THE KOREAN STOCK MARKET: STRUCTURE, BEHAVIOR, AND TEST OF MARKET EFFICIENCY

An empirical test on the Korean stock market by evaluating the capital market internationalisation, by examining the effects of inflation / real variables on stock returns, and by examining the ability of the stock market to help investors to 'correctly price' the shares in the market.

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D E C L A R A T I O N

A B S T R A C T

This thesis evaluates the Korean capital market internationalisation and examines the efficiency of the Korean stock market comprehensively. For this purpose this study is concentrated on three main areas as follows.

First, this thesis evaluates the capital market liberalisation by examining the internal market mechanism and conducting geographical comparisons. The general structure of the Korean securities market and disclosure system are described, and the development of the capital market is reviewed. The liberalisation plan is examined. It is found that the internationalisation plan of the Korean capital market should be gradual and balanced with general economic conditions. Several measures are recommended to enhance the functions of the domestic capital markets. Also comparative characteristics of capital market in the Far East are described, including equity market, bond market, money market, and foreign exchange market.

Second, this thesis examines the relationship between the macro economic activities and the capital market in Korea. Using the interest rate model for 14.5 years, the expected inflation is uniformly positively related to inflation. The relations between stock returns and expected inflation, and between stock returns and unexpected inflation showed negative. Thus, the common stocks in Korea are found not hedging against inflation. And real variables influence to real stock returns as fundamental determinants of equity values. However, these real stock return-inflation relations are found varying over time. The results of the recent five and half years period showed positive relation or no relation between real stock return and inflation.

Third, this thesis examines the efficiency of the Korean stock market at three different levels. In the weak form empirical tests, the results manifest mixed behavior across samples. But the average results by serial correlation analysis, runs analysis, and spectral analysis do not show random walk behavior. In the frequency distribution model, the average results indicate relatively fat tails. In the semi-strong form test, the valuation effects of bonus stock issue announcements are found to react to share prices in a relatively short period. Investors on average cannot get significant abnormal returns. In the strong form test, the excess returns from following the 467 recommendations made by the four Korean stockbrokers turned out to be significant before deducting transactions costs. But considering transactions costs, the abnormal gain is close to zero.

In summary, the results show that the Korean stock market in its early stages did not have the ability to help investors to 'relatively correctly price' the shares. More recent evidence shows improved efficiency which is likely to continue as the capital market expands.

CHAPTER I. OBJECTIVE AND ORGANISATION.

1.1 Introduction.

The roles of the capital market in an economy may be viewed from the following perspectives.

a. Financing capital for the government and corporate sectors, etc.

b. Providing the investing public with a marketplace for investing their financial assets, and

c. Contributing to an efficient management of the economy.

Corporate financing in Korea historically relied heavily on external funding, especially on the banking sector. Also the capital market itself was made up of many different kinds of financial institutions which competed with each other within often fairly narrow limits laid down by the government. These limits included the areas of activity permitted for each institution and the scale of interest rates and commissions charged for various services. The capital market, however, continued to evolve by diversifying its asset and liability mix, offering more financial services, and upgrading its function as a financial intermediary, concurrent with the modernisation and industrialisation of the Korean economy. With improved financial techniques and closer links with international financial markets, the financial industry in Korea seems to have become modernised.

Especially during the last several years, the stock market in Korea has undergone a process of expansion, liberalisation, and internationalisation. With a fairly short history, its market value of total listed stocks has expanded from 916 billion won (US$ 2 billion) in 1975 to 70,804 billion won (US$ 110 billion) in September 1989. The percentage of market value to GNP increased from 9.1% in 1975 to 13.2% in 1986, to 65.7% in Semtember 1989. The Korea Composite Stock Price Index advanced

from 89.73 as the end of 1975 to 163.37 as the end of 1985, and to 920.20 as the end of October 1989. Also the listed value of bonds increased over 16 times during the last nine years.

However, little research has been done on the Korean stock market efficiency, even though enormous contributions on the advanced markets have been made to the understanding of the behavior of securities. Given that this field is one of the most intensely researched areas of finance, the number of publications which has to be reviewed is very large, clearly there are many areas requiring further and better research. Conditions in the market place change overtime. Intensive research in this area is only possible with the advent of large high speed computers and the setup of large computerised databases. Also the validity of the Efficient Market Hypothesis(EMH) has not led to any consensus wide acceptance among academics and wide dissemination of its findings in the international capital market. Until now, the central theme of EMH is still rejected by most practitioners and disputed by some academics as well.

The idea that a stock market can be 'efficient' was first propounded by Fama(1970). He defined an efficient stock market as follows:

"The primary role of the capital market is the allocation of the ownership of the economy's capital stock. In general terms, the ideal is a market in which prices provide accurate signals for resource allocation: that is, a market in which firms can make production and investment decisions, and investors can choose among the securities that represent ownership of the firms' activities under the assumption that security prices at any time 'fully reflect' all the available information. A market in which prices always 'fully reflect' available information is efficient."

In a well organised stock market, the structure becomes more complex, to the extent that it includes a whole range of investors and institutions, and approximates closer the efficient market.

1.2 Objectives of the research.

The objective of this research is to examine the pricing efficiency of the Korean stock market comprehensively. For this purpose this study concentrates on three main areas which are the following:

a. The evaluation of the capital market internationalisation by examining the internal market mechanism and conducting geographical comparisons.

b. The effects of inflation / real variables on stock returns.

c. The ability of the stock market to help investors to 'correctly price' the shares that are offered in it.

This thesis is composed of ten chapters. Chapter 1 describes the objectives and organisation of this research. The period covered and the sources of data are explained.

Chapter 2 evaluates the Korean capital market liberalisation. The general structure of the Korean securities market and disclosure system are described, and the development of capital market is reviewed. The internationalisation, following a original long-term plan for capital liberalisation laid out in 1981 and a revised plan in 1988, is examined.

Chapter 3 describes comparative aspects of capital market characteristics in the Far East - Korea, Japan, Taiwan, and Hong Kong. These four countries illustrate a wide diversity of economy and financial systems, ranging from a high degree of centralisation and government control(Korea) to economies where market mechanisms are the prevalent means of allocating resources (Hong Kong). This chapter takes a deeper and more detailed look at the current state of evolution of the local financial markets and instruments. This includes the securities market, i.e., bond and equity markets, and money market and foreign exchange market.

Chapter 4 analyses the role of financial markets in the

savings process and the role of financial institutions in the allocation of financial resources. The Korean financial system is currently under extensive review to identify potential institutional reforms. Several measures are recommended for financial liberalisation in 1990s.

Chapter 5 examines the relationship between the macro economic activities and the capital markets in Korea. Empirical tests are carried out on the relations between stock returns and inflation and(or) real variables. For this purpose, 12 variables are regressed using monthly, quarterly, and semi-annual data for 173 months. To examine the consistency of the results, the most recent 66 months'data are also analysed. There is much evidence that common stock returns did not work as hedging against inflation in the Korean economy during January 1975-June 1989. The data for the Korean capital market test the hypothesis that a negative relation exists between stock returns and inflation and a positive relation exists between stock returns and real variables which are more fundamental determinants of equity values.

Chapter 6 deals with the literature connected with research on the subject of capital market efficiency. For many years a considerable volume of research activity has been devoted to testing the validity of the Efficient Market Hypothesis as an explanatory model of pricing behaviour in various speculative markets in the large and developed capital markets. However, little research has been devoted to those of developing countries, even though their markets have grown rapidly in the 1980s.

Chapters 7-9 examine the Korean Stock market efficiency, which is the main topic of this thesis, in three different forms; that is, its weak form, semi-strong form, and strong form. Chapter 7 is a comprehensive investigation of the weak form of the efficient market hypothesis. The actual test is carried out by serial correlation analysis, runs test, and spectral analysis.

With these tests, the efficiency characteristics of two different periods are compared with each other. Also to check the effect of price limit system, the trimmed data are applied for the same model. Before doing them, frequency distributions are analysed.

Chapter 8 analyses an empirical test of the semi-strong form of the Efficient Market Hypothesis. The valuation effects of bonus stock issue announcements are examined in two different ways. First, ex-right day opening prices are compared with theoretical opening prices. In addition, the magnitude of the overnight price adjustment is analysed using the prior day closing to ex-day closing stock returns. Second, announcement effects are examined using the closing prices around the announcement dates and adjusting for the payment of the dividend.

Chapter 9 tests the strong form Efficient Market Hypothesis in Korea. The value of verbal recommendations, using the unpublished, confidential lists of approved stocks which are produced each week, is investigated. In this empirical test, 467 recommendations by four major Korean stockbrokers are examined for any degree of forecasting ability.

Finally chapter 10 summarises and concludes this thesis.

1.3 The period covered.

The intention has been to use as long a period of data as possible. However, given that the socio-political conditions affect the operation of the capital market, the period covered for this research is from January 1975 to June 1989. For the examination of the relation of stock returns to inflation / real variables, two different time periods are used: long-term of 173 months and short-term of 66 months. For the efficient market empirical tests, several different periods are covered. Also recent period data were more frequently used, considering the

abrupt development of capital market more recently.

1.4 The sources of Data.

The data used in this study were obtained from the following sources:

a. Share prices and bond index on the Korean market: Dongsuh Securities Co., Ltd., Daewoo Securities Co., Ltd., The Korea Stock Exchange, The Korea Securities Supervisory Board, and The Ministry of Finance of the Republic of Korea.

b. Economic variables in Korea: The Bank of Korea, Economic Planning Board.

c. Recommendation lists: Five leading Korean securities houses.

d. Economic and capital market data on Japan, Hong Kong, and Taiwan: The World Bank, IMF, The Bank of Japan, The Tokyo Stock Exchange, The Hong Kong Government, The Central Bank of China, The Taiwan Stock Exchange.

1.5 Limitations of the research.

There were some limitations to this study, which were raised by the type of information available. They are as follows:

a. The stock market in Korea has developed in a quite short time. Thus, the period covered for this study is relatively short compared with other research on the advanced markets.

b. The bond market in Korea is very simple in product. The listed amount and trading volume have expanded enormously in recent years. The bond market yield has been reported only since 1974.

c. In the absence of monthly data on the GNP growth rate, Industrial Production Index(IPI) was used. We assume that the IPI is closely related with the GNP growth rate.

d. The Korean stockbrokers do not keep the unpublished recommendation lists for a long time. Thus, the period covered for the strong form empirical test is relatively short.

CHAPTER II. EVALUATION OF THE KOREAN SECURITIES MARKET LIBERALISATION.

2.1 Introduction.

During the last several years the financial sector in Korea has expanded tremendously, following the precedent of the real sector. Trade and foreign exchange transactions have been liberalised to a great extent and the domestic capital market is opening to internationalisation. At the end of 1988, the import liberalisation ratio reached 95.4% and it is expected to increase further in the coming years. With the recent acceptance by the IMF's Board, in November 1988 Korea became an IMF Article VIII country, within the context of the now necessary overall liberalisation of the foreign exchange control system. As for the capital market, following a long-term plan for capital market liberalisation laid out in 1981 and a plan for stimulating capital market liberalisation in 1987, the government announced a long-awaited plan in December 1988 detailing the steps for completion of the process of liberalising the Korean securities market.

In this chapter, liberalisation of the Korean capital market will be evaluated. The general structure and the development of Korean securities market will be reviewed.

2.2 The structure of the Korean securities market.

2.2.1 Sources of regulation and administration.

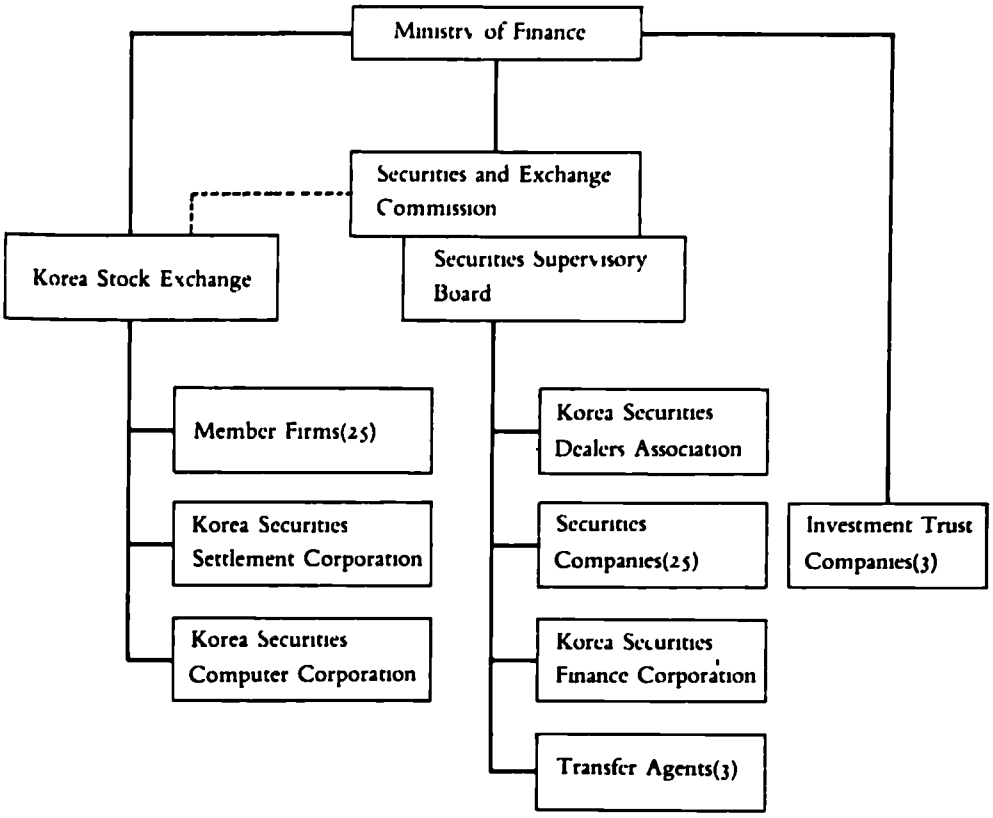
In order to supervise the overall operations of the securities market, several laws and internal regulations are principally applied. The principal source of Korean securities law is the Securities and Exchange Law ('SEL') of 1962 (as last amended as of 28th November 1987). The SEL was largely based on its Japanese counterpart, which was in turn modelled on the U.S.

securities statutes, including the Securities Act of 1933 and the Securities and Exchange Act of 1934. The SEL regulates both the issuing and the secondary markets. The Presidential Decree and the Ministry of Finance Regulations promulgated under the SEL, supplement the SEL with more detailed regulations (Shin 1983, Kim & Chang 1988, Korea Stock Exchange 1988).

A variety of special statutes also constitute part of the system of securities regulation. They include the Capital Market Promotion Law of 1968, which was substantially amended in 1987, and the Securities Investment Trust Business Law of 1969 which was amended on 31st December 1976. The Commercial Code, the basic law on commercial and corporate matters, is also applicable in the absence of a relevent provision in the SEL or any other special statute.

In Korea, the Ministry of Finance(MOF) plans the basic policies for and supervises the overall operations of the securities market. The major regulatory bodies under the MOF are the Securities and Exchange Commission(SEC) and its executive organ, the Securities Supervisory Board (SSB). Composed now of nine commissioners who are under the control and influence of the MOF, the SEC is the policy making body in the area of securities regulation. The SSB, acting as the executive body of the SEC, implements the policies established by the SEC. Both the SEC and the SSB enact rules within the power delegated them by the SEL, the Decree and the MOF regulations. In addition, the Korea Stock Exchange(KSE) and the Korea Securities Dealers Association also have their own charters, rules, and regulations governing various aspects of their business operations as self-regulatory bodies. The KSE is authorised under the Securities and Exchange Law to exercise supervision over the member firms and to take appropriate measures to operate the securities market efficiently.

(Chart 2.1) **The structure of securities administration**



(Source) Korea Stock Exchange, Oct. 1988, p.9

2.2.2 Market operations.

(1) Listing of new issues: The SEL addresses the issuance of securities and the disclosure of corporate information. Financial institutions that have received special underwriting licences from the Ministry of Finance and have at least 0.5 billion won in paid-in capital are allowed to participate in an underwriting organisation. At the end of June 1989 there are four types of securities - equity shares, warrants, debt securities, and beneficiary certificates - that are permitted to be listed on the Exchange. Although there are three types of underwriting systems available, most underwriting in Korea is done on a firm underwriting basis, meaning that underwriters make outwright purchases from the issuer of securities to be offered to the public. When a corporation intends to delist its securities, it

must submit a delisting application to the KSE with the minutes of the general shareholders meeting reflecting the resolution to delist. The KSE may, however, reject an application for delisting in cases where the corporation does not fall under the delisting criteria. At the same time, the KSE may delist the securities of a listed corporation without an application at anytime the corporation falls under one or more of the delisting criteria. If the KSE intends to delist securities, it must first apply for an approval from the SEC.

(2) Trading system: There are two secondary markets in Korea, the Over The Counter (OTC) market and the KSE. The KSE market is conceptually divided into three areas of stock market, investment trust market and bond market. Equities listed on the KSE are divided into two major sections. A new lising is always initially assigned to the second section. The main difference between the first and the second section is that margin trading is not allowed in the latter. When equity shares in the second section meet some requirements, they are transfered to the first section, but if a listed company fails to maintain all the criteria, its shares will be transfered back to the second section.

The Entrust Contract Rules of the Exchange stipulated under the SEL provides items with which member firms are obligated to comply in the opening of accounts and receiving orders from their customers. All orders are transmitted directly and individually to the floor of the KSE through the Computerised Order-routing System. The Stock Market Automated Trading System(SMATS) was introduced on 3rd March 1988, following a pilot run. The system, developed to cope with the ever-increasing number of listed companies and trading volume, is designed to replace the traditional manual handling of orders by the electronic execution of orders. When a member firm keys an order into the order-routing terminal in its offices, the order is fed directly into and recorded in the files of the system by issue, price, and time of order. Then, a table of orders per issue is generated on the screen of the system monitor for order-execution installed at the

trading post on the floor of the KSE. If the order can be executed in accordance with trading rules, an KSE employee presses the appropriate funtion key and the order is automatically matched. When the transaction is consummated, the system automatically feeds the result back to the originating firm.

(3) OTC market: Securities are transacted not only on the Stock Exchange, but also on the Over-The-Counter market. The Article 194 of the SEL regulates transactions, methods of payments, and other requirements of the OTC market. The OTC market has no special organisation. Since it has no designated place or facility, transactions can be done anywhere. As a result, individual investors have difficulty obtaining detailed data and information owing to a variety of obstacles in and finding their partners.

Most of the stocks transacted at the OTC market are unlisted stocks which do not meet the listing requirements of the Exchange, and take on high risk for the investment. The differences between the Exchange and the OTC market can be summarised as follows.

(Table 2.1) Comparisons between the OTC market and the Exchange.

	OTC market	Stock Exchange
1.Place of transaction	Sponsoring companies	KSE
2.Method of transaction	Relative bargain	Auction
3.Price of transaction	Multi-prices	Single price
4.Objects of transaction	Registered stocks	Listed stocks
5.Participants of transaction	Investors, & securities companies	Securities co.s
6.Period of settlement	One working day	Three days
7.Entrustment deposit	100%	40%
8.Brokerage commission	0.4%	0.4% or less
9.Securities transaction tax	0.5%	0.5%

(Source) Daewoo, May 1989.

(4) Stock Index: The KSE publishes the Korea Composite Stock Price Index(KCSPI) daily, which is an index of all equities

listed on the KSE. On 4th January 1983, the method of computing the index was changed from the Dow Jones method to the aggregate value method. In the new method, the market capitalisation of all listed companies is aggregated and this aggregate is expressed as a percentage of the aggregate market capitalisations of all listed companies as at the base date (the first trading day of 1980). The computation formula for the index is as follows:

$$\text{Index} = \frac{\text{Current aggregate market value}}{\text{Base aggregate market value}} \times 100$$

The KCSPI is supplemented by section indexes, 34 industrial sub-group indexes, and indexes based on capital stock size. The section indexes are composed of the first and the second section index. The indexes based on capital stock include three indexes for small companies, medium-sized companies, and large companies. All indexes are calculated and published every 20 minutes each trading session (KSE 1989).

(5) Brokerage commission: The KSE discontinued fixed commission schedule and introduced a negotiable commission system on 11th July 1988. However, all brokers currently apply similar rates, ranging from 0.2% to 0.4%, depending on the total trading value on the same day for the same issue for the same client. The commission rate for odd lots of less than ten shares is in the 0.6% range and determined by the same way. The commission for bonds is applied by the securities company in the range of 0.3% of the sales value.

(6) Daily price change limit: The KSE relies on the daily price change limit based on the previous day's closing price to counteract temporary imbalances in supply and demand and to avoid a sudden wide fluctuation of the share prices. The daily limit, however, does not apply on the first day of shares going ex-dividend or ex-rights or being newly listed. The daily price limits in 1970s were between 5%-13%, scaled on the previous closing prices. After revising this limit scale several times,

the current daily price change limit of shares is divided into thirteen grades, except for issues designated as 'supervised' or 'administered'(as of October 1989). The limit is halved for supervised issues while administered issues are subject to their own price limits of 50 won if the market price is less than 5,000 won and 100 won if 5,000 or more. The daily price limit does not apply to bond trading, except for those of convertible bonds and bonds with warrants.

(Table 2.2) Daily share price change limit (Oct. 1989)

Previous Close	Limit	Previous Close	Limit
less than 3,000	100	30,000 - 39,999	1,300
3,000 - 4,999	200	40,000 - 49,999	1,600
5,000 - 6,999	300	50,000 - 69,999	2,000
7,000 - 9,999	400	70,000 - 99,999	2,500
10,000 - 14,999	600	100,000 -149,999	3,000
15,000 - 19,999	800	150,000 or more	4,000
20,000 - 29,999	1,000		

(7) Securities taxation: Under the provisions of the Income Tax Law, securities taxation is related only to interest and dividend incomes as there are no taxes on capital gains which accrued from the Korean securities market for resident-investors. The taxation of non-residents depends on whether they have so-called 'permanent establishments' in Korea. According to the Foreign Exchange Control Act, non-residents must have operated or worked in Korea for more than six months to obtain permanent establishment.

Investors must include dividends and interests received in principle, regardless of the type, in their gross income. However, the government gave tax previleges to small shareholders, shareholders of listed companies, small investors using their real names to encourage savings and the development of the securities market. These tax beneficiaries are exempted or subject only to a 10% final withholding tax, whereas the others are subject to gross income tax at the end of a tax year as well

as 25% withholding tax. A corporation (individual) who is liable for corporate tax (income tax) in Korea is subject to a residence tax at the rate of 7.5% of its corporate tax (income tax). In addition there are two temporary special taxes of defence tax and education tax which are due to expire in 1990 and 1991 respectively. Education tax is 5% of interest income and dividend income which are liable to a final withholding tax off 10%. Corporations are exempted from education tax. A corporation with a chargeable income of of less (more) than 500 million won in a business year is subject to the defence tax at the rate of 20% (25%) of its payable corporation tax. An individual with an income of less (more) than 8.4million won in a tax year is subject to defence tax at the rate of 10% (20%) of his income.

Effective from 1979, a securities transfer tax is levied on the seller of securities at the base rate of 0.5% of the sales value. There are some exemptions as follows.

- all the listed shares whose market value is lower than par value of 5,000 won,
- the government or local government entity,
- underwriters involved in transfer of shares resulting from their underwriting within six months from the date thereof,
- investment trusts management companies,
- securities companies transferring shares to securities savings,
- foreign investment institutions under the Foreign Exchange Control Act (KF, KEF).

(Table 2.3) Interest, dividend income tax on minority shareholders or minority corporate bondholders

	Real name	Street name
Income tax	10%	20%
Education tax	5	5
Defence tax	1(2)	2(4)
Residents' tax	0.75	1.5
Total	16.75(17.75)%	28.5(30.5)%

(Note) Figures in parenthesis indicate the case where interest, dividend income taxes go over 8.4million won.

2.2.3 Shareownership.

The KSE publishes the shareownership biannually on the record book basis by type of investors and size of shareholdings. During the last three years, the number of individual investors increased over six times to 8.51 million, or about 20% of the total population, at the end of 1988. The number of shares held by individual investors increased to 71.8% of total listed shares from 52.49% in 1985. This sharp gain was mainly due to the increase in new listings, public offerings of government-owned enterprises, and employee share owner scheme.

(Table 2.4) Percentage of ownership by shareholders

	1985	1986	1987	1988
a.Government & Gov't owned corp.	0.42	0.16	0.12	1.39
b.Banking institutions	7.10	7.41	6.00	6.89
c.Securities companies	7.35	6.72	2.63	3.14
d.Insurance companies & others	30.01	30.27	25.59	14.14
e.Foreigners	2.63	3.01	3.31	2.65
f.Individuals	52.49	52.43	62.35	71.79
Total	100.00	100.00	100.00	100.00

(Source) KSE 1989.

2.3 Disclosure system.

Corporate disclosure provides the general public investors with complete and precise information on the relevant company's business performance and financial conditions to let them make the right investment dicisions. It enables fair price formation through the rationalisation of investment decision-making by providing proper information to the investors. In order for the disclosure system to function efficiently disclosure materials should be complete and precise, up-to-date, and easy for the investors to use. And for it to be easy to use they should be easily accessible to them and easy to understand. Also they must be widely dispersed (KSDA 1988).

According to the Securities and Exchange Law, the required disclosure materials are registration statements and prospectus in the new issues market, and the annual report, semi-annual report, and non-periodic report (when necessary) in the trading market.

2.3.1 Disclosure in the New Issues Market.

The registration statement and the prospectus are important basic means of disclosure in the new issues market. The registration statement which is submitted to the SEC includes a wide spectrum of indispensable information about a company wishing to make a public offering, for example, the outlook for the company, description of the public offering, proposed use of the funds raised, CPA's audit opinion, and other matters related to financial statements. The prospectus, which is provided to the public, is designed to prevent securities brokers and dealers from the fraudulent practice of selling shares by giving investors faulty information.

2.3.2 Disclosure in the Trading Market.

The continuous disclosure in the trading market provides the public with information about corporate action or development affecting share price, investment decision, or other matters of significant interest to shareholders. It is indispensable for the protection of investors and enables the Exchange to efficiently perform its function of maintaining a fair and orderly market.

(1) Periodic Reports.

In accordance with the Securities and Exchange Law, a listed company shall submit to the Exchange and the SEC an annual report within 90 days following the close of the business year and a semiannual report within 45 days following the first half of the business year. These reports include the general condition and a

brief history of the company, business conditions, and financial statements with a CPA audit opinion. The Exchange must keep and make all such reports available to the public for a period of two years.

(2) Contingent Disclosures.

Contingent disclosures can be classified into three categories, direct disclosure, indirect disclosure, and disclosure by inquiry.

A direct disclosure means that a listed company provides corporate information directly to the investing public through the broadcasting facilities for the dissemination of market information. In this method, the Exchange may tape-record the details of information given to the Exchange by telephone and announce them on behalf of the company.

An indirect disclosure is the dissemination of reported information through the means of the daily official list or the Market Information Service System. This information can be reported to the Exchange either by telephone or in writing.

A disclosure by inquiry results when news or rumors about a listed company cause or might cause unusual market activity or a substantial price change in the securities concerned. In such cases, The Exchange request the company concerned to provide de facto information about the news or rumor.

2.4 The development of the Korean securities market.

The Korean securities market has matured and expanded considerably over the past several years. Among the major driving forces have been the excellent performance of the Korean economy and the expected internationalisation of the securities market. As a result, a growing number of international investors view it

as one of the most attractive markets around the world.

The Korea Stock Exchange was established in 1956, but initially it was mainly a market for government bonds, rather than for corporate stocks. However, the Securities and Exchange Law was enacted in 1962 and the Korea Stock Exchange was reorganised as a corporation because the government sought to foster trading in corporate shares and bonds. Since then the government has taken a number of policy measures to develop the capital market. This effort was aimed at expanding corporate financing through the capital market and at providing high quality corporate securities to investors.

In spite of these policy measures, the development of the securities market in the past has lagged behind the country's rapid economic development. The reasons for this lethargy include
a) poor corporate performance during the economic recession following the second oil shock,
b) the volatility of stock prices, and
c) the fact that other financial assets and property investment have been more attractive as a result of the deregulation of the financial institutions and the high inflation until 1983. In 1983, the government released 'Measures for the Reinforcement of Capital Market Function'. This was intended to revitalise the market which had down-trended since 1979. Since then, public offerings, in addition to secondary offering by listed companies, have shown increasing strength. Helped by high economic growth and measures to encourage corporations going public, the number and market value of listed companies have increased rapidly since 1983.

Virmani(1985) examined the pattern of the proportion of stocks issued and held by corporations from 1975-82. The former was 75% and 79% at the two end points while the latter was 17% at both points. The proportions of stocks held by individuals also shows similar patterns, but increased from 58% in 1975 to 63% in 1982. However, the importance of stocks in the individual

portfolio declined from 25% of total assets in 1975 to 16% in 1982.

However, huge increases in the demand from individual and institutional investors and the supply of new shares during past several years have led to a substantial increase in market capitalisation. The number of listed companies increased from 48 in 1970, to 502 in 1988 and the total market value as a percentage of GNP was 9.0% in 1985; it increased to 26.3% in 1987 and 57.8% in 1988.

One hundred and thirteen firms went to the public in 1988, raising aggregate funds of W1,049bn. Total funds of W7,770bn were raised through new issues, including rights offerings in 1988. This was over four times the amount raised in 1987. The privatisation plan, which included the Pohang Steel & Iron Company (Posco), contributed a huge increase in funds through the stock market. The Korea Electric Power Corporation (Kepco), floated in June 1989, advanced the total market value further.

By the end of August 1989, the Korean stock market capitalisation amounted to 94 trillion won or US$ 141 billion, and a total of 567 firms were listed on the KSE. The market has already joined in the world's ten largest markets, and seems destined to become the second largest market in Asia, in terms of market capitalisation.

The total amount of public and corporate bonds listed on the Korea Stock Exchange increased sharply from W26.7bn in 1970 to W2,544.7bn in 1980 and reached W33,680bn at the end of 1988. Trading value increased from W890bn in 1980 to W8,545bn in 1988. However, the private sector suffered considerable difficulties in raising funds through the issuance of corporate bonds from 1987, due to the massive flotation of government bonds to absorb excess liquidity. The overloaded underwriting of Monetary Stabilisation Bonds by non-bank financial institutions, which are major corporate bond buyers, reduced their capacity to underwrite

corporate debt securities in the capital market.

(Table 2.5) Corporate funds raised through securities market
(in mil.won)

Year	Stocks			Corporate bonds	Total
	New	Outstand	Offering		
1976	40.559	33,445	101,941	86,280	262,225
1978	23,777	17,744	285,201	326,340	653,062
1980	345	-	170,803	963,700	1,134,848
1981	3,045	-	302,996	1,036,148	1,342,189
1982	-	-	274,242	2,093,186	2,367,429
1983	20,800	1,000	431,769	1,426,524	1,889,093
1984	81,190	200	397,672	1,804,063	2,283,125
1985	33,860	1,200	259,528	3,176,744	3,471,332
1986	33,360	9,700	797,705	2,728,871	3,569,636
1987	197,714	46,049	1,654,950	3,189,617	5,088,330
1988	554,115	495,316	6,720,644	4,244,320	12,014,395
1989 July	527,149	1,402,876	6,634,883	3,831,640	12,396,548

(Note)
New: Public offerings of new securities before listing.
Outstand: Public offerings of outstand securities before listing.
Offering: Offerings by listed companies.
(Source) KSE, Yearbook, various issues.

Reflecting the active securities market during several years, the securities industry has enjoyed exceptional profitability and capital growth, and witnessed significant deregulation. Due to the amendment of the SEL in November 1987, 25 investment management companies were established during 1988. By the end of September 1989 the number of branch offices of the securities firms had increased to 601 from 231 in 1983, and manpower had grown up to 19,280 from 4,816 in 1980. Under such favorable conditions, fiscal year 1988 (the end of March 1989) saw total profits for 25 member firms climbed to over 1.96 trillion won, increasing 78.3% over the year before(KSE 1989).

Against such stunning growth, non-resident investors or securities houses have been eager to participate in the local bourse, but with no winning causes. However, under the new plan of securities market internationalisation which was announced in

December 1988, foreign securities houses will be authorised to establish branch offices in Korea, or to set up brokerage houses jointly with Korean entities in 1991. Starting in 1991, proceeds from the sale of underlying shares of Korean overseas convertible bonds can be used to purchase domestic shares. Then in 1992, foreign investors will be allowed to invest directly in Korean securities on a limited basis.

(Table 2.6) Key statistics of Korea Stock Exchange, 1963-89

Year	NC	NSH	MV	%GNP	Turnover	Index
1963	15	15	10	-	259	-
1965	17	15	15	-	165	-
1970	48	76	98	3.6	46	-
1975	189	291	916	9.1	48	89.73
1978	356	963	2,893	12.1	66	144.86
1980	352	753	2,527	6.9	44	106.87
1981	343	696	2,959	6.6	86	131.37
1982	334	682	3,300	6.5	66	127.71
1983	328	708	3,490	5.9	54	121.11
1984	336	723	5,148	7.8	74	142.46
1985	342	772	5,570	9.0	66	163.37
1986	355	1,411	11,995	13.2	107	272.61
1987	389	3,102	26,172	26.3	105	525.11
1988	502	8,541	64,544	57.8	124	907.20
1989 July	547	-	70,804	65.7*	126*	895.66

(Notes)
NC: Number of listed companies.
NSH: Number of shareholders (1,000s).
MV: Total market value (billion won).
%GNP: Total market value as a percentage of GNP.
Turnover: Turnover as percentage of market value.
Index: Korea Composite Stock Price Index (4th Jan. 1980=100).
*: Annualised ratios.

(Table 2.7) Key statistics for listed bonds (* in million won)

Year	No	Listed Amount*	Sales-Volume*	Sales-Value*
1968	6	740	32	26
1970	35	26,714	4,216	3,579
1975	344	220,033	16,658	13,518
1980	1,234	2,544,669	910,701	889,876
1985	3,728	12,001,032	3,778,913	3,578,092
1986	4,408	17,112,567	3,221,722	3,166,853
1987	5,167	25,006,704	7,595,466	7,238,335
1988	5,089	33,680,051	8,994,110	8,545,305
1989 July	5,399	41,299,074	3,360,316	3,212,288

2.5 Internationalisation of the capital market.

The Korean capital market is undergoing a process of expansion, liberalisation and internationalisation. A formal liberalisation plan of the Korean capital market was started in 1981. In January 1981, the Korean Government announced its Capital Market Liberalisation Plan, which specified four stages of gradual movement toward full integration of the domestic and international capital market. However, the economic environment surrounding Korea has changed substantially. In December 1988, therefore, the government unveiled its revised plan for liberalising the capital market.

The original purpose of Korea's revised liberalisation plan was to open the capital market gradually to international investors, specifically designed for its economic conditions, and to avoid any kind of rapid opening which would completely expose a vulnerable, immature and fragile securities market. This case was observed in the Southern Cone countries of Latin America (Uruguay, Chile and Argentina).

Up to 1985, Korea experienced chronic deficits in its balance of trade account. When the capital market liberalisation was announced, Korea was experiencing an extraordinarily high current account deficit, almost entirely financed by reliance on borrowing from foreign banks. However, supported by three consecutive surplus years from 1986, Korea no longer needed to open capital markets radically in order to induce foreign capital inflow. Moreover, high domestic interest rates and continuing currency appreciation facilitated the capital influx from abroad, fuelling fears of inflation. These lessons were learned over several years and induced the government to revise the original plan (Daewoo 1989b, Koh and Res 1989).

2.5.1 The original plan in 1981.

(1) Stage 1 (1981-84): Preparatory phase

International investors were allowed to invest indirectly in Korean Securities, such as a closed-end fund and domestically managed unit trusts. In addition, foreign securities houses were given the licences to set up representative offices in Korea and domestic securities houses were encouraged to implement reciprocal advancements in the major international financial centres. For the upcoming market opening, the groundwork has already been established by the legal framework, personnel training and computerised trading system.

(2) Stage 2 (from 1985): Limited liberalisation

The limited allowance of direct portfolio investment by international investors and the issuance and listing of Korean securities in international capital markets.

(3) Stage 3 (late 1980s): Further liberalisation

The relaxation of limits on direct foreign investment in domestic securities allowed domestic corporations to raise equity funds in external markets with the prior approval of the Ministry of Finance. It also permitted foreign securities houses to conduct capital market business in Korea, and domestic securities houses to conduct overseas business.

(4) Stage 4 (early 1990s): Complete liberalisation

This stage will implement the full liberalisation of the Korean capital market by allowing Korean investors to invest in international capital markets and by permitting international securities to be listed in the Korea Stock Exchange.

2.5.2 Recent progress.

In line with capital market liberalisation, foreign trade and foreign exchange transactions have been substantially liberalised to make the economy more competitive. As McKinnon and Shaw suggest, financial liberalisation could produce the optimal result of maximising investment and raising the average efficiency of capital investment (Koh and Res 1989).

(Table 2.8) Progress in capital market internationalisation

Year	Month	Remarks	Amount(US$mil.)
1981	November	Korea International Trust	25
		Korea Trust	25
1984	May	Korea Fund	60
1985	March	Korea Growth Trust	30
	April	Seoul International Trust	30
		Seoul Trust	30
	December	Korea Small Companies Trust	2
		Samsung Electronics CB issued	20
1986	March	Korea Emerging Companies Trust	3
	May	Daewoo Heavy Industry CB issued	40
	June	Korea Fund capital base increased	40
	July	Yukong CB issued	30
1987	March	Korea Europe Fund	30
	August	Gold Star CB issued	30
1988	June	Korea Europe Fund capital base increased	30
	October	Saehan Media CB issued	30
1989	August	Korea Fund capital base increased	60
	October	Sammi Steel BW issued	50
1989	December	Suhtong CB expected	30
1990	January	Dong-Ah Construction Industial CB expected	50
		Total	645

(Source) Ministry of Finance, Dongsuh Securities.

