital markets are not fully integrated with the US market (see 5.3.), other ADR studies have examined the linkage and the transfer of pricing information between the ADR market and the market in the underlying stock (see 5.1.5). It has generally been shown that the ADR market and the underlying share market appear to be efficient since one market responds to innovations in the other market. The transfer of pricing information seems to run from the domestic market to the ADR market which is not surprising, since these firms are headquarterd in their home market (Lau and Diltz, 1994). Moreover, it appears to be likely that the majority of company-relevant information and news concerning the economic developments are produced in the home market. However, the stock prices of global IPOs may follow a different lead-lag relationship.

The issue of price leadership and the speed of price convergence is of importance for a number of reasons. The speed of price convergence provides evidence on the degree of integration between both markets which is of relevance, as shown previously, for the cost of capital of a firm. It also allows inferences concerning

differences in transaction costs in the two markets since the trading cost hypothesis predicts that the market with the lowest overall trading costs will react most quickly to new information (Fleming, Ostdiek, and Whaley, 1996). The issue of price leadership bears important managerial implications since the stock may become more aligned to the US market, and hence more driven by US market factors. It is also relevant for the question of information disclosure to the market. Questions concerning what is an appropriate time to announce company news and what is the right way to communicate with shareholders arise. It can even affect strategic decisions of companies. While US companies have traditionally pursued an approach geared towards enhancing "shareholder value", in particular Continental European companies were more interested in capital maintenance leading to huge hidden reserves (see also 3.1.3.1.). Hence, if a stock is more driven by US market factors the management may be forced to adopt an "US style" approach. However, this could possibly change its long-term policies and leave its "old" domestic shareholders discontented. These problems may possibly be considered as some form of "costs of international listing".

The remainder of this chapter is organised as follows. Section 1 presents the hypotheses to be tested. Section 2 describes the sample and the methodology. The empirical findings are presented in Section 3. The first part reports first day returns and trading activity. The second part conducts unit root tests, and part 3 describes the results of cointegration tests. Part 4 examines the direction of information flows between ADRs and underlying shares. Section 4 concludes this chapter.

9.1 Hypotheses tested

The purpose of this chapter is to investigate the lead-lag relationship for non-US companies which conducted a simultaneous initial public offering on the NYSE and on their domestic stock exchange. While it appears plausible that underlying share prices of seasoned firms lead ADR prices, it may be different for global IPOs which were offered to the public in two markets simultaneously. Seasoned firms, which list internationally, are likely to be established in their domestic market and to be mainly held by domestic investors. In most cases, their order flow has solely been traded on the domestic stock exchange. This is, however, not the case for global IPOs which have not build up an investor base in one particular market.

The results of Chapter 7 have shown that the issue of trading activity is of importance since international listings experience a substantial increase in their total order flow. This seems to be of particular relevance for international equity offerings, which have an ADR tranche, since trading is not concentrated in the domestic market but also takes place on the NYSE. Hence, the link between trading volume and transfer of pricing information[186] may explain the differences between seasoned firms and cross-border IPOs.

The findings of Chapter 6 have suggested that cross-listing has a different impact for emerging market companies. Hence, we also examine whether the price discovery role of the NYSE differs for emerging market and developed market firms. The price leadership of ADRs may be even more pronounced for emerging market firms

[186] Several models provide a theoretical basis for a linkage between information arrival, trading volume, and the variance of return on a security (see Kyle (1985) and Admati and Pfleiderer (1988)). Freedman (1991) extends these models to internationally cross-listed stocks. For a more detailed discussion of these issues, see 5.1.3.

because trading in their domestic markets may involve special problems due to illiquidity, slow settlements, and poor custodial services.

This chapter also contributes to the IPO literature by examining first day returns and issue day trading activity for international IPOs. Although previous research has argued that ADR IPOs should be less underpriced, since US investors possess less information about foreign companies, empirical evidence is only weak. Moreover, the reasons why US investors should be less informed are not clear. The majority of foreign issues are conducted by global US investment banks which also have a strong presence in foreign markets. Hence, we would not expect significant differences. For the same reasons, there should be no differences in first day returns between emerging market and developed market firms.

Hypothesis:

1.) Global IPOs experience a special price discovery since the ADR price leads the underlying share price. However, this effect may differ between emerging market and developed market firms.

2.) First day returns of ADR IPOs are similar to "normal" IPOs. There is no difference between emerging and developed market firms.

9.2 Sample and Methodology

Our initial sample consists of all foreign firms that conducted an initial public offering (IPO) of ADRs on the New York Stock Exchange (NYSE) between 1991 and July 1994. During that period 24 companies, which were not traded in their home market or in the US market prior to their offering, conducted an initial public offering.

Table 9.1.
Description of IPO sample

This table lists 23 ADR IPOs which listed between 1991 and July 1994. It shows the offering date, country of origin, the ADR gross proceeds (in US$m), and the offer price (in US$).

Offer Date	Issuer	Country	ADR-Gross proceeds (US$ m)	Offer Price (US$)
14/05/91	Telmex	Mexico	1090.00	27.25
17/07/91	Telecom Corp. of New Zealand	New Zealand	545.30	22.58
07/04/92	Waste Management	UK	329.75	20.48
09/04/92	ICA	Mexico	326.50	17.00
31/03/93	Dina	Mexico	173.10	16.00
12/05/93	Zeneca	UK	150.35	29.48
12/05/93	Argentaria	Spain	147.80	16.07
13/05/93	Fila	Italy	135.00	18.00
13/05/93	Industrie Natuzzi	Italy	144.90	15.00
29/06/93	YPF	Argentina	2375.00	19.00
01/07/93	Radio Centro	Mexico	45.60	15.00
26/07/93	Shanghai Petrochemical	Hong Kong	137.70	20.39
14/09/93	Coca Cola Femsa	Mexico	151.40	20.50
22/09/93	Tribasa	Mexico	210.80	15.50
04/11/93	Bufete	Mexico	95.80	23.00
14/12/93	Televisa	Mexico	874.90	64.00
14/12/93	Grupo Mexicao de Desarrollo	Mexico	248.50	17.00
25/01/94	Cristaleris	Chile	96.00	23.88
09/02/94	IMI	Italy	133.20	19.24
28/04/94	Tele Danmark	Denmark	1172.00	23.53
15/06/94	Iusacell	Mexico	155.70	27.25
30/06/94	Banpais	Mexico	102.70	10.00
15/07/94	Durango	Mexico	67.50	18.00

Table 9.1. lists the 23 firms in the sample for which stock price data was available. It can be seen that approximately 60 percent of the IPOs are emerging market firms with the majority from Mexico. Moreover, two different type of firms can be distinguished: primary IPOs and dual IPOs. While 19 companies were simultaneously offered in their home market and on the NYSE (dual IPOs), 4

companies were only offered on the NYSE but were not listed on their domestic stock exchange (primary IPOs). Hence, our empirical analysis examines the price behaviour of 17 international dual IPOs for which stock prices (ADR prices and domestic prices) and trading volume data (ADR volume and domestic volume) are available[187]. The data sources are the ADR database of the Bank of New York, the New York Stock Exchange, and Datastream.

The first day adjusted return for each IPO is defined as the percentage change in the ADR offering price to the closing price on the first day of trading (r_i) less the equivalent change in the S&P 500 which serves as a benchmark (r_m).

$$ar_i = r_i - r_m \qquad (9.1.)$$

Before examining the price discovery role of ADRs and underlying shares, it has to be determined if there is a long-run stable relationship between them (see Quan (1992) on the price discovery role of futures and spot prices). Hence, the methodology used to examine the long-run relationship between ADR prices and underlying share prices, and their short-run dynamics, involves three steps: 1.) testing for the order of integration; 2.) cointegration tests; and 3.) causality tests.