Permitting foreign portfolio investment in Korea was expected to boost the demand for domestic securities, which had remained sluggish during 1979-80.

Since the liberalisation plan was set forth, seven investment trusts, two closed-end funds, six convertible bonds, and one bond with warrant issue were launched. The seven

investment trusts are managed by domestic investment trust companies, but the size of the trust cannot be increased without approval from the government. The closed-end funds (Korea Fund and Korea Europe Fund) are listed on the New York and London Stock Exchanges respectively. The Korea fund is managed by Scudder, Stevens and Clark and the Korea Europe Fund is managed by Korea Schroder Fund Management Ltd. All the Korean issues have been very successful and they are now traded with large premiums. It reflects the combined effect of the increasing interest of foreign investors in the Korean market at present, the higher expected profits of Korean companies in the future, as well as an expectation that the market will remain closed to foreign direct portfolio investment for a considerable period.

(Table 2.8) Investment in Korean securities from abroad

	*(US$m)
International trust funds (7)	145
Korea Fund	160
Korea Europe Fund	60
CBs issued / expected abroad(7)	220
BW issued abroad(1)	50
Total	645

*Value of the initial offerings.
Source: Ministry of Finance

The methods of fund raising became increasingly diverse in the domestic capital market. In addition, domestic corporations were able to carry out mobile financing in the international capital market. By the end of Sept. 1989, five convertible bonds had been floated on the Euromarket and were traded actively with high premiums of 30 - 115%. The first equity warrant issue in the international market was issued in October 1989 by Sammi Steel Corporation Ltd., with Dongsuh Securities Co Ltd. and Merril Lynch acting as lead managers.

(Table 2.10) Performance of Funds, Trusts, and CBs

	NAV(US$) or CB price	%Change			
	31 August 1989	1 month	6 month	12 month	Since issue
Korea Fund	19.22	16.7	11.6	57.8	416.7(08/84)
Korea Europe Fund	27.56	15.6	10.3	58.4	165.0(04/87)
Korea Int'l Trust	66.37	13.0	9.0	60.0	709.9(11/81)
Korea Trust	79.91	12.3	12.7	69.6	571.2(11/81)
Korea Growth Trust	46.27	12.7	12.9	55.0	406.6(03/85)
Seoul Int'l Trust	46.34	9.5	10.7	56.8	398.3(04/85)
Seoul Trust	44.83	7.2	3.2	56.4	253.3(04/85)
Samsung Elec. CB	970%	15.5	74.8	203.1	870(12/85)
Yukong CB	350%	15.7	48.9	118.8	250(07/86)
Daewoo H.I. CB	665%	35.0	72.7	189.1	565(05/86)
Goldstar CB	195%	17.1	19.6	85.7	95(09/87)
Saehan Media CB	185%	23.3	42.9	-	85(09/88)
KCSPI	975.28p	8.9	6.3	46.8	

(Notes)
Adjusted to show % change in US dollars.
NAV: Net asset value.
CB price: All percentage growth rates are based on mid prices.
(Source) Daewoo Sept.1989

2.5.3 The revised plan in 1988.

The government revised the original plan of 1981 and stated that by 1992 the domestic capital market would expand and be mature enough to take on a massive inflow of foreign capital on a limited basis. Before opening the market in the target year 1992, all the necessary preconditions for the capital market liberalisation could be met. The timetable for liberalisation is as follows.

(1) Preparation for the eventual international market opening (1989)

- Increase the number of listed companies in both the Korea Stock Exchange and over-the-counter, promote the role of institutional investors, and induce new investors from all strata of the society.

- Deregulate the securities industry and strengthen the role of the Securities Supervisory Board.
- Diversify indirect investment vehicles and expand the size of existing funds and trusts.
- Ease domestic firms' eligibility requirements for issuing overseas securities and allow firms to use the proceeds domestically
- Increase the maximum equity stakes of foreigners in domestic securities companies.

(2) Preparation for the eventual international market opening (1990).

- Continue to expand and develop the domestic securities market.
- Establish the so-called matching Fund, to be invested in both foreign and domestic securities and to be sold to both domestic and overseas investors.
- Allow Korean convertible bond holders to convert, sell, and invest the bonds in the domestic securities market.
- Allow foreign brokers to upgrade the status of their representative offices to branches and set up joint-ventured securities houses.

(3) The second year (1992).

- Allow foreigners to invest with capital other than the proceeds from the sales of converted equity.
- Increase the number of domestic brokers participating in international securities business.
- Allow individual domestic investors to purchase overseas securities on a limited basis.

To make Korean equities more acceptable to the international investors, they should be more acceptable domestically. Measures which Korea ought to consider now to strengthen the domestic capital market to facilitate greater foreign and domestic portfolio investment include :

a) Issue price should be determined by the level and quality of earnings, not by par value. Since par value reference pricing has no economic significance, the government should discourage it (World Bank 1988). Even though issue-at-market price system was introduced in the Korean stock market recently, the discount rate is relatively high. Around 95% of the market price is recommendable. Dividend should be determined flexibly on the basis of corporate profits and investment needs.

b) For the preparation of opening the market, the overall size of the market should be expanded and domestic demand should be enhanced. The possibility of market volitility trend from large capital flows should be reduced. For this purpose, more blue chip shares should be listed. On the demand side, regulations preventing domestic institutional investors from investing in equities should be relaxed. The percentage of institutional investor such as pension funds, insurance companies and investment trust companies in Korea is low at under 30% in 1988. Public education as to the role and advantages of securities can also be useful in enhancing demand.

c) The securities industry should be released from the government's interventions, and fair and rational trading rules should be strengthened. Additional regulatory measures are necessary in more standardised accounting practices, more competitive underwriting procedures, and stronger investor protection measures.

d) To alleviate the bias against equity further government efforts are needed to promote the use of non-guaranteed bonds. The use of credit ratings should also be promoted so as to bring about more efficient pricing relative to risk and increasing corporate financial discipline.

2.6 Conclusion.

It is worth emphasising here that the risks associated with lifting restrictions on capital movements in and out of Korea in

order to facilitate foreign portfolio investment can be increased. Thus complete or immediate liberalisation of capital market will not be necessary to attract greater amounts of equity inflows. Partial and selective liberalisation should suffice. Moreover, the liberalisation plan of the Korean capital market has to be balanced with the overall economic liberalisation policy, including trade and foreign exchange. As for general financial deregulation, entry of new financial intermediaries should be gradual and interest rates for loans could be freed immediately. Many economists would agree that the capital market should not be opened until current account transactions and domestic financial markets are deregulated (Park 1987). Emphasis and concern is also placed on the difference in the speed of adjustment in the asset and commodity markets.

Portfolio investments are flexible and portfolio decisions can be easily changed, whereas because of time lags, the structure of production, investment and trade adjusts slowly to new arrangements. If the capital market is opened first, therefore, portfolio decisions are likely to be consistent with the undistorted condition in the long-run, whereas. because of trade restrictions, real investment decisions will be distorted. In addition, the allocation of windfalls from the liberalisation of the capital market has to be borne in mind.

Due to the considerable increase of share prices in the process of capital market liberalisation, portfolio investors receive disproportionate benefits and only eligible companies of overseas fund raising have the opportunities to finance at the cheaper rate than the domestic financing. It is desirable, as Mahler(1988) suggested, to introduce capital gains tax on securities transactions gradually to parallel income distribution nationwide, and the opportunities of financing in the international financial market have to be expanded to additional corporations. The risk of losing control over domestic assets through foreigners' portfolio investment can be removed by restricting such investment to a class of non-voting shares or by

imposing percentage ceilings by listed company or industry.

In summary, a major theme of this chapter has been that internationalisation plan of the Korean capital market should be gradual and balanced with general economic conditions. Several measures were recommended to enhance the functions of domestic securities market. In this way Korea would take a positive step towards the model of capital market liberalisation.

Chapter III. COMPARATIVE ASPECTS OF CAPITAL MARKET DEVELOPMENT AND LIBERALISATION IN THE FAR EAST.

3.1 The changing world capital markets.

The world capital market has been transformed in important ways due to a sharp acceleration in the pace of innovation, deregulation and structural changes in recent years. Major new financial instruments which are mostly taking the form of off-balance-sheet commitments have either been created or have dramatically increased their role in the financial structure. Traditional demarcation between different financial institutions are steadily being eroded and in the process, the financial systems are becoming less structured. Financial institutions are broadening the range of services offered and a trend towards the concept of financial conglomerates is emerging. International credit flows have shifted away from loans through large international financial institutions into direct credit markets. The volume of daily transactions has multiplied. Capital markets have become far more closely integrated worldwide(BIS 1986, Becketti and Sellon 1989).

3.1.1 Deregulation and liberalisation.

Financial deregulation or liberalisation includes both external and internal liberalisation. External liberalisation generally entails opening up domestic financial markets to international financial flows, removing exchange controls, eliminating barriers to the entry of foreign financial institutions, and so on. Internal financial liberalisation refers to the reforms leading to a freer functioning of the domestic credit controls relating to credit rationing, interest rate ceilings, and differenciated reserve requirements. Also the elimination of discriminating practices and capital requirements that drastically curtail the free entry of local participants into the domestic market is included (Blejer and Sagari 1988).

The deregulation or liberalisation in financial markets around the world has been advanced on an unprecedented scale. Financial institutions and market structures have been reshaped to lower the cost of serving customer demands for financial services. And product lines of traditionally heterogeneous financial institutions are rapidly fusing into a homogeneous blend. New regulatory policies have been introduced gradually in order to allow the various sectors of the financial system sufficient time to adjust to the new financial market environment as well as to changing macroeconomic conditions.

The result of financial deregulation was the weakening in the competitive position of regulated financial institutions relative to unregulated financial institutions and direct financiers. This led simultaneously to a reduction in the ability of the monetary authorities to control the growth of total financing and a growing perception amongst regulated institutions that the costs of regulated status outweighed the benefits. The speed and spread of financial deregulation and liberalisation has been different from country to country due to the differences in the old statutory framework.

The relaxation of financial regulations from the standpoint of legislation continues; movements within the scope of regulations on the part of the banks into different areas of business and aggressive moves into banking from other fields of business have become apparent, and there has been a trend towards homogeneity of the banks, securities houses, insurance companies, retailers etc. as well as towards an ever-expanding grey area.

3.1.2 Securitisation.

The securitisation of the liabilities of households and business is spreading very rapidly. The selling of whole loans and participations dates back to before the 1880s, but securitisation is a recent innovation in asset sales (Pavel 1986, 1989). It involves the direct issuance of securities or the

packaging of 'conventional' loans by banks and other intermediaries for sale to the market in the form of some kind of a pass-through or other security. Like whole loan sales, securitisation provides an additional funding source and may eliminate assets from a loan orginators balance sheet. Unlike whole loan sales, however, securitisation is often used to market small loans that would be difficult to sell on a stand-alone basis.

Since the debt crisis, international finance has been transformed in a number of fundermental respects. Markets for syndicated bank loans and international bonds have become increasingly segmented for developed and developing country borrowers, reflecting differences in their creditworthiness. International bond markets have grown in stature relative to the syndicated loan market as commercial banks slowed their international lending to reduce concentrations of credits, and industrialised country borrowers increasingly turned to bond finance. Increased uncertainty and volatility in the current economic environment and stiff competition in international finance have encouraged the development of instruments that are more liquid and flexible than traditional bank loans and whose price is more stable than fixed-rate bond issues.

As a result, international financial markets have become increasingly 'securitised' in the 1980s, in that a much wider array of readily marketable instruments is now available and being utilised. The sector experiencing the most rapid growth has been Eurodollar floating-rate notes (FRNs) (Bank of England 1987). Floating-rate notes have been able to satisfy certain needs of both lenders and borrowers during periods of high and variable interest rates, unstable macroeconomic conditions, and uncertainty about the future trends in interest rates and inflation. Note Issuance Facilities and other backup credit facilities have also been developed to attempt to combine some of the charracteristics of the traditional syndicated loan with those of a floating rate note. Also the topic on debt-equity

swaps is still actively discussed (Blackwell and Nocera 1988, Helpman 1988, and Ramachandran 1988). However, after the market crash in October 1987, the speed and spread of securitisation is diminishing.

Domestically, securitisation is most fully developed in the USA. It is a means to obtain finance at a lower cost, given the downgrading of their own securities by the rating agencies. It can also be seen as a response to tougher capital requirements on the part of supervisors. The depth of securities markets in the USA is also an important factor. In the absence of one or more of these factors in domestic markets elsewhere-particularly a lack of depth of securities markets - the trend towards securitisation has been weaker. Also the commercial paper market has played a major role in the process of securitisation in the USA. Commercial paper markets are being established in other countries, including UK, West Germany, France, Netherlands and Japan. Internationally the trend toward securitisation is being enhanced by the growth of the Euro-Commercial paper market (Pavel 1986)

The convertible bond, warrant and zero-coupon bond are recent and successful additions. Also several types of loan-backed securities have been introduced. Pass-throughs, mortgage-backed bonds, pay-through, certificates of automobile receivables (CARs), certificates of amortising revolving debts (CARDs) are also new types of securitisation of bank loans. Growth has also been marked in the area of options, futures and swaps on financial and stock market instruments (Ayling 1986 p.110). Securitisation largely entails disintermediation, and requires services supplied by investment banks, such as placing and underwriting.

Securitisation has already begun to change the financial services industry. It has enhanced the flow of credit, changed the way firms manage their portfolios, and increased the number of firms that compete for commercial and retail customer

financing.

3.1.3 Globalisation.

The generic term 'globalisation' is used to refer to the expansion of money and capital market 'without borders' which has become clearly apparent since the beginning of the 1980s. Money and capital markets first expand as domestic markets, but as the internationalisation of the real economy proceeds, with increasing trade transactions and direct investment abroad, portfolio investments abroad also gradually become active. The factors behind promotion of globalisation are as follows (Llywellyn 1985, Ayling 1986, BIS 1986, Nikko 1988).

a. Expanding international payments imbalance.
b. Pursuit of more favourable sources of funds and targets of investment.
c. Worldwide financial deregulation and internationalisation.
d. Progress of financial innovation.
e. Multinational clients.
f. Development of technology.
g. Increasing user sophistication.

The large banks and other financial institutions are expanding their business areas towards globalisation. This has been aided by improved communications, and merger and acquisition activities. Increasingly these institutions want to be able to serve all types of financial business in and out of every market place, at all times. The benefits of global services arise in more efficient allocation of available funds through the improved operation of the market mechanism, and increased liquidity for asset holders. But in the developing countries the market institutions are relatively new and inexperienced, cost is high and capital resources are low. Hence these developments may have had harmful effects on the financial institutions, investors, and even on the real economy.

3.2 Financial development in the Far East.

3.2.1 Finance and real growth.

Over the past two decades, the market economies of the Far East have experienced rapid development, together with even more rapid growth in international trade flows and economic interdependence. The market economies of Japan, Hong Kong, Taiwan and Korea over the past two decades exhibit three common characteristics: rapid economic growth, spectacular expansion of exports, and substantial increases in the rates of savings and investment. Commensurate with this strong economic performance has been the increasing role of domestic and foreign finance, and the accelerated development of financial institutions, markets and instruments.

The theoretical case for the role of financial intermediation in economic development generally is well understood. (Patrick 1966; Gurley and Shaw 1955, 1960, 1967; Goldsmith 1969; Khatkhate 1972; Shaw 1973; McKinnon 1973; Galbis 1977; Gupta 1984; and Dornbusch and Reynoso 1989). For most of the Far East Economies, financial development has been documented through national case studies, and also to some extent by cross country comparisons utilising pooled cross-section and time-series data. (The studies include: for Korea, Cole and Park 1983; for Japan, Otto 1961, and Patrick 1967, 1987; for Taiwan, Lee 1985; for cross-country studies, Fry 1978, 1985). Real economic growth goes hand in hand with an increasing amount and diversity of activity of financial institutions, markets, and instruments. Deepening of the financial structure, as measured by increases in ratios of different types of recorded financial assets to total assets or GNP (table 3.1) is a common, but not universal tendency, at least until high levels of income are achieved (Cole and Patrick 1986).

Table (3.1) Trands of FIRs in the Far East, 1970-1988

Year	Japan	Hong Kong	Taiwan	Korea
1970	3.69	1.14*	2.15	1.79
1975	4.00	1.62	2.84	1.44
1980	4.77	3.18	3.29	3.10
1981	4.93	3.84	3.23	2.64
1982	5.11	4.63	3.52	3.02
1983	5.48	5.37	3.66	3.82
1984	5.50	5.11	3.72	3.98
1985	5.75	5.97	3.88	4.26
1986	6.00	6.11	4.02	4.22
1987	6.81	6.28	4.31	4.35

FIR: Financial Interrelation Ratio = Financial Asset Balance/GNP in current prices.
*Figure in 1971.
(Sources)BOJ; ECONOMIC STATISTICS ANNUAL, various issues.
The Central BOC;; FLOW OF FUNDS IN TAIWAN DISTRICT, various issues.
Hong Kong Government: HONG KONG MONTHLY DIGEST OF STATISTICS, variouis issues.
BOK, ECONOMIC STATISTICS YEARBOOK, various issues.

3.2.2 Financial structure.

The main determinants of the size and structure of a financial system are the level of economic development, and the extent to which the system is relied upon to intermediate between savers and investors (Gurley and Shaw 1967). The financial systems of the Far East have been much shaped by history. Japan has a relatively wide range of financial intermediation covering the spectrum of risk and maturity of primary security issues.

General financial development in Japan is not radically different from, and in many respects similar to, that in the United States. However, despite Japan's growing importance in the industrial world and in international trade, the financial system remains highly regulated (Eken 1984; Suzuki 1986, 1987). Features of the system include,

a) a predominance of indirect finance through the banking system over direct finance,
b) controls on the quantity and distribution of credit and on

interest rates, which are generally below market clearing rates, c) a high degree of specialisation among financial institutions due to regulatory or market segmentation.

At the end of 1988, the Japanese financial system consisted of the Central Bank, 87 member banks of the Federation of Bankers Associations of Japan, 81 foreign banks, financial institutions for small-business, financial institutions for agriculture, forestry and fishery, 213 Securities finance institutions, 47 insurance companies, and public financial institutions (Bank of Japan 1989).

Hong Kong follows the British model of serving as an international financial centre, offering banking services to neighbouring countries. Foreign banks are very important. The banking sector in Hong Kong, as well as other financial services, consequently, are highly developed and produce a relatively large fraction of GDP for financial, real estate, and business services combined. At the end of 1988 Hong Kong's financial system consisted of the Exchange Fund, 131 commercial banks, 343 registered deposit-taking companies or finance companies, and 115 representative offices of foreign banks, as well as insurance companies, money brokers, and commodity, gold, and stock exchanges. There is no central Bank. Bank notes are issued by two of the commercial banks. The commercial banking systems in Japan and Hong Kong are predominantly privately-owned.

In Korea, financial institutions consist of the central bank, banking institutions, non-bank financial institutions and the securities market. Domestic and foreign commercial banks and 7 specialised banks compose the banking institutions. Non-bank financial institutions are 3 development institutions, 38 investment companies, many savings institutions and insurance companies. Direction and control of the financial system has had a significant role in the Government's development strategy in Korea. In the 1960s credit and interest rate policy was merely one among a host of tax, tariff, and import concessions to

exporting industries. With the reduction and elimination of some of these concessions in the 1970s, and the perceived need to change the structure of the economy, the financial system began by the mid-1970s, to have a much more central role in development strategy.

The structure of Korean financial regulation has three elements: the creation of new public and private financial institutions with specified limitations on the type of activities, the control of the level and structure of interest rates, and the direct and indirect credit allocation policies. This strong government intervention has been quite distortive in terms of allocation of credit; high leverage of firms and poor development of the equity market; high industrial concentration; and slow development of the financial sector (Wijnbergen 1983, Anderson 1983, Virmani 1985).

Table (3.2) indicates ratios and monetary and financial aggregates. M2 ratio is highest in Hong Kong, lowest in Korea. Japan has a relatively high currency ratio for a developed country because individuals and small businesses typically use cash rather than cheques as means of payment.

Securities comprise the largest part of total financial claims in Japan. The Taiwanese and Korean governments have made some efforts to develop capital markets, but the value of the securities outstanding still remains well under 55% of the GNP.

Table (3.2) Ratios of monetary and financial aggregates for the Far East, 1987(%)

	Currency	M1	M2	M3	Securities
Japan	8.7	30.8	108.7	172.2	134.7
Hong Kong	8.0	22.7	187.9	206.4	123.1
Taiwan	9.2	50.7	135.1	n.a.	50.7
Korea	5.0	10.4	41.3	94.4	52.4

(Notes)
a. The denominator is GNP for Japan, Taiwan and Korea, and GDP for Hong Kong.

b. Securities consists of the current market value of bonds and shares.
(Sources)
BOJ, Economic Statistics Monthly, June 1988
BOK, Monthly Statistical Bulletin, July 1988
CBOC,Financial Statistics Monthly, May 1988
CSD, Hong Kong Monthly Digest of Statistics, April 1988.

3.2.3 Financial reform and liberalisation.

The Far Eastern nations had informal, unregulated, traditional, market-determined financial systems before western penetration (Gurley, Patrick and Shaw 1965; Otto 1961; Patrick 1967). Governments issued coins and currency and engaged in some regulation, but financial activities, which in some countries came to be quite sophisticated, were predominantly outside regulatory control. On to this 'traditional' sector were grafted 'modern' financial institutions, predominantly through colonisation except for Japan (Emery 1984, Cole and Park 1983). Government policies to strengthen national economies, tighten regulation of the organised financial sector, and direct finance toward particular development objectives have had profound consequences for the structure and performance of the financial system in each country. Government owned specialised institutions and preferential allocation of cheap credit created segmented financial markets and market niches, especially in Korea and Taiwan (Tan and Kapur 1986).

In contrast, Hong Kong simply allowed easy entry in a competitive, market-oriented system. The Japanese government successfully created a privately owned commercial banking system very early in its modern development by providing government deposits and endorsing private banknote issues. One important feature of the financial system has been the emergence of large, family-owned financial and industrial conglomerates: Zaibatsu in Japan, Chaebol in Korea, and ethnic Chinese family networks in Hong Kong and Taiwan (Johnes and Sakong 1980, Cole and Park 1983, Yung 1985, Yoo and Lee 1987).

The unregulated financial market is large and still plays an important financing role in Korea and Taiwan, and in Japan to a lesser extent. The relative importance of the unregulated sector is greater the less developed the economy and the more repressed the regulated banking and financial system. There is little data available on the unregulated sector and it is difficult to obtain the exact size of the market and prevailing interest rates (for Korea, Cole and Sakong(1985) or Cole and Park(1983), and for Taiwan, Kohsaka(1984), and for Japan, Patrick(1966). As economic development has brought financial deepening and a build-up of financial assets, distortions in the credit markets due to excessive regulation have become more apparent (in Korea, Taiwan, and Hong Kong). Various policies have been introduced to overcome the regulatory obstacles through financial liberalisation and, more recently, deregulation.

Financial liberalisation was implemented in the 1950s (Taiwan) and 1960s(Korea), defined and given academic respectability by McKinnon and Shaw in the early 1970s, and taken up as the new orthodoxy by the IMF and World Bank in the 1970s and early 1980s. The newly emerging economic strength of these nations has given rise to a wide range of changes in their financial systems (Royama 1985; Suzuki 1986). After the oil shocks, the general economy in the Far East shifted to lower growth. In the course of economic development, the old statutory financial framework was no longer suitable for the changed international environment. The new economic realities require deregulation, following the US and UK example, and financial structure in these countries has been shifting to liberalisation of interest rates and foreign exchange.

This policy shift has blurred the boundaries of institutional specialisation, narrowed the spreads between interest rates of regulated and unregulated markets and led to greater integration of previously segmented markets. It has also led to greater competitiveness among financial institutions and in some cases to higher risk of insolvency for individual

institutions (Suzuki 1986, and BIS 1986).

3.3.2 Characteristics of the capital markets in the Far East.

Along with rapid economic development and the liberalisation of domestic financial systems, capital markets in the Far East have undergone substantial changes. Capital markets in Japan and Hong Kong are viable and active, and suffer little official intervention. On the other hand, the still infant markets in Taiwan and Korea have been influenced by their governments in terms of prices and quantities of stocks, bonds and foreign exchange (Koh and Res 1989).

The evolution of the stock, bond, and short-term money markets in the Far East since the beginning of the 1970s are briefly compared in two interrelated directions:
a) to obtain aggregate estimates of net securities issues, govenment and private, in absolute amounts and relative to real variables, such as gross domestic investment and GNP;
b) to obtain evidence on the size and functions of capital markets, particularly the amount of new issues, also absolutely and relatively.

A brief description of the evolution of the foreign exchange market is also included.

3.3.1 Securities markets.

Securities markets in the Far East exhibit different performances and different stages of development according to economic strength, government policies, and historical background. In the Japanese financial structure of the high growth period that favoured indirect finance, the securities market had a tendency to be underdeveloped. But after 1975, the securities market grew extremely rapidly under the influence of

the large-scale flotations of Government bonds and internationalisation. To date Hong Kong has remained attractive as a financial centre for foreigners owing to the laissez-faire attitude of the government, which allows complete freedom of funds into and out of the city, imposes no exchange controls, and operates a simple, low tax system.

In Taiwan and Korea, the business of raising capital through bond and share issues, and subsequently trading the securities so created is growing fast but is still immature. Distortions and unfair practices owing to inadequacies of transport, communications and information are being fast eroded. The introduction of sophisticated electronic data-processing is narrowing areas of informational monopoly. There remains an irreducible core of knowledge concerning financial transactors based upon personal judgements of character and ability (Wai and Patrick 1973, Kindleberger 1987).

A securities market requires three basic components: private and public enterprises to issue securities; parties to subscribe to the issues; and parties to trade confidently in the securities created, so conferring on long-term financial instruments, bonds and equities, the precious characteristics of liquidity. The largely adequate demand for securities in the Far East where economic and financial development has progressed beyond rudimentary stages, stems from speculative interest and the unsatisfied portfolio needs of certain financial institutions. Demand for securities by pension and superannuation funds, life insurance companies, unit trusts and similar financial institutions is substantial and growing rapidly.

But the main obstacle to large-scale and rapid development of securities markets in Taiwan and Korea is the chronic deficiency in the supply of securities arising from the size and forms of business organisations prevalent there. Local enterprises, regardless of size and industry category, are generally run by individuals, families or cohesive social groups;

the corporation is not a favoured business form. Owners and managers often have little need or desire to raise share capital locally. First, bank credit has often been easy to obtain and access to foreign-capital markets readily available for large corporations. Second, debt finance has been the main vehicle to fund growth and as a result many owners and managers in Taiwan and Korea are not inclined to raise equity capital through local securities markets. However, they may be obliged to issue shares locally, in harmony with government policy to increase domestic capital formation and to raise the share of local ownership (Tsiang 1985, Tsai 1987, and Nam 1988).

The relative size of new securities issues and trading value in the Far East can be appraised not only in intercountry comparisons but also by comparison with the situation in developed and developing countries. The total supply of securities issues for both government and private sectors varies among countries themselves in relation to GDP. Total market values of securities in Taiwan and Korea are only 50.7%, 52.4% of GNP respectively in 1987.

Table (3.3) Supply of new issues of securities -selected ratios (1987, %)

Country	M/Y	ME/Y	MB/Y	*M/Y	I/Y	S/Y
Japan	134.7	100.2	34.5	4.2	24.2	28.1
Hong Kong	123.1	116.5	6.6	14.3	21.5	30.1
Taiwan	50.7	44.8	5.9	1.9	19.6	38.8
Korea	52.4	26.8	25.6	5.2	37.2	36.7

(Notes)
M: Total market value of equities and bonds oiutstanding
*M: New issues of equities and corporate bonds, excluding free share distributions.
ME: Market value of equities.
MB: Listed bonds of outstanding
Y: GNP, but GDP for Hong Kong.
I: Total investment.
S: Savings.

3.3.1.1 Bond market

The issuance of bonds, commercial paper and notes is an activity related closely to loan syndication. The financial institutions can meet the borrowers' demands for funds either by lending from their own resources or by raising money from the public on an ad hoc basis, on behalf of the borrowers. These two related segments of the market - bonds and loans - complement and often compete against each other. This, in turn, encourages the development of innovative hybrid instruments and provides flexible alternatives to satisfy the different needs of disparate borrowers.

A bond can be issued either by a corporate borrower, including a multi-national or a financial institution, for its own internal funding or it can be issued by a sovereign borrower to finance budgetary or balance of payment deficits. It can be isssued by a government or a corporation either in the domestic or overseas market.

The bond market in Japan has expanded rapidly during the past decade in the domestic and overseas markets. The rapid increase in government bond issues in the domestic market and corporate bond issues in the overseas markets are major factors contributing to the expansion of the market in terms of the volume of issues and transactions. However, bond markets in Korea, Taiwan and Hong Kong are still substantially underdeveloped in terms of size, depth and scope compared with banking loans and other financial instruments. The bond markets are virtually nonexistent with the exception of government-guaranteed bonds and bank-secured corporate bonds in Korea and Taiwan. However, the governments of these countries have maintained low yields on such bonds. They promoted sales of these bonds to the market by imposing statutory holding requirements for banks, insurance companies and pension funds. This resulted in an inactive secondary market for government bonds.

Nevertheless, Korea and Taiwan are beginning to develop bond markets to meet the need to finance rapidly growing business activities and continuing investment by state and public enterprises. Their bond markets are therefore expected to expand at an accelerating pace over the next decade.

3.3.1.2 Equity market.

The equity market developments in the Far East span a variety of markets exhibiting different performances and different degrees of official involvement. The viable, active and larger markets in Japan and Hong Kong involved less official intervention. On the other hand, in Korea and Taiwan, governments promote and influence the markets in various ways (Koh and Res 1989).

(Table 3.4) Stock Exchanges: features(1987)

	Japan*	Hong Kong	Taiwan	Korea
1. No. 1)Domestic	1,912	276	141	389
2)Foreign	52	n.a.	-	-
2. Market Value.				
1)Stocks	2,288,771	54,074	48,549	26,172
2)Bonds	853,450	3,070	6,394	25,007
3. Trading value.				
1)Stocks	1,960,997	47,862	93,472	20,494
2)Bonds	992,755	66	7,748	7,238
4. Turnover Ratio	94.0	83.9	184.2	54.2
5. Members	118	85	28	25
6. Restrictions	Medium	Low	High	High

(Notes)
1. No.: Number of listed companies.
2. Market Value: Total market value (US$ Mil.).
3. Trading Value: US$ Mil.
4. Turnover Ratio: percentage of trading value by market value.
5. Members: Number of member firms.
6. Restrictions: Level of restrictions on foreign investment.
7. * Tokyo Stock Exchange only.

3.3.2 Money markets.

The money market is an integral and significant part of the financial system. The financial instruments traded in the money market usually have an original maturity of less than one year. The minimum transaction is generally very large and is, therefore, wholesale in nature. It is a very dynamic and exciting market, in which banks, finance companies, brokers, and dealers carry out their day today transactions. The significance of the market lies in the fact that it is predominantly a free and competitive market and responds to forces of supply and demand in the most efficient way.

Terminology and availability may vary from market to market. However, overdraft, commercial paper, trade bills, bankers acceptances, and certificates of deposit are common debt instruments found in major money markets.

A comparison of money markets in the Far East shows a broadly similar grouping of participants and instruments. Some variances are to be expected but major differences appear in the different levels of development, control, liberalisation, and in some cases due to inherent national characteristics. Hong Kong, for example, has historically swung between "laissez faire" and strict market control with the latter constraints especially apparent during the years following involvement in global conflicts when the economy was at its weakest.

In the Far East, Hong Kong todate is the only country to have whole heartedly embraced all the liberalisation principles (though they do form the core of the Japanese programme) and it is interesting to note again that theirs has historically been an unfettered financial market. Taiwan's domestic money market developed relatively unhindered and unsupervised but remains limited and localised. Korea has in place many of the elements of a good money market but is too closely supervised and regulated at present to develop much further.

(Table 3.5) Comparisons of the Far East money markets

	Japan	Hong Kong	Taiwan	Korea
1. Varieties of available instruments:	medium	limited	limited	limited
2. Secondary market:	limited	Very limited	V-limited	V-limited
3. Degree of regulation:	medium	low	high	high
4. Demand for funds:	medium	medium	strong	strong
5. Internationalisation of local currency:	medium	high	none	none
6. Sophistication of the market (cash market vs. futures market):	medium	efficient	limited	limited
7. Central bank's role:	medium	low	influential	influential

3.3.3 Foreign exchange markets.

Government control over the price and the transaction of foreign exchange in the Far East is as ubiquitous as government control over interest rates. Foreign exchange is transacted freely in Hong Kong. The governments of Taiwan and Korea have liberalised exchange control. However, it is not freely traded in Korea and Taiwan. Japan shifted to a floating exchange rate system since 1973.

The major participants of the foreign exchange transactions are banking institutions. All foreign exchange transactions in Taiwan and Korea must be executed by banks duly authorised by the Ministry of Finance and Central Bank. Currently, nation-wide banks and local branches of foreign banks are authorised to engage in foreign exchange transactions in Taiwan and Korea. In Hong Kong the major participants are banks, DTCs and large corporations.

(Table 3.6) Characteristics of foreign exchange markets in the Far East

	Japan	Hong Kong	Taiwan	Korea
1.Government control:	medium	low	high	high
2.Major participants:	LB	FB	LB & FB	LB & FB
3.Foreign exch. system:	floating	pegged (US$)	managed	floating (basket)

(Notes) LB: local banks
FB: forein banks

Many observers hold that the currencies of the Far East have been undervalued against major currencies (for Japanese yen, see Bergsten 1982, Williamson 1983; for Korean won and new Taiwan dollars, see Morgan Guaranty 1987). Although we question the economic significance of overvaluation or undervaluation with respect to exchange rates determined in free markets, we shall nevertheless examine evidence as to whether the yen, won, NT$, and HK$ were undervalued againste dollar.

The real (effective) exchange rate of the Korean Won vis-a-vis to the US dollar appreciated by as much as 11.6% during 1975-1979 and, despite substantial nominal depreciation in 1980-81, appreciated further during 1981-82. This exchange rate development seems to be one of the main causes for the deceleration of Korean export growth during the latter half of the 1970s. A second reason for the loss of competitiveness were the development of structural abnormalities in the economy owing to improper credit and resource allocation. In addition, other factors include the second oil shock, poor harvests and political instability surrounding the death of President Park Chung-Hee.

The real effective exchange rates for Taiwan were much more stable. Even though the Korean real exchange rate could have been kept stable with faster nominal depreciation, such a strategy would have accelerated already high inflation, aggravating the imbalance in other sectors of the economy (Koh and Res 1989).

Rana(1981) examined whether exchange rate risk has increased in the present system of generalised floating for eight Asian developing countries, including Korea and Taiwan. In the pegged period, since exchange rates do not respond to changes in prices in the short run, the real effective exchange rate for each country was more unstable than the nominal rate. In the generalised floating period, however, the real effective exchange rate was more stable. Also in the current float the third country exchange rates of Taiwan and Korea might be offsetting the differential inflation rates between the trading partners and the pegged country rather than the differential between home and trading partner's inflation used in his study.

3.4 Conclusion.

In this chapter, the most basic trends which have emergered in recent decades in international finance and the comparative aspects of the Far East capital markets have been reviewed. These changing trends form the common global background for all countries and regions of the world, particularly those that are open to international trade and finance. Recent development includes deregulation and liberalisation, securitisation, and globalisation. This chapter also takes a deeper look at the current state of evolution of financial markets in the Far East. The market economies of the Far East have experienced rapid development and growth in international trade flows. Korea, Japan, Hong Kong, and Taiwan have all experienced the nearest thing to an economic miracle in the post-war period, emerging from being the lesser developed of the 1950s to become the industrial nations of the 1980s. And yet, these four countries illustrate a wide diversity of financial systems, ranging from a high degree of centralisation and government control(Korea) to

economies where market mechanisms are the prevalent means of allocating resources(Hong Kong). The undergoing fundamental changes of the world financial system have forced policy makers in the Far East to review existing understandings and theories on the issues related to financial liberalisation.

CHAPTER IV. ECONOMIC GROWTH AND FINANCIAL DEVELOPMENT IN KOREA.

4.1 Introduction.

Korea was successful in recovering from the severe economic recession caused by the two major oil shocks and political unrest during the 1970s and early 1980s. In 1986, the Korean economy experienced a historic turnabout in its current account, which shifted to a surplus of US$4.6 billion, combined with strong non-inflationary growth. Among the conditions for such a growth, the important role of the financial market cannot be ignored (Dornbusch and Reynoso 1989). In the past, financial intermediation in Korea has relied mostly on the flow of funds through the banking sector and there has been little research that deals with the securities market. However, during the recent years, the Korean financial structure has drastically changed with the support of a series of measures to promote investment in securities, to encourage enterprises to go public, and to strengthen their underwriting function. Thus, the role of the securities market has rapidly become more important than before.

This chapter analyses the financial aspects of the more general issue of transition from a centralised to a relatively laissez faire system in Korea. The major argument is that economic growth is not strictly an economic phenomenon. It is a process which is manifested in the cource of wide-ranging social transformation. Economic changes occur in close relation to the general development of society. Even if economic growth was to proceed in the short-term, ahead of the developments in other fields, the latter would have to keep abreast of economic growth in the long-term for the former to continue smoothly. Therefore, the financial sector has to be parallel with the real sector. In the long-term, one sector cannot develop with the other lagging far behind.

4.2 The engines of the high growth.

Korea has recently been in the limelight of the world economy as a newly industrialising country (NIC) along with Hong Kong, Singapore, and Taiwan. From a per capita income of barely US$87 in 1962, when the first five year economic development plan was launched, Korea has experienced a dramatic transformation in its economy and society, with a per capita income exceeding US $4,040. Real GNP growth has averaged 9.05% during 1962-1988. The traditional, closed, agrarian economy of the early 1960's has been replaced with a dynamic and vibrant industrial economy (Koh and Res, 1989).

Prior to the early sixties, economic development was quite slow, even stagnant, due to non-economic factors. In 1963, Korea reached a turning point in its economic development. Since that year,, it has sustained a high rate of growth in GNP. The sudden increase in the growth of output was attributable to the change in the development strategy adopted in the early 1960's, although there were certain other economic and noneconomic factors that cannot be easily quantified.

Kim(1985) divided the development of industrial policy in the post-Korean War period(1953-1986) into four phases corresponding with the evolution of Korea's industrial incentive system. The first phase(1953-1960) was characterised by import substitution. The second phase(1961-1965) marked the transition to an export-oriented industrialisation strategy. In the third phase(1966-1979), the export-oriented strategy became institutionalised. Rapid economic growth was achieved through structural change in export commodities with a significant diversification in export markets. In the fourth phase(1980-present), a series of comprehensive institutional reforms were adopted to promote a greater role for market mechanisms and to reduce government intervention. To increase foreign competition in the local economy, liberalisation of imports and direct foreign investment was carried out, and to promote more efficient allocation of

resources, preferences for specific industries have been reduced, competition-limiting activities banned, and financial reform carried out(Koo 1986).

The successful paths to industrialisation of the Korean economy are as follows: ambitious and well-calculated government policies, including strongly outward-oriented trade strategy; a high level of investment; highly skilled and motivated human resources; flexible policymaking and the significant role of government; strong commitment to technology upgrading; a reasonable-sized domestic market; and existence of a few large conglomerates.

4.3 The role of financial markets in the savings process.

4.3.1 Trends in the financial and the non-financial sectors.

Korea's fast growth and its rapidly rising savings ratio were accompanied by a remarkable monetisation of the economy. The Marshallian k, the ratio of money to GNP (i.e., the inverse of velocity), has increased continuously. Table 4.1 shows the Marshallian k ratios for reserve money, M1, M2, and M3 for Korea during 1962-1988.

The reserve money/GNP ratio has declined and the M1/GNP has remained remarkably stable. In contrast, the ratios of M2/GNP and M3/GNP have almost continuously been rising. The sharp rise was due to all these three factors working in the same direction: overall asset intensity rose; asset distribution shifted toward individuals, who tend to hold higher portfolio shares in quasi money; and all sectors shifted portfolio composition in favour of quasi money.

(Table 4.1) The Marshallian k ratios

Year	RM/GNP	M1/GNP	M2/GNP	M3/GNP
1962	8.4	11.1	14.5	-
1965	6.0	8.1	12.1	-
1968	9.5	10.8	26.4	-
1970	10.9	11.2	32.8	-
1972	10.3	12.5	35.0	40.5
1974	10.3	12.6	32.7	40.5
1976	10.4	11.1	30.3	38.1
1978	11.6	11.2	32.7	42.2
1980	8.7	10.2	33.7	47.9
1981	6.2	8.8	34.7	51.5
1982	7.5	11.4	39.2	61.0
1983	6.9	11.5	38.9	63.8
1984	6.4	10.3	41.9	68.1
1985	5.9	10.4	39.2	75.2
1986	5.5	9.7	37.4	78.1
1987	7.1	9.6	38.1	87.1
1988	7.9	9.8	39.6	95.6

(Notes) RM = Reserve money = Bank notes & coins issued + Reserve deposits of deposit money banks
M1 = Currency in circulation + Deposit money (Demand deposits of monetary institutions)
M2 = M1 + Quasi - money (Time & savings deposits and resident's foreign currency deposits at deposit money banks)
M3 = M2 + OFI deposits + Debentures issued + Commercial bills sold +CDs
Deposit money banks = Commercial Banks and Specialised Banks
OFI = other financial institutions : Development institutions + Investment institutions + Savings institutions + Insurance institutions.
(Source) Bank of Korea, various issues.

However, financial deepening went with little diversification of the financial system. The money flow remains dominated by indirect financing in the corporate business sector. Although the relative share of direct financing continued to rise steadily helped by various measures taken to boost the role of the securities market in business financing since the early 1970s, the indirect financial institutions which consisted of banks and non-banking institutions were the most important fund sources to meet growing demands of corporate enterprises in the course of rapid economic development.

Until the 1970s, the development of financial institutions

in Korea had not kept pace with the growth of the industrial and commercial customers. Growth rates of financial institutions have been lower than industrial and commercial companies, and traditional financial services have not been diversified and developed. The financial sector has been segmented into a large number of financial institutions each with a different range of often overlapping activities. Because of the fiduciary nature of financial institutions, it was deemed especially essential to limit their entry through licensing and to monitor their operations by supervisory authorities. The business base of each kind of institution was defined too narrowly to allow profitability, and the institutions themselves pressed for logical extensions of their business into related services. The Government permitted the institutions to move into new lines of financial services. The demarcation of activities between different financial institutions has become less clear and the result is a residual lack of coherence in the system.

4.3.2 Changing patterns of main sources of debt finance.

In 1960s and 1970s, three main sources were important in debt finance. They were banks, the curb market, and foreign capital. But in the 1980s direct financing through the securities market and the indirect market through non-bank financial institutions have increased continuously in the composition of external financing by source.

Bank borrowing, the main source for indirect financing, recorded 37.5% of total borrowing during 1965-1969 and 40.4% during 1970-1974. Since then, its share has declined to 23.8% during 1980-1984.

The curb market is an unregulated, semi-legal credit market in which loan suppliers and demanders can transact freely using uncontrolled interest rates. The main features that spurred both the demand for and supply of funds in the curb market are the

policy of maintaining low official interest rates, the stringent credit rationing in the regulated financial markets, and insufficient short-term funds available through the regulated banking system, which mainly provides term lending. The existence of differentials in the interest rates charged to borrowers is interpreted by McKinnon(1973) and Wai(1975) to introduce segmentation and the absence of market clearing. By that criterion, the existence of differential rates within Korea's curb market and between it and bank loans suggests that it was not an efficient market.

However, as van Wijnbergen(1983) points out, in a market where borrowers have different characteristics, differential rates which reflect this indicate that interest rates are acting as an efficient market-clearing mechanism. Estimates of the size of the curb market in Korea vary greatly, from around 10-20% of total loans to 40% at the most. Its interest rates have been much higher than those on so-called 'policy loans' through the banking system, which have amounted to roughly half of total bank loans over the 1970s.

In 1972 the government took a series of measures designed to channel the curb market money into the financial institutions and to set up the money market. Since then the non-bank financial market has been activated and the curb market has receded. Direct financing remained only at 14.6% on the average during 1960-1964, but rose steadily through the 1970s and went up sharply to 41.0% during 1980-1984, owing to the expansion of the bond market by corporations and the increase in the demand for securities by institutional investors such as investment trust companies.

Unlike some other developing countries which have achieved growth with mostly domestic resources (e.g. Taiwan), Korea has depended heavily on foreign resources for its development because domestic financial sources have not been sufficient to meet the ever growing fund demand. Until 1963, Korea had no foreign debt. In 1964 and 1965, it received US$440 million and US$430 million

of foreign loans respectively. After the financial reforms in 1965, foreign debt was increased to US$110 million in 1966 and rose to US$540 million by 1976. At the end of 1986, Korea's total outstanding foreign debt amounted to US$45.5 billion, making Korea one of the biggest borrowers in the international capital market. However, the current account has changed dramatically from a chronic deficit to succesive surpluses from 1986. The surpluses on current account were US$ 4,617 million in 1986, US$ 9,854 million in 1987, US$ 14,161 million in 1988, and US$2,449 million during January-June 1989. The Korean government has been focusing on reducing the external debt, a major hindrance to economic development, by the early repayment of short-term loans and long-term loans whose conditions are unfavorable. Thus Korea's total outstanding foreign debt was reduced to under US$31.2 billion by the end of 1988, while the debt service ratio had decreased to 7.6% in 1988 from 18.3% in 1985. On the other hand, the prevalence of direct foreign investment has not been as great as in many Latin American countries.

Numerous statistical studies of the relationships between economic growth and capital inflow, between foreign finance (especially aid) and domestic savings in developing countries have been undertaken. The authors found that foreign capital inflow generally gave a significant positive impact on savings, but the results were not unambiguous, and should be treated with caution. The studies can be divided into two groups:

a. Studies which investigate the relationship between foreign aid and domestic savings ratio. Rahman(1968). Landau(1971), Weisskopf (1972), Papenek(1973), and Gupta and Islam(1983) all found negative relationships.

b. Studies which investigate the relationship between the rate of growth and the inflow of foreign aid. Positive relationships were found by Brecher and Abbas(1972) and Islam(1972) for Pakistan, and Jacoby(1966) for Taiwan, Gulati(1978) and Mosley

(1980) both obtained mixed results, suggesting a positive relationship for poor countries and negative or insignificant relationships in some advanced countries. These results are conveniently summarised by Dowling and Hiemenz(1983), and Kitchen(1986). Studies of the role of foreign capital in economic growth for Korea were analysed as a positive impact by Frank, Kim and Westphal(1975), Krueger(1980), B. Y. Koo(1981), Barone(1983), and Stoever(1986).

Korea has been able to control and direct foreign capital to its own advantage or diminish its impact on the economy. In fact, the contribution of foreign saving is now much less prominent. However, through loans, credits, subcontracting and direct foreign investment, foreign capital played the major role in shaping Korea's overall rate of growth and economic structure during the past two decades.

4.4 The role of financial institutions in the allocation of financial resources.

4.4.1 Monetary policy and selective credit control.

The Bank of Korea's monetary policy is divided into quantitative and selective credit control. Quantitative credit control is exercised to influence the demand and supply of funds in financial markets, and, ultimately, to influence the aggregate economic activities without distorting any specific sector. Quantitative credit control consists of i)interest rate policy, ii) rediscount policy, iii) open market operations. Direct or selective credit control is the placing of ceilings on loans from financial institutions, to allocate credit through differential intervention by facilitating or restraining the supply of funds to a specific economic sector.

Financial policy, particularly selective credit control, has

had a significant role in the process of high economic growth observed during last two decades. Large volumes of funds have been continually provided to key industries - the chemical industry,, heavy industry, and industry that is export related - at preferential, low interest rates. Optimum fund allocation through the financial market mechanism, has yet to become a reality, because strong government regulation of lending activities, notably fund allocation, makes it much more difficult for the commercial banks to change the volume and conditions of credit in a way that makes credit more profitable and efficient.

Until the 1970s the government (Ministry of Finance) played the role of the banks under the assumption that, if left to bankers, the allocation of financial resources would not be carried out in the direction of the satisfactory fulfilment of the economic plans. The government determined the budget of the banking system, including the central bank (Bank of Korea), controlled the appointment of most of the bank directors and officers, and exercised the powers of bank supervision and examination. The Temporary Act on Bank Administration, the revised Bank of Korea Act in 1962, and the Presidential Decree for Economic Stability and Growth in August 1972 were the main legal means which gave official power to the government. The commercial banks played a very limited role in the decision making process of banking activities such as domestic loans, guaranteeing repayment of foreign loans and policy preference loans. Since March 1982, however, the government has relaxed the guidelines for bank lending to some extent.

There were criticisms on the strict control of banking activities by the government. Y.C. Park(1982), B. K. Min(1985), and U. C. Chung(1987) suggest that in a complex economy, the ability of the government to manage the economy in an efficient manner is very limited and that in the future the allocation of financial resources should to a large extent be left in the hands of the private sector.

4.4.2 Development finance and commercial bank behaviour.

As the supreme policy-making organ of the Bank of Korea, the Monetary Board, within the purview of the Bank of Korea, exercises other functions explicitly granted to it and has the general directory, or regulatory and supervisory responsibilities, over the activities of banking institutions as well as the operations of the Bank of Korea.

The amended Bank of Korea Act in 1962 empowered the Minister of Finance to request reconsideration of resolutions adopted by the Monetary Board. And the Monetary Board laid down guidelines in 1962 for efficient allocation of banking funds and government funds that required the specialised banks to finance preferential sectors. The specialised banks were orginally established under special laws and are dedicated to serving particular areas; small and medium-size business, foreign exchange and international financing, consumer financing, and the financing of farming and fishing. The credit control policies also strongly influenced commercial bank behavior.

Commercial banks have played a leading role in the financial market. However their relative importance in the financial system has gradually decreased as specialised banks and other non-bank financial institutions have expanded their business. Their share of total assets, according to the Financial Survey, droped from 82.5% in 1975 to 61.9% in 1985. Seven specialised banks' weight of total assets has advanced from 18.5% in 1975 to 35.0% in 1985. During 1970s many non bank financial intermediaries were established such as development institutions, savings institutions and investment companies.

As national income grew and the economic environment changed, the non banking financial institutions and securities companies have rapidly increased their share of the financial

market. The various government restrictions on commercial bank activities have led to a decline in commercial banking's share of the market. As McKinnon(1980), Ito(1984) and Fry(1985) indicated, selective credit policy has produced a considerable amount of financial layering that has increased the costs of financial intermediation through commercial banks and development financial institutions. Instead of raising funds from a common pool of loanable funds, each group of financial institutions has its own source of funds earmarked for special uses. This, clearly, makes each institution's costs additive to the total cost of intermediation between the saver and the ultimate borrower.

Also the result is an extreme suppression of financial institution profits, especially the profits of the commercial banks. Financial intermediation is no longer the principal source of profit for these banks. Foreign exchange and international transactions have become more preponderant. Commercial banks could receive interest on reserve requirements and maintain profits.

4.4.3 Development of non-bank financial industry.

From the end of 1960s, the government reorganised the existing banking system to diversify the sources of investment funds by introducing various non-bank financial institutions and by fostering the securities market. For this purpose three development institutions, eleven short-term financing companies to induce unorganised curb market funds into the organised financial market, and five merchant banking corporations to induce foreign capital and supply medium-and long-term funds for business enterprises, were introduced between 1967-1977. However, the financial interrelation ratio (the ratio of the balance of domestic financial assets to GNP in current prices) declined over the period ending in 1976 due to low interest rates and high inflation. But from the second half of 1970s, this ratio began

to rise. It increased from 1.23 in 1976 to 3.82 in 1983, and then has kept more stable at 4.26 in 1985 and 4.35 in 1987.

The securities market, like commercial banking, has been characterised by pervasive government control, with the terms and conditions for the securities underwriting set by underwriters' cartel. Since 1972, however, it has grown rapidly with the support of a series of measures to promote investment in securities, to encourage enterprises to go public, and to strengthen their underwriting function. Due to the relatively high interest rate and the great degree of autonomy in management compared with monetary institutions, these non-monetary financial intermediaries have grown considerably more rapidly than banks. The market share of non-monetary financial intermediaries in terms of assets increased rapidly from 18.3% in 1965 to 44.4% in 1986, and to 46% in 1987.

(Table 4.2) Comparison of assets for the monetary and nomonetary institutions

Year	TFA	TAFS	FMI/TAFS(%)	FNMI/TAFS(%)
1970	7,163	1,900	81.7	18.3
1975	27,471	9,068	78.8	21.2
1980	113,652	42,919	68.7	31.3
1981	148,214	56,654	65.6	34.4
1982	189,468	73,434	63.9	36.1
1983	225,118	88,533	61.0	39.0
1984	264,536	107,120	59.0	41.0
1985	311,958	128,972	57.5	42.5
1986	354,605	149,046	55.6	44.4
1987	415,918	183,486	54.0	46.0

(Notes)
TFA : Total financial assets (Bil. Won)
TAFS : Total assets of financial sector (Bil. Won)
FMI : Financial assets of Monetary Institutions
FNMI : Financial assets of Non-financial Institutions
(Source) Bank of Korea, ECONOMIC STATISTICS YEARBOOK, 1972-1989.

4.5 Financial liberalisation.

4.5.1 Financial regulation and the underdeveloped financial industry.

Until the 1970s the financial industry in Korea was tightly regulated by the government under the categories of entry restrictions, activity restrictions, pricing constraints, balance sheet constraints and preferential loans. However, strong financial intervention caused adverse effects in many respects. Financial resource allocation was distorted heavily in order to develop what is called the strategic industries such as heavy and chemical industry through the regulation of financial institutions by credit rationing and ceilings on interest rates. The financial sector was fragmented without any close interrelationships.

Under the influence of inflation, financial institutions couldn't be expected to make significant progress, since the price mechanism was not free to allocate financial resources efficiently and the evaluation of investment projects couldn't be carried out effectively. Businesses have never hesitated to incur debts at controlled low interest rate. Domestic saving was of relatively little importance since the financing of the economy depended largely on the creation of money and borrowing of foreign capital.

Generally the financial sector and the real sector develop side by side and one cannot go far if the other is left behind. However, the pattern of development in Korea seems to have been an exception, in the sense that the financial sector appears to have been greatly lagging behind the real sector. The financial interrelation ratio is far lower than those of advanced countries and lower than that of Hong Kong (Table 4.3).

(Table 4.3) Financial Interrelation Ratio

	Korea	Japan	Hong Kong	Taiwan
1975	1.44	4.00	1.62	2.84
1980	3.10	4.77	3.18	3.29
1984	3.98	5.50	5.11	3.72
1987	4.35	6.81	6.28	4.31

FIR: Financial asset balance/GNP in current prices.
(Sources) Bank of Korea, Bank of Japan, Hong Kong Government, The Central Bank of China.

For many years economists have argued that developing countries should rely more heavily on the market mechanism and should liberalise their economies to international trade and capital movements.

McKinnon(1973) and Shaw(1973) analysed financial repression in the developing countries including those of Brazil, Korea, and Taiwan and provided a theoretical basis for the benefits from a liberal financial regime. Eliminating financial repressions, i.e., market determination of interest rates and lifting controls over financial institutions in asset management and ownership, are important factors for financial deregulation. They suggested that full financial liberalisation could produce the optimal result of maximising investment and further raising the average efficiency of capital investment, if monetary reform could succeed in mobilising domestic savings and allocating them to efficient uses.

Monetary reform is a step toward a fully liberated financial sector and should be distinguished from full financial liberalisation. The experience of the Southern Cone countries of Latin America (Argentina, Chile, and Uruguay) have generated a great deal of research that extensive and radical economic liberalisation would result in renationalisation of banks, reimposition of banking regulations and unstable financial markets.

In view of many potential problems with financial

liberalisation in developing countries, what could be the most effective way of liberalising domestic financial markets without impairing the payments system? Park(1987) suggests that there are certain institutional reforms developing countries should undertake before moving to full financial liberalisation. Keeping the linkages between large business groups and banks at an arm's length in order to prevent the groups from dominating the banking system, separating the monetary and intermediation functions of banks, and developing non-bank financial intermediaries such as mutual funds, pension funds, finance companies, trust firms, and insurance companies which could be subject to less government control.

4.5.2 Financial liberalisation in the 1990s.

Economic environmental changes from a government-led economy to a private-led economy demanded financial liberalisation and restoration of the market mechanism in the financial market. The process of financial liberalisation and encouragement of efficient markets by deepening and eliminating the fragmentation of markets could improve the process of mobilising savings, as well as the efficiency of investments. The reorganisation of the financial system commenced in 1981, when the financial liberalisation policy was adopted. This effort included several goals a) to enhance financial autonomy, b) to rely on the market mechanism, c) to deregulate financial services d) to internationalise the securities market.

(a) The government has encouraged financial institutions to diversify and offered more autonomy in decision-making to promote competition and efficiency. Several state-owned banks have been sold to the private sector. Overall intervention in bank management has been reduced. The allocation of banks annual budget, personnel management, and organisational structures are no longer subject to approval by the government.

(b) In the management of monetary policy, the government has tried to rely on the market mechanism. The Central Bank influences strongly the general level of interest rates. However, market forces have become more important factors in the determination of interest rates, and interest rate differencials between general loan and preferencial policy loans of banks were eliminated in 1982. As inflationary expectations recede with continued price stability, the gap between official and free market interest rates has continued to narrow. Moreover the ceilings on inter-bank call rates and issuing rates of unsecured corporate bonds were lifted. Different interest rates based on borrowers' creditworthiness were introduced from Jan. 1984. To increase efficiency, five nation-wide commercial banks were privatised. Entry barriers were lowered in the financial sector. Twelve investment and finance companies, fifty-seven mutual savings companies, and two nationwide commercial banks were permitted to open for business in 1982-1983. And a deposit insurance scheme was introduced to protect depositors who have accounts in these non-bank financial intermediaries.

(c) Integrating segmented financial markets and eliminating restrictions on the demarcation of financial services are further developments toward financial liberalisation. Since 1982, the sale of commercial bills, credit card business, sales of government and public bonds on repurchase agreements, factoring business, trust business, mutual installment savings business and negotiable certificate of deposit business were introduced to diversify commercial banking. Some discriminatory regulations on foreign banks have been lifted. Foreign banks were permitted to join the National Banking Association in 1984 for the purpose of exchanging business information with domestic banks and were permitted to make use of the rediscount facilities from 1985. Commercial paper was introduced for investment and finance companies and merchant banking corporations in 1981, and for large securities companies in 1984. The Cash Management Account for investment and finance companies and merchant banking corporations was introduced in 1984, and the Bond Management Fund

for investment trust companies and securities companies in 1987. Moreover, computerisation has enabled financial institutions to supply more sophisticated financial services such as on-line systems, cash dispensers, and night depositories. The distinction between different financial institutions is therefore becoming blurred, and competition is increasing in financial markets.

(d) Recently banking regulations were revised with the purpose of establishing banks as the central institutions in the financial industry, giving banks more autonomy in dealing in various areas of financial services and in raising their profitability. Furthermore, the central bank will also become more neutral and independent in its monetary and banking policies. In line with the global trend toward a more universal banking system, the banking business will be extended to foreign exchange, securities, long-term deposits and lending. Also the creation of bank holding companies which can be involved in securities, leasing, merchant banks, short-term finance, insurance and other non-bank business areas are suggested.

Establishing new financial institutions will advance the financial sector further to support the real sector. The government has permitted the establishment of new financial institutions. Between 1987-1988, fifteen capital management companies were newly established. By 1990, five small and medium sized industrial banks and five trust companies will be established in the provinces for the equal development of local areas. In addition, the establishment of twelve life insurance companies, six provincial leasing firms, a nationwide commercial bank and a second credit guarantee fund is on the agenda.

(e) Liberalisation of the capital market is also in process. The government prepared a long-term blueprint in 1981 to develop the securities market with the issue of guidelines detailing a four-phase liberalisation programme to fully liberalise the capital flow in an out of the country by the early 1990s. However, the

original plan was revised in 1988 due to the abrupt changes in the current account from 1986. Portfolio investment abroad for domestic investors was encouraged prior to opening the domestic capital market to international investors.

(f) The Government's commission on financial reform is winding up six years labour with indications that policymakers are finally serious about reforming the formerly moribund financial sector. The reform plan is set to include a loosening of interest rate controls, the lowering of barriers between bank and non-bank financial institutions, and the giving of greater autonomy to the central bank and the nationwide private banks. The Government sought and obtained article eight status in the International Monetary Fund as a first step in the liberalisation of foreign exchange transaction and relaxed foreign exchange transaction to some extent.

There are, however, a large number of future tasks to be completed before full financial liberalisation in 1990s is achieved. Interest rates should further be liberalised and determined by market forces. Also the gap between official and free market rates should continue to narrow. An enhancement of the international financial capabilities of domestic financial institutions is a prerequisite task for internationalisation of financial services. And financial institutions need to grow as a more competitive and integrated part of those markets by offering diverisfied financing instruments for a wide range of customers.

4.6 Conclusion.

The financial policies implemented by the Korean government have played a key role in Korea's economic development. The government, however, avoided financial policies based solely on market mechanism, and instead, the government chose to manage the financial system, using it to mobilise both domestic and foreign

financial resources and allocate these resources in ways to support its high-growth policies (Lee 1988, Koh and Res 1989). Also financial intermediation in Korea has relied heavily on the flow of funds through the banking sector and there has been little research that deals with the capital market. Due to the changing worldwide financial environment and domestic economic conditions during the recent years, the domestic financial structure has drastically changed.

In this chapter, the sources of the high growth of the Korean economy were briefly reviewed. Also the role of financial markets in the savings process and the role of financial institutions in the allocation of financial resources were analysed. The Korean financial system is currently under extensive review to identify potential institutional reforms. Several measures were recommended for financial liberalisation in 1980s. The financial market should be harmonised for integration and specialisation of financial services in response to the needs of the market rather than by legislation. Entry barriers should be lowered further with institutional arrangements to prevent excessive disruption and instability of the market. Thus the internationalisation of the Korean financial system should be promoted not only for a sound development of the financial market, but also for sustained economic growth.

CHAPTER V. STOCK RETURNS, INFLATION, AND REAL ACTIVITY.

5.1 Introduction.

Three different approaches have traditionally been discussed in the theory of security analysis. They are fundamental analysis, technical analysis, and the random walk hypothesis. Fundamental analysis deals basically with security valuation. It insists that the stock price of a firm is mainly determined by financial factors such as the earnings stream, dividends and the value of assets held, in addition to some external economic factors. The technical analysis is a trend-tracing approach that deals not with the matter of stock valuation but with the forecasting of stock prices. Proponents of technical analysis usually plot the trend of stock prices and trade volume to forecast the future stock prices, because analysts believe that stock prices have a propensity to repeat past behaviour.

The random walk hypothesis says that available data are not useful in estimating the future stock prices, because the stock market instantaneously reflects the new and relevant information. According to this approach, the behaviour of stock prices is totally random, thus, it is impossible to forecast stock prices.

Because technical analysis and the random walk hypothesis place emphasis on the movement of stock prices, they do not properly explain the factors that affect stock prices. In addition, most of the studies which exploit fundamental analysis were limited to the analysis of an individual security. In fact, no comprehensive research has been found on the Korean capital market which explains clearly the relationship between stock market behaviour and overall economic movements.

As for the major factors affecting stock prices, several variables can be considered. They are money supply (M1, M2, and

M3), interest rate, inflation, industrial production (or GNP growth rate). Movements in earnings and dividends of firms may also affect stock prices.

This chapter examines the relation between inflation and real stock returns in Korea. The data will be tested for consistency with the hypothesis that the negative relation between real stock returns and inflation holds, caused by a positive relation between real stock returns and real variables which are more fundamental determinants of equity values.

The performance of equities, bonds, and other assets has been widely researched in the United States. Empirical findings usually support the theoretical hypothesis that equities are riskier and thus have a higher yield than fixed income instruments(Ibbotson and Sinquefield 1976, Ibbotson Associates 1986, Wydler 1989). There is much evidence that common stock returns and inflation have been negatively related in the post-war period. Bodie(1976), Jaffe and Mandelker(1976), Nelson(1976), Fama and Schwert(1977), Fama(1981 1982), and Gultekin(1983b) have shown that the relation between real stock returns and inflation is negative in the US. Gultekin(1983a) and Solnik(1983) extend the investigation of this relation to other advanced countries and confirm that their results do not support the Fisher Hypothesis. This evidence is surprising in the light of the view that common stocks, as claims against real assets, should be a good hedge against inflation (Fisher hypothesis). While expected stock returns and expected inflation in the U.S. have been found to be negatively related, Firth(1979) showed that in the United Kingdom the results are just the opposite of those in the U.S. The relation between normal stock returns and inflation has been reliably positive which is consistent with the Fisher Hypothesis. Fama and Gibbons(1984) compared the forecast power of different inflation models. Interest rate models provide slightly better monthly forecasts and substantially better eight- and fourteen-month forecasts of inflation than a univariate time series model.

Geske and Roll(1983) note Fama's prediction of a negative inflation-real activity relation in the post-war period. They argue that the central bank responds counter-cyclically to real activity shocks. Specifically, a drop in real activity leads to increased deficits which, in turn, lead to an increase in money growth (to the extent that debt is monetised). An unanticipated drop in stock prices signals this chain of events, leading to negative relations between real stock returns and changes in expected inflation. Geske and Roll, however, do not analyse the money supply process completely, as Kaul(1987) notes. A counter-cyclical monetary response does reinforce the negative real activity-inflation relations witnessed during the post-war period. However, Kaul argues that if central banks follow a procyclical monetary policy, real activity and inflation could be either unrelated or even positively related. This would lead to insignificant or positive relations between stock returns and inflation.

Kaul(1987) hypothesises that the relation between stock returns and inflation is caused by the equilibrium process in the monetary sector. More importantly, this relation varies over time in a systematic manner depending on the influence of money demand and supply factors. He found that the negative stock return-inflation relations in the post-war period were caused by money demand and counter-cyclical money supply effects in the US, Canada, UK, and Germany. On the other hand, pro-cyclical movements in money, inflation, and stock prices during the 1930s lead to relations which are either positive or insignificant.

In a recent study, Titman and Warga(1989) examine whether stock returns provide forecasts of changes in interest rates and inflation. In contrast to earlier work, they find a significant positive relation between stock returns and future inflation rate changes as well as a significant positive relation between stock returns and future interest rate changes.

5.2 Inflation and financial assets.

5.2.1 Inflation, the money stock, and fiscal policy.

There is no clear agreement among economists about the causes of inflation and differences of opinion on the subject are even greater among politicians. Monetarists stress that inflation is always and everywhere a monetary phenomenon. Money supply(M2) is generally considered the most useful of the published figures. Monetarism is the application of neoclassical precepts to the problems of inflation and unemployment (the Phillips Curve). It is based on the standard, economic textbook view of markets in which price changes, including wages, reflect shifting demand and supply curves. They believe that monetary and fiscal policies are important determinants of the rate of inflation. And both monetary and fiscal policies work in the same direction.

However, monetarism has little regard for the importance of institutions in its explanation of recent events. The economy is one of atomistic competition or, if the existence of unions and oligopolies is recognised, the market system still performs 'as if' market power is not in evidence. Thus, a more widely acceptable explanation of today's events takes into account the importance of institutions and institutional change (Hahn 1982, Cornwall 1984). Today's world of powerful corporations and unions, according to this view, is one of institutions that yield market and political power on a wide scale. This affects not only the way in which markets work but it substantially alters the nature of the inflationery process. Thus, demand-pull forces and cost-push are given as the other causes of recent inflation. Restrictive demand measures must be pronounced and prolonged in order to bring inflation down noticeably.

5.2.2 Nominal and real returns.

The original idea of relating the nominal interest rate to expected inflation is commonly attributed to Irving Fisher(1930). In his seminal work on interest rates, he suggested that the nominal interest rate fully reflects the available information about the future values of the inflation rate and, thus, the nominal interest rate can be expressed as the sum of a 'real' rate and an expected inflation rate. This hypothesis says that the real interest rate does not change much. Otherwise there would be large excess supply or demand for loans. Hence, higher inflation must largely be offset by equivalently higher nominal interest rates to maintain the equilibrium real interest rate. This proposition, also known as the Fisher Effect or Fisher Equation, has been widely accepted among financial economists and can be generalised to rates of return on common stocks and other assets (Jaffe and Mandelker 1976, Gultekin 1983).

Fama and Schwert(1977) explain the generalised Fisher effect such that if the market is an efficient or rational process of the information available at time t-1, it will set the price of any asset j so that the expected nominal return on the asset from t-1 to t is the sum of the appropriate equilibrium expected real return and the best possible assessment of the expected inflation rate from t-1 to t. Formally,

(5-1) $E(\tilde{R}_t|\phi_{t-1}) = E(\tilde{r}_t|\phi_{t-1}) + E(\tilde{\pi}_t|\phi_{t-1})$

where $\tilde{R}_t$ is the nominal return on asset j from t-1 to t,

$E(\tilde{r}_t|\phi_{t-1})$ is the appropriate equilibrium expected real return on the asset implied by the set of information ϕ_{t-1} available at t-1.

$E(\tilde{\pi}_t|\phi_{t-1})$ is the best possible assessment of the expected value of the inflation rate $\tilde{\pi}_t$ that can be made on the basis of ϕ_{t-1}, and

tildes denote random variables.

As a quantity theorist Fisher felt that the real and monetary sectors of the economy are largely independent. He

hypothesised, thus, that the expected real return in equation (5-1) is determined by real factors, like the productivity of capital, investor time preferences, and tastes for risk, and that the expected real return and the expected inflation rate are unrelated. This assumption is convenient for this study because it allows the examination of the asset return / inflation / expected real returns relationship.

The tests of the joint hypothesis that the market is efficient and that the expected real return and the expected inflation rate are independent can be obtained from the following standard regression model,

$$\tilde{r}_t = \alpha + \beta E(\tilde{\pi}_t | \phi_{t-1}) + \tilde{\epsilon}_t \qquad (5\text{-}2)$$

The regression model in (5-2) estimates the conditional expected value of the dependent variable as a function of the independent variable. Provided that the expected inflation rate can be estimated, an estimate of β that is indistinguishable from unity is consistent with the hypothesis that the expected return on common stocks varies in one-to-one correspondence with the expected inflation rate. And since the expected real return is equal to the expected nominal return minus the expected rate of inflation, an estimate of β which is statistically indistinguishable from 1.0 is also consistent with the hypothesis that the expected real return on the asset and the expected inflation rate are uncorrelated.

While studies in Gibson(1970 1972), Fama and Schwert(1977), Fama and Gibbons(1982), and others have found a positive relation between nominal interest rates and inflation in the government bond markets, studies in the U.S. stock market have revealed an anomalous negative relation between nominal stock returns and inflation.

5.2.3 Hedging against inflation.

Nominal (observed) interest rates consist of two components - the 'real' rate of interest, to which real saving and investment respond, and a premium based on expected changes in the price level. This can be generalised to cover any return, certain or uncertain:

$$\tilde{NR} \approx \tilde{RR} + \tilde{I}$$

where

$\tilde{RR}$ is the return in real terms,

$\tilde{NR}$ is the return in nominal or monetary terms,

$\tilde{I}$ is the change in prices.

The tildes(~) indicate that the values of the variables may not be known with certainty in advance.

Investors are usually concerned with real, not nominal, returns, and a single price index is taken as adequate to characterise the difference. Thus, the expected real return can be expressed as the difference between the expected nominal return and the expected change in prices.

$$E(\tilde{RR}) = E(\tilde{NR}) - E(\tilde{I})$$

where

$E(\tilde{RR})$ is the expected real return on a security or portfolio,

$E(\tilde{NR})$ is the expected nominal return on a security,

$E(\tilde{I})$ is the expected rate of change in prices.

If investors are concerned with real returns, all securities will be priced so that expected nominal returns incorporate expected inflation. The expected return on every security should thus account for expected inflation.

Nominal interest rates for securities with no risk of default should cover both a requisite expected real return and the amount of inflation expected over the period in question. The real return, after the fact, will be the difference between the nominal return and the amount of inflation actually experienced. Only when actual inflation equals expected inflation

will actually real return equal expected real return on such securities.

The rate of worldwide inflation has been increasing over the last three decades. Korean economy is not exceptional. The average annual rate of inflation during 1965-1980 was 18.8%, even it is stable as 4.2% during 1980-1988. Perhaps more important, inflation appears to have become more predictable. The typical difference between the rate of inflation in one year and in the previous year in the advanced economies was less after 1950 than before. More relevant, the variation in the actual real return was also smaller. If so, investors may well have been willing to invest in short-term highly liquid securities even though they expected to earn nothing at all in real terms. If they are willing to do so still, such securities will be priced to give an expected real return of approximately zero.

If this assumption is made, the market's predicted rate of inflation over the near future can be estimated by simply looking at the current annual yield on short-term government securities. In a sense, Treasury Bill yields represent a consensus prediction of inflation - a prediction likely to be more accurate in many cases than the predictions of any single forecaster(Sharpe 1981).

Investors are concerned more with real returns than with nominal returns. This implies that securities that provide a hedge against inflation should be considered more attractive, other things equal, than those that do not. Of course in an efficient capital market other things would not be equal, and the former would not be priced to be inferior in some other dimension - for example, expected return. And most security returns are subject to additional uncertainty because of factors unrelated to inflation. The ability of a security to hedge against inflation, following Sharpe(1981), could be summed up in a number(h_t) in an equation of the form:

$$\tilde{R}_t = \alpha_t + h_t\tilde{I} + \tilde{\epsilon}_t$$

where

α_t is a constant,
h_t is the security's sensitivity to inflation,
$\tilde{I}$ is the rate of inflation,
$\tilde{\epsilon}_t$ is the uncertain portion of the return of the security not related to inflation.

The above formula fails to differentiate between expected and unexpected inflation. Because all securities might serve as hedge against expected inflation, but only certain ones might hedge against unexpected changes in the rate of inflation. Thus, it is preferable to treat the two aspects seperately as,

$$\tilde{R}_t = \alpha_t + eh_t I_e + uh_t \tilde{I}_u + \tilde{\epsilon}_t$$

where

α_t is a constant,
eh_t is the security's sensitivity to expected inflation,
I_e is the expected rate of inflation,
uh_t is the security's sensitivity to unexpected inflation,
$\tilde{I}_u$ is the unexpected inflation, i.e., the difference between the actual rate of inflation and the rate that was expected.
$\tilde{\epsilon}_t$ is the uncertain portion of the return of the security not related to inflation.

A good estimate of short-term expected inflation is provided by the return on short-term Treasury Bills. If investors are willing to settle for an expected real return of zero on six month Treasury Bills, the return on such a bill will indicate a consensus estimate of inflation over the forthcoming six months. The difference between the actual rate of inflation during a period and the Treasury Bill rate at the beginning of the period can thus be considered the amount of unexpected inflation (Fama and Schwert 1977, Sharpe 1981).