The first step is to test whether the time series under examination are stationary. If a time series is integrated (or non-stationary) any shock to the series is permanent. Hence, an integrated series will not revert back to its mean after a shock. To find the order of integration of a time series is very important from a modelling perspective, since Sims, Stock, and Watson (1990) and Balke (1991) have shown that any econometric model with an integrated time series will be misspecified. Therefore,

[187] This eliminates Telecom Corp. of New Zealand, since Datastream does not provide trading volume data for New Zealand, and YPF of Argentina.

Augmented Dickey-Fuller (ADF) tests are conducted to find the unit root of each series. The ADF tests are based on the following regression:

$$\Delta X_t = a_0 + a_1 X_{t-1} + \Sigma^2_{j=1} b_j \Delta X_{t-j} + \nu_t \qquad (9.2.)$$

where X_t is each price series, Δ the first difference operator, and ν_t the error term. To ensure that the residual series is approximately white noise, a sufficient number of lagged differences has to be included. Previous research, that has examined the order of integration for equity prices, has found that they are integrated of order one. Hence, we expect to find a similar result.

Once the order of integration is determined, the second step is to test for cointegration between the ADR price and the underlying share price. The cointegration test aims to detect whether certain linear combinations of the series may be stationary, although each individual series is non-stationary. The tests for cointegration have been developed by Johansen (1988, 1991) and Johansen and Juselius (1990, 1992). It is based on maximum-likelihood estimation, and is designed to test for the number of linearly indpendent cointegrating vectors among the variables. Since we have two variables, the null hypothesis tests that there is no cointegrating relationship ($r = 0$). If this is rejected, we test that at most one cointegrating vector ($r \leq 1$) exists. Two commonly used test statistics are computed: the trace test and the maximal eigenvalue test. The first tests the restriction $r \leq q$ ($q<n$) against the the completely unrestricted model $r \leq n$. The trace test is defined as

$$\text{Trace Test} = -T \Sigma^n_{i=q+1} \ln(1 - \hat{}\rho_i). \qquad (9.3.)$$

where T is the number of time periods. In the maximal eigenvalue test, the null hypothesis is that at most q cointegrating vectors exist. The alternative hypothesis is that only one additional cointegrating vector exists ($r \leq q+1$). It is defined as

$$\text{Maximal Eigenvalue Test} = -T \ln (1 - \hat{\rho}_{q+1}). \tag{9.4.}$$

The critical values for these tests are provided by Johansen and Juselius (1990). Kasa (1992) discusses the differences between both tests. Since the the trace test takes account of all n-q of the smallest eigenvalues, it will tend to have greater power than the maximal eigenvalue test when the λ_i are evenly distributed. However, the maximal eigenvalue test will most likely give better results when the λ_i are either large or small. In practice, both tests should be jointly considered.

The third step which examines the direction of the information flow depends on the results of the previous two tests. Only if the first two criteria are satisfied the analysis can be continued. In the following, two approaches will be used to examine the short-run dynamics of prices: 1.) the Garbade and Silber approach; and 2.) error-correction tests.

Garbade and Silber (1979) develop a model that analyses the short-run behaviour of prices on identical assets trading in different market centres. The Garbade and Silber approach provides a framework to examine whether the adjustment between prices in market A and B is symmetrical, or one-sided in which case a "dominant-satellite" relationship exists. Similar to Pagano and Roell (1991), we estimate the following equations to test for the existence of this relationship between the ADR market and the respective domestic market:

$$A_t - A_{t-1} = \alpha + \beta_{ADR} (D_{t-1} - A_{t-1}) \tag{9.5.}$$

$$D_t - D_{t-1} = \gamma + \beta_{DOM} (A_{t-1} - D_{t-1}) \tag{9.6.}$$

where A_t and D_t are the logarithms of the ADR price for day *t* and the underlying share price for the same day. α and γ are constants. The coefficients β_{ADR} and β_{DOM}

measure the influence of the lagged price from one market on the current price in the other market. The ratio $\beta_{DOM}/(\beta_{ADR} + \beta_{DOM})$ measures the relative dominance of the ADR market compared to the domestic market in the price discovery process. Moreover, we also measure the speed of convergence between ADR and domestic market prices by the following equation:

$$D_t - A_t = \alpha + \delta(D_{t-1} - A_{t-1}) + \varepsilon_t \qquad (9.7.)$$

where δ measures the rate of convergence. If δ is small, prices converge quickly because a small fraction of the price difference on day *t -1* will persist to day *t*.

To further investigate the intermarket relationship between the NYSE and the domestic market, Granger causality tests are conducted. Engle and Granger (1987) have shown that, if two price series are cointegrated, an error correction term should be incorporated since a pure VAR (vector autoregression) representation could be misspecified. A common interpretation of the error-correction model for cointegrating variables is that they reflect the partial adjustment of one variable to another. The error-correction representation is a vector autoregression of first differences of the variables augmented by one lag of the equilibrium error term. The error correction model is estimated by the following equations:

$$\Delta Y_{jt} = -\alpha_1 Z_{t-1} + \Sigma^{m}_{i=1} b_{1i} \Delta Y_{j,\,t-i} + \Sigma^{m}_{i=1} c_{1i} \Delta X_{j,t-i} + \varepsilon_t \qquad (9.8.)$$

$$\Delta X_{jt} = -\alpha_2 Z_{t-1} + \Sigma^{m}_{i=0} b_{2i} \Delta Y_{j,\,t-i} + \Sigma^{m}_{i=1} c_{2i} \Delta X_{j,t-i} + \varepsilon_t \qquad (9.9.)$$

where is ΔY_{jt} (ΔX_{jt}) is the differenced dependent variable, and $\Delta Y_{j,\,t-i}$ ($\Delta X_{j,t-i}$) is the differenced lagged idependent variable. The equilibrium error is obtained from the cointegrating regression $X_t=a+bY_t+Z_t$. ΔY_{jt} and ΔX_{jt} can be affected by two different channels. The conventional way to explain causality is to examine the impact of the

differenced lagged variables. Another causal channel in the error-correction model is through the residual term from the cointegrating regression. The coefficients of the error-correction term α_1 and α_2 capture the single period response of the dependent variable to departures from equilibrium. The intuition for the error-correction term is that differences between the ADR price and the underlying price at time *t-1* will tend to get smaller at time *t* due to arbitrage activity (Fleming, Ostdiek, and Whaley, 1996).

Table 9.2

Market time tables

This table shows the opening hours of the respective stock markets in local time and in New York time.

Stock Markets	Hours (Local Time)	Hours (New York Time)
Chile	9.30am - 1.45pm/	9.30am - 1.45pm/
	4.00pm - 5.15pm	4.00pm - 5.15pm
Denmark	9.00am - 3.30pm	3.00am - 9.30am
Hong Kong	10.00am - 12.30pm/	9.00pm - 11.30pm/
	2.30pm - 3.30pm	1.30am - 2.30am
Italy	10.00am - 1.45pm	4.00am - 7.45am
Mexico	8.30am - 2.00pm	9.30am - 3.00pm
Spain	11.00am - 5.00pm	5.00am - 11.00am
UK	8.30am - 4.30pm	3.30am - 11.30am
US	9.30am - 4.00pm	9.30am - 4.00pm

Source: Euromoney Handbook of World Stock Echanges 1993

Similar to Malliaris and Urrutia (1992) and Eun and Jang (1996), this model incorporates the effect of time zone differences into the causality tests. In general, if the domestic price precedes (in terms of time zone) the US market, equation (9.9.) is used which includes the contemporaneous price from the preceding market as an

independent variable. Table 9.2 shows the market time tables of the stock markets in our sample. It can be seen that Hong Kong and Europe precede the US market. For example, the domestic closing price for a Spanish firm is established at 11.00am New York time, while the corresponding ADR closing price is recorded 5 hours later at 4.00pm New York time. Chile is in the same time zone as New York. Mexico follows the NYSE by one hour but its stock exchange closes only one hour earlier than the NYSE in local NYSE time. Hence, equation (9.9.) is used to test whether prices of firms from Europe (Denmark, Italy, Spain, and UK) and from Asia (Hong Kong) cause ADR prices. Equation (9.8.) is used for Mexican and Chilean stocks since they are in the same time zone as the US. To test whether the ADR price causes the domestic price, equation (9.8.) is used for all countries since the US time zone follows the other time zones.

The optimal lag length for each model is defined by using Akaike's information criterion (AIC). Following Arshanapalli and Doukas (1993), we allow the lag length to vary. The AIC is calculated for each lag and the order with the lowest AIC is chosen as the optimal.

9.3 Empirical results

The empirical tests comprise four parts. Part 1 provides descriptive statistics. Part 2 examines the order of integration. Part 3 tests whether ADR and underlying share prices are cointegrated. The tests in Part 4 hinge on the results of Part 2 and 3. If the ADR price and the underlying price are cointegrated we study the lead-lag relationship and the nature of the adjustment process by using the Garbade and Silber approach and error-correction tests.

9.3.1 Descriptive statistics

Table 9.3. reports descriptive statistics for the ADRs. It appears that the gross proceeds of ADR IPOs (US$ 387.37 m) are comparatively large when compared to other IPO studies[188]. This finding is consistent with Doukas and Yung (1992) who report US$111.34m for ADR IPOs and US$16.53m for domestic IPOs. However, it can be seen that a big difference exists between the largest offering (US$2375.00m) and the smallest offering (US$45.60m).

The average first day return for all ADR IPOs is 7.16 percent. The level appears to be lower than the findings of previous studies. For example, Ritter (1991) reports 14.1 percent for the US and Levis (1993) finds 14.3 percent for the UK. Loughran, Ritter, and Rydqvist (1994) provide international insights for 25 different countries and show that initial returns range between 80.3 percent (Malaysia) and 4.2 percent (France). However, Doukas and Yung (1992) find that ADR IPOs are less underpriced (0.96 percent) than normal IPOs. They argue that this is consistent with

[188] Ritter (1991) reports average gross proceeds of US$ 24.76 m for US IPOs and Levis (1993) reports £ 26.78 m (including privatisations).

Rock's (1986) model since US investors are likely to be less informed about foreign firms than US firms. Moreover, in their view this finding also suggests that foreign capital markets are not fully integrated with the US capital market.

Table 9.3.

Descriptive statistics and price performance of ADR IPOs on the NYSE between 1991-1994

This table shows descriptive statistics for the ADR IPO sample. The offer size is shown in US$m and underpricing is expressed in percent.

	Mean	Standard deviation	Minimum	Maximum	Median
Panel A: All IPOs (N=23)					
Offer size	387.37	538.03	45.60	2375.00	151.40
Underpricing	7.16	7.31	-1.33	22.71	6.26
Panel B: Primary IPOs (N=4) vs. dual IPOs (N=19)					
Offer size					
- Primary IPOs	169.95	52.80	135.00	248.50	148.15
- Dual IPOs	433.14	583.63	45.60	2375.00	155.70
Underpricing					
- Primary IPOs	7.54	3.00	4.04	10.86	7.63
- Dual IPOs	7.08	2.51	-1.33	22.71	7.99
Panel C: Emerging market IPOs (N=15) vs. developed market IPOs (N=8)					
Offer size					
- Emerging	409.78	622.13	45.60	2375.00	155.70
- Developed	345.35	364.14	135.00	1172.00	149.08
Underpricing					
- Emerging	7.22	8.37	-1.33	22.71	2.22
- Developed	7.04	5.29	0.10	16.92	6.26

To examine international IPOs in more detail, we compare primary with dual IPOs (Panel B) and emerging market with developed market IPOs (Panel C). Panel B suggests that there are no substantial differences between primary IPOs and dual IPOs. While primary IPOs (US$169.95m) seem to have a lower offer size than dual IPOs (US$433.14m), the medians hardly differ. First day returns are also very similar for primary IPOs (7.54 percent) and dual IPOs (7.08 percent). Panel C provides similar results for emerging market and developed market firms. There do not appear to be major differences in offer size and first day returns between emerging market and developed market firms.

Table 9.4. provides information concerning the trading activity of international IPOs. It compares first day trading volume on the NYSE and in the domestic market and contrasts it with the average trading volume in the post-listing period. It can be seen that first day trading volume exceeds by far the average daily trading volume in the one year post-listing period. While the ADR volume is US$85.31m on average, the post-listing volume is only US$8.12m. The difference is not so pronounced for the domestic market but the first day volume (US$38.27m) is still approximately four times the post-listing period volume (US$9.81m).

Table 9.4.

Volume analysis

The table shows first day trading volume and average daily trading volume in the 1-year post-listing period. First day trading volume and average daily volume is shown for ADRs and underlying shares. The order flow figures are calculated as follows: ADR volume/ (ADR volume + domestic volume). Daily ADR volume is also compared to the ADR offering size: Daily ADR volume/ ADR offering size.

Company	Country	First day trading volume in US$m			Average daily trading volume in the post-listing period (1 year) in US$m			Daily volume as percent of ADR offering size	
		ADR volume	Domestic volume	% of ADR-volume of total order flow	ADR volume	Domestic volume	% of ADR-volume of total order flow	First day	Average day (1-year post-listing period)
Cristaleris	Chile	42.41	1.36	96.90	4.27	2.21	65.93	44.17	4.45
Tele Danmark	Denmark	364.78	101.39	78.25	12.37	15.46	44.46	31.12	1.05
Shanghai Petrochemical	Hong Kong	91.91	21.43	81.09	9.20	16.31	36.06	66.74	6.68
IMI	Italy	104.18	42.86	70.85	5.42	18.25	22.89	78.21	4.06
Banpais	Mexico	13.75	0.29	97.94	0.61	0.43	58.79	13.38	0.59
Bufete	Mexico	38.27	5.92	86.60	3.62	2.31	61.02	39.95	3.78
Dina	Mexico	78.18	1.72	97.85	5.68	1.35	80.84	45.17	3.28
Durango	Mexico	18.55	2.61	87.67	2.21	0.92	70.48	27.48	3.27
ICA	Mexico	133.96	28.61	82.40	12.78	4.57	73.67	41.03	3.91
Iusacell	Mexico	21.49	21.71	49.74	1.43	4.17	25.50	13.80	0.92
Radio Centro	Mexico	14.64	1.00	93.63	0.60	0.67	47.16	32.10	1.31
Televisa	Mexico	260.69	38.87	87.02	31.04	8.73	78.06	29.80	3.54
Telmex	Mexico	103.36	206.35	33.37	26.76	12.55	68.08	9.48	2.45
Tribasa	Mexico	72.76	2.29	96.95	4.86	1.21	80.11	34.51	2.30
Argentaria	Spain	2.09	N/A	N/A	5.51	47.67	10.36	1.41	3.72
Waste Management	UK	32.72	42.35	43.58	6.27	8.01	43.93	9.92	1.90
Zeneca	UK	56.56	93.62	37.66	5.41	22.02	19.93	37.62	3.60
Total		**85.31**	**38.27**	**76.34**	**8.12**	**9.81**	**52.18**	**32.70**	**3.00**

The table also shows the percentage of ADR volume of total order flow on the first day and for the post-listing period. It is calculated by dividing the ADR volume by the sum of the total volume (ADR+domestic) on the same day. The results show that the NYSE comprises 76.34 percent, on average, of the total order flow on the first day. This percentage differs across companies with a minimum of 33.37 percent for Telmex and a maximum of 97.94 percent for Banpais, but yet 12 companies have a higher trading activity on NYSE than in their domestic market. Although the share of the ADR volume of the total order flow declines to 52.18 percent in the post-offering period, the ADR volume is still higher than the domestic volume in the case of 9 companies. The ADR market seems to be of particular importance for emerging market firms. These results are in line with the findings of Chapter 7 for NYSE and NASDAQ, and Domowitz, Glen, and Madhavan (1995) for Mexican firms who show that the ADR market is relatively large compared to the domestic market. These results indicate that a substantial amount of information and demand in these stocks originates from the US market.