(Table 5.1) Sensitivities of assets to expected and unexpected inflation, six-month holding periods, July 1959-July 1971

Asset	Sensitivity to EI (eh_t)	Sensitivity to UI (uh_t)
6-month U.S. Treasury Bills	1.0	0
1-2 year U.S. government bonds	1.08	-1.15
2-3 year U.S. government bonds	1.03	-1.75
3-4 year U.S. government bonds	.88	-2.37
4-5 Year U.S. government bonds	.79	-2.75
Private residential real estate	1.27	1.14
Common stocks	-4.26	-2.09

(Source)
Fama and Schwert(1977).
(Notes)
EI: Expected inflation.
UI: Unexpected inflation.

Table 5.1 shows that the interest rate on a six-month Treasury Bill is a relatively unbiased estimate of the rate of inflation expected over the next six months. It thus hedges one-for-one against expected inflation. Of course a six-month Treasury Bill cannot provide a hedge against unanticipated inflation over its life.

5.3 The model.

Three aspects of post-war stock return-inflations in U.S. have been identified by empirical research: expected inflation, unexpected inflation, and changes in expected inflation. They are all negatively related to real stock returns. In this part, following Fama(1981) and Kaul(1987), the hypotheses concerning these relations are traced in the Korean stock market.

5.3.1 Stock returns and expected inflation.

The most anomalous of stock return-inflation relations in U.S. market is perhaps the negative relation between expected real stock returns and the level of expected inflation. This is because the level of expected inflation is an ex ante variable, regressions of realised stock returns on expected inflation estimate the relation between the ex ante expected component of stock returns and ex ante expected inflation(Kaul 1987).

Fama(1981) suggests a money-demand based model to explain this relation, using money-demand theory to model (ex post) the expected inflation process. Assuming that real activity, money, and the interest rate are exogenous with respect to the price level, following Fama(1981) and Kaul(1987), the typical money demand equation can be converted into a model for inflation.

(5-3) $I_t = \alpha + \beta_1 DRA_t + \beta_2 DR_t + \beta_3 DM_t + \epsilon_t$

where

I_t: inflation rate for period t,
DRA_t: growth rate of anticipated real activity,
DR_t: change in the continuously compounded interest rate,
DM_t: growth rate of nominal money,
ϵ_t: random disturbance term.
$\beta_1<0$ and β_2, $\beta_3>0$; changes in the interest rate and the growth rate of money are presumed to have the usual positive relation with inflation.

5.3.2 Stock returns and unexpected inflation / changes in expected inflation.

Geske and Roll(1983) consider one type of monetary response which reinforces Fama's prediction of a negative relation between inflation and real activity in the U.S. They argue that stock returns are negatively related to contemporaneous changes in expected inflation because they signal a chain of events which results in a higher rate of monetary expansion. Exogenous shocks in real output, signalled by stock market, induce changes in tax revenue, in the deficit, in Treasury borrowing and in Federal Reserve 'monetisation' of the increased debt. Rational bond and stock market investors realise this will happen. They adjust prices and interest rates accordingly and without delay. Thus, Geske and Roll(1983) conclude that stock price changes, which are caused by changes in anticipated economic conditions, will be negatively correlated with changes in expected inflation.

Following Geske and Roll, consider a simple adaptive expectations model,

(5-4) $EI_t = EI_{t-1} + \tau[I_t - EI_{t-1}] + \epsilon_t$

where

EI_t: expected inflation over period t to t+1 as of t,
τ: speed of adjustment (>0),
ϵ_t: random disturbance term.

If the true return is between stock returns and changes in expected inflation, $EI_t - EI_{t-1}$, the contemporaneous unexpected inflation variable, UI_t, could serve as a proxy. This paper examines the relationship between stock return-inflation in the Korean economy, which is shown as negative in research on the U.S. data.

5.4 The data.

The study employs regression models of market returns on equity and bonds, on rates of inflation for the period January 1975-June 1989. The method currently used to compute the Korea Composite Stock Price Index was adopted at the beginning of 1983, changing from a price-weighted method to a method based on aggregate market value. The Stock Exchange reported the revised Index backdated to the beginning of 1975. The data of Consumer Price Index(CPI), Wholesale Price Index(WPI), Money Supply(M1 and M2), and Industrial Production Index(IPI) were obtained from the Bank of Korea, and Government Bond Yield(GB) and Korea Composite Stock Price Index(KCSPI) were obtained from Dongsuh Securities Co., Ltd. and the Korea Stock Exchange. The rate of inflation is defined as the natural logarithm of the ratios of the values of the CPI and WPI at t and t-1. Instead of using Treasury Bond Yield as in other research in the U.S. market, The short-term Government Bond Yield less than one year was used for calculating interest rates.

M1 is defined as currency in circulation and deposit money (demand deposits at monetary institutions), and M2 includes M1 and quasi-money (time & savings deposits and resident's foreign currency deposits at monetary institutions). The rates of Money Supply(M1, M2) and IPI is calculated as the natural logarithm of the ratios of the total values of M1, M2, and IPI. Stock returns are calculated in nominal and real terms. SPI is the nominal stock return, and RSc and RSw are the real stock returns which are measured by CPI and WPI respectively. All the variables are calculated by monthly, quarterly, and semi-annual data respectively.

For the general calculations, the MiniTab package was used in the City University Business School. Means, standard deviations, and autocorrelations of monthly changes of sample data are shown in table 5.2. The sample autocorrelations of the returns on

Government Bonds, CPI, and WPI are similar for all twelve lags and reliably different from zero. On the other hand, the autocorrelations of monthly changes of M2 and SPI are generally close to zero for most lags except lag twelve (the seasonal lag). In short, the behaviour of the autocorrelations of nominal monthly changes differ across samples.

(Table 5.2) Summary description of monthly nominal changes of samples (January 1975-June 1989)

	N	Mean	Median	TRMean	SD	SEMean	Q1	Q3
GB	173	0.0186	0.0182	0.0182	0.0091	0.0007	0.0123	0.0236
CPI	173	0.0083	0.0061	0.0077	0.0102	0.0008	0.0017	0.0126
WPI	173	0.0067	0.0040	0.0053	0.0134	0.0010	0.0000	0.0086
M1	173	0.0140	0.0101	0.0145	0.0567	0.0043	-0.0200	0.0500
M2	173	0.0175	0.0158	0.0172	0.0143	0.0011	0.0086	0.0265
SPI	173	0.0142	0.0123	0.0125	0.0569	0.0043	-0.0209	0.0419
RSc	173	0.0059	0.0015	0.0043	0.0588	0.0045	-0.0290	0.0358
RSw	173	0.0075	0.0036	0.0064	0.0598	0.0046	-0.0274	0.0367
IPI	173	0.0109	0.0112	0.0093	0.0575	0.0044	-0.0244	0.0379

Autocorrelations

Lag	1	2	3	4	5	6	7	8	9	10	11	12
GB	0.52	0.46	0.36	0.41	0.35	0.39	0.31	0.34	0.41	0.33	0.39	0.42
CPI	0.53	0.33	0.31	0.24	0.30	0.24	0.26	0.28	0.30	0.33	0.39	0.39
WPI	0.50	0.22	0.18	0.19	0.25	0.31	0.37	0.27	0.31	0.36	0.25	0.21
M1	-0.23	-0.01	0.23	-0.26	-0.07	0.02	-0.10	-0.18	0.18	-0.04	-0.14	0.49
M2	0.04	0.18	0.12	0.02	0.06	0.14	0.04	-0.02	0.14	0.11	0.20	0.42
SPI	0.01	0.11	-0.01	0.10	0.00	0.06	-0.01	0.17	-0.01	0.12	0.03	0.26
RSc	0.06	0.11	0.02	0.15	0.04	0.06	0.05	0.21	0.02	0.15	0.08	0.30
RSw	0.07	0.13	0.04	0.16	0.05	0.09	0.07	0.22	0.05	0.17	0.09	0.30
IPI	-0.28	-0.10	-0.09	-0.11	0.12	0.06	0.15	-0.14	-0.01	-0.21	-0.07	0.60

(Note)
TRMean: 5% trimmed mean.
SEMean: Standard error of the mean = SD/$\sqrt{N}$
Q1: the first or lower quartile.
Q3: the third or upper quartile.
GB: the Government Bond Yield.
CPI: the change of Consumer Price Index.
WPI: the change of Wholesale Price Index.
M1: the change of Currency in circulation and deposit money.
M2: the change of M1 and quasi-money.
SPI: the nominal stock return.
RSc: the real stock return, measured by CPI.
RSw: the real stock return, measured by WPI.
IPI: the change of Industrial Production Index.

5.5 Empirical evidence in the Korean stock market.

5.5.1 Expected inflation forecasts.

Obtaining reliable estimates of expected inflation and the implied estimates of unexpected inflation and changes in expected inflation is needed to test the hypothesis of this paper. The methodology of Fama and Gibbons(1984) is followed which extracts inflation forecasts, EI_{t-1}, from treasury bill rates assuming that expected real returns follow a random walk.

Following Irving Fisher(1930) the one-period interest rate, TB_{t-1}, observed at the end of period t-1 can be broken into an expected real return for period t, ER_{t-1}, and an expected inflation rate, EI_{t-1},

(5-5) $TB_{t-1} = ER_{t-1} + EI_{t-1}$, or

(5-6) $EI_{t-1} = -ER_{t-1} + TB_{t-1}$

Isolating the inflation forecast EI_{t-1} in the interest rate requires a model for the expected real return. The evidence of Hess and Bicksler(1975), Fama(1976b), Garbade and Wachtel(1978), and Fama and Gibbons(1982 1984) suggests a model in which the expected real return is a random walk. In the Korean stock market, the Treasury Bill rate is not suitable for this test because of discontinuity of issuance and restricted coupon rate. Instead of Treasury Bill rate, the short-term (less than one year) government bond rate (GB) was used. The short-term government bond rate is actually quite close to the Treasury Bill rate in Korea.

Following Fama and Gibbons(1984), the ex post real return for month t is

(5-7) $GB_{t-1} - I_t = ER_{t-1} + \delta_t$

then the difference between the real returns for t and t-1 is

(5-8) $(GB_{t-1} - I_t) - (GB_{t-2} - I_{t-1}) = \tau ER_{t-1} + \delta_t - \delta_{t-1}$

where ER_{t-1} is the expected real return,

τER_{t-1} is the change in the expected real return from month t-1 to month t, and

δ_t is the unexpected component of the real return for month t.

If ER_{t-1} is a random walk, τER_{t-1} and δ_t are both white noise. The difference between the real returns for month t and t-1 can then be represented as a first-order moving average process (Cryer 1986, Chapt.4),

(5-9) $$(GB_{t-1} - I_t) - (GB_{t-2} - I_{t-1}) = u_t - \theta u_{t-1}$$

and the moving average parameter θ is close to 1.0(0.0) when the variance of δ_t is large(small) relative to the variance of τER_{t-1}.

The autocorrelations of the monthly levels and differences of real return GB_{t-1} are shown in table 5.2. Consistent with the random walk model for the expected real return ER_{t-1} in table 5.2, the first-order autocorrelation of the real return $GB_{t-1} - I_t$ is 0.39, and other autocorrelations show a tendency to decay toward zero at higher-order lags except lag 12month (the seasonal lag). The first-order autocorrelation of the monthly differences of $GB_{t-1} - I_t$ is slightly large, -0.34, but autocorrelations in higher lags 4-8 are quite small.

Following Fama and Gibbons(1984), the moving average parameter θ in equation (5-9) was estimated, using nonlinear least squares. The monthly data for January 1975-June 1989 yield;

(5-10) $$(GB_{t-1} - CPI_t) - (GB_{t-2} - CPI_{t-1}) = \hat{u}_t - \underset{(0.0453)}{0.8114}\hat{u}_{t-1}$$

or

(5-11) $$(GB_{t-1} - WPI_t) - (GB_{t-2} - WPI_{t-1}) = \hat{u}_t - \underset{(0.0348)}{0.8922}\hat{u}_{t-1}.$$

The autocorrelations except lag 1 of the $\hat{u}_t$ estimated according to the backforecasting procedure are close to zero. The estimate of the expected real return for month t is the fitted value

(5-12) $$ER_{t-1} = (GB_{t-2} - CPI_{t-1}) - 0.8114\hat{u}_{t-1}$$

Using the expected real return estimated from (5-12), the expected inflation rate for month t extracted from the government bond yield is

(5-13) $EIGB_{t-1} = GB_{t-1} - ER_{t-1}$.

This model is used to attempt to explain the anomalous stock return-inflation relations.

The same models are used for the quarterly and the semi-annual data. The moving average parameter θs are 0.9876 and 0.9904 for CPI and WPI of quarterly data, and 0.8340 and 0.2998 for CPI and WPI of semi-annual data respectively.

Some results of estimates of inflation regressions for the period January 1975-June 1989 are shown in table 5.4. Models (1)-(4) in table show the regressions of the ex post monthly inflation rate (CPI and WPI) for month t on EI_{t-1}, expected inflation rate. Their estimated regression coefficients are 0.627, 0.635, 0.588, and 0.565 respectively. They will be used as estimates of the ex ante expected rate, even though they absorb less than 32% of the sample variance of the monthly inflation rate.

(Table 5.3) Means, Standard deviations, and Autocorrelations of monthly variables

Variable	N	Mean	TRMean	SD	SEMean	Q1	Q3
CPI_t-CPI_{t-1}	173	-0.007	-0.007	0.986	0.075	-0.559	0.602
$GB_{t-1}-CPI_t$	173	1.037	1.044	1.056	0.080	0.443	1.628
$\tau(GB_{t-1}-CPI_t)$	173	0.004	0.044	1.167	0.088	-0.654	0.781

	Autocorrelation								
Lag	1	2	3	4	5	6	8	10	12
CPI_t-CPI_{t-1}	-0.29	-0.19	0.04	-0.13	0.12	-0.08	0.01	-0.02	0.19
$GB_{t-1}-CPI_t$	0.39	0.19	0.11	0.02	0.04	0.01	0.06	0.11	0.16
$\tau(GB_{t-1}-CPI_t)$	-0.34	-0.10	0.01	-0.09	0.05	0.03	0.03	-0.09	0.10

(Note)

$\tau(GB_{t-1}-CPI_t) = (GB_{t-1}-CPI_t) - (GB_{t-2}-CPI_{t-1})$, i.e., changes in the real rate of government bond yield.

As seen in table 5.4, CPI and WPI are positively related to the expected inflation, using the interest rate model, in all the regressions except regression (6) which t-ratio (-1.37) is not significant. Thus, monthly data show more powerful than quarterly or semi-annual data in forecasting expected inflation. And CPI and WPI are negatively related to real stock returns in regressions (3) and (4).

(Table 5.4) Estimates of expected inflation regressions for the period January 1975-June 1989

No.	Model										
		Rho_1	2	3	4	8	12	R^2 (%)	F	s(e)	DW
PANEL A: Monthly data											
(1)	$CPI_t=0.003+0.627EIGBc_{t-1}+\epsilon_t$										
		(3.44)	(8.94)								
		0.14	-0.00	-0.07	-0.05	0.02	0.24	31.8	79.91	0.0084	1.71
(2)	$WPI_t=0.0024+0.635EIGBw_{t-1}+\epsilon_t$										
		(2.20)	(7.40)								
		0.30	-0.07	-0.07	-0.14	0.01	0.09	24.2	54.82	0.0118	1.40
(3)	$CPI_t=0.0035+0.588EIGBc_{t-1}-0.0272RS_t+\epsilon_t$										
		(3.97)	(8.29)			(-2.44)					
		0.12	0.03	-0.06	-0.07	-0.01	0.21	33.8	44.10	0.0083	1.75
(4)	$WPI_t=0.0033+0.565EIGBw_{t-1}-0.0514RS_t+\epsilon_t$										
		(3.02)	(6.59)			(-3.39)					
		0.27	-0.06	-0.08	-0.16	-0.01	0.05	28.6	34.85	0.0114	1.46
PANEL B: Quarterly data											
(5)	$CPI_t=0.016+0.330EIGBc_{t-1}+\epsilon_t$										
		(6.30)	(8.29)								
		0.29	0.07	0.33	0.28	0.03	-0.05	55.2	68.64	0.0172	1.33
(6)	$WPI_t=0.022-0.086EIGBw_{t-1}+\epsilon_t$										
		(4.62)	(-1.37)								
		0.53	0.62	0.54	0.41	0.18	0.03	1.6	1.89	0.0328	0.94
PANEL C: Semi-annual data											
(7)	$CPI_t=0.043+0.016EIGBc_{t-1}+\epsilon_t$										
		(5.63)	(0.26)								
		0.50	0.68	0.23	0.37	-0.06	-0.22	0.3	0.07	0.0429	0.95
(8)	$WPI_t=0.023+0.352EIGBw_{t-1}+\epsilon_t$										
		(2.34)	(3.36)								
		0.08	0.52	-0.14	0.34	-0.21	-0.12	27.6	11.27	0.0462	1.77

(Notes)
CPI_t, WPI_t: the inflation rate by CPI or WPI.
EIGBc, EIGBw: the expected inflations measured by CPI, WPI.
RS_t: the real stock return for month t.
R^2: (adjusted) the coefficient of determination.
F: F-ratio.
s(e): the residual standard error.

DW: Durbin-Watson test.
Rho: autocorrelations of residuals.
ϵ_t: random disturbance term.
The numbers in parentheses below estimated regression coefficients are t-ratios.

5.5.2 Real activity and inflation.

Following Fama(1981), the relations between inflation and the measures of current and future real activity are also documented in table 5.5. The theoretical basis for this study of inflation-real activity relations is a 'rational expectations' combination of money demand theory and a simple version of the quantity theory of money of Fisher(1911). Fama(1981) represent the demand for money function, for empirical purposes, as

(5-14) $\tau \ln m_t = \tau \ln M_t - \tau \ln P_t$
$= \alpha + \beta_1 \tau \ln A_t + \beta_2 \tau \ln R_t + \epsilon_t$

where
m_t and M_t are the quantities of real and nominal money,
P_t is the price level,
A_t is a measure of anticipated real activity,
R_t is one plus the nominal interest rate,
ϵ_t is a random disturbance, and
τ indicates the difference of the relevant variable.

Fama(1981 p.548) says, "the theory postulates that $\beta_2<0.0$, that is, the demand for money at time t is negatively related to the rate of interest set at t since the interest rate is the opportunity cost of holding a unit of money which generates returns in the form of transactions services rather than generalised purchasing power. On the other hand, if $\beta_1>0.0$, more real money is demanded at t to accomodate the larger volume of transactions generated by a higher level of real activity anticipated for the near future." He, thus, takes this assumption that money demand is forward looking with respect to real activity to be the essence of a rational expectations model of money demand. To specify the endogenous and exogenous variables in (5-14), he adopts a simple rational expectations version of the Fisherian quantity theory of money as follows.

(5-15) $\tau \ln P_t = -\alpha - \beta_1 \tau \ln A_t - \beta_2 \tau \ln R_t + \beta_3 \ln M_t - \epsilon_t$.

Thus, the major hypothesis of this part is to examine, using the Korean market data, that this negative relation between inflation and real activity, with real activity assumed to cause inflation, is the key to the spurious negative relations between stock returns and inflation observed in the U.S. economy.

Estimates of inflation regressions are shown in table 5.5, for monthly data as regressions from (1) to (5), for quarterly data as regressions (6)-(8), and for semi-annual data as regressions (9)-(12). In the regressions (3) (7) (9) and (10), the inflation rate is negatively related to the current, future, and past growth rates of industrial production, IPI_t, IPI_{t+1}, and IPI_{t-1}. But IPI_{t-1} in regression (6), measured by quarterly data, does not coincide with other results. Money growth is measured by M2. The results from the estimated money demand / inflation regressions are reliably positive in regressions (4) (5) (8) (11) and (12). Uniform results are seen in both CPI and WPI data. Regression(4) presents the monthly correlation between CPI and lagged and current money growth. All of the coefficients are positive and the eight month lagged coefficient is slightly higher than other coefficients.

(Table 5.5) Estimates of inflation-real activity regressions for the period January 1975-June 1989

No.	Model									
	Rho	1	2	3	4	8	12	R^2 (%)	F	s(e)	DW
PANEL A: Monthly data											
(1)	$CPI_t=0.0018+0.352GB_{t-1}+\epsilon_t$										
		(1.07)	(4.32)								
	0.44	0.15	0.14	0.08	0.15	0.25		9.3	18.62	0.0097	1.11
(2)	$WPI_t=0.0001+0.357GB_{t-1}+\epsilon_t$										
		(0.04)	(3.25)								
	0.38	0.09	0.05	0.07	0.14	0.08		5.3	10.54	0.0131	1.24
(3)	$CPI_t=0.0087-0.005IPI_t-0.026IPI_{t-1}-0.004IPI_{t+1}+\epsilon_t$										
		(10.17)	(-0.34)		(-1.81)		(-0.03)				
	0.55	0.34	0.30	0.25	0.30	0.36		0.2	1.14	0.0102	0.90
(4)	$CPI_t=-0.001+0.117M2_t+0.045M2_{t-2}+0.101M2_{t-4}+0.073M2_{t-6}$										
		(-0.50)	(2.13)		(0.80)		(1.84)		(1.27)		
	$+0.148M2_{t-8}+\epsilon_t$										
	(2.83)										
	0.43	0.21	0.07	0.10	0.08	0.24		11.6	5.31	0.0091	1.64
(5)	$WPI_t=0.0022+0.130M2_{t-1}+0.128M2_t+\epsilon_t$										
		(1.10)	(1.84)		(1.73)						
	0.36	0.15	0.09	0.11	0.05	0.21		2.7	3.34	0.0133	1.62
PANEL B: Quarterly data											
(6)	$CPI_t=0.0259+0.092IPI_{t-1}-0.112IPI_t-0.049IPI_{t+1}+\epsilon_t$										
		(4.79)	(1.24)		(-1.56)		(-0.68)				
	0.46	0.39	0.60	0.42	0.24	0.07		3.9	1.73	0.0244	0.96
(7)	$WPI_t=0.0285-0.031IPI_{t-1}-0.150IPI_t-0.095IPI_{t+1}+\epsilon_t$										
		(3.84)	(-0.31)		(-1.52)		(-0.95)				
	0.23	0.48	0.42	0.29	0.19	0.11		5.1	0.92	0.0334	1.53
(8)	$CPI_t=-0.0062-0.121IPI_t-0.011SPI_t+0.460GB_t+0.162M2_{t-1}+\epsilon_t$										
		(-0.73)	(-1.92)		(-0.40)		(3.28)		(1.64)		
	0.08	-0.04	0.29	0.18	0.03	-0.01		28.1	6.37	0.0209	1.72
PANEL C: Semi-annual data											
(9)	$CPI_t=0.0681-0.152IPI_{t-1}-0.081IPI_t-0.114IPI_{t+1}+\epsilon_t$										
		(3.84)	(-0.85)		(-0.40)		(-0.61)				
	0.48	0.70	0.23	0.47	-0.02	-0.22		8.2	0.66	0.0439	0.96
(10)	$WPI_t=0.0742-0.193IPI_{t-1}-0.248IPI_t-0.110IPI_{t+1}+\epsilon_t$										
		(3.31)	(-0.85)		(-0.97)		(-0.46)				
	0.36	0.42	0.18	0.38	0.03	-0.15		13.5	1.15	0.0556	0.68
(11)	$CPI_t=-0.0218+0.347M2_{t-1}+0.101M2_t+0.208M2_{t+1}+\epsilon_t$										
		(-0.97)	(1.40)		(0.75)		(0.87)				
	0.73	0.43	-0.02	-0.28	-0.14	-0.10		34.9	5.46	0.0347	0.53
(12)	$WPI_t=-0.0393+0.261M2_{t-1}+0.230M2_t+0.268M2_{t+1}+\epsilon_t$										
		(-1.16)	(0.71)		(1.14)		(0.76)				
	0.66	0.37	-0.10	-0.30	-0.00	-0.15		14.7	2.43	0.0518	0.68

(Notes)
CPI_t, WPI_t: the inflation rate by CPI or WPI.
GB_{t-1}: the government bond rate observed at t-1.
EIGBc, EIGBw: the expected inflations measured by CPI, WPI.
SPI_t: the nominal stock return for time t.
RS_t: the real stock return for time t.
IPI_t: the industrial production index for time t.
$M2_t$: the money supply(M2) at time t.
R^2: (adjusted) the coefficient of determination.
F: F-ratio.
s(e): the residual standard error.
DW: Durbin-Watson test.
Rho: autocorrelations of residuals.

ϵ_t: random disturbance term.
The numbers in parentheses below estimated regression coefficients are t-ratios.

5.5.3 Stock returns, inflation, and real activity.

A direct test of the proxy hypothesis is to regress stock returns on both inflation and real variables. The relevant regressions are shown in table 5.6. The hypothesis regarding real stock return-real activity relations is that, given efficient capital markets, these relations should be positive. Table 5.6 documents strong positive relations between a measure of monthly and quarterly real stocks returns, RS_t, and the real variables. In regressions (7) (17) and (18), the coefficients of IPI, changes of industrial production index in natural logarithm, are positive in times t, t-1, and t+1. Regressions (7) (17) and (18) indicate that current rate of change in IPI, IPI_t, explains slightly more than the variations of the past and future changes in the industrial production index. As seen in regressions (25) and (26), IPI_{t+1} using semi-annual data is negatively related to the real stock returns. But their t-ratios are very small. Monthly, quarterly, and semi-annual real stock returns are negatively related to all the inflation variables of expected inflation, $EIGBc_{t-1}$ and $EIGBw_{t-1}$, changes in expected inflation, $\tau EIGBc_t$ and $\tau EIGBw_t$, in regressions (1)-(4), (13)-(16), and (22)-(24).

Regressions (5) and (6) show monthly relations between real stock returns and expected and unexpected inflations. Stock returns are uniformly negatively related to expected and unexpected inflations. Unexpected inflation, $UIGBc_t$ or $UIGBw_t$, is just the difference between the ex post inflation rate for year t and $EIGB_{t-1}$. In regression (10), the positive relations between real stock returns and money supply(M1, M2) are seen. However, in regressions (19)-(20), the real stock returns show negative relations to quarterly variables of money supply ($M2_{t-1}$, $M2_t$, and $M2_{t+1}$). Also the nominal stock returns are negatively related to money supply in regression (21). In another regressions of (27)

and (28), using semi-annual data, the future variables of money supply show positive relations to the real stock returns, but the current and the past variables of money supply show negative relations. This means that money supply does not work coincidently with monthly, quarterly, and semi-annual real stock returns. Regressions (11) and (12) show the relations between real stock return and real variables. Government bond yield is also negatively related with real stock return. As seen in table 5.6, the Durbin-Watson test is relatively large and autocorrelations of residuals of monthly data are relatively small (noise) except lag 12 (seasonal lag). Thus, it may be confirmed that the stock market in Korea does not work as hedging against inflation and real variables influence real stock returns as fundamental determinants of equity values. These anomalous relations, witnessed in the Korean Economy, are consistent with other research in industrial economies (Fama 1981, Gultekin 1983, and Kaul 1987).

(Table 5.6) Estimates of regressions of stock returns on real variables (January 1975-June 1989)

No.	Model Rho_1	2	3	4	8	12	R^2 (%)	F	s(e)	DW
PANEL A: Monthly data										
(1)	$RSc_t=0.0185-1.43EIGBc_{t-1}+\epsilon_t$									
	(3.11)		(-2.99)							
	0.00	0.07	-0.01	0.11	0.18	0.27	4.5	8.94	0.0573	1.99
(2)	$RSw_t=0.0174-1.36EIGBw_{t-1}+\epsilon_t$									
	(3.27)		(-3.21)							
	0.01	0.07	-0.01	0.09	0.17	0.27	5.2	10.32	0.0581	1.97
(3)	$RSc_t=0.0220-1.86EIGBc_{t-1}-0.947\tau EIGBc_t+\epsilon_t$									
	(3.51)		(-3.43)		(-1.65)					
	0.01	0.07	-0.01	0.09	0.18	0.27	5.5	5.88	0.0570	1.99
(4)	$RSw_t=0.0192-1.64EIGBw_{t-1}-0.835\tau EIGBw_t+\epsilon_t$									
	(3.53)		(-3.55)		(-1.47)					
	0.01	0.08	-0.01	0.07	0.17	0.27	5.9	6.28	0.0579	1.98
(5)	$RSc_t=0.0201-1.690EIGBc_{t-1}-1.42UIGBc_t+\epsilon_t$									
	(3.19)		(-3.09)		(-2.99)					
	-0.01	0.11	-0.02	0.08	0.15	0.24	5.8	6.19	0.0572	2.00
(6)	$RSw_t=0.0195-1.78EIGBw_{t-1}-1.234UIGBw_t+\epsilon_t$									
	(3.71)		(-4.09)		(-3.32)					
	-0.01	0.10	-0.03	0.07	0.14	0.23	10.2	10.69	0.0568	2.00
(7)	$RSc_t=0.0031+0.184IPI_t+0.0106IPI_{t+1}+0.0791IPI_{t-1}+\epsilon_t$									
	(0.65)	(2.16)		(0.13)		(0.96)				
	0.06	0.12	-0.01	0.11	0.21	0.27	1.2	1.71	0.0583	1.86
(8)	$RSc_t=0.0122-0.942EIGBc_{t-1}+0.188IPI_t+\epsilon_t$									
	(2.03)		(-1.96)		(2.39)					
	0.01	0.10	-0.05	0.08	0.16	0.24	4.0	4.57	0.0577	1.95
(9)	$RSw_t=0.0147-1.40EIGBw_{t-1}+0.226IPI_t+\epsilon_t$									
	(2.79)		(-3.36)		(2.91)					
	0.02	0.13	-0.06	0.02	0.12	0.21	8.9	9.33	0.0572	1.95
(10)	$RSc_t=0.0108+0.0444M1_t+0.293M2_t+\epsilon_t$									
	(1.45)	(0.55)		(0.85)						
	0.05	0.12	0.01	0.14	0.21	0.29	0.5	0.44	0.0591	1.89
(11)	$RSc_t=0.0209+0.149IPI_t+0.0224M1_t-1.49CPI_t-0.242GB_t+\epsilon_t$									
	(2.05)	(1.96)		(0.29)	(-3.36)	(-0.48)				
	-0.01	0.12	-0.06	0.03	0.11	0.20	7.5	4.50	0.0566	1.99
(12)	$RSc_t=0.0185+0.188IPI_t+0.196M2_t-1.42CPI_t-0.20GB_t-0.284EIGBc_t+\epsilon_t$									
	(1.70)	(2.36)		(0.57)	(-2.93)	(-0.37)	(-0.52)			
	0.00	0.13	-0.07	0.03	0.11	0.20	7.5	3.73	0.0567	1.97

No.	Model										
	Rho_1	2	3	4	8	12		R^2 (%)	F	s(e)	DW
PANEL B: Quarterly data											
(13)	$RSc_t=0.0392-0.678EIGBc_{t-1}-0.582\tau EIGBc_t+\epsilon_t$										
		(2.22)	(-1.83)			(-2.22)					
	0.05	0.04	0.34	0.33	0.11	0.03		5.1	2.48	0.1124	1.89
(14)	$RSc_t=0.0395-0.527EIGBw_{t-1}-0.466\tau EIGBw_t+\epsilon_t$										
		(2.16)	(-1.46)			(-2.04)					
	0.10	0.09	0.35	0.34	0.10	0.08		3.9	2.11	0.1168	1.79
(15)	$RSc_t=0.0714-2.03EIGBc_{t-1}-1.90UIGBc_t+\epsilon_t$										
		(3.41)	(-3.22)			(-3.38)					
	0.03	0.09	0.18	0.22	0.08	0.08		14.7	5.73	0.1065	1.93
(16)	$RSc_t=0.0573-1.72EIGBw_{t-1}-1.67UIGBw_t+\epsilon_t$										
		(3.12)	(-3.30)			(-3.75)					
	-0.00	-0.00	0.20	0.17	0.06	0.00		17.9	7.10	0.1095	1.93
(17)	$RSc_t=-0.0169+0.306IPI_{t-1}+0.885IPI_t+0.032IPI_{t+1}+\epsilon_t$										
		(-0.68)	(0.90)			(2.69)		(0.10)			
	0.13	0.09	0.40	0.37	0.20	0.12		7.6	2.49	0.1114	1.73
(18)	$RSw_t=-0.0195+0.429IPI_{t-1}+0.923IPI_t+0.077IPI_{t+1}+\epsilon_t$										
		(-0.76)	(1.23)			(2.72)		(0.23)			
	0.14	0.13	0.39	0.41	0.24	0.17		8.1	2.59	0.1149	1.69
(19)	$RSc_t=0.0981-0.409M2_{t-1}-0.569M2_t-0.462M2_{t+1}+\epsilon_t$										
		(2.11)	(-0.76)			(-1.12)		(-0.90)			
	0.12	0.18	0.29	0.30	0.04	0.05		6.0	1.08	0.0981	1.76
(20)	$RSw_t=0.1070-0.447M2_{t-1}-0.632M2_t-0.458M2_{t+1}+\epsilon_t$										
		(2.24)	(-0.81)			(-1.20)		(-0.86)			
	0.16	0.23	0.31	0.32	0.05	0.06		1.0	1.17	0.1193	1.66
(21)	$SPI_t=0.0984-0.140M2_{t-1}-0.619M2_t-0.234M2_{t+1}+\epsilon_t$										
		(2.25)	(-0.28)			(-1.29)		(-0.49)			
	0.07	0.16	0.24	0.22	0.03	0.04		0.0	0.80	0.1088	1.84
PANEL C: Semi-annual data											
(22)	$RSc_t=0.0848-0.938EIGBc_{t-1}-0.712\tau EIGBc_t+\epsilon_t$										
		(2.15)	(-1.87)			(-1.88)					
	0.26	0.34	0.27	0.02	-0.17	0.02		6.3	1.88	0.1715	1.44
(23)	$RSw_t=0.1020-1.30EIGBw_{t-1}-1.09\tau EIGBw_t+\epsilon_t$										
		(2.66)	(-2.62)			(-2.48)					
	0.24	0.32	0.19	0.03	-0.18	0.00		18.8	4.00	0.1681	1.48
(24)	$RSc_t=0.1340-1.92EIGBc_{t-1}-1.83UIGBc_t+\epsilon_t$										
		(2.77)	(-2.46)			(-2.42)					
	0.21	0.19	0.25	-0.05	-0.28	0.06		13.7	3.06	0.1646	1.55
(25)	$RSc_t=-0.0600-0.016IPI_{t-1}+1.86IPI_t-0.226IPI_{t+1}+\epsilon_t$										
		(-0.89)	(-0.02)			(2.42)		(-0.32)			
	0.38	0.44	0.39	0.28	-0.04	-0.06		14.2	2.38	0.1673	1.16
(26)	$RSw_t=-0.0662+0.026IPI_{t-1}+2.03IPI_t-0.231IPI_{t+1}+\epsilon_t$										
		(-0.95)	(0.04)			(2.55)		(-0.31)			
	0.43	0.47	0.40	0.30	-0.00	-0.09		16.9	2.70	0.1731	1.06
(27)	$RSc_t=0.1910-1.470M2_{t-1}-0.491M2_t+0.58M2_{t+1}+\epsilon_t$										
		(1.60)	(-1.13)			(-0.69)		(0.46)			
	0.28	0.25	0.23	-0.08	-0.20	0.00		0.0	0.82	0.1826	1.40
(28)	$RSw_t=0.2080-1.38M2_{t-1}-0.620M2_t+0.52M2_{t+1}+\epsilon_t$										
		(1.66)	(-1.01)			(-0.83)		(0.39)			
	0.34	0.27	0.21	-0.07	-0.17	-0.04		0.0	0.76	0.1927	1.29

(Notes)
RSc_t, RSw_t: the real stock returns for time t.
SPI_t: the nominal stock return for time t.
IPI_t: the change of industrial production index for time t.
$M1_t$, $M2_t$: the change of M1, M2 for time t.
GB_t: the government bond yield for time t.

EIGBc: the expected inflation using equation 5-13, measured by CPI.
EIGBw: the expected inflation using equation 5-13, measured by WPI.
τEIGBc, τEIGBw: the changes in expected inflation.
$UIGBc_t$, $UIGBw_t$: the unexpected inflation measured by CPI and WPI.
R^2: the coefficient of determination.
s(e): the residual standard error.
The numbers in parentheses below estimated regression coefficients are t-statistics.
Rho: the residual autocorrelation.
ϵ_t: random disturbance term.

5.5.4 The experience of the recent economy.

In this section, an attempt is made to test whether real stock return-inflation relations vary over time in a systematic manner. The stock market in Korea has been very active during the past several years. Similar tests are made on the shorter period data of January 1984-June 1989. The contention is that the positive stock return-real variable relation or the negative stock return-inflation relation is likely to be stable over time. Table 5.7 presents means, standard deviations, and autocorrelations of sample data in the period of January 1984-June 1989. Autocorrelations of this period except lag twelve (seasonal lag) are generally much smaller than those of the whole period data.

(Table 5.7) Summary description of monthly changes
(January 1984-June 1989)

	N	Mean	Median	TRMean	SD	SEMean	Q1	Q3
GB	66	0.0123	0.0125	0.0124	0.0050	0.0006	0.0093	0.0152
CPI	66	0.0034	0.0031	0.0035	0.0055	0.0007	0.0000	0.0066
WPI	66	0.0008	0.0010	0.0008	0.0045	0.0006	-0.0022	0.0039
M1	66	0.0070	0.0030	0.0085	0.0679	0.0084	-0.0420	0.0692
M2	66	0.0120	0.0118	0.0120	0.0116	0.0014	0.0034	0.0200
M3	66	0.0187	0.0187	0.0187	0.0088	0.0011	0.0125	0.0246
SPI	66	0.0296	0.0194	0.0284	0.0661	0.0081	-0.0188	0.0773
RSc	66	0.0262	0.0171	0.0250	0.0660	0.0081	-0.0260	0.0759
RSw	66	0.0288	0.0189	0.0279	0.0663	0.0082	-0.0216	0.0759
IPI	66	0.0093	0.0106	0.0086	0.0603	0.0074	-0.0231	0.0320
CAB	66	0.0005	0.0036	0.0010	0.0139	0.0017	-0.0073	0.0092
GFX	66	0.0126	0.0121	0.0204	0.1028	0.0127	-0.0085	0.0538

Lag	Autocorrelations											
	1	2	3	4	5	6	7	8	9	10	11	12
GB	-0.09	0.06	0.03	0.05	-0.13	0.10	-0.04	0.11	0.13	-0.09	-0.04	0.16
CPI	0.09	-0.19	-0.01	0.13	0.10	0.02	-0.06	-0.00	0.05	-0.08	0.06	0.23
WPI	0.11	-0.31	-0.11	0.21	0.24	-0.16	-0.00	0.17	0.06	-0.08	0.03	0.11
M1	-0.28	-0.12	0.31	-0.33	-0.10	0.09	-0.13	-0.14	0.19	-0.02	-0.19	0.52
M2	0.01	-0.01	0.11	-0.12	-0.14	0.14	-0.18	-0.15	0.13	-0.00	0.04	0.45
M3	0.02	0.02	0.35	-0.10	-0.15	0.35	-0.02	-0.09	0.20	-0.04	-0.08	0.32
SPI	-0.06	0.12	-0.16	0.16	-0.10	0.08	-0.08	0.09	-0.12	0.26	-0.01	0.21
RSc	-0.05	0.07	-0.16	0.18	-0.10	0.09	-0.07	0.10	-0.13	0.24	0.00	0.21
RSw	-0.05	0.11	-0.15	0.17	-0.11	0.07	-0.07	0.11	-0.12	0.24	-0.01	0.22
IPI	-0.31	-0.07	-0.11	-0.06	0.01	0.07	0.08	-0.05	0.01	-0.17	-0.08	0.46
CAB	-0.42	-0.03	0.14	-0.07	-0.09	0.18	-0.24	-0.02	0.23	-0.09	-0.22	0.32
GFX	-0.05	-0.21	0.01	-0.02	0.01	0.03	-0.05	-0.05	-0.04	0.03	0.13	-0.06

(Notes)
GB: the government bond yield.
CPI: the change of consumer price index.
WPI: the change of wholesale price index.
M1: the change of currency in circulation and deposit money.
M2: the change of M1 and quasi-money.
M3: M2+Other Financial Institutions' deposits+Debentures issued +Commercial bills sold+CD+RP.
SPI: the nominal stock return.
RSc, RSw: the real stock returns, measured by CPI, WPI.
IPI: the change of industrial production index.
CAB: the change of the balance of current account.
GFX: the change of the holding amount of Gold and foreign exchange

Table 5.8 presents estimates of stock return-inflation or real variable relations for the period of January 1984-June 1989 period. The expected inflation rate for month t extracted from the equation (5-13),

$EIGB_{t-1} = GB_{t-1} - ER_{t-1}$

where

$$ER_{t-1} = (GB_{t-2} - CPI_{t-1}) - 0.9672\hat{u}_{t-1} \quad \text{or,}$$

$$ER_{t-1} = (GB_{t-2} - WPI_{t-1}) - 0.9792\hat{u}_{t-1}.$$

These results can be compared with the whole period in tables 5.4-5.6. The most interesting feature of table 5.8 is perhaps the positive coefficients of both the expected inflation and unexpected inflation variables to the real stock returns in the

regressions (4)-(6). But in regressions (8) and (9), changes of expected inflation is negatively related with stock returns as seen for long-term data. Also expected inflation is negatively related to the CPI and WPI in regressions (1) and (2).

These regression results are surprising, because the observed positive- but not significant-relation between stock return-inflation is in direct contrast to the previously documented negative relations for the January 1975-June 1989 period. Why does the positive relation between the real stock returns and expected inflation hold in January 1984-June 1989? Also the relation between stock returns and current M1 (regression 11) did not explain the positive relations. In this period, the financial industry developed abruptly as explained in chapters II and IV. The current account changed from a chronic deficit to a huge suplus, and the stock market has been very strong. Whereas economic variables have fluctuated, the stock prices have advanced continuously. Even during the worldwide stock market crash in October 1987, the Korean stock market did not react adversely. Was one lesson to be learned that the Korean financial economy is on 'auto-pilot' - in the sense that it is managed with exceptional efficiency by the powerful bureaucracy? This explanation is indirect, thus the relations with other variables were tested.

As seen in chapter IV, Korea's fast growth and its rapidly rising savings ratio have been accompanied by a remarkable monetisation of the economy. If we look at the trend of the Marshallian k (the ratio of money to GNP, i.e., the inverse of velocity), we get an interesting clue. The Marshallian k ratios for reserve money and M1 have decreased in recent years and the ratio for M2 is relatively stable. However, the Marshallian k ratio for M3 has continuously increased. This can be explained by comparison of financial assets between monetary and non-monetary institutions as examined in section 4.4.3. Also the balance in the current account (CAB) can be used as a variable to explain the relation of inflation-real variable or stock return-real

economy. As seen in table 5.7, quarterly lags of autocorrelations of M3, and lags 1 and 12 of CAB are a little bit large, but the others are relatively small.

Inflation in recent years can be explained by M2, M3, and the current account balance more than M1. Also high stock returns may be explained by CAB_t and GFX_{t-1} (Gold and Foreign exchange holdings). In regressions (10) and (12), the surplus of current accout are explained as positive relations to stock returns and to CPI.

(Table 5.8) **Estimates of regressions of inflation, stock returns, and real variables (January 1984-June 1989)**

No.	Model Rho$_1$	2	3	4	8	12	R^2 (%)	F	s(e)	DW
(1)	$CPI_t=0.0038-0.0684EIGBc_{t-1}+\epsilon_t$ (5.39)(-1.94)									
	0.03	-0.05	0.00	0.07	-0.08	0.22	4.1	3.76	0.0054	1.92
(2)	$WPI_t=0.0004-0.0656EIGBw_{t-1}+\epsilon_t$ (0.65)(-2.19)									
	0.08	-0.15	-0.08	0.17	0.13	0.05	5.6	4.81	0.0044	1.83
(3)	$CPI_t=0.0014-0.0089IPI_t+0.084GB_t+0.0346M2_t+0.0360M3_t+0.0020CAB_t$ (0.51)(-0.74) (0.55) (0.50) (0.39) (0.04) $+0.0017GFX_t+\epsilon_t$ (0.24)									
	0.12	-0.15	-0.03	0.07	-0.05	0.29	2.6	0.26	0.0057	1.76
(4)	$RS_t=0.023+0.547EIGBc_{t-1}+\epsilon_t$ (2.66)(1.27)									
	-0.03	0.08	-0.15	0.15	0.08	0.21	0.09	1.61	0.0662	2.01
(5)	$RS_t=0.030+0.191EIGBw_{t-1}+\epsilon_t$ (3.43)(0.42)									
	-0.05	0.11	-0.16	0.16	0.10	0.21	0.03	0.18	0.0672	2.05
(6)	$RS_t=0.0224+1.71EIGBc_{t-1}+0.15UIGBc_t+\epsilon_t$ (2.13) (1.41) (0.10)									
	-0.03	0.07	-0.15	0.16	0.08	0.21	2.5	0.80	0.0668	2.00
(7)	$RS_t=0.0304-0.70EIGBw_{t-1}+0.84UIGBw_t+\epsilon_t$ (3.43)(-0.34) (0.44)									
	-0.06	0.12	-0.17	0.15	0.09	0.21	0.0	0.18	0.0676	2.07
(8)	$RS_t=0.0267+0.219EIGBc_{t-1}-0.213\tau EIGBc_t+\epsilon_t$ (2.82) (0.28) (-0.46)									
	-0.05	0.04	-0.13	0.17	0.11	0.21	0.0	0.83	0.0656	2.10
(9)	$RS_t=0.0297-0.163EIGBw_{t-1}-0.291\tau EIGBw_t+\epsilon_t$ (3.08)(-0.20) (-0.60)									
	-0.08	0.09	-0.14	0.17	0.13	0.24	1.2	0.32	0.0664	2.14
(10)	$RS_t=0.0276+0.217IPI_t+0.773M2_t-1.36M3_{t-1}+1.04CAB_t+\epsilon_t$ (1.42) (1.64) (1.04) (-1.38) (1.90)									
	0.03	0.01	-0.21	0.02	0.00	0.15	8.9	2.59	0.0630	1.88
(11)	$RS_t=0.0029-0.189M1_t+1.29M2_t+0.63M3_t+\epsilon_t$ (0.12)(-1.14) (1.80) (0.49)									
	-0.02	-0.01	-0.11	0.12	0.09	0.16	2.0	1.45	0.0656	1.98
(12)	$RS_t=0.0129+1.08CAB_t+\epsilon_t$ (1.32) (2.30)									
	-0.04	0.05	-0.21	0.12	0.01	0.20	6.2	5.30	0.0640	2.03

5.6 Conclusion.

The main purpose of this chapter has been to examine the relation between inflation and real stock returns in Korea. Using the interest rate model in the period of January 1975-June 1989 data, the expected inflation was uniformly positively related to actual inflation (CPI and WPI). The relations between stock returns and expected / unexpected inflation showed negative. Also stock returns and the changes of expected inflation were negatively related. These results do not coincide with the Fisher Hypothesis, as reflected in U.S. results, that common stocks, as claims against real assets, should be a good hedge against inflation. The hypothesis regarding real stock return-real activity relations is that, given efficient capital markets, these relations should be positive. The monthly and quarterly results indicated positive relations and the current rate of change in IPI explains slightly more than the variations of past and future changes in the industrial production index. The results of monthly, quarterly, and semi-annual data for the relations between money supply and the real stock returns do not coincide with each other. And the government bond yield was negatively related to real stock returns.

In another attempt, we examined whether real stock return-inflation relations varied over time. We found that these real stock return-inflation relations still vary over time. The results of the most recent five and half years period show a positive relation or no relation between real stock return and inflation. M2 and the balance of current account were found more powerful in explaining the stock return and (or) inflation. Some of the dissimilarity in the behavior of short-term expected and unexpected inflation rates is probably a specific stock market environmental consequence in recent years. However, it attributes the increasing similarity in the behavior of longer-term unexpected inflation rates to real market forces.

In summary, the Korean stock market does not work simply as

a hedge against inflation and real variables influence to real stock returns as fundamental determinants of equity values. Also, in short-term subperiods, these real stock return-inflation relations are found to vary over time.

CHAPTER VI. EFFICIENT MARKET RESEARCH: THEORY AND EVIDENCE UP TO THE PRESENT TIME.

6.1 Introduction.

The primary function of a stock market is to allocate ownership of the economy's capital stock. If stock prices provide accurate signals for resource allocation, firms are able to make correct production - investment decisions, and investors are able to choose the most suitable stocks for investment. These choices are only possible if the market is efficient, that is, if stock prices fully reflect all available information.

For many years a considerable volume of research activity has been devoted to testing the validity of the Efficient Market Hypothesis(EMH) as an explanatory model of price behaviour in various speculative markets; commodity, foreign exchange and stock markets. Basically, this hypothesis states that changes in prices are independent over time. If this hypothesis is correct, it implies that no trading rule based on past prices will earn an economic profit.

Usually capital market efficiency has been tested in the large and sophisticated capital markets of developed countries. Little research has been devoted to those of developing countries, even though their markets have grown rapidly in 1980s. Therefore one must be careful to limit any conclusions to the appropriate arena from which they are drawn. A cross-country survey by U Tun Wai and Patrick(1973) of the actual experience of less developed countries with capital markets suggests that

"With a few exceptions (for example, in Brasil, India, Malaysia and Singapore), markets are thin with little or no trading and with relatively few and insignificant amounts of new public issues by private corporations... Information is poor and manipulation is substantial, especially for private issues. It is our strong view that the most profitable line of research would lie in detailed case studies of capital markets in specific countries."

During several years, the stock market in Korea has been developing rapidly and is expected to be opened to the international investors in 1992. However, efficiency tests on this market could not be found in the international literature except one random walk study done by Cooper(1982) for 30 stock markets in the world. Korea was included, but the sample was limited to 300 weekly observations of the Korea Composite Stock Price Index(KCSPI).

The efficiency of the Korean Stock Market in this piece of research is tested in three different forms; that is, its weak form, semi-strong form and strong form. The weak form states that historic price movements cannot be used to predict future price movements; or successive price movement are independent of (i.e. unrelated to) previous price movements. In other words, chartists who use historic price information to predict future prices are basically wasting their time. The statistical tests that will be adopted in order to test this form of efficiency will be the following; frequency distribution, serial correlation, runs analysis, and spectral analysis. With these tests, the efficiency characteristics of two different periods are compared with each other: 1978-1980 and 1986-1988. Semi-strong form tests are involved with the effect of public announcements on shares' returns. The announcements of bonus issues are considered in this study during 1985-1988. Strong form tests evaluate the unpublished recommendations of the Korean brokerage houses or analysts, if an investor following the recommendations would have achieved significantly positive abnormal returns.

The results of these tests show the extent to which the Korean stock market is pricing-efficient, that is, whether it helps the market participants to 'correctly' evaluate individual securities.

6.2 The Efficient Market Hypothesis.

If stock prices fully reflect the available information, and these prices react instantaneously, and in an unbiased fashion to new information, then this rules out the existence of any trading system which would consistently outperform the general level of market return (Fama 1970, Keane 1983, Sheffrin 1983, Strong and Walker 1987). Returns will be a "fair game" with respect to the information set. This approach, for the first time, was described by Fama(1970) in terms of an "expected return" or "fair game" model. In notational terms, the expected return theories are of the form:

(6-1) $$E(\tilde{P}_{j,t+1}|\phi_t)=[1+E(\tilde{r}_{j,t+1}|\phi_t)]P_{j,t}$$

where

E : the expected value operator

$P_{j,t}$: the price of security j at time t

$P_{j,t+1}$: its price at t + 1

$r_{j,t+1}$: the one-period percentage return $= (P_{j,t+1} - P_{j,t})/P_{j,t}$

ϕ_t : a set of information to be fully reflected in the price at t

$\tilde{}$: indication of random variables at t

The assumptions that the conditions of market equilibrium can be stated in terms of expected returns and that equilibrium expected returns are formed on the basis of the information set ϕ_t have a major empirical implication. Thus let

(6-2) $$X_{j,t+1}=P_{j,t+1} - \tilde{E}(P_{j,t+1}|\phi_t)$$

where $X_{j,t+1}$: the excess market return of security j at time t+1, and

(6-3) $Z_{j,t+1}$ by $Z_{j,t+1}=r_{j,t+1}-E(\tilde{r}_{j,t+1}|\phi_t)=0$

Then

(6-4) $$E(\tilde{X}_{j,t+1}|\phi_t)=E(\tilde{Z}_{j,t+1}|\phi_t)=0$$

which says that the sequence $(X_{j,t})$ is a "fair game" with respect to the information sequence (ϕ_t). Or more generally, let

$V_{t+1}(\phi_t)$ be the excess market value (i.e., the difference between actual market value and the conditionally expected market value) of any collection of the securities generated by any trading system based on ϕ_t. Then $\tilde{E}(V_{t+1}|\phi_t)=0$ can be derived as a "testable implication" of the efficient market model.

Fama(1970) considered sufficient conditions to determine capital market efffeciency as follows.

(a) There are no transaction costs in trading securities.

(b) All available information is costlessly available to all market participants.

(c) All agree on the implications of current information for the current price and distributions of future prices of each security. In such a market, the current price of security obviously "fully reflects" all available information. But though the three conditions above are not necessarily sources of market inefficiency, they are potential sources. And all three exist to some extent in real world markets. Measuring their effects on the process of price information is, of course, the important goal of empirical work in this area.

In the early 1960's, academic workers continued to investigate the randomness of stock prices, and the financial community continued to be indifferent, indignant, or only amused. The variety of opinion stemmed from disbelief in the validity of the findings or from the misconception that randomness implied a kind of senselessness in the determination of stock prices. As of this date, the vast bulk of the empirical evidence has been in support of the efficient markets and random walk hypothesis, but technical and fundamental analysts continue to flourish, commanding sizable quantities of investors' capital in the process. Technical and fundamental analysts argue that the tests continued within the academic community have been unidimentional, too restrictive, or too simplistic to offer conclusive proof that market movements cannot be forecast in advance. However, academic workers point out that their experiments have yet to indicate the existence of any market inefficiencies and no practicing analyst

has yet presented conclusive evidence of consistently significant outperformance. (Le Roy 1976, Murphy 1977, Bishop and Rollins 1977, Benthelehem 1979, Grossman and Stiglitz 1980, Beaver 1981, Hatzoulis and Stark 1981, Ferguson 1983, Treynor and Ferguson 1985, and Joy and Jones 1986). Despite all the criticisms, however, the EMH as presented by Fama is still adopted by most researchers on the field, and it has been used in a variety of areas since 1980s. With the wide acceptance of the information based model of market behaviour, empirical research has become more focused on how and at what speed the market reacts to the receipt of various types of information as well as on the limits of informational efficiency exhibited by the market.

The explanation of the apparent randomness of stock prices lies in understanding the market making mechanism. In an efficient market where information is freely available, the price of a security can be expected to approximate its "intrinsic" value because of competition among investors. Intrinsic values can change as a result of new information. If, however, there is only a gradual awareness of new information and all that it implies, successive price changes will exhibit dependence. If the adjustment to information is virtually instantaneous, successive price changes will be random. Although implicit in the work of many, including Moore(1965) and probably even Adam Smith, the first specification of efficient markets and their relationship to the randomness of prices of things traded in that market is attributable to Samuelson(1965) and Mandelbrot(1966).

If a market has zero transaction costs, and if all participants and potential participants in the market have the same time horizons and homogeneous expectations with regard to prices, the market will assuredly be efficient and prices in such a market will fluctuate randomly (Lorie and Hamilton 1973). LeRoy(1976) criticised Fama's model for being tautological and, therefore, empirically vacuous.
"Any stochastic processes $\{r_{j,t}\}$, $\{P_{j,t}\}$, $\{X_{j,t}\}$, and $\{Z_{j,t}\}$ related by equations (6-2) and (6-3), and the rate of return

definition $r_{j,t+1} = (P_{j,t+1} - P_{j,t})/P_{j,t}$ will obey equations (6-1) and (6-4). It follows that these equations cannot properly characterise an efficient capital market, however defined, since they are as true of the most naive Dow theory model as of a pure random walk. Because the equations imply no restrictions on the data, they cannot possibly generate testable implication, contrary to Fama's clear implication".

However Fama(1976) replied by denying tautology. And he presented the model in a different way which hopefully is free of whatever is misleading or difficult to follow in an earlier approach.

"$f(P_t|\phi_{t-1}) = f_m(P_t|\phi^m_{t-1})$

where $P_t=(P_{1t,2t,\ldots,P_{nt}})$ is the vector of prices of securities at time t, ϕ_{t-1} is the set of information available at t-1, ϕ^m_{t-1} is the set of information used by the market, $f_m(P_t|\phi^m_{t-1})$ is the market assessed density function for P_t, and $f(P_t|\phi_{t-1})$ is the true density function implied by ϕ_{t-1}. Market efficiency says nothing specific about how the characteristics of $f_m(P_t|\phi^m_{t-1})$ determine the equilibrium expected return $E_m(\tilde{R}_{jt}|\phi^m_{t-1})$. This is the province of the model of market equilibrium."

Murphy(1977) argues that efficiency is not an accurate description of the capital markets and may not even be a very good description, and there are serious problems with the risk/reward relationship, the existence of various classes of 'winners' and perhaps even the statistical methods. Grossman and Stiglitz(1980) criticise that arbitrage profits cannot be perfectly eliminated when arbitrage is costly. However, it should be mentioned that Grossman and Stiglitz did not comment on this point at all, the existence of investors who choose to pay, in order to acquire and process information may not be due to the

fact that they can consistently obtain a return on this outlay. Rather it can be due to the point made by Lorie and Hamilton (1973), Henfrey, Albrecht and Richards(1977), Firth(1977) and Hevas(1984) that the necessary conditions for efficiency are far less stringent and are merely that information be readily available to a "sufficient" number of investors, that transaction costs be "reasonable" , and that, in the absence of agreement about the implications of current information and expectations regarding price movements, there be no evidence of consistent superiority or inferiority by significant participants in the market.

Ferguson(1983) illustrates four obvious possibilities for the stock market to be inefficient: information, analysis, judgment, and idiosyncratic behaviour. Rosenberg et al(1985) suggest two strategies (book/price strategy and specific return - reversal strategy) in detecting market inefficiency and show still larger profits to be made. Treynor and Ferguson(1985) show that the pastprices, when combined with other valuable information, can indeed be helpful in achieving unusual profit. However, it is nonprice information that creates the opportunity. Sorensen discussed at the same paper that their assumptions (explicit and implicit) pop up throughout the manuscript. Therefore a review of them adds clarity and puts the model in perspective.

6.3 Weak Form Empirical Studies.

All the empirical research on the theory of efficient markets has been concerned with whether prices "fully reflect" particular subsets of available information. A distinction is made between three potential levels of efficiency(Fama 1970). They are weak form efficiency, semi-strong form efficiency, and strong form efficiency. Weak form efficiency implies that the market is efficient in the weak sense if share prices fully reflect the information implied by all prior price movements. Price movements in effect are totally independent of previous movements, implying the absence of any price patterns with prophetic significance. As a result, investors are unable to profit from studying charts of past prices. In addition, efficiency at the weak level rules out the validity of 'trading' rules, such as 'sell a stock if it falls by X% below a certain price level', designed to produce above-average returns. Prices would respond only to new information such as new economic events.

6.3.1 Testing the Random Walk Hypothesis

The random walk hypothesis is indeed the true challenge for both fundamental and technical techniques. It assumes that the security trading mechanism represents an 'efficient' marketplace, which is characterised by the presence of a large number of rational, profit-seeking, risk-averting investors who compete freely with each other in their efforts to predict the future value of individual securities. Information significant enough to affect any security's future value is available to all investors immediately. As a result, chart reading by technical analysis or recommendation by fundamental analysis contains no useful information that will enable an investor to consistently outperform a buy and hold strategy in managing portfolio.

The random walk hypothesis is usually tested by looking for

association between stock price changes on consecutive days. The tests fall into frequency test, regression analysis, and runs test. Frequency distribution tests investigate the degree of normality in price changes from transaction to transaction. If transactions are fairly uniformly spread across time, and if the number of transactions per day, week, or month is very large, then the Central Limit Theorem leads us to expect that these price changes will have normal or Gaussian distributions.

Regression analysis examines whether price changes were linearly related over time. They examine the correlation between past price changes and future price changes. For example, if P_{t+1} is today's price change and P_t is yesterday's price change, they fit the line

$$P_{t+1} = \alpha + \beta P_t.$$

The term 'α' measures the expected change in price, unrelated to the previous price change. The term 'β' measures the relationship between the previous price change and the next price change. Many have taken the log of price relatives. Others have used the rate of return on both sides of the equation.

Historically, the stock market has attracted surprisingly little study by professional scholars or statisticians until three decades ago. It is interesting to note that Carl Menger is reported to have made careful studies of the Vienna stock market in 1871, developing the concept of marginal utility and his theory of prices. Later, the French mathematician, M.L. Bachelier, published his 'Theorie de la Speculation'(1900) in which the random character of stock price movements was derived. Later, A de Pietri-Tonelli, a student and expositor of Pareto, repeatedly quoted Bachelier approvingly in his work 'La Speculazione di Borsa'(1912), but he didn't elaborate on the random walk explicitly (Granger and Morgenstern 1970). The first reference to the highly significant studies was made by A. Cowles (1937). After the war, a number of studies have appeared by Kendall(1953), Alexander(1961), Cootner(1962), Osborne(1962) etc.

Their results may be summarised as follows.

(Table 6.1) Empirical studies of serial correlation analysis

No	Author	Data	Variables	Interval	ACC
1.	Kendall(1953)	22 commodities(UK)	Price	1 week	0.088
2.	Kendall	19 indicies(UK)	Price	1week	0.131
	& Alexander			2 weeks	0.134
	(1961)			4 weeks	0.006
				8 weeks	-0.054
				16 weeks	0.156
3.	Moore(1964)	30 companies(US)	Log price	1 week	-0.056
4.	Cootner	45 companies(US)	Log price	1 week	-0.047
	(1962)			14 weeks	0.131
5.	Fama	30 companies(US)	Log price	1 day	0.026
	(1965)			4 days	-0.039
				9 days	-0.053
				16 days	-0.057
6.	Brealey(1970)	FT index(UK)	Price	1 day	0.02
7.	King(1966)	63 companies(US)	Log price	1 month	0.018
8.	Praetz	16 indices	Log price	1 week	0.000
	(1979)	20 companies (Australia)	Log price	1 week	-0.118
9.	Jennergren	15 companies	Log price	1 day	0.068
	(1975)	(Norway)		2 days	-0.070
				5 days	-0.004
10.	Jennergren	30 companies	Log price	1 day	0.102
	& Korsvold	(Sweden)		3 days	-0.021
	(1975)			5 days	-0.016
11.	Errunza	64 companies	Log price	1 month	-0.163
	(1979)	(Brazil)			
12.	Laurence	16 companies (Malaysia)	Log price	1 day	0.041
	(1986)	24 companies (Singapore)	Log price	1 day	0.078
13.	Brown and Easton (1989)	Daily prices (UK)	Log price	1 day	0.049

(Note)
ACC : Average correlation coefficient.

Other researchers have used more complicated models of expected return and then examined the correlation of excess return. Galai(1977) used a model developed by Black and Scholes to estimate expected returns on the option market and then examined the correlation of excess return. Roll(1970, 1982) used the term 'structure' of interest rates to estimate expected return in the Treasury Bill market and then looked at the

correlation of excess returns.

The correlation coefficient may be heavily influenced by one pair of extreme observations (so called outliers). In order to correct for this possible bias we can use the non-parametric runs test which takes into account only the signs of P_t and not their magnitude. Designate a price increase $P_{t+1}>0$ by +, a price decrease by -, and constant by 0. If price changes were positively related, it would be more likely that a + was followed by a + and - by a -, than to have a reversal in sign. This would mean that an investigator analysing a sequence of correlated price changes would expect to find longer sequences of +'s and -'s than could be attributed to change. Consecutive occurrences of the same sign are called a run. A sequence of + + 0 - - - - +, for example, would be made up of four runs. If runs tend to persist (that is, if there are trends), the total number of runs will be fewer and the average length of runs longer than if the series were random. Stigler(1964), Fama(1965), Granger and Morgenstern(1970), and many others did work in this area.

6.3.2 Testing Filter Rules.

Alexander(1964) tried to devise trading rules based solely on price changes that could produce abnormally high rates of return. A filter rule goes as follows:

If the price of a security moves up at least X%, buy the security and hold it until its price moves down at least X% from the subsequent high, at which time sell the stock and go short; the short position is maintained until the price rises X% above the subsequent low, at which time cover the short position and buy the stock. If the stock price changes by less than X% up or down, simply do not make any transaction. Such trading rules are called X% Filters. The magnitude of X is a matter of individual choice, so one can have 1%, 2%, 5% etc., filter rules, where each filter indicates a different set of transactions even though all

deal with the same stock and are based on the same set of price changes.

The filter rule evidence for weak-form efficiency is not, however, as obvious as it seems to many. The studies of the 1960s tended to understate filter rule returns relative to buy-and-hold and to do a poor job of selecting possible winners. In addition, these tests did not have statistical confidence bounds for judging significance. Fama and Blume(1966), looking at the Dow 30 of the late 1950s, found no profits for the best(0.5%) rule after adjusting for transactions costs. Also Jennergren(1975) couldn't get any results showing a profit from examining filter rules for Swedish stocks. Beebower and Priest(1980) found little net evidence that the active trades they examined moved the market in an unfavourable direction. Frankfurter and Lamoureux(1988), using 906 stocks'monthly returns for the period 1963-1981, applied the filter techniques, but they could't get any benefits above a simple buy-and-hold strategy. However, Sweeney(1988), using 14 NYSE securities in period of 1970-1982, got highly significant profits for a floor trader.

In chapter VII, the weak form efficient market hypothesis on the Korean stock market will be tested.

6.4 Semi-strong Form Empirical Studies.

The market is efficient in the semi-strong sense if share prices respond instantaneously and without bias to newly published information. Whether or not the users of information might differ amongst themselves about the significance of new data, the implication is that the prices that are actually arrived at in such a market would invariably represent the best interpretation of the information. The focus of empirical studies of this form seeks to analyse share price movements to see exactly how long it takes for the share price to digest and

respond to new information.

Publicly available information is so large and heterogeneous that it is impossible to test for market efficiency relative to all the sources of information. However, one can test several types of information which are conceived to have a major effect on stock prices. Information on the stock splits, bonus issues, rights issues, published investment recommendations, earnings announcements, and weekend or yearend effects are examples of the semi-strong form empirical tests. Some of them are summarised in table (6.2).

(Table 6.2) Semi-strong form empirical studies

No	Name	Subjects	Country
1.	FFJR(1969)	Stock splits	US
2.	Bar-Yosef & Brown(1977)	Stock splits	US
3.	Firth(1977)	Capitalisation issues	UK
4.	Morris(1975)	Inflation accounting	UK
5.	Firth(1979)	Recommendations	UK
6.	Bidwell(1977)	Recommendations	US
7.	Saunders & Woodward(1976)	Money supply	UK
8.	Franks et al.(1977)	Mergers	UK
9.	Merrett et al.(1967)	Right issues	UK
10.	French(1980)	Weekend effect	US
11.	Baesel et al.(1982)	Granville's prediction	US
12.	Roll(1983)	Yearend effect	US
13.	Theobald and Price(1984)	Weekend effect	UK
14.	Grinblatt et al.(1984)	Stock splits	US
15.	Kato and Schallheim(1985)	Seasonality	Japan
16.	Brennan and Copeland(1988)	Stock splits	US

6.4.1 Stock splits and capitalisation issues.

Fama, Fisher, Jensen and Roll(FFJR 1969) examined the effects of stock split. The excess cumulative return was positive over 30 months before the split. But after the announcement of split, no such excess return could be made. Bar-Yosef and Brown (1977) found also positive abnormal cummulative excess return before the split. However, this upward trend stoped at the split date and moreover, after this date the abnormal cummulative

return actually declined.

Grinblatt, Masulis, and Titman(1984) used daily data and looked at shareholder returns on the split announcement date as well as the split ex-date. For the sample of 125 'pure' stock splits they found statistically significant returns on the ex-date and around the announcement date. They also confirmed earlier studies on stock dividends by Foster and Vickrey(1978) and Woolridge(1983). Recently Brennan and Copeland(1988) provided a signalling theory explanation for stock splits and showed that it was consistent with the data.

Merrett, Howe and Newbould(1967) observed an average return of 1.2% over the right issue data and 3.2% over the following year. Firth(1977) tested the impact of capitalisation issues on share prices. There was no mechanical way of forecasting the occurance of a capitalisation issue. Without having inside knowledge of when an issue was to be made, no consistently profitable investment strategy appeared to exist.

6.4.2 Published investment recommendations.

Firth(1979) examined the recommendations in three newspaper portfolios to see if the tipsters out-performed the market and to determine how quickly new information (if any) contained in the 'tip' was discounted into the share price. The result was clear that once a tip had been published it was impossible to profit thereby if only for the simple fact that newspapers were available to all. Bidwell(1977) found that brokerage research did not increase the return on the recommended investments beyond what could be achieved by a random drawing from the list of all stocks registered on the NYSE.

6.4.3 Announcement effects of economic indicators or mergers.

Saunders and Woodward(1976) examined the effect of the money supply variables on the market to see how quickly the market incorporated such new information. No relationship however could be found. Franks, Broyles, and Hecht(1977) analysed abnormal share price behaviour around the time of the merger to see how the gains, if any, were allocated between acquiror and acquiree. A distinctive positive trend was noticeable throughout indicating the sample to have performed better than predicted by 22.7%. This trend is most likely due to changes in the industry. To compensate for this, the forecasting model was altered to include the appropriate sector index. As a result, the positive trend disappeared and the predictive model was therefore more accurate.

6.4.4 Weekend effects or seasonality.

French(1980) studied daily returns on the Standard and Poor's composite portfolio of the 500 largest firms on the NYSE over the period 1953-1977. The negative returns on Monday (mean -0.1681) were highly significant. Another interesting test in stock prices is the so-called yearend effect, which has been documented by Branch(1977), Keim(1983), Reinganum(1983), Gultekin and Gultekin(1983), and Roll(1983), using US data. Stock returns decline in December of each year, especially for small firms and for firms whose price had already declined during the year. Then the prices increase during the following January.

Theobald and Price(1984), using U.K. daily index data in Section I, II, III, analysed seasonality and found to be strongest for the means of the return distributions. However, while finding a negative weekend effect, as in U.S. studies, this was observed to hold only as a pervasive phenomenon for non ex div Mondays and for two of the four subperiods studied. Kato and Schallheim(1985) examined stock returns on the Tokyo Stock Exchange for the presence of January and size effects and found remarkable similarity with the U.S. market.

In chapter VIII, the sample data will be tested by the models of semi-strong form efficient market hypothesis.

6.5 Strong Form Empirical Studies.

The market is efficient in the strong sense if share prices fully reflect not only published information but all relevant information including data not yet publicly available. If the market were strongly efficient, therefore, even an insider would not be able to profit from his privileged position. These tests consist of an examination of the performance of analysts' recommendations or professionally managed portfolios., i.e., mutual funds, and insider trading. Some of the research is summarised in table (6.3).

Table (6.3). Strong form empirical studies

No	Name	Data	Country	Remark
1.	Friend, & his assoc. (1962)	189 mutual funds	US	Performance
2.	Sharpe(1966)	34 mutual funds	US	Performance
3.	Jensen(1969)	115 mutual funds	US	Performance
4.	Fitzgerald(1975)	635 analysts' recom	UK	Recommendation
5.	Bjerring et al(1983)	221 additions	Canada	Recommendation
6.	EGG(1986)	Data base by BTC	US	Recommendation
7.	Dimson & Marsh(1984)	4187 forecasts	UK	Recommendation
8.	Rutherford(1969)	142 unit trusts	UK	Performance
9.	Cranshaw(1970)	New unit trusts	UK	Performance
10.	Russell & Taylor(1968)	20 unit trusts	UK	Risk
11.	BSS(1969)	14 unit trusts	UK	Risk
12.	Lorie & Niederhoffer(1968)	mutual funds	US	Insiders
13.	Jaffe(1974)	200 large firms	US	Insiders
14.	Kerr(1980)	120 stocks	US	Insiders
15.	Givoly and Palmon(1985)		US	Insiders
16.	Seyhun(1986)	6000 transactions	US	Insiders
17.	Levy & Lerman(1987)	424 stocks	US	Insiders
18.	Ippolito(1989)	143 mutual funds	US	Performance
19.	McNichols(1989)	733 forecasts	US	Signalling

(Notes)
Insiders : Insider information

6.5.1 Portfolio performance tests.

Friend, Brown, Herman, and Vickers(1962) examined the performance of the mutual funds and found it was insignificantly different from the performance of an unmanaged portfolio with similar asset composition. Rates of return on the latter were measured by the Standard & Poor's Index. About half of the funds performed worse and half of the funds performed better than the unmanaged portfolios. There was no evidence of consistently superior performance by any of the funds. Sharpe(1966) studied accounts for rates of return and risk, as measured by variability in rates of return for individual funds. Even the professional managers of mutual funds failed consistently to outperform a comprehensive market index. Jensen(1969) compared the performance of individual mutual funds with the expected performance from randomly selected portfolios of equal riskiness. He found that a mutual fund that was superior to a randomly relected portfolio in one period was superior to a randomly selected portfolio in a subsequent period about half the time.

Rutherford(1969) used the Spearman correlation coefficient, for the consistency or inconsistency of the rankings from year to year, but no degree of consistency in ranking could be recognised. Cranshaw(1970) investigated superior performance of new unit trusts comparing average investment performance of new unit trusts against all unit trusts. The result was only a relatively small difference in performance which is not sufficient to explain the preponderance of new trusts in the top twenty. Ippolito(1989) studied the performance for 143 mutual funds over the period 1965-1984. Mutual funds, net of all fees and expenses, except load charges, outperformed index funds on a risk-adjusted basis.

6.5.2 Analysts' recommendations or forecastings.

Fitzgerald(1975) examined the recommendations of 25 stockbroking firms over the period January 1971 to March 1973.

Stockbroking firms were first classified into six different groups based on their answers to a questionaire. Residuals analysis was used to study the behaviour of the share price around the time the recommendation was published. No advantage could be taken of the recommendations, because abnormal returns totaled approximately 1.0%, still insufficient to cover transaction costs. Bjerring, Lakonishok, and Vermaelen(1983) evaluate the recommendations of a Canadian brokerage house by a number of techniques. The results reveal that an investor following the recommendations would have achieved significantly positive abnormal returns, even after allowing for transactions cost.

Elton, Gruber, and Grossman(1986) examine the information content in analysts' recommendations. The data contained over 10,000 classifications per month prepared by over 720 analysts at 34 brokerage houses. Excess risk adjusted returns could be earned by buying upgraded stocks or stocks that were in a better classification and selling downgraded stocks or stocks that were in a lower classification. One was better off following the advice of the average or concensus forecaster than the advice of any set of forecasters who performed best over a previous period. Dimson and Marsh(1984) analysed 4,187 return forecasts made for 200 of the largest U.K. common stocks provided by thirty five different firms of analysts. They correlated actual return with forecasted returns and found an average correlation coefficient of 0.08. Thus, the square of the correlation coefficient, $(0.08)^2 = 0.0064$, of realised return is explained by analysts' forecasts of return.