To compare first day trading activity for ADR IPOs to the results of previous IPO studies, we calculate the daily trading volume as a percentage of the ADR offering size. The results show that on the first day about 32.70 percent of the newly issued stock changed hands, on average. This finding is similar to Barry and Jennings (1993), who report 35 percent for a sample of US IPOs, and Miller and Reilly (1987) with 22.1 percent. Such a proportion for the first day appears enormous since a normal secondary market turnover averages about 30-40 percent a year (see Miller and Reilly, 1987). Moreover, the average daily proportion of shares traded subsequent to the offering seems to be very high. While Miller and Reilly's (1987) findings indicate that daily trading volume of IPOs gradually declines to about 1.3

percent of the offering size after 20 days, our findings show that ADR IPOs average 3 percent throughout the 1-year post-listing period. This high trading activity may be caused by the arbitrage activity which is necessary to keep the ADR price and the underlying share price in line.

Table 9.5.
Cross-correlations
This table shows cross-correlations between the ADR return and the Standard & Poor 500 index (S&P), the return on the underlying share and the return on the domestic index, and the domestic index return and the Standard and Poor 500 return for each company during the 1-year post-listing period.

Company	Country	ADR - S&P	Underlying - Domestic index	Domestic index - S&P
Cristaleris	Chile	0.084	0.331	0.309
Tele Danmark	Denmark	0.168	0.505	0.035
Shanghai Petrochemical	Hong Kong	0.274	0.469	0.048
IMI	Italy	0.179	0.596	0.104
Banpais	Mexico	0.091	-0.070	0.202
Bufete	Mexico	0.211	0.466	0.257
Dina	Mexico	0.234	0.527	0.126
Durango	Mexico	0.117	0.095	0.200
ICA	Mexico	0.300	0.718	0.300
Iusacell	Mexico	0.192	0.078	0.231
Radio Centro	Mexico	0.159	0.175	0.268
Televisa	Mexico	0.325	0.702	0.218
Telmex	Mexico	0.440	0.819	0.416
Tribasa	Mexico	0.302	0.659	0.245
Argentaria	Spain	0.247	0.709	0.173
Waste Management	UK	0.184	0.367	0.302
Zeneca	UK	0.329	0.440	0.229

Table 9.5. reports return (first difference in the log-level) cross-correlations. The results show that in 14 cases underlying share returns are more highly correlated with the domestic index than ADR returns with the S&P 500 index. However, we cannot discern a clear pattern that ADRs from one particular country have a higher correlation with the S&P 500 than from other countries. Moreover, there appear to be no differences concerning the magnitude of return correlations between various domestic indices and the S&P 500 index[189]. This results indicate that any findings of

[189] The differences in correlation between the domestic index and the S&P 500 for companies from the same country is due to different time periods since the 1-year post-listing period of each company is considered.

a lead-lag relationship between ADR prices and underlying share prices are not simply caused by cross-correlations among different indices.

9.3.2 Unit root tests

Previous empirical research has generally shown that many economic and financial time series require differencing to obtain stationarity. Stationarity of ADR prices and the corresponding underlying share prices is examined by conducting Augmented Dickey-Fuller (ADF) tests around a constant mean. They test the null hypothesis of a unit root against the alternative hypothesis that the series does not have a unit root.

In all cases, we include two lags to account for serial correlation in the error term[190]. Table 9.6. reports similar ADF results for ADRs and their underlying shares for price levels and stock returns likewise. The results show that the null hypothesis of a unit root (that all the series are nonstationary) cannot be rejected for stock prices at the 5 percent significance level. However, the null hypothesis of a unit root is strongly rejected for stock returns. Hence, ADR prices and their corresponding underlying share prices appear to be integrated of order one, *I*(1). As expected ADRs and their underlying shares have similar temporal properties because in a frictionless market they will be priced identically (Kim, Mathur, and Szakmary, 1995). This finding is consistent with previous research (e.g. see Arshanapalli and Doukas (1993) and Taylor and Tonks (1989)) which examines stationarity for equity prices.

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[190] We also conducted tests using a higher number of lags but the results appear to be insensitive to the number of lags.

Table 9.6.
ADF (Augmented Dickey-Fuller) unit root tests[a]
This table shows the t-statistics for H_0: $a_1=0$ (see equation). ADF tests are conducted using two lags.

Company	Country	ADR		Underlying	
		Levels	Differences	Levels	Differences
Cristaleris	Chile	-2.71	-8.90	-2.56	-8.46
Tele Danmark	Denmark	-2.06	-9.01	-1.96	-8.71
Shanghai Petrochemical	Hong Kong	-1.78	-8.94	-1.68	-8.97
IMI	Italy	-1.39	-9.79	-1.48	-9.97
Banpais	Mexico	-1.16	-9.02	-0.85	-8.84
Bufete	Mexico	-2.15	-7.57	-2.25	-7.98
Dina	Mexico	-1.45	-9.55	-1.45	-9.93
Durango	Mexico	-0.85	-8.03	-0.74	-8.79
ICA	Mexico	-2.80	-10.26	-2.80	-10.35
Iusacell	Mexico	-0.21	-8.91	-0.66	-8.34
Radio Centro	Mexico	-1.86	-8.25	-1.80	-7.63
Televisa	Mexico	-1.12	-8.89	-1.15	-8.43
Telmex	Mexico	-0.80	-8.74	-0.65	-8.72
Tribasa	Mexico	-1.52	-8.91	-1.50	-8.98
Argentaria	Spain	-1.93	-9.17	-2.09	-9.04
Waste Management	UK	-0.74	-8.90	-0.82	-8.47
Zeneca	UK	-1.49	-8.31	-1.47	-8.39

[a] The 95% critical value is -2.87

9.3.3 Cointegration tests

In a next step, we perform Johansen cointegration tests on two variables: ADR prices and underlying share prices. We convert underlying share prices into real US dollar prices using daily spot exchange rates. To make ADR prices and underlying share prices comparable, we adjust them according to their conversion ratio, since one ADR can represent a multiple or a fraction of the underlying shares[191]. The analysis is carried out by performing Johansen tests without a trend and a lag length of 3.

[191] This transformation is exemplified for Zeneca which has an ADR to underlying share ratio of 1:3. If we assume that the price of one ADR is US$ 30 and the price of one underlying share is US$ 10, then the underlying share price is multiplied by three.

Table 9.7.

Johansen cointegration tests

The table shows the results of Johansen cointegration tests which is based on two variables: the ADR price and the underlying share price. Two test statistics are shown: Trace Test and Maximal Eigenvalue Test. All tests are estimated without a trend and using 3 lags.