6.5.3 Insider information.

Lorie and Niederhoffer(1968) investigated stock performance following months in which there were at least two more buyers than sellers or at least two more sellers than buyers among the insiders of a company. They found that a security experiencing an

intensive buying month was more likely to advance than to decline relative to the market in the 6 months subsequent to the event. Conversely, a security experiencing an intensive selling month was more likely to decline than to advance relative to the market in the 6 months subsequent to the event. In order to estimate the profitability of insider trades, Jaffe(1974) examines the performance of a security. Including transaction costs eliminated profits for outsiders in all but the intensive trading samples, where profits on the order of 2.5% could be earned. Kerr(1980) calculates the rate of return on a portfolio constructed from the insider buying list and the rates of return on a random portfolio (i.e., S & P Index). That value, 0.0484, reveals no significant difference between the return on the insider based portfolio and the random portfolio. Givoly and Palmon(1985) correlate insider trading with subsequent news announcements and get surprising results that there is no relationship between insider trading and news events. Seyhun(1986) investigates the availability of abnormal profits to insiders and to outsiders who imitate insiders. As a percentage of stock price, the expected loss to insiders and firm size are negatively correlated.

Levy and Lerman(1987) check the hypothesis that low P/E stocks indeed performed better using stochastic dominance tests. The low P/E portfolio was found to dominate high P/E portfolios and the random buy-and-hold portfolios for all risk-averse investors.

In chapter IX, the empirical tests of strong form efficient market hypothesis on the Korean stock market will be generated.

6.6 Empirical studies on the emerging capital markets.

Over the last two decades a substantial amount of empirical research has been undertaken to investigate market behaviour in the U.S. and other major industrial countries of the world.

While a limited number of empirical work is available for the stock markets of the emerging or less developed countries, considerable testing still needs to be undertaken for the underdeveloped capital markets of the world. Interest in these markets has increased significantly in recent years, but doubts about their riskiness remain. Errunza and Rosenberg(1982) compared risks and returns of investment between developed and less developed countries, and found the reverse conclusion that investment risk for large corporations was lower in less developed countries than developed countries. A number of emerging markets are reasonably well-developed. In terms of market depth, breath, turnover, and efficiency, the emerging markets compare favourably with smaller developed markets. Further, the international investors would be better able to bear the liquidity and diversification constraints of individual firms and markets in relation to domestic investors in these markets who primarily hold local assets (Levy and Sarnat 1970, Errunza 1983, Errunza and Losq 1987).

The definition of emerging market is sometimes ambiguous, but for convenience, all the other markets except the USA, UK, and Japan will be included in this paper. Recently the findings of studies for the EMH on the emerging markets are increasing, including Norway and Sweden(Jennergren and Korsvold 1975), Germany(Conrad and Juttner 1973), Holland(Theil and Leenders 1965), Spain(Palacios 1977), Greece(Hevas 1984), Hong Kong, Singapore and Malaysia (Law 1983, Dawson 1984 1987, Neoh 1986, Laurence 1986), Thailand (Sareewiwatthana and Malone 1985, Barnes 1986), Kuwait (Gandhi et al 1980) , Finland(1988), and Mexico (Haugen et al.1985). Also world market analysis is found in Cooper(1982). Some of them are summarised in table (6.4).

Table(6.4) Summary of EMH on the emerging markets

Name(year)	Country(Sample)	Testing method	Efficiency
1.Jennergren(1975)	Sweden (30)	Filter test	Reject
2.Jennergren & Korsvold(1975)	Norway(15) & Sweden(30)	Serial. runs. & distribution tests	Reject
3.Officer(1975)	Australia(651)	Seasonality	Accept
4.Jûttner & McHugh (1976)	Australia(188)	Runs.serial.	Reject
5.Roux & Gilbertson(1978)	Johannesburg(24)	Serial.runs.	Reject
6.Ang & Pohlman (1978)	Far East	Serial	Accept
7.Hai Hong(1978)	Far East(4)	Serial.runs.	Japan-accept Others-reject
8.Gandhi et al(1980)	Kuwait(index)	Serial.runs.	Reject
9.Law(1983)	Hong Kong(56)	Serial.runs.	Reject
10.Dawson(1984)	Hong Kong(267)	ARR	Accept
11.Wong & Kwong (1984)	Hong Kong(28)	Serial.runs.	Reject
12.Sareewiwatthana & Malone(1985)	Thailand(30)	CAPM & APT	Reject
13.Parkinson(1985)	Kuwait	Theil-Leenders	Reject
14.Barnes(1986)	Thailand(72)	Serial.runs.spectral	Accept
15.Laurence(1986)	Malaysia(16) & Singapore(24)	Serial.runs.	Reject
16.Dawson(1987)	Hong Kong(21), Singapore (39) & Malaysia(21)	New issues	Accept & reject

(Notes)
ARR : Abnormal average return.
Serial: Serial correlation analysis.
Runs: Runs test.
Spectral: Spectral analysis.

6.7 Implications of the efficient market hypothesis.

Even if not agreeable between a believer and the investment community, the validity of the random-walk or efficient market

hypothesis draws its significance, ultimately, from its practical implications for market participants. The concept of EMH cannot adequately be defined except in terms of its practical consequences for investors, an efficient market being one whose prices are such that investors cannot 'beat the market' other than by chance (Keane 1983). EMH says that most security analysis is logically incomplete and valueless. Therefore, any hope for earning consistent abnormal returns for a given risk level lies in nonstandard ways of combining and analysing information, or in obtaining information that is not generally available to other market participants, or in obtaining this information prior to other market participants. Many investors do subscribe to the conventional view, and it is a fair assumption that few are personally familiar with the empirical research literature.

The optimal policy for believers of the EMH is to secure a position which minimises the chance of being beaten by the market, in effect to hold the market portfolio. An investor's primary task is to maximise diversification and to minimise transaction costs. Even without the prospects of superior profits, an efficient market may be assumed to dépend heavily upon the activities of a skilled broker or investment analyst who is a kind of financial interior decorator to design portfolios to reflect his client's personality. Under this strategy, the roles of the investment advisers are to perform:
(a)determination of the appropriate level of risk for the portfolio, (b) achievement of the desired level of risk by constructing a portfolio of well-diversified common stocks, which is either dampened through inclusion of riskless assets or leveraged by purchasing on margin, (c) periodic review of the appropriateness of the level of risk, (d) maintenance of the desired level of risk, (e) management of additions to and deletions from the portfolio to minimise taxes and provide either for additional investment or for the reduction of investment in order to make disbursements, (f) minimisation of transaction costs. To do them, investment advisers deserve more research and resources than they traditionally receive (Lorie et al. 1985).

Market efficiency also implies that the suppliers of capital should accept rather than seek to exploit the market's prices and the financial managers should accept rather than seek to exploit its signals. The price of time and risk and, therefore, the benchmark for evaluating investment projects, is determined solely in the market place, and not only applies equally to all companies in the market, but is incapable of being affected by them.

6.8 Conclusion.

This chapter deals with the literature connected with research on the subject of capital market efficiency. Given that this field is one of the most intensely researched areas of finance, the number of publications which has to be reviewed is very large. Clearly there are many areas requiring further and better research. Conditions in the market place change overtime. It would be informative to repeat some of the early work on more recent data. Intensive research in this area is only possible with the advent of large high speed computers and the setup of large computerised databases.

For the weak form and semi-strong form efficiency, the weight of the evidence on the advanced capital markets is overwhelmingly in favour of efficiency. The evidence suggests that the stock market rapidly and accurately discounts new information into share prices, so stock prices confirm to a fair game model. But they are not precisely a random walk because of small first-order dependencies in prices and nonstationarities in the underlying price distribution over time. The empirical tests are not consistent with the strong form. In certain situations, individuals with inside information appear to be able to earn abnormal returns. In particular, corporate insiders can beat the market when trading in the securities of their firm. More

evidence of the strong form hypothesis would be desirable, particularly of performance of forecasting and performance of institutions other than pension funds and unit trusts. If the market is efficient as per the strong form hypothesis then the semi-strong form and the weak form hypothesis also hold.

While a limited number of empirical work is available for the emerging capital markets, many of their results are not consistent with the efficient market hypothesis in even their weak form and semi-strong form. More testing still needs to be undertaken for the underdeveloped capital markets of the world. The efficient market test on the Korean capital market with international literature could not be found, even its market has grown rapidly in recent years, as explained in Chapter II.

CHAPTER VII. THE WEAK FORM EMPIRICAL TESTS OF THE KOREAN STOCK MARKET.

7.1 Introduction.

As explained in chapters II and III, the capital market in Korea has been developing rapidly during past two decades and it is on the way of liberalisation to international investors in 1992. However, besides some descriptive studies, no research has been found in the international literature in respect of the behaviour of the capital market. The reason is believed to be that a computerised databank has not been established until recent years, even though the Stock Exchange has promoted the computerisation of securities transaction since 1975. In recent years, however, the securities industry in Korea has experienced consolidation with the merger of major firms and acquisitions by large business groups. The capital base has been broadened gradually since the Government's measures for the Reinforcement of Capital Market Functions was inacted in July 1983 to induce corporations in good standing to go public and help propel the new issue market.

During the last several years, Korean securities houses realised a spectacular business performance helped by the market rally, and in their attempt to strengthen competition and to boost preparation for internationalisation, one after another, they concentrated on stronger capital base, and manpower. Especially large houses which are permitted to do international business are setting up over ten securities and economic research institutes for research activities to provide quick, in-depth information to investors both home and abroad. On the other hand, investment management firms were newly opened in 1988. The competitive boom of establishing them by securities companies or others resulted in the appearance of over 20 new-born firms. This changing environment is expected to make a great contribution to capital market research in the near future.

This chapter is a comprehensive investigation of the weak form of the efficient market hypothesis in the Korean stock market. The actual tests will be the followings: serial correlation analysis, runs test, and spectral analysis. Before doing these tests, frequency distributions will be analysed. With these tests, the efficiency characteristics of two different periods are compared with each other. Thirty companies in January 1978 to December 1980 and thirty four companies in January 1986 to December 1988 were selected as samples. Also the Korea Composite Stock Price Indices (KCSPIs) were compared in the same periods. To investigate short-term movements, huge numbers of daily price observations were used (total 53,887 observations). Also some effects of daily price limit system will be examined, with the exclusion of data of over 10% fluctuation in a day.

7.2 The models used.

For the weak-form tests, three different models are used in this research:

(a) Serial correlation coefficient model.
(b) Runs analysis model.
(c) Spectral analysis model.
Before doing these, the distribution of price changes will be tested to see if it is normally distributed. The significance tests are followed by the three different models which are mentioned above.

7.2.1 Frequency distribution model.

There is a simple way of analysing the distribution of changes in log price, by constructing frequency distributions for the individual stocks. Mathematically, the pricing model may be expressed in a number of ways but the simplest model is of the

form:

$$P_t = P_{t-1} + E_t$$

Where P_t is the price of a stock at time t, P_{t-1} is the price of the stock in the immediately preceding period and E_t is a random error.

As Granger and Morgenstern(1970) and Cooper(1982) stated:
a) if E_t and E_{t-k} are uncorrelated where k is any lag and $k > 0$, then P_k is a second-order martingale, i.e., the absence of serial correlation does not in itself imply independence,
b) if E_t and E_{t-k} are independent where $k > 0$, then P_t is a strict random walk,
c) if E_t and E_{t-k} are independent and E_t are all identically normally distributed, then P_t is a Wiener process.

The sum to which P dollars will amount after k periods at a continuous rate of return U_t is

$$A = P \exp (U_t k)$$

after one time period where k = 1

$$A = P \exp (U_t)$$

We know that $P_{t+1}/P_t = \exp [\log (P_{t+1}/P_t)]$

$$P_{t+1} = P_t \exp [\log (P_{t+1}/P_t)]$$

therefore, $U_t = \log (P_{t+1}/P_t) = \log P_{t+1} - \log P_t$

where P_{t+1} : the stock price at the end of day t + 1,
P_t : the stock price at the end of day t.

For each stock, the empirical proportions of price changes within given standard deviations of the mean can be computed and compared with what would be expected if the distributions were exactly normal.

7.2.2 The Serial Correlation Coefficient Model.

The serial correlation coefficient (r_k) provides a measure of the relationship between the value of a random variable in

time t and its value k periods earlier. The population serial correlation coefficient (R_k) is estimated using the sample serial correlation coefficient(r_k). For the variable U_t, ($=\log P_{t+1} - \log P_t$), the serial correlation coefficient for lag k is the correlation between pairs of terms k units apart, viz

$$(7\text{-}1) \qquad r_k = \frac{\mathrm{Cov}\ (U_t,\ U_{t-k})}{\sigma(U_t)\cdot\sigma(U_{t-k})}$$

which can be approximated by

$$(7\text{-}2) \qquad r_k \approx \frac{\mathrm{Cov}\ (U_t,\ U_{t-k})}{\mathrm{Var}\ (U_t)}$$

where U_k is a log price relative,
$t = 1, 2, \ldots, n$
$k = 1, 2, \ldots, n-1$

Or in more analytical terms

$$(7\text{-}3) \qquad r_k = \frac{\frac{1}{n-k}\sum_1^{n-k}\left[U_t - \frac{1}{n-k}\sum_1^{n-k}U_t\right]\left[U_{t+k} - \frac{1}{n-k}\sum_1^{n-k}U_{t+k}\right]}{\left[\frac{1}{n-k}\sum_1^{n-k}(U_t - \frac{1}{n-k}\sum_1^{n-k}U_t)^2\cdot\frac{1}{n-k}\sum_1^{n-k}(U_{t+k} - \frac{1}{n-k}\sum_1^{n-k}U_{t+k})^2\right]^{\frac{1}{2}}}$$

In practice (and also for theoretical convenience) it makes for simplicity to modify these definitions to some extent. Instead of measuring the first (n-k)U's about their mean, we may measure about the mean of the whole set of observations; and similarly for the values at the end. Thus, writing $\bar{U}$ for $\sum_1^n \frac{U_t}{n}$, we may put as follows (Kendall and Stuart, 1964 & 1976).

$$(7\text{-}4) \qquad r_k = \frac{n}{n-k}\cdot\frac{\sum_1^{n-k}(U_t - \bar{U})\cdot(U_{t+k} - \bar{U})}{\sum_1^{n}(U_t - \bar{U})^2}$$

Hagerman and Richmond(1973) suggested another approach as the following estimate of the slope coefficient in the regression

model for large samples

$$U_t = \alpha + \beta U_{t-k} + E_t$$

In this model, β is the effect of the return from t-k-1 to t-k on the return from t-k to t-k+1. α is the average continuously compounded monthly return on the security if β is zero, which is implied by serial independence.

If the distribution of U_t has finite variance, then for large samples, the standard error of r_k may be computed as $\sigma \approx \sigma(r_k) = \sqrt{\frac{1}{n-k}}$ (Fama 1965, Cooper 1982, Wong and Kwong 1984). We will test whether r_k is significantly different from zero, by comparing r_k with the statistic $|2\sigma|$. If $|r_k| \leq 2|\sigma|$, then r_k is not significantly different from zero. If $|r_k| > 2|\sigma|$, then it is significantly different from zero, which means that there exists a linear dependence among U_t, U_{t-k}.

7.2.3 Runs Analysis Model.

A 'run' is defined as a sequence of price changes of the same sign. For stock price changes, there are three different types of price change: positive (+), negative (-), and zero (0). Therefore, there are three different types of runs. The number of runs over any given period is the number of sign changes plus one. The larger is the positive serial dependence in price changes, the smaller will be the expected number of runs. The expected number of runs (m) is compared with the actual number of runs (R) and the standardised normalised variable k tests the statistical significance of (R - m):

$$k = \frac{R + 1/2 - m}{\sigma_m} \tag{7-5}$$

where

$$m = \frac{N(N+1) - \sum_{i=1}^{3} n_i^2}{N}$$

m : the expected number of runs in the series.
N : the total number of price changes or differences (U_t).
n_i :the number of price changes of each type (i = 1 for positive changes, i = 2 for negative changes, i = 3 for no change).

The standard error of m is

$$(7\text{-}6) \qquad \sigma_m = \left[\frac{\sum_{i=1}^{3} n_i^2 \{\sum_{j=1}^{3} n_i^2 + N(N+1)\} - 2N \sum_{i=1}^{3} n_i^3 - N^3}{N^2 (N-1)} \right]^{\frac{1}{2}}$$

The computation of m is based on two assumptions: that the sample proportions of positive, negative and zero price changes are good estimates of the population proportions and that successive price changes are independent (Wong and Kwong 1984).

For large N, the sampling distribution of m is approximately normal. Because the distribution of k is N(0,1), then the critical value of k at the 5% level of significance is ±1.96. Wherever $k \geq |1.96|$, then the sign movements series are not randomly distributed and a tendency exists for a movement in the direction to be succeeded by a further movement in the same direction. In such cases, the random walk hypothesis is rejected, otherwise, it is accepted.

7.2.4 Spectral analysis model.

7.2.4.1 Introduction.

Spectral analysis decomposes a time series into a number of components, each associated with a frequency or period. The 'frequency' of variation is the reciprocal of the period. Frequency indicates the number of cycles per unit of time, and the period describes the length of the time required for one complete cycle. This chapter examines the transformation of changes in the log of share prices which defines the correspondence between the time domain and the frequency domain. This allows the researcher to pinpoint any cyclical or seasonal patterns and to measure their relative importance in a way which the simple statistical methods of time series analysis cannot. This spectral decomposition of a time series yields a spectral density function and measures the relative importance of each of the frequency bands in terms of its contribution to the overall variance of the time series. Essentially, spectral analysis is an examination of the variance of a time series with respect to frequency components (Rausser and Cargill 1970, Leuthold 1972).

Two special types of spectra need to be noted. If the spectrum is flat, indicating that every component is present to an equal amount, the series is merely a sequence of uncorrelated readings, a so-called 'purely random or white noise series'. That means, if the random walk model is in fact true, then :

(7-7) $X_t = \log P_{t+1} - \log P_t$

where P_t is the closing price series in time t, the model suggested that X_t has mean zero and is uncorrelated with X_{t+k}, all $k \neq 0$. The X_t series is called white noise. If the spectrum has a clear peak at some frequency, this results in a 'cycle' appearing in the series. In practice, estimated spectra are rarely of either of these shapes, rather being very high at zero and very low frequencies (long periods) and consistently falling in value as frequency increases, except for possible peaks at the seasonal frequencies ('typical spectral shape').

Spectral analysis has been much used in testing necessary conditions for market efficiency, in the context of commodity markets, futures markets, securities markets, money markets, and foreign exchange market. The subject is to decide if the estimated spectrum departs from a population spectrum which is a constant independent of frequency or price always follow a random walk. Previous studies on share prices have been carried out by Granger and Morgenstern(1963, 1970), Praetz(1973, 1979), Cooper (1982), and Hevas(1984). Bond prices have been studied by Granger and Rees(1968), Juttner, Madden and Tuckwell(1975). Also Larson (1964), Roll(1972), Leuthold(1972), Dusak(1973), and Cargill and Rauser(1975) have studied on the commodity or futures prices. The main references on applied spectral analysis in social science are Granger and Hatanaka (1964), Fishman(1969), Harvey(1975), and Kendall(1976). The notation here follows those of Harvey(1975) and Praetz(1979).

7.2.4.2 The model to be tested.

Consider the Fourier transform which expresses $f_x(w)$ in terms of the $\tau_x(k)$ and w, i.e.,

$$f_x(w) = \frac{1}{2\pi} \sum_{k=-\infty}^{\infty} \tau_x(k) \exp(-iwk), \qquad -\pi \le w \le \pi \tag{7-8}$$

where w is frequency measured in radians per unit time, $f_x(w)$ is a continuous function of w called the theoretical power spectrum and i is the square root of -1, and $\tau_x(k)$ is the covariance between X_t and X_{t+k}.

Since we are dealing with a real process, the autocovariance function will be symmetric about k=0, and likewise the power spectrum will be symmetric about w=0. Expression (7-8) can therefore be expressed as

$$(7\text{-}9) \qquad f_x(w) = \frac{1}{2\pi}\,[\sigma_x^2 + 2\sum_{k=1}^{\infty} \tau_x(k)\cos wk], \qquad 0 \le w \le \pi$$

Estimation of the spectrum corresponding to a theoretical $f(w)$ often uses a finite set of values, denoted $\{w_j\}$, $j=0, 1, .., m$, as it is impossible to estimate overall values of w, $0 \le w \le \pi$. A very commonly used set of values is an equispaced set (Praetz 1979) defined by $w_j = j\pi/m$. For the size of m, conventional wisdom suggests $m \approx n/5$ to $n/6$, where n data points are available.

Therefore spectral estimates are of the form

$$(7\text{-}10) \qquad \hat{f}(w_j) = \frac{1}{2\pi}\,[\mu_0 C(0) + 2\sum_{k=1}^{m} \mu_k C(k)\cos w_j k]$$

where

$$C(k) = \sum_{t=1}^{n-k} (X_t - \bar{X})(X_{t+k} - \bar{X}) \,/\, (n-k)$$

i.e., $C(k)$ is the autocovariance coefficient of order k.

μ_k : a set of weighting coefficients.

m : an arbitrary integer to be chosen by the user representing the maximum lag.

w_j : a set of real numbers with $|w_j| \le \pi$ $(j = 0, 1, 2, \ldots, m)$

If an appropriate set of weights is not used, the estimates $f(w_j)$ are not consistent estimates of $f(w)$. Therefore weights μ_k are used for consistent estimates of $f(w)$. There are several weights functions used, and the commonly used set of windows are the 2nd Tukey-Hanning weights and the 2nd Parzen weights (Jenkins 1961).

(1) the 1st Bartlett weights $\mu_k = 1$
(2) the 2nd Bartlett weights $\mu_k = 1-k/m$
(3) the 1st Tukey-Hanning weights
$\mu_k = 1-2a+2a\cos\pi k/m$
(a=0.23 suggested)

(4) the 2nd Tukey-Hanning weights

$$\mu_k = \frac{1}{2}(1 + \cos \pi k/m), \qquad |k| < m$$
$$= 0, \qquad |k| \geq m$$

(5) the 1st Parzen weights $\mu_k = 1-k^2/m^2$

(6) the 2nd Parzen weights

$$\mu_k = 1 - 6k^2(1 - |k| / m)/m^2 \qquad 0 \leq |k| \leq \frac{m}{2}$$
$$= 2(1 - |k| /m)^3 \qquad \frac{m}{2} \leq |k| < m$$
$$= 0 \qquad |k| \geq m$$

(7) Daniell $\mu_k = \sin kh / kh$ $(k=0, 1, \ldots n)$

After having obtained the spectral estimates, the next step is to examine whether or not they represent a significant deviation from a white-noise time series. It has been shown that for a sequence of uncorrelated normal variates, the periodogram is proportional to a chi-squared variate with two degrees of freedom (Fishman 1969, Praetz 1979). Spectral estimates will be asymptotically chi-squared with equivalent degrees of freedom (EDF) a function of the weights $\{\mu_k\}$ used. More specifically, for the 2nd Tukey-Hanning weight and for the 2nd Parzen weight, they are

$$\text{EDF} = 2\,\frac{2}{3}\,\frac{n}{m} \quad \text{for the 2nd Tukey-Hanning weights}$$
$$= 3.7\,\frac{n}{m} \quad \text{for the 2nd Parzen weights.}$$

The significance of the spectral ordinates, therefore, can be estimated by getting confidence interval at a level α of significance. The confidence intervals used are of the form (Howrey 1968, Praetz 1979, Gottman 1981, Hevas 1984).

(7-11) $$1 - \alpha = P\{f(w_j)\ V_1 \leq \hat{f}(w_j) \leq f(w_j)\ V_2\}$$

or $$P\{X^2_{EDF,\alpha/2} \leq \frac{EDF \cdot \hat{f}(w_j)}{f(w_j)} \leq X^2_{EDF,\alpha/2}$$

where

$$V_1 = X^2_{EDF,1-\alpha/2} \quad \text{/ EDF is the lower limit}$$

and $$V_2 = X^2_{EDF,\alpha/2} \quad \text{/ EDF is the upper limit.}$$

As the flat spectrum can be simplified to $f(w)=\sigma^2/2\pi$ for all w by the equation (7-9), actual spectral estimates are compared whether they deviate from the flat spectrum. In this case σ^2 can be replaced by the sample variances (Praetz 1979). Therefore, the actual test is to consider the number of estimates that lie outside the confidence interval and compare them with the expected number of observations to lie out of the confidence intervals. Praetz(1979) has shown that for a 95% spectral confidence limits (α=0.05), the expected value of s, the number of estimated spectral ordinates, is given by

(7-12) $$E(s) = 0.05(m + 1)$$

The only problem which this approach presents is to judge whether the difference, s-E(s), presents a serious deviation from a white noise or not. Any answer on that is, for the time being, subjective relying explicitly on the researcher's personal judgement (Hevas 1984).

7.3 The sample data and Results.

7.3.1 Sample data and adjustment.

In selecting sample stocks the primary factor considered was homogeneity of both market sector and trading activity. Data for this study are composed of individual stock price observations of two different periods: 30 companies commencing 1st January 1978 through 31st December 1980 and 34 companies commencing 1st January 1986 through 31st December 1988. These samples were the stocks of major companies in various industries and were traded actively. For the period of 1986 - 1988, four extra sample companies were added. They were selected each one company from four financial subsectors: provincial bank, short-term finance company, securities company, and insurance company. They were not traded actively in 1970's. But now they became some of the most actively traded stocks. Also the Korea Composite Stock Price Index(KCSPI) was compared in the same periods. For each sample, the daily share prices which it is actually traded were traced. The share price which is not traded is excluded, regardless of whether it moved downward or upward. Thus there are sixty six samples with about 400 - 900 observations per sample (total 53,887 observations). Original stock price data were obtained from Dongsuh Securities Co., Ltd. in Seoul which is one of the biggest investment bankers in Korea with market capitalisation of nearly US$ 2.0 Bil. at the end of March 1989.

Before using the data for statistical tests, they were transformed and screened for large errors using the following methods. The actual tests were not performed on the daily prices themselves but on the first differences of their natural logarithms. The variable of interest is

$$U_t = \log_e \frac{P_{t+1}}{P_t} = \log_e P_{t+1} - \log_e P_t,$$

where P_{t+1} is the closing price of the stock at the day t+1,

and P_t is the closing price at the day t.

This is a procedure widely used in the empirical research for the following reasons:

(a) The change in the log price is the yield, with continuous compounding, from holding the stock for that day (Fama 1965), that is

$$\frac{P_{t+1}}{P_t} = \exp\left(\log_e \frac{P_{t+1}}{P_t} \right)$$

$$P_{t+1} = P_t \exp\left(\log_e \frac{P_{t+1}}{P_t} \right) = P_t \exp\left(\log_e P_{t+1} - \log_e P_t \right)$$

This is equivalent to the assumption that investors are interested in proportional changes in share prices rather than in their absolute value.

(b) Moore (1965) has shown that the variability of price changes for a given stock is an increasing function of the price level of the stock; taking logarithms seems to neutralise most of this price level effect.

Also sample data were adjusted for cash and stock dividends, splits, and rights issues as those models established by Fama (1965). Rights issue adjustment assumed the value of a right,

$$R = (P_t - P_r) / (n + 1),$$

where

P_t = closing price on last trading day before ex-right day,
P_r = subscritption prices, and
n = number of rights required to buy one new share
(Laurence 1986).

Appendices 7.1 and 7.2 present the samples of common stocks and adjustment factors used in the weak-form tests. The analyses were performed by Fortran 77 programme using the Prime computer in the City University.

7.3.2 The Results.

7.3.2.1. Frequency distributions.

The particular issue considered here is whether or not share prices follow a random walk. For the frequency distribution analysis, the 'Fama' approach is utilised. In a perfectly competitive stock market, share prices presumably equal their intrinsic values. Gross rates of return, discounted for the risk of every individual stock, should be the same for all stocks. Therefore, prices that fully reflect the available information are the correct signal to guide the efficient allocation of capital. Since share price related information could be generated randomly during the day-to-day operation of the economy, share prices would also adjust randomly upwards or downwards with respect to new information, if the market is efficient.

Appendices 7.3(1)-7.3(6) illustrate means, standard deviations, and the proportions of observations within 0.5, 1.0, 1.5, 2.0, 3.0, 4.0 and 5.0 standard deviations of the mean, as well as the proportion greater than 5.0 standard deviations from the mean found by Fama(1965). Two different data sets are used in this research. One is the total samples. The other is the trimmed data. This is to check the daily price limit system in the Korean stock market. The daily share price upward or downward limit was around 5%-13% in 1970s. But to find the daily prices which have moved to the actual limit is almost impossible. Thus, the trimmed data used here exclude observations of over ±10% movement in a day. Thirty observations in 1978-1980 and thirteen observations in 1986-1988 were found over ±10% in the difference of daily share price return. But the daily returns on the ex-right day of right issues, bonus issues, and dividend payment are included in the trimmed data, even though they are over ±10% of daily return, because the price limits do not apply.

Comparisons of empirical frequency distributions with other markets are summarised in table 7.1. On the first line of the

body of the tables the proportions for the unit normal distribution are given. Also the comparisons of the unit normal and the empirical distributions were given in appendices 7.3(7)-7.3(9). Positive numbers in these tables mean the excess of relative frequency in the empirical distribution over what would be expected for the given interval, if the distribution were normal. Similarly, negative numbers are interpreted as the deficiency of relative frequency within the given interval.

Some samples are very close to normal distribution (e.g., sample no.30, 20, 81, 83), but some samples are very far from the normal distribution (No. 29, 6, 7). Within 0.5 standard deviation, all the samples are negative except one (sample No.20). But within 2.0 standard deviations, only 9 out of 66 are negative. The empirical distributions of 59 among 66 samples are more peaked in the center within 1.0 standard deviation than the normal distribution. And average results over 3.0 standard deviations have larger tails than the normal distribution. This indicates relatively 'fat' tails combined with peakedness or leptokurtosis. The results using the ±10% trimmed data are quite similar as those using the total data. Even though the daily share price limit system exists, the empirical distribution of daily share price returns fluctuated very widely within the limit. Also the bonus issue, right issue, and cash dividend payment had sometimes a quite positively effect on share prices. On the ex-right dates on which the daily share price limit system does not apply, the daily share price returns in many cases were found very large.

Compared with other markets, empirical distributions in the center within 1.0 standard deviation in Korean market during 1978-1980 is similar as Singapore and Malaysia, and less close to normal distribution than USA and Sweden. However, the results of between 1986-1988 are presented much closer to the normal distribution than those of other researches and those of between 1978-1980. This means that the market has recently become more similar to those of advanced markets. Also the reduced limit of

daily share price upward or downward in 1986-1988 compared with that of 1978-1980 seemed to have affected the empirical results.

(Table 7.1) Comparison of empirical frequency distributions

	INTERVALS							
	0.5SD	1.0SD	1.5SD	2.0SD	3.0SD	4.0SD	5.0SD	>5.0SD
Normal	0.3830	0.6826	0.8664	0.9545	0.9973	0.9999	1.0000	0.0000
Korea								
(1).1978-1980								
30 Co(x)	0.5271	0.7561	0.8721	0.9378	0.9871	0.9971	0.9989	0.0011
30 Co(y)	0.5204	0.7529	0.8693	0.9356	0.9877	0.9979	0.9992	0.0008
KCSPI	0.5455	0.8114	0.9148	0.9568	0.9875	0.9909	0.9932	0.0068
(2).1986-1988								
34 Co(x)	0.4537	0.7086	0.8502	0.9431	0.9966	0.9994	0.9998	0.0002
34 Co(y)	0.4519	0.7064	0.8485	0.9418	0.9969	0.9997	1.0000	0.0000
KCSPI	0.4224	0.7295	0.8881	0.9532	0.9920	0.9988	0.9989	0.0011
USA(a)	0.4667	0.7469	0.8847	0.9478	0.9886	0.9970	0.9988	0.0012
Sweden(b)	0.4624	0.7487	0.8833	0.9451	0.9877	0.9966	0.9990	0.0010
Norway(b)	0.5534	0.8038	0.8995	0.9447	0.9815	0.9921	0.9963	0.0037
Malaysia (c)	0.5609	0.7967	0.8995	0.9462	0.9833	0.9943	0.9970	0.0030
Singapore (c)	0.5814	0.8085	0.9056	0.9487	0.9820	0.9926	0.9963	0.0037
Johannesburg (d)	0.5316	0.7733	0.8903	0.9436	0.9834	0.9948	-	-

(Notes)
- x: Results using total samples.
- y: Results using trimmed data which are excluded over ±10% of the first difference of daily share prices.
- SD: Standard deviation.
- (a) Fama (1965).
- (b) Jennergren and Korsvold (1975).
- (c) Laurence(1986).
- (d) Roux and Gilbertson(1978).

In appendices 3(10)-3(12), extreme tail areas in terms of number of observations rather than relative frequencies are calculated and they are summarised in table (7.2). In sampling from a normal distribution the probability that an observation will be more than two standard deviations from the mean is 0.04550. In a sample of size N, the expected numbers of observations more than two, three, four, and five standard deviations from the mean are Nx0.04550, Nx0.0027, Nx0.000063, and N x0.0000006 respectively.

(Table 7.2) Summary of analysis of extreme tail areas

	INTERVALS											
	>2SD			>3SD			>4SD			>5SD		
	EN	AN	AN/EN	EN	AN	AN/EN	EN	AN	AN/EN	EN	AN	AN/EN
Korea												
(1). 1978-1980												
30(x)	1079.6	1464	1.4	64.1	293	4.6	1.49	63	42	0.0142	25	1761
30(y)	1078.3	1507	1.4	64.0	279	4.4	1.49	49	33	0.0142	19	1338
KCSPI	40.0	38	1.0	2.4	11	4.6	0.06	8	133	0.0005	6	12000
(2).1986-88												
34(x)	1289.3	1624	1.3	76.5	92	1.2	1.79	16	9	0.0170	5	294
34(y)	1288.8	1657	1.3	76.5	85	1.1	1.78	8	4	0.0170	1	59
KCSPI	39.9	41	1.0	2.4	7	2.9	0.06	1	17	0.0005	1	200
USA(a)	1787.4	2058	1.2	106	448	4.2	2.51	120	48	0.0233	45	1931

(Notes)
x: the results using all the daily share price returns.
y: the results using the ±10% trimmed daily share price returns.
SD: Standard deviation.
EN: Expected numbers.
AN: Actual numbers.
(a) Fama(1965).

The results are not consistent across the samples. But the average shows that actual numbers are higher than expected numbers and if we are closer to tail areas, the ratio of actual numbers by expected numbers becomes much larger. And actual samples show slightly less leptokurtosis than does the KCSPI. However, at the extreme tail areas the results are much different from sample to sample. For instance, 18 actual numbers out of 30 samples in 1978-80 and 23 out of 34 samples in 1986-88 over four standard deviations are smaller than expected numbers. Some samples show fluctuations of daily share price returns within three standard deviations. 6 actual numbers out of 30 samples in 1978-1980 and 18 out of 34 samples in 1986-1988 over three standard deviations are smaller than expected numbers. The distributions at the extreme tail areas in Korean market are closer to a normal distribution than that of Fama(1965). Also between the two different periods, the average result of 1986-1988 is much closer to a normal distribution than that of 1978-1980. The trimmed data showed slightly reduced fat tails.

7.3.2.2. Serial Correlation Coefficient Analysis.

This test is simply a computation of the correlation coefficients between price changes lagged 1,2,3,4.... etc., time periods.(Kendall 1976). Basically, the efficient market theory tells us whether the change of today's price can be predicted by the change in share price of yesterday or several days ago. Serial correlation coefficients were computed on the sample data's log price differences between consecutive transaction days (differencing interval 1) for lags 1-10. Results for lags 1-10 are shown in appendices 7.4(1)-7.4(2). Of the 64 serial correlation coefficients for lag 1, only 19 are non-significant at the 5% level. The largest coefficient is 0.323 and the smallest coefficient is -0.095, while the mean serial correlations for 30 samples in 1978-1980 is 0.098 and for 34 samples in 1986-1988 is 0.110. While for lag 1 the serial correlation coefficients are generally positive, only four out of 64 are negative. Agreement in signs among the coefficients for different stocks may indicate that there is a constant pattern of dependence.

However, King(1966) argued that price changes of different stocks are related to a certain extent to a 'market' component common to all stocks. Wong and Kwong (1984) mentioned that this common market component may tend to produce a common sign for r_k of all stocks during a specific sampling period. And 44 out of 64, or 69%, of samples are statistically significant at least at the 2σ level. For lag 2, 46 of 64 serial correlation coefficients are negative and 20 of 64 or 31.3% are significant at 2σ level. While mean values tend to become smaller as the lag increases, no distinct patterns emerge from serial correlation coefficients for lags greater than four. If we compare two different periods, the numbers of significance at 2σ level are only slightly larger in lags 1, 5, 7, and 9 in 1986-1988 than in 1978-1980.