		Trace[a]		Eigenvalue[b]	
		r=0	r=1	r=0	r=1
Cristaleris	Chile	54.16	8.99	45.17	8.99
Tele Danmark	Denmark	72.18	4.18	68.00	4.18
Shanghai Petrochemical	Hong Kong	54.83	4.26	50.58	4.26
IMI	Italy	33.73	2.41	31.32	2.41
Banpais	Mexico	14.47	6.73	7.74	6.73
Bufete	Mexico	38.51	6.47	32.04	6.47
Dina	Mexico	50.47	1.87	48.60	1.87
Durango	Mexico	29.96	1.52	25.44	1.52
ICA	Mexico	23.85	9.01	14.84	9.01
Iusacell	Mexico	18.27	2.22	16.05	2.22
Radio Centro	Mexico	24.36	4.81	19.55	4.81
Televisa	Mexico	60.70	2.23	58.47	2.23
Telmex	Mexico	39.05	6.32	32.74	6.32
Tribasa	Mexico	21.25	5.36	15.89	5.36
Argentaria	Spain	50.14	4.35	45.79	4.35
Waste Management	UK	41.41	1.15	40.26	1.15
Zeneca	UK	55.91	2.03	53.88	2.03

[a] The critical values for r=0 are 19.96 (95% level) and 17.85 (90% level). The critical values for r=1 are 9.24 (95% level) and 7.52 (90% level).
[b] The critical values for r=0 are 15.67 (95% level) and 13.75 (90% level). The critical values for r=1 are 9.24 (95% level) and 7.52 (90% level).

Table 9.7. shows the results of the cointegration tests for ADRs and their underlying shares. Trace and eigenvalue tests indicate that ADR prices and underlying share prices are cointegrated. In the case of 16 (out of 17) sample firms, the hypothesis of no cointegrating relationship (r=0) can be rejected at the 5 percent level since trace and eigenvalue tests exceed their respective critical values of 19.96 and 15.67. For Banpais the eigenvalue (7.74) does not exceed the required value. But the trace statistic (14.47) is significant at the 10 percent level. To be cointegrated, we also need to show that no more than one cointegrating relationship exists since we have only two variables. The results show that the hypothesis, that only one or less cointegrating relationships exist, cannot be rejected at the 5 percent level because none of the firms exceeds the critical value of 9.24 (trace and eigenvalue likewise).

9.3.4 Direction of information flows between ADRs and underlying shares

After establishing that a long-run stable relationship of prices exists we now analyse the short-run behaviour of ADR prices and underlying share prices. Therefore, we conduct the "Garbade and Silber approach" and test the causality using an error-correction model.

Table 9.8. shows the results of the lead-lag relationship between NYSE prices and domestic market prices. The coefficients β_{dom} and β_{ADR} measure the influence of the lagged price from one market price on the current price in the other market. If the estimated value of β_{dom} is positive and significant, then the ADR price leads the underlying share price. Vice versa, the domestic price leads the ADR price if the estimated value of β_{ADR} is positive and significant. If both values are positive and significant a mutual feedback relationship exists.

The relationship between both prices can also be measured by calculating the ratio $\beta_{dom} / (\beta_{ADR} + \beta_{dom})$. It is important to note that there is no theoretical reason to expect negative values[192]. Hence, negative estimates of β_{ADR} and β_{dom} are set to zero before calculating this ratio. If the ratio is unity (so that $\beta_{ADR} = 0$), convergence of ADR and underlying share prices occurs because the domestic price moves towards the ADR price. In this case, the domestic market is a pure satellite of the NYSE market. If this ratio equals zero (so that $\beta_{dom} = 0$), the ADR price always adjusts towards the domestic market price and the NYSE market is a pure satellite. The coefficient δ measures the speed of convergence between ADR and underlying

[192] For a mathematical explanation, see Garbade and Silber (1983).

share prices. A small value indicates that prices converge quickly because only a small fraction of the price difference on day t - 1 will persist to day t.

The results in Table 9.8. provide some interesting insight into the mutual adjustment and feedback effects from the ADR market to the respective domestic market. It emerges that NYSE prices seem to lead domestic prices in a great number of instances. In the case of 6 firms (Cristaleris, Bufete, Durango, Iusacell, Tribasa, and Waste Management), the ADR market contributes 100 percent to the price discovery process since the above specified ratio equals 1. Hence, in these cases the domestic market appears to be a pure satellite of the NYSE market. The presence of highly significant values of β_{dom} for Cristaleris (t = 8.21), Bufete (t = 6.81), Durango (t = 5.56), Iusacell (t = 4.49), and Tribasa (t = 5.70) corroborates this finding. This suggests that strong feedback occurs from the ADR price to the underlying share price.

The fact that Cristaleris, Bufete, Durango, Iusacell, and Tribasa originate from an emerging market (Chile and Mexico respectively) suggests that NYSE trading may play a special role for the price discovery of emerging market firms. Moreover, the ratio also appears to be comparatively high for the remaining Mexican firms. The estimated values for the ratio range between 0.663 (Televisa) and 0.914 (Banpais). This suggests that the ADR price contributes between 66 to 91 percent to the price discovery of emerging market firms. Moreover, highly significant values of β_{dom}, only Banpais[193] has an insignificant β_{dom} (t = 1.54), indicate strong feedback effects from the NYSE to the domestic market. On the other hand, developed market firms seem to have lower ratios. In particular, the estimated values of IMI (0.322) and Argentaria (0.484) are below 0.5 which suggests that the domestic market has a more

[193] However, the inclusion of Banpais in the analysis appears questionable since the condition of cointegration is hardly fulfilled (see Table 5).

important role in the price discovery process. While the ADR market contributes 32 percent (IMI) and 48 percent (Argentaria) for the price discovery respectively, the domestic market's contribution is higher with 68 percent for IMI and 52 percent for Argentaria. Since β_{ADR} as well as β_{dom} are positive and significant for Argentaria, IMI, Zeneca, and Shanghai Petrochemical a mutual feedback relationship exists between the ADR and the domestic market in these stocks. Interestingly, the estimated values of β_{ADR} are only significant for firms which experience a mutual feedback relationship with the NYSE.

Table 9.8.

Lead-lag relationship between NYSE prices and domestic market prices

The table shows the results of the Garbade and Silber approach. t-statistics for the significance of β_{ADR} and β_{dom} are shown in brackets.

Company	Country	β_{dom}	β_{ADR}	Ratio	δ
Cristaleris	Chile	0.489	-0.052	1	0.563
		(8.21)	(-0.84)		
Tele Danmark	Denmark	0.706	0.089	0.888	0.205
		(12.89)	(1.14)		
Shanghai Petrochemical	Hong Kong	0.395	0.232	0.630	0.373
		(5.25)	(3.08)		
IMI	Italy	0.120	0.253	0.322	0.547
		(2.51)	(3.14)		
Banpais	Mexico	0.032	0.003	0.914	0.965
		(1.54)	(0.18)		
Bufete	Mexico	0.334	-0.067	1	0.733
		(6.81)	(-1.50)		
Dina	Mexico	0.559	0.185	0.751	0.256
		(5.59)	(1.56)		
Durango	Mexico	0.197	-0.002	1	0.805
		(5.56)	(-0.05)		
ICA	Mexico	0.243	0.039	0.862	0.718
		(4.25)	(0.62)		
Iusacell	Mexico	0.079	-0.024	1	0.945
		(4.49)	(-1.56)		
Radio Centro	Mexico	0.117	0.046	0.718	0.837
		(3.87)	(1.20)		
Televisa	Mexico	0.791	0.402	0.663	0.205
		(6.40)	(0.03)		
Telmex	Mexico	0.518	0.094	0.846	0.388
		(6.40)	(1.11)		
Tribasa	Mexico	0.285	-0.057	1	0.772
		(5.70)	(-1.02)		
Argentaria	Spain	0.379	0.404	0.484	0.216
		(3.82)	(3.93)		
Waste Management	UK	0.723	-0.145	1	0.422
		(0.66)	(-1.89)		
Zeneca	UK	0.414	0.339	0.550	0.247
		(3.75)	(2.82)		

Notes:
β_{dom} measures the influence of ADR prices on the domestic price.
β_{ADR} measures the influence of the domestic price on the ADR price.
"Ratio" represents the relative contribution of the ADR price to the price discovery process and is calculated as follows: $\beta_{dom} / (\beta_{ADR} + \beta_{dom})$.
δ measures the speed of convergence between the ADR and the domestic price.

The estimates of δ show a wide range between 0.205 (Tele Danmark and Televisa) and 0.965 (Banpais). This means that in the case of Tele Danmark only 20 percent of the differential between the ADR price and the underlying price on day *t* persists

to day *t* -1, while 90 percent of the differential persists for Banpais prices. This implies that arbitrage in Tele Danmark is undertaken more quickly than, for example, in Banpais. The results in Table 9.8. suggest that developed market firms seem to have lower δ-estimates than emerging market firms. However, the estimates of Televisa (0.205), Dina (0.256), and Telmex (0.388) are of similar magnitude. This indicates that the trading activity in a stock is of importance for the speed of convergence, since trading volume in these three stocks is comparatively high (see also Table 9.4.). Although the Garbade and Silber approach provides a good estimation of the lead-lag relationship and the speed of convergence, sufficient statistical tests for the significance of the ratio and the speed of convergence are not provided. To overcome this problem, a cointegration approach will be used in the following.

Table 9.9. presents the results of Granger causality tests. It includes estimates of the error correction term and F-values for the significance of the lagged price changes. The optimal number of lags for each company is obtained using the AIC criterion and is shown in brackets. The error correction model test two causal forces. The lagged price changes provide information about the short-run influence from the change in one market on the other market. They indicate whether causality between the two markets or a mutual feedback relationship exists. The error correction coefficients reflect the degree to which prices adjust to correct the last-period equilibrium error. They help to identify the direction of the causal flows and show the speed with which departures from the equilibrium are corrected. In an efficient market, the magnitude of the error correction coefficient should be unity because 100 percent of the price differential between the ADRs and the underlying shares should be corrected within one day. However, we could not infer market inefficiency if the coefficients are significantly lower than 1 since markets are not frictionless.

Moreover, the error correction coefficients allow inferences concerning the transaction costs in both markets because the trading cost hypothesis predicts that the market with the lowest overall trading costs will react most quickly to new information.

Table 9.9. shows that the lagged price changes of 16 companies are significant when the first-order difference of the underlying price is the dependent variable. Hence, there are causal flows running from the ADR market to the domestic market. On the other hand, when the first-order difference of the ADR price is the dependent variable, the lagged price changes of only 11 companies are significant. This indicates that for 11 companies (Tele Danmark, Shanghai Petrochemical, IMI, Bufete, Dina, Durango, ICA, Radio Centro, Argentaria, Waste Management, Zeneca) a mutual feedback relationship exists since ADR prices react to price changes in the underlying shares and vice versa. The results for Tele Danmark, Shanghai Petrochemical, IMI, Argentaria, Waste Management, and Zeneca suggest stronger causal flows from the domestic to the ADR market because the first causal channel (lagged differenced variables) is highly significant. However, in the case of 5 companies the ADR price seems to lead the domestic price. In particular, these results confirm the findings of the Garbade and Silber approach for Cristaleris, Iusacell, and Tribasa that the domestic market is a pure satellite of the ADR market.

The results in Table 9.9. show that the error correction term (α_2) has a significant impact on the domestic price for 15 companies. Only in the case of IMI and Argentaria it is insignficant. The error correction coefficient α_1 is only significant for 6 companies (Tele Danmark, Shanghai Petrochemical, IMI, Argentaria, Waste Management, and Zeneca). As described above, this allows us to make inferences about the direction and the speed of the price adjustments towards the equilibrium.

In the case of 4 firms (Tele Danmark, Shanghai Petrochemical, Waste Management, and Zeneca), adjustments seem to be accomplished in both markets since α_1 and α_2 are significantly different from both zero and unity. While for Waste Management the speed of adjustment is higher in the ADR market than in the domestic market (0.418 vs. 0.385), this is reversed for Tele Danmark, Shanghai Petrochemical, and Zeneca. This is exemplified for Zeneca: 62.7 percent of the price differential between the ADR and the underlying share price is corrected within one day on the London Stock Exchange. Price adjustments also take place on the NYSE, however, only 32.2 percent are corrected within one day. It shows that arbitrage activities will bring the ADR price down (up) by selling (buying) ADRs and buying (selling) underlying shares if prices differ. However, this also suggests that a transaction cost-advantage exists on the London Stock Exchange since a higher proportion of the equilibrium error is eliminated within one day.

Table 9.9.
Causality tests from one market to the other

The table shows the results of Granger causality tests using the following model:

1. $\Delta Y_{jt} = -\alpha_1 Z_{t-1} + \Sigma^m_{i=1} b_{1i} \Delta Y_{j,t-i} + \Sigma^m_{i=1} c_{1i} \Delta X_{j,t-i} + \varepsilon_t$

2. $\Delta X_{jt} = -\alpha_2 Z_{t-1} + \Sigma^m_{i=0} b_{2i} \Delta Y_{j,t-i} + \Sigma^m_{i=1} c_{2i} \Delta X_{j,t-i} + \varepsilon_t$

Causality from the domestic price to the ADR price for Denmark, Hong Kong, Italy, Spain, and UK uses equation 2. Causality from the domestic price to the ADR price for Chile and Mexico uses equation 1. Causality from the ADR price to the domestic price uses equation 1. α_1 and α_2 show the results for the error correction term. t-statistics are shown in brackets. The null hypotheses of no causality are $\Sigma\Delta Y_j = 0$ or $\Sigma \Delta X_j = 0$ for equations 1 and 2 respectively. The test for causality is based on a F-statistic calculated by estimating equations 1 and 2 in both unconstrained and constrained forms.

$F = [(SSE_c - SSE_u)/m] / [SSE_u/ (T-2m-1)]$

The F-statistic follows a Chi-square distribution. The computed Fs are reported in the table. The lag length differs for each estimation and is shown in brackets.

Company	**Country**	**Domestic price to ADR**		**ADR to domestic price**	
		α_1	$\Sigma\Delta Y_j$	α_2	$\Sigma \Delta X_j$
Cristaleris	Chile	0.032 (0.41)	1.35(2)	0.284 (5.52)*	19.77*(2)
Tele Danmark	Denmark	-0.597 (-4.90)*	29.76*(3)	-0.556 (-4.80)*	27.57*(4)
Shanghai Petrochemical	Hong Kong	-0.549 (-6.97)*	81.07*(2)	0.251 (2.06)*	7.67*(2)
IMI	Italy	-0.332 (-5.02)*	85.73*(3)	0.121 (1.05)	2.85*(3)
Banpais	Mexico	0.026 (1.33)	1.99 (3)	0.066 (2.91)*	1.86 (4)
Bufete	Mexico	0.064 (1.16)	4.89*(2)	0.273 (4.85)*	18.22*(2)
Dina	Mexico	-0.221 (-1.14)	5.89*(2)	0.438 (2.66)*	19.01*(2)
Durango	Mexico	-0.025 (-0.44)	3.64*(3)	0.243 (4.04)*	7.11*(3)
ICA	Mexico	-0.011 (-0.16)	3.88*(2)	0.150 (2.43)*	14.09*(2)
Iusacell	Mexico	0.019 (1.11)	0.45 (4)	0.087 (3.65)*	5.91*(4)
Radio Centro	Mexico	-0.065 (-1.65)	3.45*(2)	0.086 (2.79)*	6.60*(2)
Televisa	Mexico	0.102 (0.52)	2.25 (2)	0.744 (4.10)*	13.84*(2)
Telmex	Mexico	-0.151 (-1.24)	0.08 (2)	0.304 (2.64)*	16.87*(2)
Tribasa	Mexico	0.022 (0.27)	2.05 (4)	0.140 (1.98)*	6.01*(4)
Argentaria	Spain	-0.559 (-6.59)*	112.55*(2)	0.254 (1.75)	5.10*(2)
Waste Management	UK	-0.385 (-3.93)*	47.20*(2)	0.418 (4.21)*	27.10*(4)
Zeneca	UK	-0.627 (-7.23)*	153.64*(2)	0.322 (2.04)*	5.40*(2)