(Table 7.3) Summary of the serial correlation analysis

lag	1	2	3	4	5	6	7	8	9	10
PANEL A: using all the share price returns										
(1). 1978-1980										
(+)	27	8	8	5	7	13	13	14	20	14
(-)	3	22	22	25	23	17	17	16	10	16
≥2σ	20	12	8	5	2	3	1	2	2	3
%	66.7	40.0	26.7	16.7	6.7	10.0	3.3	6.7	6.7	10.0
AV	0.10	-0.04	-0.04	-0.03	-0.02	-0.01	-0.01	-0.01	0.02	-0.00
(2). 1986-1988										
(+)	33	10	12	9	12	20	13	15	27	17
(-)	1	24	22	25	22	14	21	19	7	17
≥2σ	24	8	6	4	6	2	2	3	3	2
%	70.6	23.5	17.6	11.8	17.6	5.9	5.9	8.8	8.8	5.9
AV	0.11	-0.00	-0.02	-0.01	-0.02	0.01	-0.01	0.00	0.03	-0.01
PANEL B: using the trimmed data										
(1). 1978-1980										
(+)	28	10	7	5	6	14	13	12	19	12
(-)	2	20	23	25	24	16	17	18	11	18
≥2σ	20	12	10	4	1	4	1	2	3	2
%	66.7	40.0	33.3	13.3	3.3	13.3	3.3	6.7	10.0	6.7
AV	0.10	-0.04	-0.05	-0.04	-0.02	-0.01	-0.01	-0.01	0.02	-0.00
(2). 1986-1988										
(+)	33	10	13	9	12	19	12	15	28	17
(-)	1	24	21	25	22	15	22	19	6	17
≥2σ	25	8	6	2	4	2	2	3	3	2
%	73.5	23.5	17.6	5.9	11.8	5.9	5.9	8.8	8.8	5.9
AV	0.11	-0.01	-0.02	-0.02	-0.02	0.00	-0.01	0.00	0.03	-0.01

(Notes)
the trimmed data: the trimmed data over ±10% of daily share price returns.
(+): Number of positive signs.
(-): Number of negative signs.
≥2σ: Number of serial correlation coefficient greater than 2σ.
%: Percentage of the number of serial correlation coefficient greater than 2σ.
AV: Average serial correlation coefficient.

If we compare the results in Korean market with others (table 7.4), the number of over 2σ are larger than those of other markets. The standard deviation in Korea is smaller than those of other markets. The results using the trimmed data also shows many numbers of serial correlation coefficient greater than 2σ

(see appendix 7.4(3) and 7.4(4)). The results of using these two different sets of data show the high levels of serial correlation, thus the change of today's price could be said to be predicted a little bit by the change in share price of yesterday or several days ago.

(Table 7.4) Comparisons of serial correlation coefficients distribution

		ASC	SD	No≥2σ	Positive No
Korea					
1978-80(30 Co.)	(x)	0.098	0.039	20/30	27/30
	(y)	0.104	0.034	20/30	28/30
1986-88(34 Co.)	(x)	0.110	0.028	24/34	33/34
	(y)	0.113	0.027	25/34	33/34
USA(a)		0.026	0.057	11/30	22/30
UK(a)		0.072	0.066	21/40	34/40
France(a)		-0.019	0.082	41/65	33/65
Italy(a)		-0.023	0.069	9/30	14/30
Germany(a)		0.078	0.075	23/35	28/35
Switzerland(a)		0.012	0.073	4/17	11/17
Sweden(a)		0.056	0.049	1/6	3/6
Brazil(b)		-0.163	0.127	5/64	6/64

(Notes)
x: using all the daily stock returns.
y: using the trimmed data.
ASC : Average serial correlation.
SD : Standard deviation of average serial correlation.
No≥2σ : Number of terms≥2σ.
Positive No.: Number of positive terms.
(a) From Solnik(1973,p.1156).
(b) From Errunza(1979, p.374). The statistics reported here are for monthly data of 64 companies.

7.3.2.3 Runs Analysis.

Following Fama (1965) runs tests were calculated for the same samples. The results for differencing interval 1 are presented in appendices 7.3(1), 7.3(3), 7.3(5) and 7.5(1)-7.5(2) for the total data and in appendices 7.5(3)-7.5(4) for the trimmed data, and are summarised in table 7.5. All but three stocks have negative standardised variables indicating that 61 of 64 companies have less actual than expected runs for each set of all the data and the trimmed data respectively.

(Table 7.5) Summary of runs analysis

Samples	RA	RE	SE	(RA-RE)/RE	SV
1978-1980					
30 Co.s(x)	393	447.8	13.146	-0.144	-5.214*
30 Co.s(y)	391	477.3	13.137	-0.144	-5.207*
KCSPI	363	442.4	14.771	-0.177	-5.275*
1986-1988					
34 Co.s(x)	447	502.5	13.513	-0.078	-2.866*
34 Co.s(y)	446	502.4	13.510	-0.078	-2.866*
KCSPI	384	429.5	14.220	-0.104	-3.096*

(Notes)
x: The result using all the stock returns.
y: The result using the trimmed data.
RA: The actual number of runs.
RE: The expected number of runs.
SE: Standard error.
(RA-RE)/RE: Fractional difference.
SV: Standardised variable.
*: over the critical value at the 5% level.

Also the significance levels of the standardised variables in table 7.5 and the mean absolute standard variables in table 7.6 are very high and the latter are much larger than those of other research, as seen in table 7.6. 46 out of 64 share prices (25 in 1978-1980, 21 in 1986-1988) do not appear to be randomly distributed. Only 18 out of 64 companies appear to be randomly distributed at 5% significance level. The results using the

trimmed data are quite similar as those of using all the data. By way of comparison, the minimum values in Korean market(-9.243, -9.330, -7.864, and -7.826) are smaller than those of other markets. Also the mean absolute standard variables in Korea are the largest levels at 5.25 in 1978-1980 and 2.96 in 1986-1988. These results strongly suggest that there is a tendency in price movements, not to follow a random walk, thus rejecting the weak form of the EMH.

(Table 7.6) Runs test comparisons(differencing interval 1,lag 1)

	Standardised variables					Reference
	<-2	<-3	Positive	MV	MASV	
Korea						
1978-80:30 Co(x)	25/30	23/30	1/30	-9.243	5.255	Appdx 7.5(1)
(y)	25/30	23/30	1/30	-9.330	5.248	Appdx 7.5(3)
1986-88:34 Co(x)	21/34	13/34	2/34	-7.864	2.963	Appdx 7.5(2)
(y)	21/34	13/34	2/34	-7.826	2.963	Appdx 7.5(4)
USA(30 stocks)	8/30	--	4/30	-4.23	1.53	Fama(1965)
Malaysia(16 stocks)	6/16	3/16	1/16	-4.54	1.73	Laurence
Singapore(24 stocks)	17/24	10/24	1/24	-6.47	2.67	(1986)

(Notes)
x: The result using all the stock returns.
y: The result using the trimmed data.
MV : Minimum value.
MASV : Mean absolute standard variable.

7.3.2.4 Spectral analysis.

The data used for spectral analysis were exactly the same as the one used in the frequency distribution test, serial correlation test, and runs test. All the share price data have been transformed by taking logarithms and then first differences. Daily returns are adjusted for dividends and capital changes. This test is to examine whether there appeared to be any cyclical fluctuations on the daily returns realised on each share separate in the market. Therefore, by determining the number of estimated spectral ordinates outwith, say, 95% confidence limits for a white noise process, randomness can be tested.

The spectral analysis was carried out using the equation (7-14).

$$1-\alpha = P\{f(w_j)V_1 \leq \hat{f}(w_j) \leq f(w_j)V_2\}$$

Spectral estimates $\hat{f}(w_j)$ were tested by upper and lower limit of $f(w_j)V2$ and $f(w_j)V1$, where V1 and V2 were the Chi-square limits. The general features of the spectral density functions estimated with the maximum number of lags m=150 are set out in appendices 7.6(1) and 7.6(4). Although there is not any objective method to determine the value of m, it is suggested conventionally that any value of $m \approx n/5$ to $n/6$ and $<n/3$ (Praetz 1979) or $m \approx n/3$ to $n/4$ (Cooper 1982, Hevas 1984). The data used for each sample were between 385-880, but usually around 750-870. Judged on this the value of m=150 should not present any problem.

The expected number of observations to lie out of the 95% confidence interval for $\alpha=0.05$ was

$$E(s) = 0.05(m+1) = 7.55$$

The 2nd Parzen weights were used for the set of windows and equivalent degrees of freedom. The number of estimates that were actually outside the confidence interval are reported in appendices 7.6(1)-7.6(4) and summarised in tables (7.8) and (7.9). As the figures in columns E(s) and s show, 28 out of 30 samples (93.3%) in 1978-1980, and 30 out of 34 samples (88.2%) in

1986-1988, yield more observations outside the 95% confidence interval than expected. The average numbers outside the 95% confidence interval (s(%)) in both periods are 16.7 (11.06%) and 15.4(10.21%) respectively compared to the 7.55(5%) of expected under normal sampling fluctuations. This represents a deviation from white noise. Comparing both periods, the average number of observations outside confidence interval in 1986-1988 is slightly smaller than that of 1978-1980.

Figures 7.1 to 7.18 show the first differences and spectral density functions of selected samples. The existence of cycles in some samples is apparent, even though the patterns of spectrum are different. For each truncation point used in the estimation, the location of the relative peaks in terms of lags per cycle and the estimated peak and trough values are given. For expository purposes, the relative peaks and troughs are grouped in the table 7.7 according to their location. KCSPI (sample number 91) show five cycles during January 1978 - December 1980. Five points of peaks are lags 34, 61, 95, 125, and 148 working days per cycle. Five points of troughs are lags 18, 51, 79, 110, and 137. The spectra of the Haitai Confectionery(Figure 7.4) shows peaks in lags 39, 72, 99, and 126. And the Cheil Sugar(Figure 7.6) exhibit major peaks in lags 14, 32, 53, 67, 92, 110, and 127. During January 1986 - December 1988 cyclical trends are clear in KCSPI(Figure 7.8), Korean Air(Figure 7.12) and Lucky Ltd.(Figure 7.14), even their frequencies are different from each other. However, Gold Star(Figure 7.18) did not show any peaks and troughs. Table 7.7 shows major peaks and troughs of some samples. In the table, each m represents a maximum lag.

Comparing the spectra across samples, some samples moved similarly with each other. For instance, Haitai Confectionery(04) and Korean Air(77), and Tongyang Nylon(56) and Pacific Chemical (60) showed peaks at the quite similar lags. Sometimes, the share prices of same industry showed simultaneous movements in the Korean stock market. But in general, the spectra showed peaks and troughs at different lags.

(Table 7.7) Location and value of spectrum peaks and troughs

Sample(No.)	Peaks m	Peaks spectra estimate	Troughs m	Troughs spectra estimate
KCSPI 78-80 (91)	34	0.4267	18	0.1135
	61	0.3186	51	0.1614
	95	0.3378	79	0.0996
	125	0.3013	110	0.1235
	148	0.3020	137	0.1841
Cheil Sugar 78-80 (02)	14	1.3667	21	0.3513
	32	0.9316	38	0.4247
	53	1.4701	59	0.5461
	67	1.2379	80	0.1785
	92	1.5690	106	0.4011
	110	0.9802	112	0.2655
	127	0.9761	135	0.2755
Haitai Conf. 78-80 (04)	39	0.9716	20	0.1835
	72	0.7989	52	0.1448
	99	0.8444	113	0.3208
	126	0.9532	145	0.2649
KCSPI 86-88 (92)	17	0.5282	13	0.1901
	41	0.4391	24	0.1664
	68	0.4012	55	0.1907
	107	0.4050	81	0.1410
	127	0.3493	118	0.1064
Tongyang Nylon 86-88 (56)	21	3.1214	6	0.3074
	33	1.7435	45	0.3650
	53	0.9582	63	0.3858
	72	1.2174	87	0.3551
	101	0.7433	115	0.1391
	130	0.6555		
Korean Air 86-88 (77)	39	1.9899	23	0.2370
	66	1.3861	57	0.7486
	100	1.8541	82	0.2925
	140	1.2113	120	0.3349
Lucky Ltd. 86-88 (59)	19	1.1783	11	0.3213
	38	1.2779	23	0.3215
	69	1.4456	55	0.5237
	99	1.1411	82	0.2685
	124	0.9446	110	0.3614
	138	0.8836	130	0.3436
Pacific Chemical 86-88 (60)	33	1.9838	9	0.4483
	52	1.2849	36	0.6633
	72	1.0423	64	0.4316
	99	1.2499	90	0.3843
			109	0.4013

(Note)
m: Maximum lag.

In summary, a simple spectral analysis of daily share returns indicates that the randomness of stock market price behavior in Korea cannot be accepted. This is consistent with the findings from consideration of frequency distributions, serial correlation, and runs test.

Table (7.8) Significance test of spectral estimates' results (1978-1980)

Sample	N	m	E(s5)	s1	s5	s10	s1(%)	s5(%)	s10(%)
1	857	150	7.55	4	13	21	2.65	8.61	13.91
2	638	150	7.55	5	18	31	3.31	11.92	20.53
3	813	150	7.55	7	21	34	4.64	13.91	22.52
4	776	150	7.55	4	12	25	2.65	7.95	16.56
5	643	150	7.55	3	7	15	1.99	4.64	9.93
6	385	150	7.55	3	9	18	1.99	5.96	11.92
7	806	150	7.55	5	11	20	3.31	7.28	13.25
8	870	150	7.55	2	11	23	1.32	7.28	13.25
9	839	150	7.55	11	27	40	7.28	17.90	26.49
10	863	150	7.55	3	10	15	1.99	6.62	9.93
11	719	150	7.55	7	17	26	4.64	11.26	17.22
12	659	150	7.55	7	16	21	4.64	10.60	13.91
13	740	150	7.55	5	12	23	3.31	7.95	15.23
14	656	150	7.55	6	14	25	3.98	9.27	16.56
15	811	150	7.55	2	15	23	1.32	9.93	15.23
16	851	150	7.55	5	14	29	3.31	9.27	19.21
17	819	150	7.55	9	23	37	5.96	15.23	24.50
18	871	150	7.55	1	8	15	0.66	5.30	9.93
19	750	150	7.55	1	7	16	0.66	4.64	10.60
20	870	150	7.55	8	19	30	5.30	12.58	19.87
21	869	150	7.55	6	16	24	3.98	10.60	15.89
22	818	150	7.55	8	18	31	5.30	11.92	20.53
23	872	150	7.55	1	10	20	0.66	6.62	13.25
24	851	150	7.55	5	12	16	3.31	7.95	10.60
25	861	150	7.55	14	28	37	9.27	18.54	24.50
26	846	150	7.55	10	28	45	6.62	18.54	29.80
27	852	150	7.55	4	11	21	2.65	7.28	13.91
28	852	150	7.55	2	11	21	1.32	7.28	13.91
29	847	150	7.55	36	52	68	23.84	34.44	45.03
30	824	150	7.55	20	31	36	13.25	20.53	23.84
Avr	791	150	7.55	6.8	16.7	26.9	4.50%	11.06%	17.79%
KCSPI	880	150	7.55	1	6	10	0.66%	3.97%	6.62%

The ratios of s1 > E(s1) = 27/30 = 90.0%
s5 > E(s5) = 28/30 =93.3%
s10 > E(s10) = 27/30 = 90.0%

(Notes)
N: Number of sample.
m: Maximum lag.
E(s1), E(s5), E(s10): Expected ordinates at 1%, 5% and 10% significant level respectively. They are 1.51, 7.55, and 15.1.
s1,s5,and s10: The numbers outside of 1%, 5% and 10% significant level respectively.
s1(%) = s1/(m+1) x 100%.
s5(%) = s5/(m+1) x 100%.
s10(%) = s10/(m+1) x 100%.
Avr: Average.

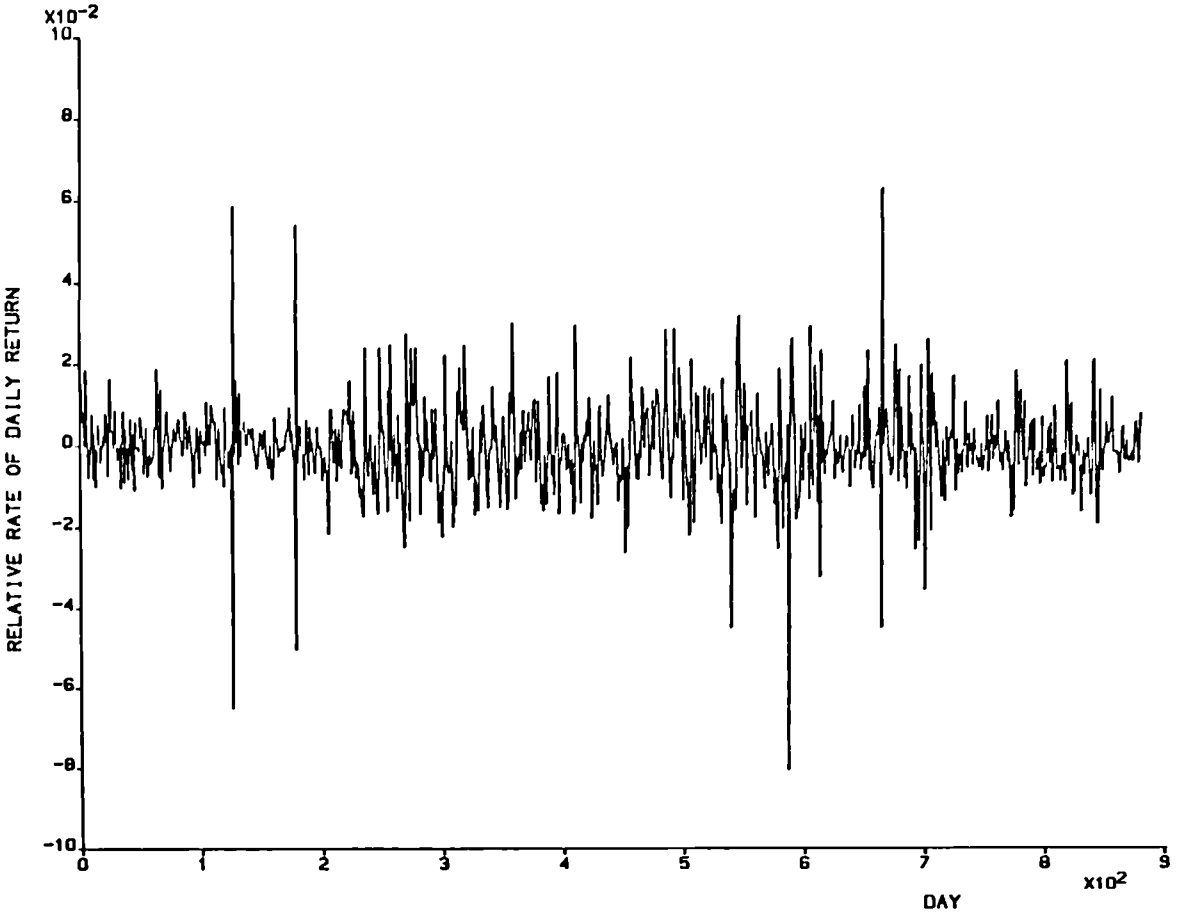
Table (7.9). Significance test of spectral estimates' results (1986-1988)

Sample	N	m	E(s)	s1	s5	s10	s1(%)	s5(%)	s10(%)
51	873	150	7.55	6	13	19	3.97	8.61	12.58
52	811	150	7.55	1	12	23	0.66	7.95	15.23
53	789	150	7.55	7	20	28	4.64	13.25	18.54
54	859	150	7.55	3	7	10	1.99	4.64	6.62
55	696	150	7.55	9	19	25	5.96	12.58	16.56
56	795	150	7.55	31	45	65	20.53	29.80	43.05
57	851	150	7.55	7	23	34	4.64	15.23	22.52
58	876	150	7.55	4	12	25	2.65	7.95	16.56
59	876	150	7.55	2	13	29	1.32	8.61	19.21
60	867	150	7.55	10	21	28	6.62	13.91	18.54
61	778	150	7.55	7	13	22	4.64	8.61	14.57
62	793	150	7.55	3	11	25	1.99	7.28	16.56
63	874	150	7.55	12	27	42	7.95	17.88	27.81
64	814	150	7.55	2	19	27	1.32	12.58	17.88
65	851	150	7.55	8	16	23	5.30	10.60	15.23
66	873	150	7.55	5	9	17	3.31	5.96	11.26
67	866	150	7.55	1	5	15	0.66	3.31	9.93
68	876	150	7.55	1	11	19	0.66	7.28	12.58
69	852	150	7.55	3	7	16	1.99	4.64	10.60
70	876	150	7.55	0	11	18	0.00	7.28	11.92
71	876	150	7.55	5	14	23	3.31	9.27	15.23
72	876	150	7.55	5	19	33	3.31	12.58	21.85
73	873	150	7.55	3	14	25	1.99	9.27	16.56
74	873	150	7.55	4	9	21	2.65	5.96	13.91
75	852	150	7.55	4	11	16	2.65	7.28	10.60
76	860	150	7.55	3	16	28	1.99	12.58	18.54
77	876	150	7.55	13	22	29	8.61	14.57	19.21
78	870	150	7.55	3	12	20	1.99	7.95	13.24
79	873	150	7.55	4	8	19	2.65	5.30	12.58
80	855	150	7.55	0	7	12	0.00	4.64	7.95
81	739	150	7.55	5	12	22	3.31	7.95	14.57
82	700	150	7.55	7	19	36	4.64	12.58	23.84
83	833	150	7.55	14	34	45	9.27	22.52	29.80
84	635	150	7.55	7	13	25	4.64	8.61	16.56
Avr	836	150	7.55	5.9	15.4	25.4	3.88%	10.21%	16.83%
KCSPI	876	150	7.55	2	11	23	1.32%	7.28%	15.23%

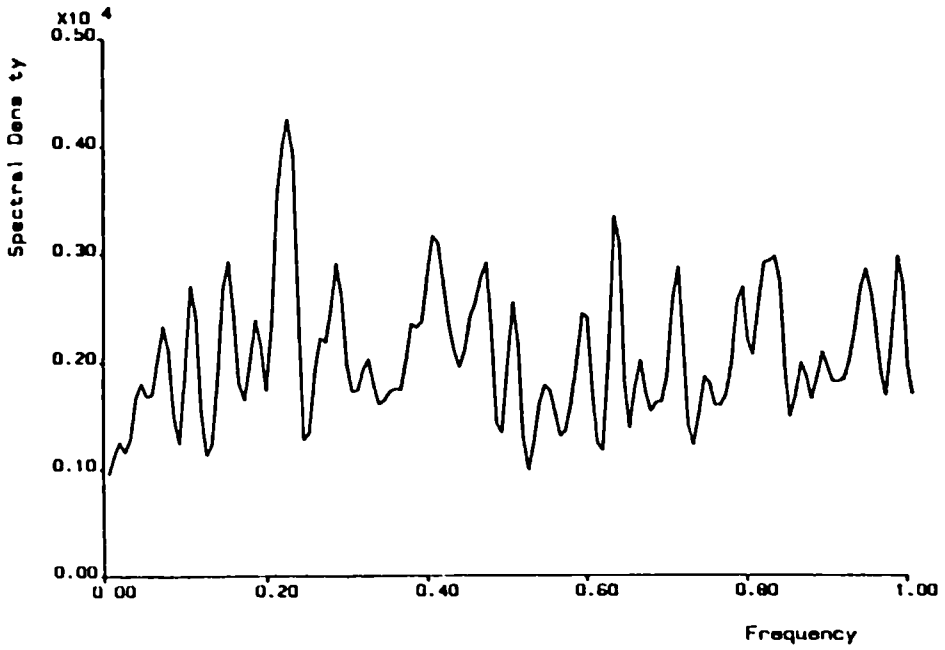
The ratios of

s1 > E(s1) = 29/34 = 85.29%
s5 > E(s5) = 30/34 = 88.2%
s10 > E(s10) = 31/34 = 91.18%

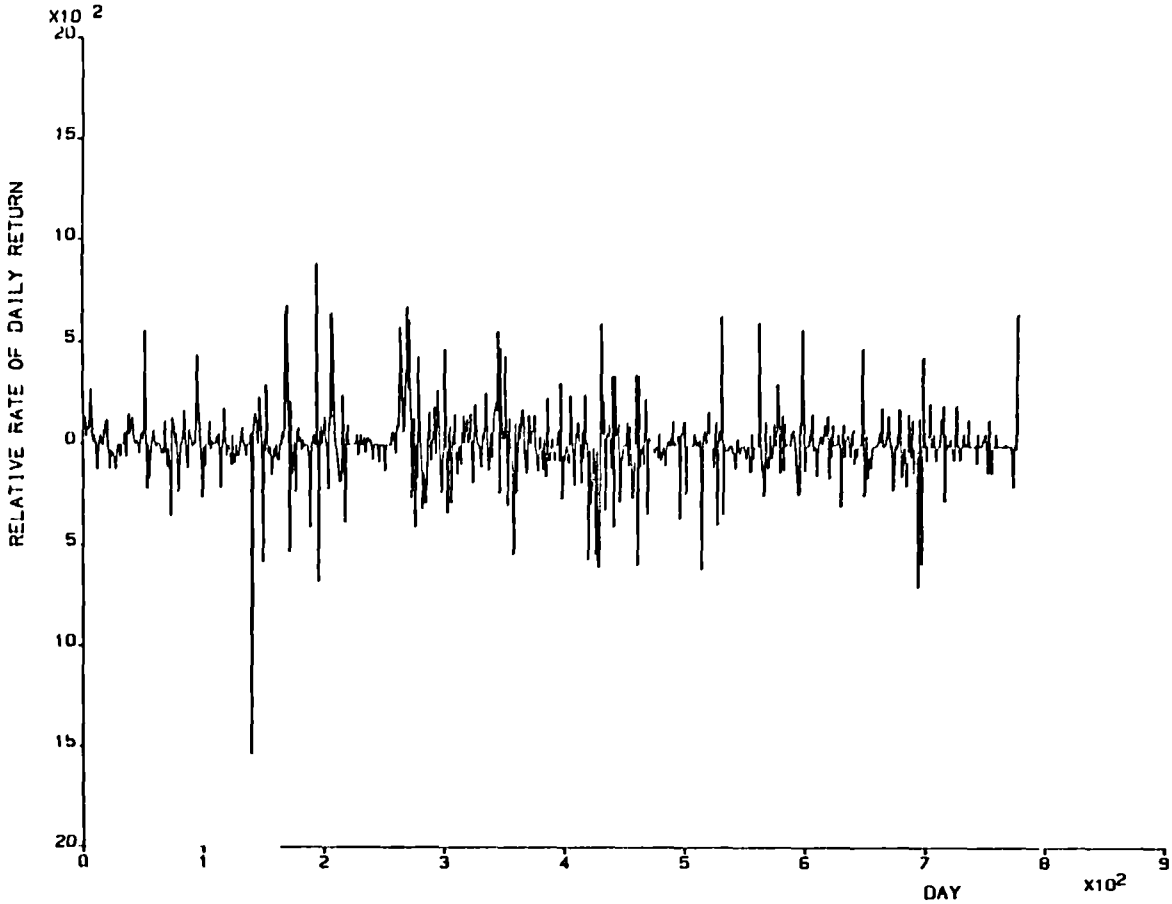
(Notes)
N: Number of sample.
m: Maximum lag.
s1, s5, and s10: The numbers outside of 1%, 5%, and 10% significant level respectively.
E(s1), E(s5), E(s10): Expected ordinates at 1%, 5%, and 10% significant level respectively. They are 1.51, 7.55, and 15.1.
s1(%) = s1/(m+1) x 100%.
s5(%) = s5/(m+1) x 100%.
s10(%) = s10/(m+1) x 100%.
Avr: Average.



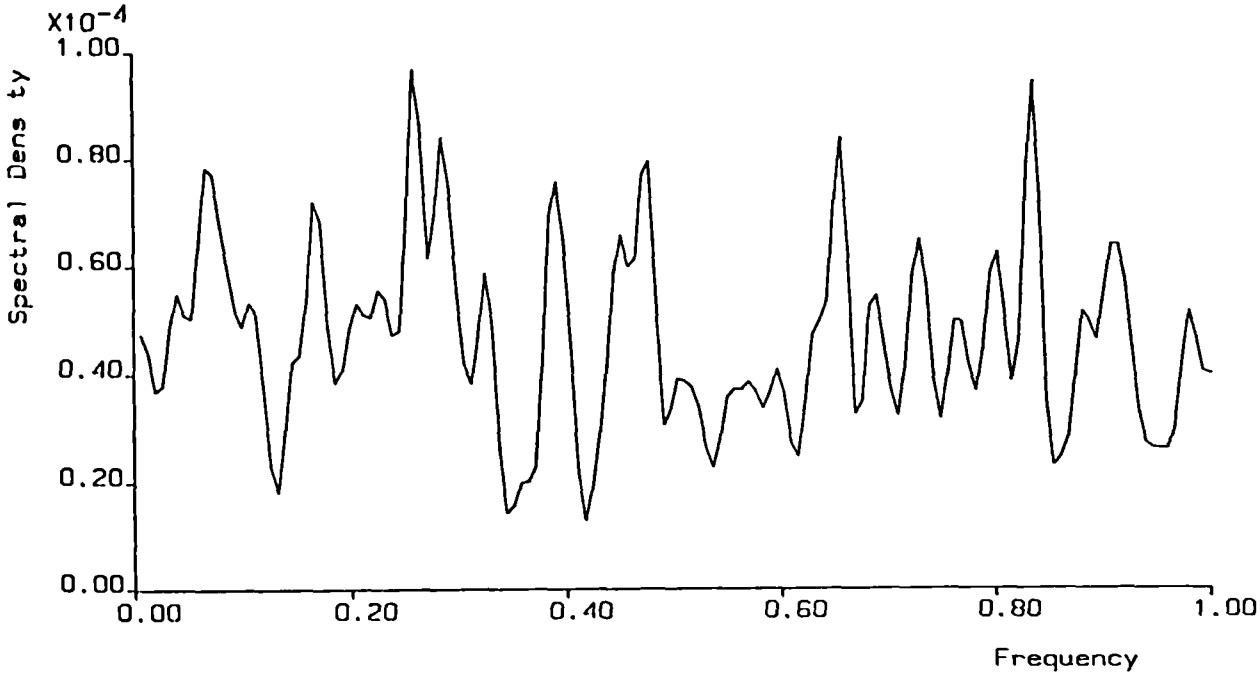
(Figure 7.1) First Difference of Daily Return (KCSPI 1978-80)



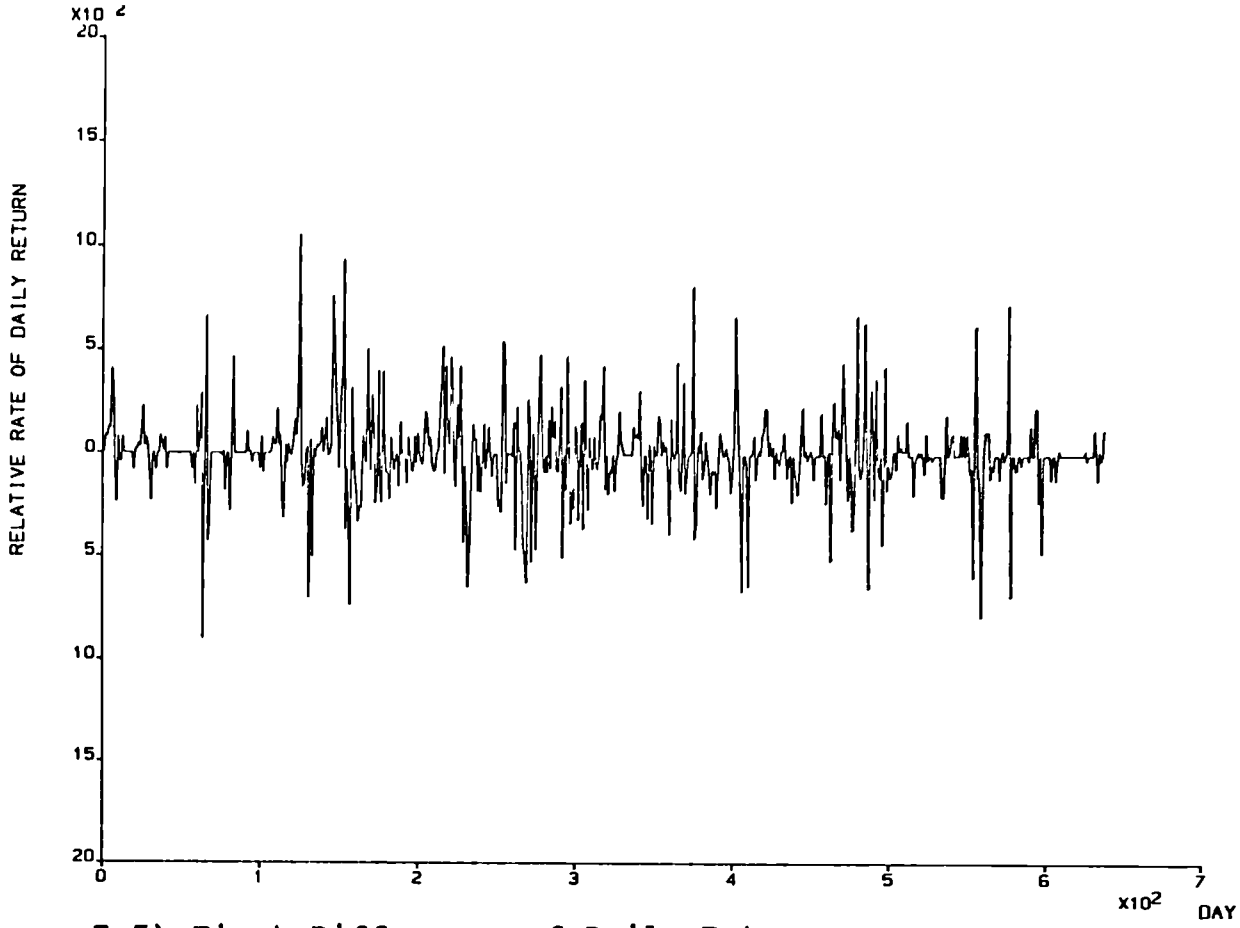
(Figure 7.2) Spectrum of First Differences (KCSPI 1978-80)



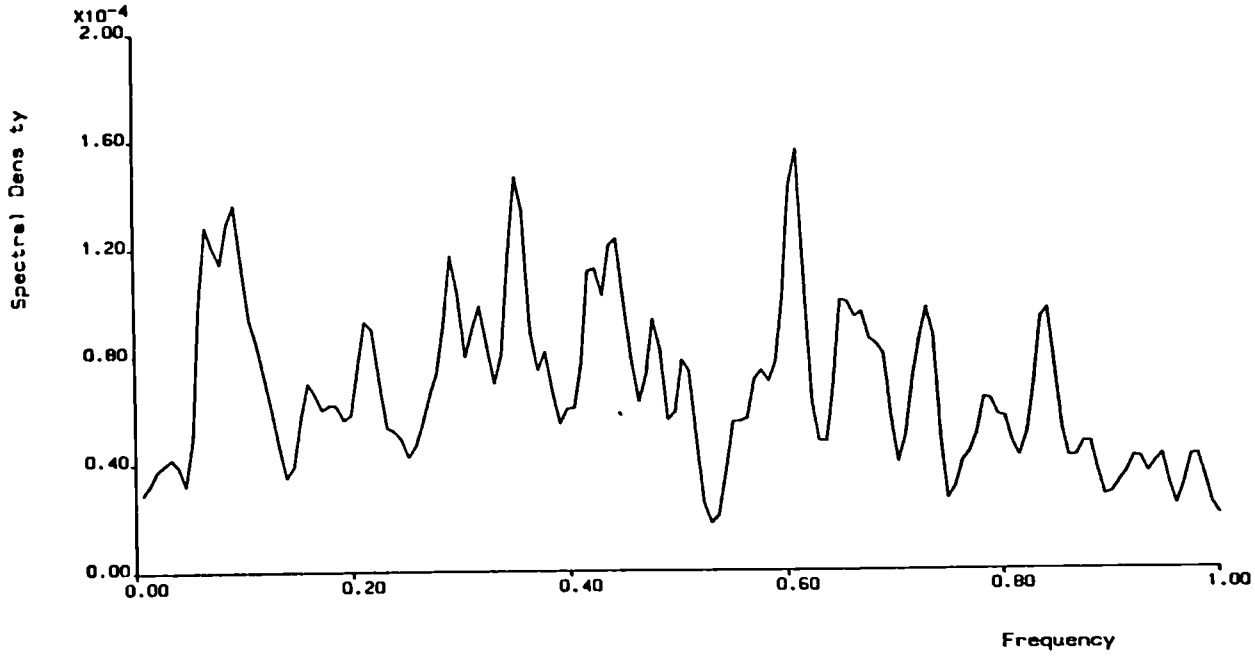
(Figure 7.3) First Difference of Daily Return
(Haitai Confectionery Ltd., 1978-80)