These results also show that for emerging market firms the price adjustment towards the equilibrium price takes place in the ADR market since α_1 is insignificant and α_2 is significant. The speed of adjustment shows strong variations across companies. While only 6.6 percent of the price differential is corrected within one day for Banpais, 74.4 percent of the difference between the ADR price and the underlying price is corrected for Televisa in the same period. Taking account of the trading volume in these stocks, as reported in Table 9.4., it can be inferred that arbitrage is carried out more quickly in higher volume stocks. The results also show that transaction costs appear to be much lower on the NYSE than in the domestic market for emerging market firms since α_2 is lower than α_1 for all firms. Hence, due to the transaction-cost advantage of the NYSE price differentials between the ADR price and the underlying price are corrected by trading on the NYSE. Other factors as settlement problems, limited depth, or poor custodial services may also contribute to this finding.

9.4 Conclusion

This paper shows that initial public offerings (IPOs) which are simultaneously offered on the NYSE and on their domestic stock exchange seem to experience a different price discovery than other companies which have listed ADRs. Our results suggest that ADR prices lead underlying share prices in many cases. This finding is particularly pronounced for emerging market firms which in the case of 5 firms appear to be pure satellites of the NYSE. We also find a higher speed of convergence for developed market firms. This implies that arbitrage between the NYSE and the domestic market is undertaken more quickly. The dominance of the NYSE for many firms is corroborated by the findings of our comparative order flow

analysis. It shows that NYSE trading comprises a high percentage of the total order flow. In contrast to previous research our results do not support the finding that ADR IPOs are less underpriced. Moreover, we do not find differences in first day returns of emerging market and developed market firms. Consistent with previous literature we also document a high first day trading activity for IPOs in their domestic market as well as on the NYSE.

10. Chapter: Conclusion

The first part of the final chapter summarises the findings of the study and presents the main conclusions from the previous analysis. The second part makes some suggestions for further research in this field.

10.1 Main conclusions from analysis

This thesis has attempted to address the questions whether international listing has an impact on liquidity, investor recognition, and international market segmentation, and hence on the cost of capital of a firm. More especially, it has been aimed to compare these effects across the three major stock exchanges for international listings - the London Stock Exchange, NASDAQ, and the NYSE - since our analysis of the structure of both markets has revealed significant differences.

The link between international listing and these factors has been suggested by a number of previous studies. It has been shown that international listing is perceived by managers to increase the liquidity of their stock, give greater access to foreign capital markets, increase the exposure for the products of the firm, and lead to a growth in the shareholder base. Early studies on international listing have shown that international listing represents an effective mechanism to dismantle barriers to international investment, and hence reduce international market segmentation. Based on the implications of models of multiple market trading, empirical research has found that international listing leads to an increase in the liquidity of a stock.

These findings have lead us to assume that international listing may be linked to liquidity and international market segmentation. Following these implications we expected that companies base their listing decision on the potential benefits offered by a particular stock exchange. However, the benefits have to be balanced by the costs of listing which are a function of the listing requirements of the host stock exchange and the standard of the reporting requirements in the domestic country of the listing firm. This implied two directions of research: firstly, since foreign firms face higher hurdles to gain access to the US market than to the UK market, they may experience larger benefits upon listing; secondly, these barriers are even higher for emerging market firms, hence their benefits could be larger. Moreover, in recent years a great number of firms have made use of the trend towards globalisation of capital markets to raise equity internationally. Hence, this raised questions whether international listings may also be subject to market conditions as suggested by the domestic equity offering literature.

Seasoned equity offerings and initial public offerings alike have been structured as global offerings to take account of the demand of foreign investors. Since the US capital market is the largest in the world, the majority of international equity offerings has included a significant US tranche. This has raised questions concerning the best structure for an international offering since the offering method affects the investor base, liquidity, and disclosure requirements of the company. In general, companies have to decide whether to access the US market using a private placement or a public offering. If a company decides to conduct an initial public offering, which is sold simultaneously in the US market and in its domestic market, additional questions arise. The analysis of the price interaction between ADR prices and underlying share prices offers inferences concerning the integration between both

markets and differences in transaction costs on the NYSE and on the domestic stock exchange.

The issue of price leadership may also be influenced by the order flow in both markets since several models provide a theoretical basis for the linkage between information arrival and trading volume. Internationally cross-listed stocks experience an increase in their trading volume since multiplemarket trading may create arbitrage opportunities between the ADR market and the domestic market. The increased competition among market makers improves the price discovery for these stocks. This suggests that trading volume is of importance for analysing changes in liquidity upon listing and the transfer of pricing information between both markets.

The empirical work reported in this thesis has attempted to take account of the institutional differences between the various markets and the theoretical propositions suggested by previous literature. To compare the impact of a listing on the London Stock Exchange, the New York Stock Exchange, and on NASDAQ, changes in liquidity and in expected returns from the pre- to the post-listing period have been analysed. To obtain further evidence on the impact of listing on liquidity, we have examined whether the decision between a public offering or a private placement in the US affects bid-ask spreads in the respective home market. Following previous literature, which provided a framework to evaluate listing as a "liquidity-enhancing project", these differences in bid-ask spreads have enabled us to quantify the impact of international listing on the cost of capital. Since market segmentation influences the cost of capital, we have also examined the linkage between the ADR market on the NYSE and the respective underlying share market for a sample of simultaneously sold IPOs.

Chapter 2 has distinguished various aspects of international listing. The majority of firms are internationally cross-listed since they obtain a dual listing on the foreign stock exchange in addition to a primary listing on their domestic stock exchange. Companies can access the market using an introduction or raise capital with their listing (public offering). Another difference is the type of foreign shares listed. While most companies list ordinary shares on the London Stock Exchange, ADRs are used to list in the US. The examination of recent trends in the international listing area has revealed significant differences between the US and the UK market. It has been shown that an increasing number of foreign firms decided to list in the US from 1990 onwards. Moreover, the majority of US listings conducted a public offering with their listing. In particular, emerging market firms raised capital with their NYSE listing.

Chapter 3 has discussed some institutional details of the international equities market. In particular, differences in regulating the issuance and trading of foreign securities in the US and the UK were examined. While the UK approach is based on the principle of mutual recognition of other countries standards, the US regulations are based on national treatment for foreign issuers. The compliance with US GAAP appears to be the major hurdle for foreign firms that seek a listing in the US. The decision between a private placement or a public offering bears important implications because it influences the marketability of an issue and the costs of raising capital. Moreover, the importance of trading in international equities was also highlighted by discussing the differences in the trading systems of the London Stock Exchange, the New York Stock Exchange, and NASDAQ.

Previous literature that examined the impact of international listing on the cost of capital has been reviewed in Chapter 4. Theoretical research found that liquidity, investor recognition, and international market segmentation have an effect on the

cost of capital. Previous studies that examined the impact of international listing on international market segmentation have argued that positive abnormal returns in the pre-listing period and negative abnormal returns in the post-listing period are consistent with the theoretical propositions. However, the new issues and domestic exchange listing literature reports similar findings but provides different explanations.

Chapter 5 has discussed the determinants of the listing decision. The review of the literature has shown that liquidity represents the main motivation of companies to obtain an international listing. The liquidity proposition is backed up by theoretical models and empirical studies on international listings and domestic exchange listings alike. Previous literature has also shown that various other forms of listing are related to liquidity which is generally proxied by bid-ask spreads or trading volume. It has also been found that the examination of price interactions between different markets allows important inferences concerning the integration of markets and differences in transaction costs. The analysis of the institutional factors revealed that the exchange choice is influenced by financial disclosure levels. Previous research argued that firms are less likely to list on foreign stock exchanges with higher disclosure level than their domestic exchange, however, none of the studies examined differences in the stock price reaction upon listing. Although access to foreign capital markets was seen as the main reason for an international listing, empirical evidence did hardly examine the link between raising capital and international listing. Moreover, the importance of market conditions for raising equity capital has been discussed since previous research has shown that firms try to take advantage of "windows of opportunity" when investors are overoptimistic about their future. The summary of this chapter and the previous chapter has provided the main implications for the empirical research in this thesis.

Chapter 6 has shown that US listings experience positive abnormal returns in the pre-listing period and a decline in expected returns in the post-listing period. London listings, however, do not experience significant changes. These findings have suggested that the institutional differences between both markets can explain the price reaction since foreign firms face higher hurdles to access the US market. These results are consistent with the theoretical implications as proposed by models of international market segmentation. Moreover, we have found significant differences between emerging market firms and developed market firms since emerging market firms experience even bigger integration effects. Although it has been shown that market conditions influence the timing of international listings, they failed to explain the negative post-listing period returns since the negative performance is not concentrated among capital raising ADR-listings. Only in the case of emerging market firms, some form of "emerging market sentiment" could not be fully ruled out. Moreover, the substantial positive abnormal return on the listing day for firms that upgrade their OTC-traded ADR programme to a "full" listing has provided additional evidence of the benefits that firms experience with their listing.

Chapter 7 has examined the changes in liquidity once firms become internationally listed. It has been shown that internationally listed firms experience positive trading volume effects. These effects have been found to be more pronounced for NYSE listings than for London and NASDAQ listings, even after adjusting for market-wide changes in volume and controlling for nationality, size, and industry effects. This has suggested that a NYSE listing offers bigger liquidity benefits which helps to explain why firms incur the higher costs associated with it. Moreover, significant short-term trading effects have been found for London and NYSE-listings. While introductions experience stronger short-term effects in the pre-listing period, the effect for public

offerings is stronger in the post-listing period. The comparison of microstucture-related characteristics of internationally listed firms and control firms has indicated that larger firms are more likely to list on the NYSE and on the London Stock Exchange. An order flow analysis has corroborated the previous findings that listing increases liquidity since a high percentage of the sample firms experienced an increase in their total order flow.

Chapter 8 has provided further evidence that international listing influences liquidity. Using a sample of firms which conducted an international equity offering with an US tranche, it has been shown that public offerings have a liquidity advantage over private placements in the 144A market. This has suggested that internationally listed firms are rewarded for complying with the stringent registration requirements of the SEC. It has been shown that internationally listed firms have lower bid-ask spreads, which holds when adjusting for size effects and controlling for other spread determinants. The lower bid-ask spread for listed firms has been explained by a larger potential shareholder base and the permission to be traded on a regulated marketplace. It has also been shown that the liquidity benefits outweigh the higher costs of a public offering which leads to a reduction in the cost of capital.

The evidence in Chapter 9 has shown that simultaneously offered international IPOs experience a different price discovery than seasoned firms. The results have suggested that in many cases ADR prices lead underlying share prices. While a mutual feedback relationship exists for developed market firms, some emerging market firms have appeared to be pure satellites of the NYSE market. It has also been found that price differentials between the ADR price and the underlying share price are corrected more quickly for developed market firms since the adjustment is undertaken in both markets. However, the NYSE seems to have a transaction cost-

advantage for trading in emerging market firms since the price differential is corrected more quickly on the NYSE. A comparative trading volume analysis has suggested that the lead-lag relationship may partly be explained by the ADR order flow. The results have not supported previous evidence that ADR IPOs are less underpriced. Moreover, no differences have been found in first day returns of emerging market and developed market firms.

10.2 Suggestions for further research

Although this thesis has provided important new evidence on the effects of international listing, it has also raised many new questions. To shed more light on this topic, the following areas of further research appear to be fruitful. While we have argued that international listings experience a decline in their expected returns, the magnitude of the negative post-listing period performance still remains a puzzle. Similar to previous research on IPOs and seasoned equity offerings other firm-specific characteristics as the operating performance or the use of the issue proceeds could be considered. In this context, it also appears interesting whether the issue proceeds are used to pursue other strategic goals as acquisitions or financing of subsidiaries in the host country.

Previous research has also documented cycles in the volume of equity issuing activity and their relationship to the business cycle. Two alternative ways are suggested to examine this issue in an international context since the issue volume of foreign firms may be related to the business cycle of the host country or to the business cycle of the home country. Very often it is argued that foreign firms, for example, issue equity in the US because comparable firms in the same industry

trade at higher P/E-multiples than firms in its domestic market. A comparison of industry P/E-ratios between the domestic and the foreign market at the time of issue may provide more evidence on the issue of whether firms can take advantage of windows of opportunity.

Future research could also investigate whether the international equity offering method (private placement or public offering) has an impact on the pricing of the issue (in particular for IPOs) and on the long-run performance. In this context, it would also be interesting to measure the impact of changes in the US shareholder base by comparing the initial amount placed with US investors and the amount held by them a few years after the issue. This would test whether public offerings lead to a stronger increase in the shareholder base than private placements. Moreover, a provisional look at our data has indicated that a number of companies return to the market to raise additional equity capital. This provides the opportunity to examine the issue of subsequent equity offerings in an international setting.

While data unavailability has been one of the major limitations of the study, the continuing growth of international listings and international equity offerings from the end of 1994 to date should offer ample opportunities to conduct more research in that area in the future.

Appendix:

Comparison between raw and log returns

Panel A: Pre-listing period	Average CAR	t-statistics	Raw returns	t-statistics
London	4.66	1.50	8.24	2.66
NASDAQ	10.67	1.86	15.15	2.61
NYSE	10.29	2.76	15.33	4.09
- Emerging	14.19	1.29	20.34	1.82
- Developed	9.37	2.41	14.15	3.63
ADR listings	11.07	2.24	15.25	3.05
- Introductions	11.06	2.73	15.82	3.85
- Public offerings	11.09	1.84	14.91	2.52

Panel B: Post-listing period	Average CAR	t-statistics	Raw returns	t-statistics
London	0.87	0.20	6.78	1.53
NASDAQ	-7.61	-0.90	2.14	0.25
NYSE	-18.63	-3.09	-10.10	-1.67
- Emerging	-61.17	-1.99	-44.23	-1.41
- Developed	-14.77	-2.45	-6.61	-1.09
ADR listings	-13.53	-1.68	-3.59	-1.12
- Introductions	-10.81	-1.74	-3.27	-0.52
- Public offerings	-18.01	-1.56	-11.74	-1.04

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