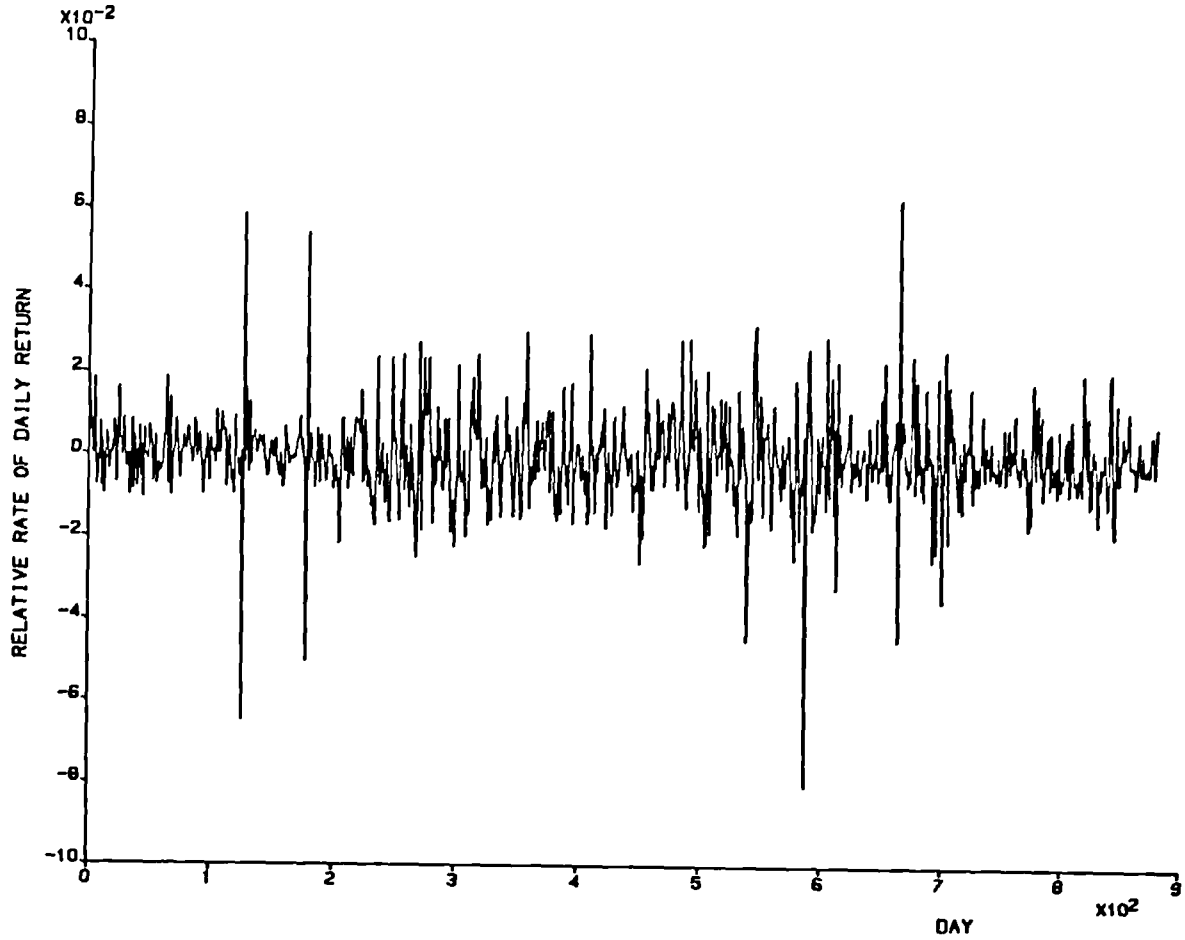
(Figure 7.4) Spectrum of First Differences
(Haitai Confectionery Ltd., 1978-80)



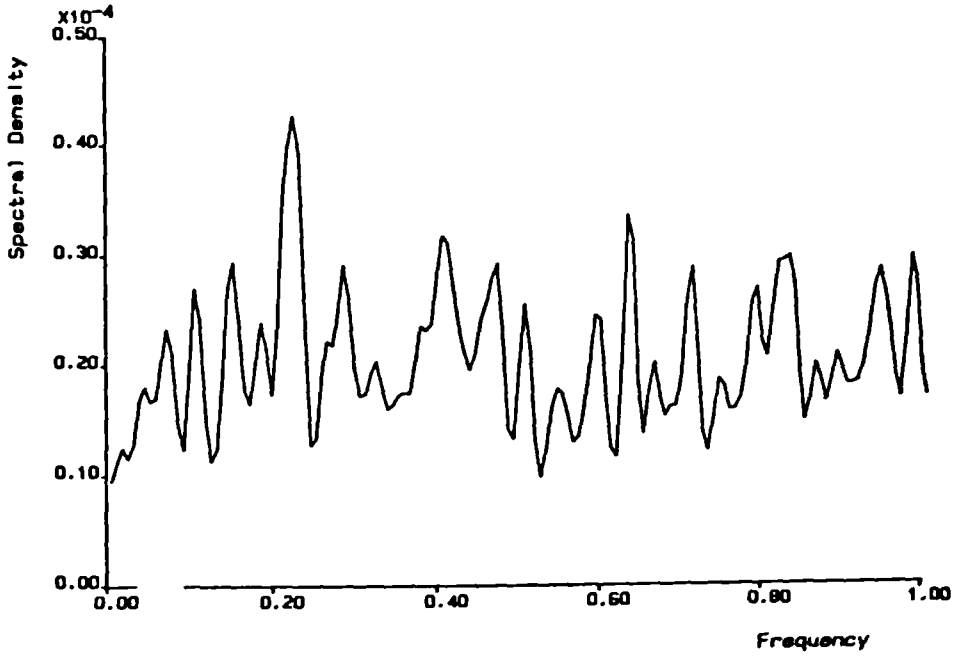
(Figure 7.5) First Difference of Daily Return
(Cheil Sugar 1978-80)



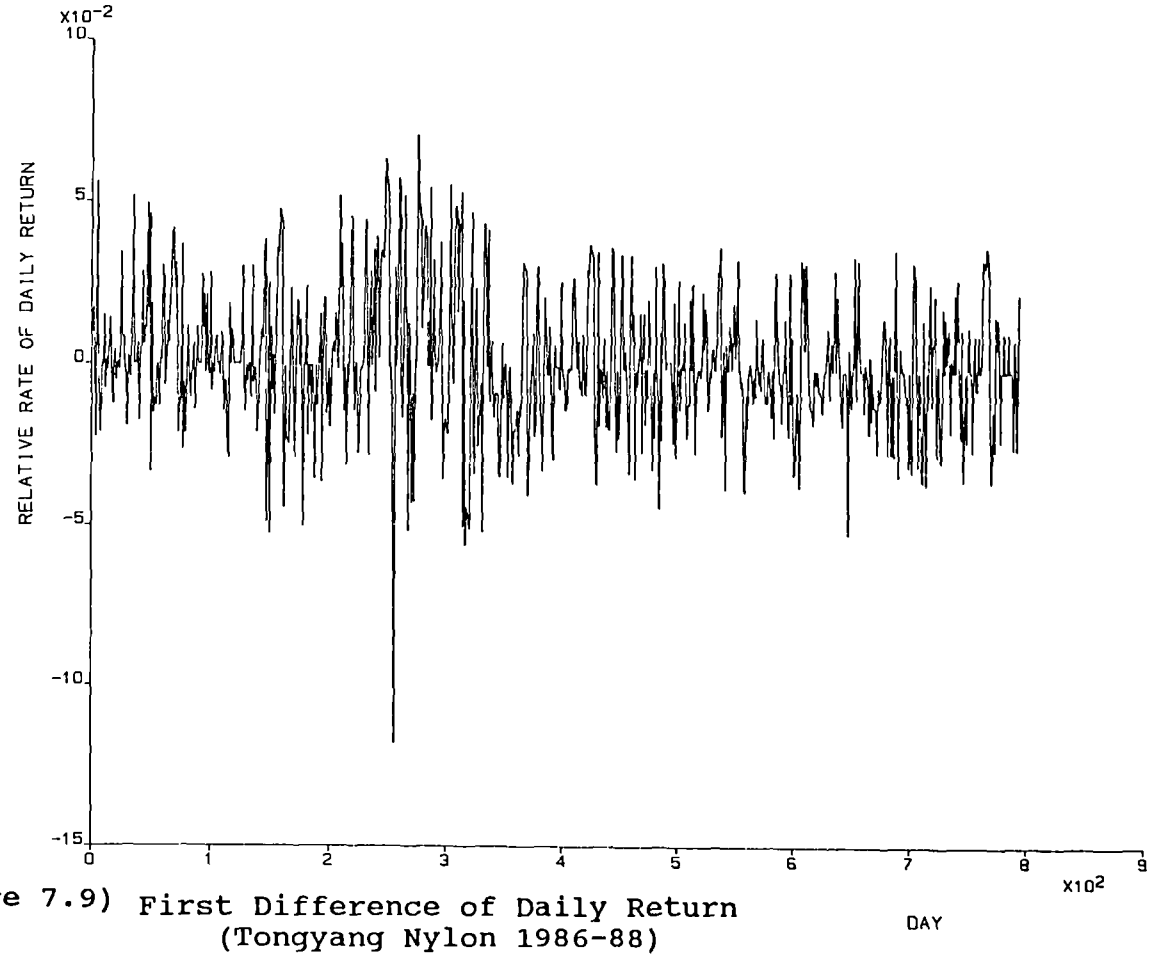
(Figure 7.6) Spectrum of First Differences
(Cheil Sugar 1978-80)



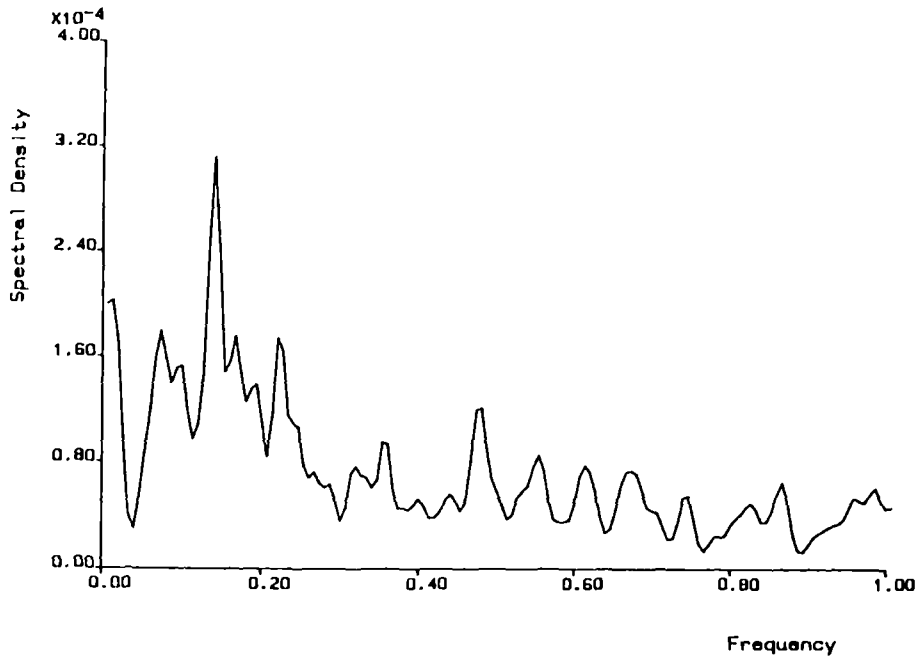
(Figure 7.7) First Difference of Daily Return (KCSPI 1986-88)



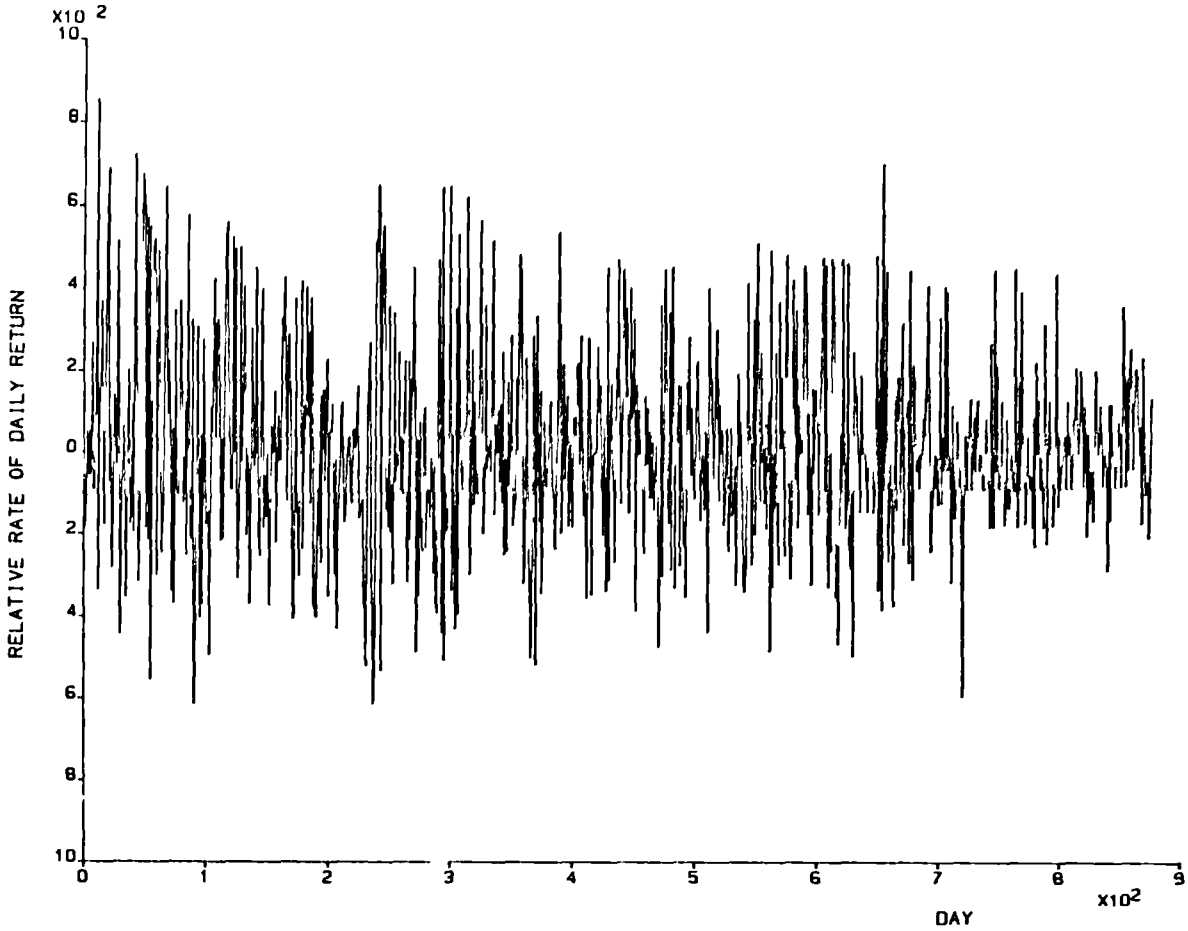
(Figure 7.8) Spectrum of First Differences (KCSPI 1986-88)



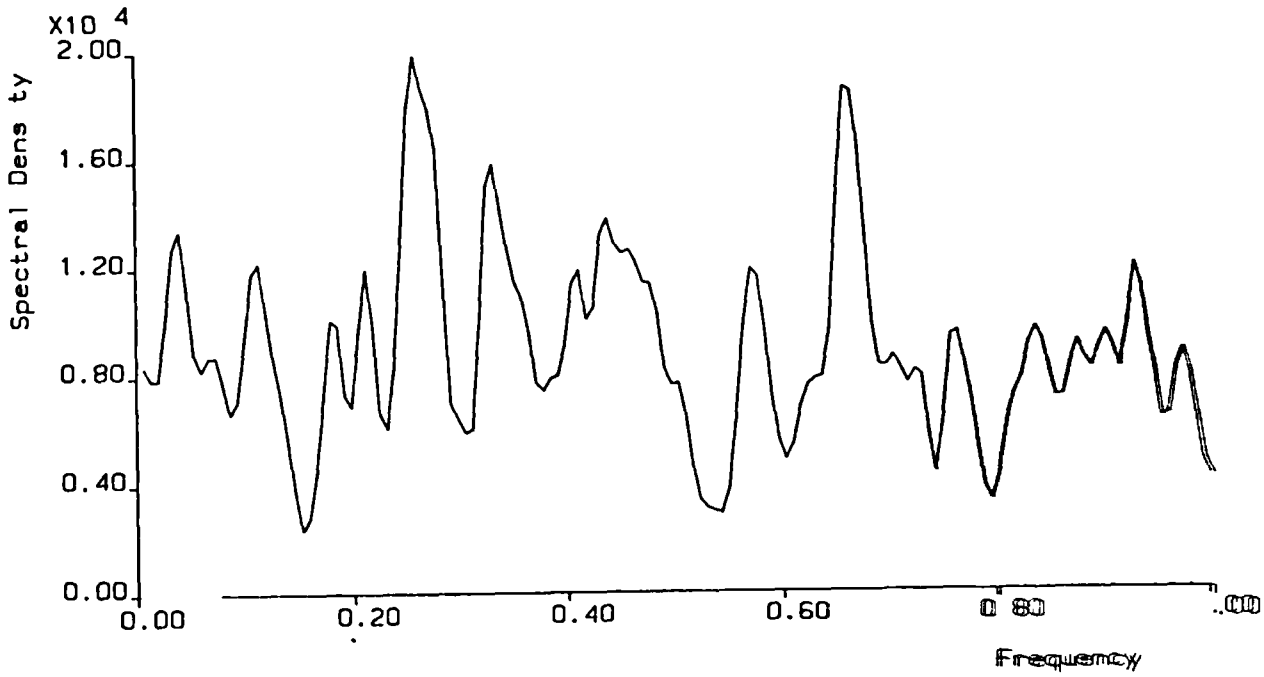
(Figure 7.9) First Difference of Daily Return
(Tongyang Nylon 1986-88)



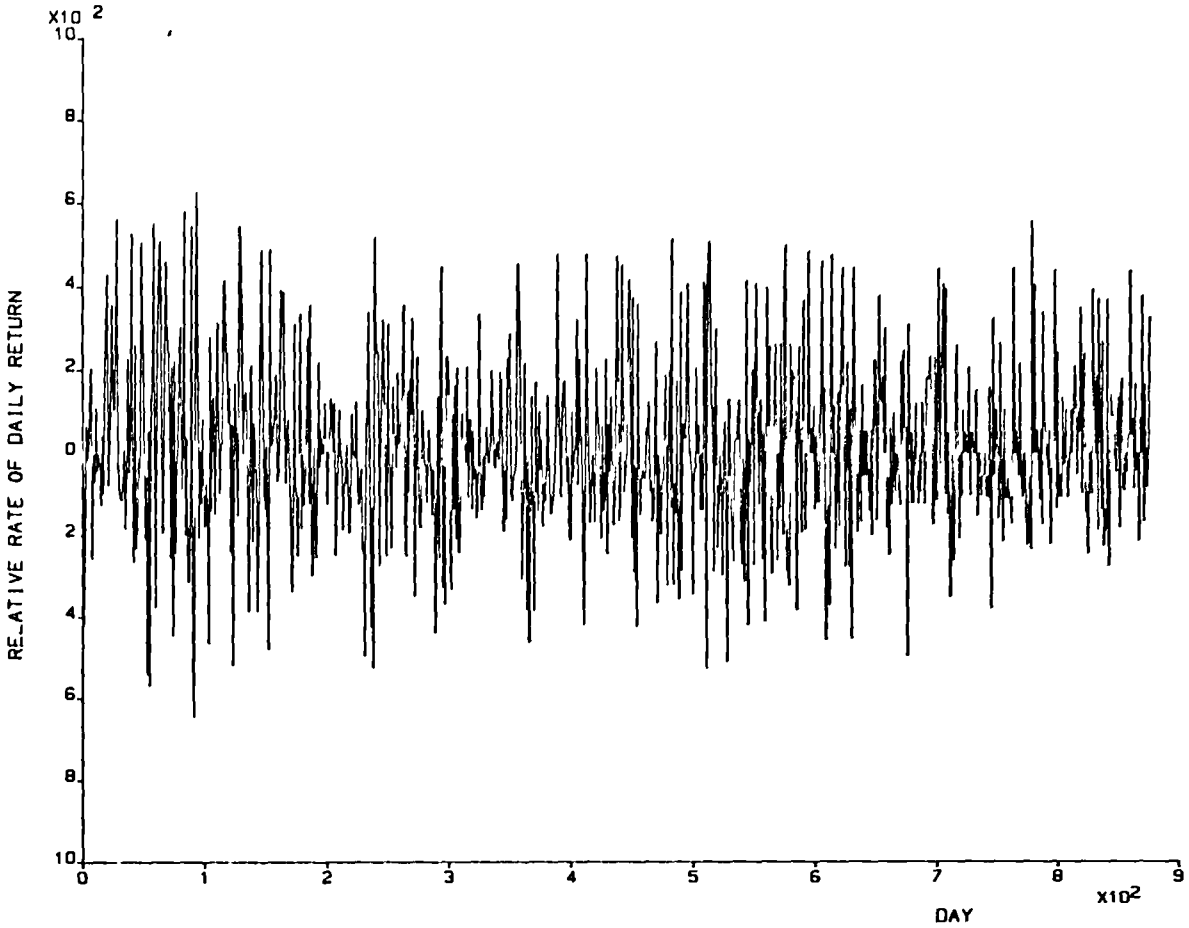
(Figure 7.10) Spectrum of First Differences
(Tongyang Nylon 1986-88)



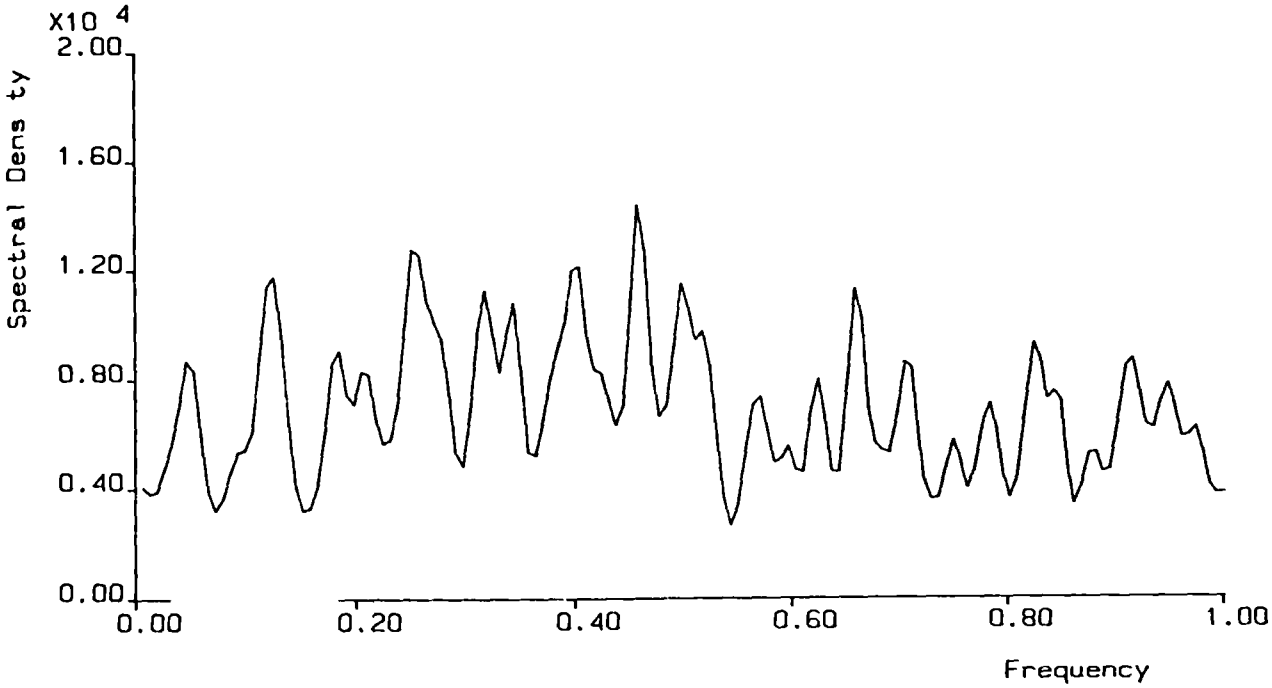
(Figure 7.11) First Difference of Daily Return
(Korean Air 1986-88)



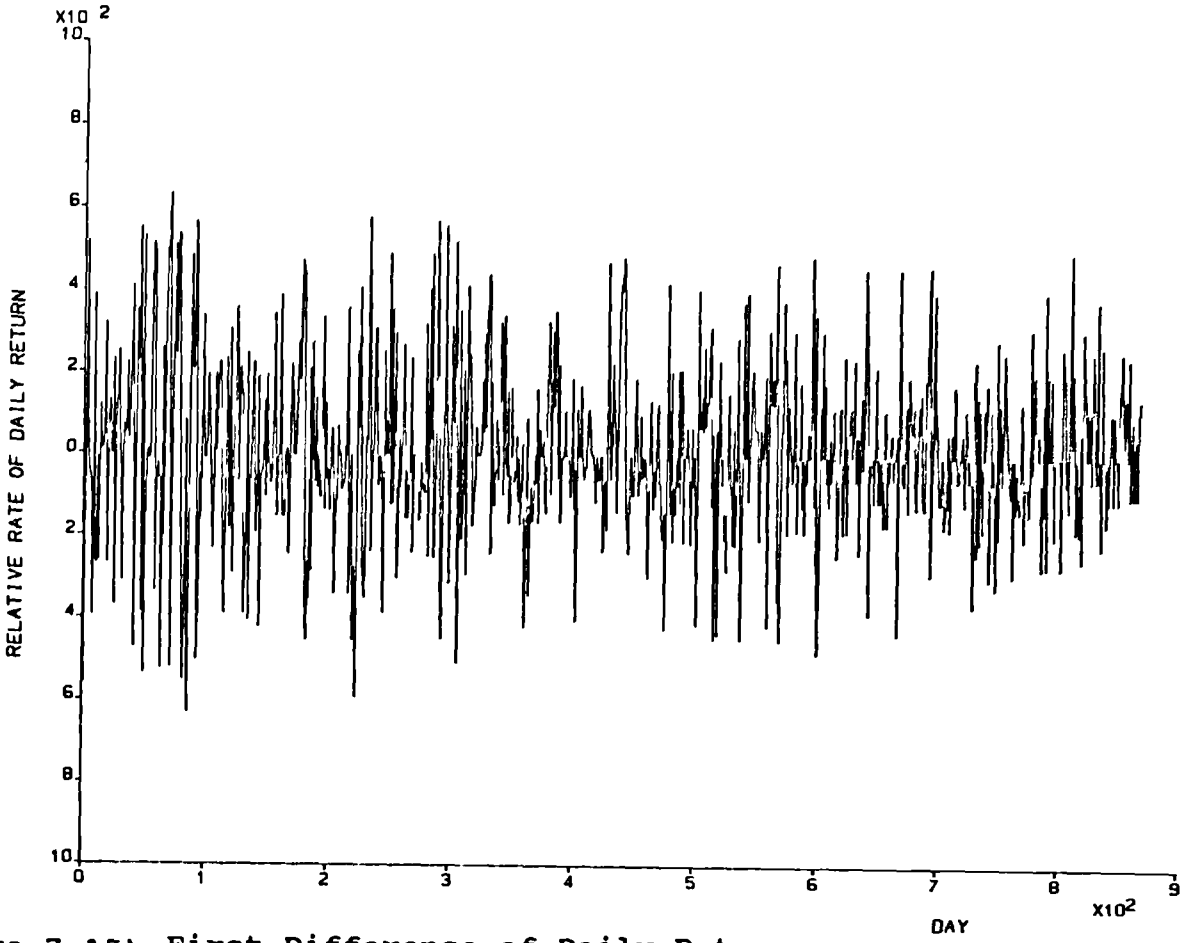
(Figure 7.12) Spectrum of First Differences
(Korean Air 1986-88)



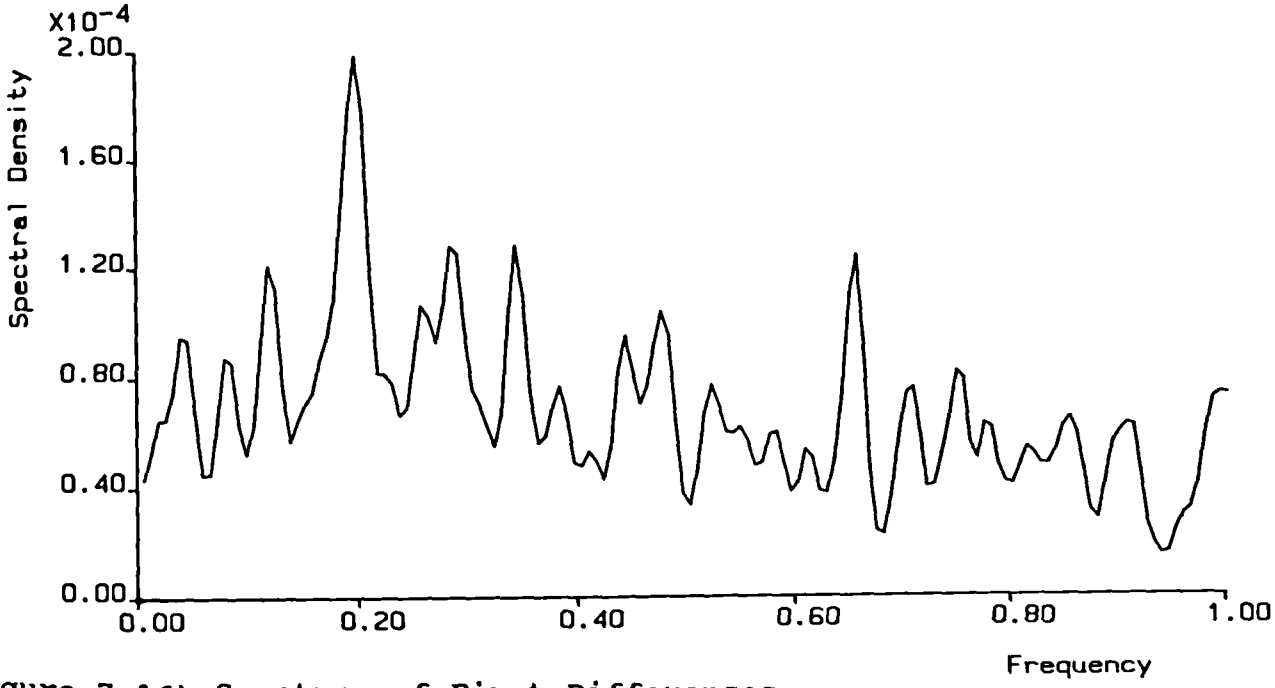
(Figure 7.13) First Difference of Daily Return
(Lucky Ltd., 1986-88)



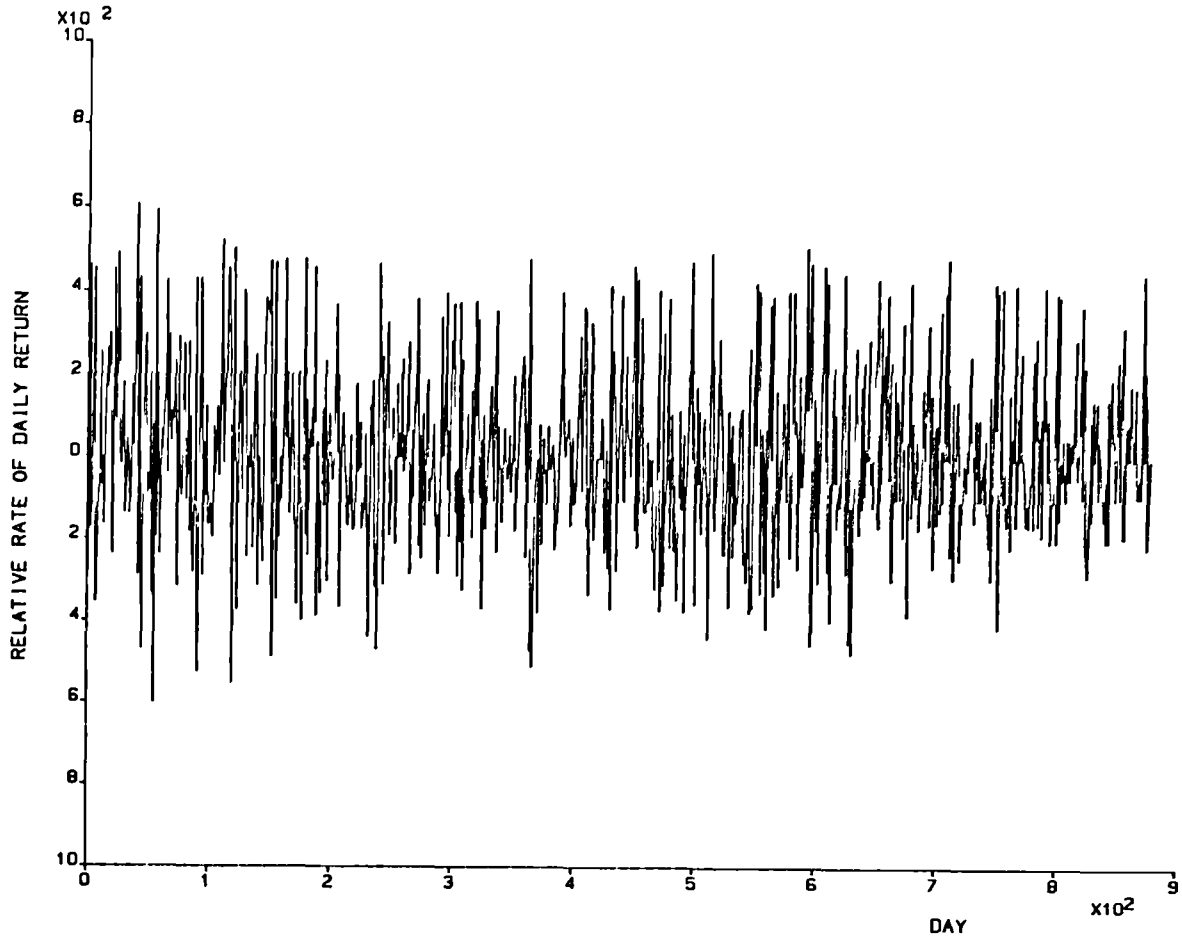
(Figure 7.14) Spectrum of First Differences
(Lucky Ltd., 1986-88)



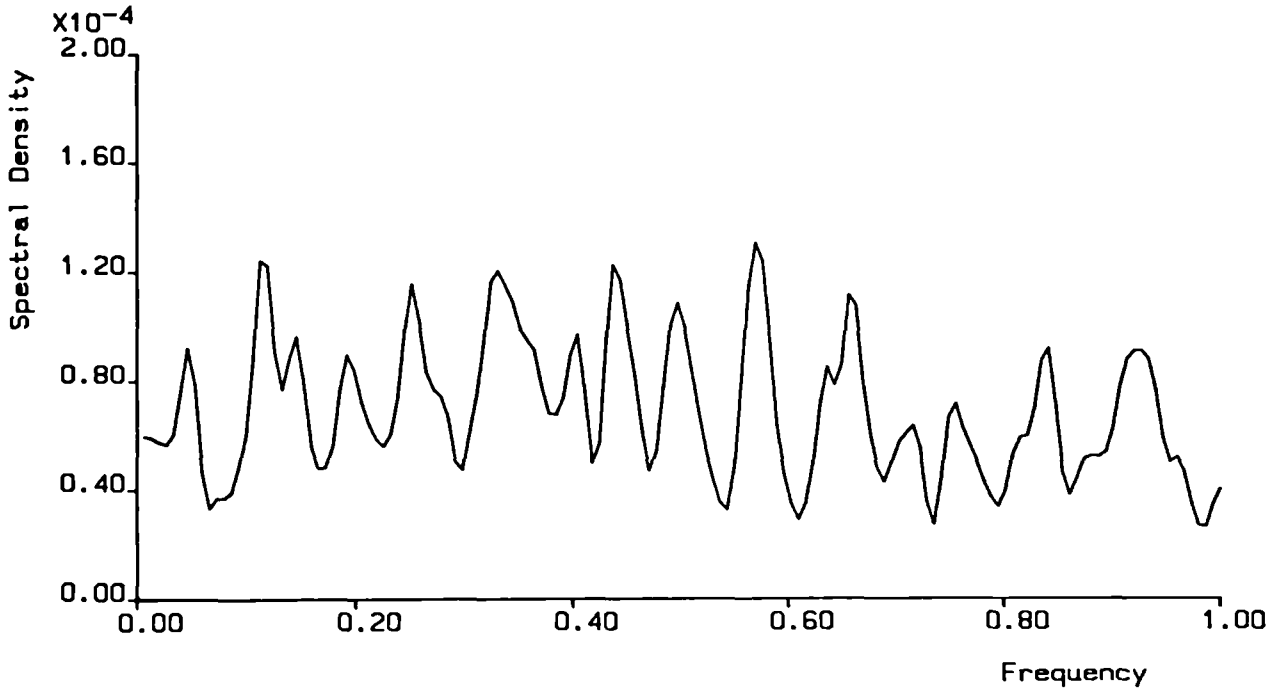
(Figure 7.15) First Difference of Daily Return
(Pacific Chemical 1986-88)



(Figure 7.16) Spectrum of First Differences
(Pacific Chemical 1986-88)



(Figure 7.17) First Difference of Daily Return
(Gold Star 1986-88)



(Figure 7.18) Spectrum of First Differences
(Gold Star 1986-88)

7.4 Conclusion.

The purpose of this chapter has been to contribute to the literature by exploring the validity of the weak form efficient market hypothesis for the Korean stock market in two different periods. To this end three statistical tests, based upon serial correlation, runs test, and spectral analysis, have provided evidence of the character of successive daily price changes for some of the most actively traded stocks and KCSPIs. Also the frequency distributions of the daily share price returns were examined.

The results manifest mixed behavior as summarised in table 7.10. In the frequency distribution model, the average results indicate relatively fat tails combined with peakedness or leptokurtosis, even though the results are not completely consistent across samples. In the serial correlation analysis, we found large numbers of significant serial correlation coefficients for lags under four. The significance levels of the standardised variables in the runs test are larger and the market seems to have a tendency in price movements, not to follow a random walk. Similar results are found in spectral analysis. Some samples exhibit random walk behaviour, but large numbers appear to deviate from a random walk. Even though the pattern of dependence relationships may vary over time, their presence is sufficient to reject the weak form of the EMH. This means that the traditional technical analysis and fundamental analysis may be useful the short-term decision making of stock portfolio choices in the Korean stock market. Comparing the two different sub-periods, deviation from a random walk in 1986-1988 is smaller than in 1978-1980. This can be interpreted as due to the improved informational efficiency of the Korean stock market recently; information is disseminated more rapidly due to the development of sophisticated communication technology, hordes of analysts, large numbers of business journals and market regulation favouring transparency.

The results of this research raise a number of problems concerning the Korean stock market which deserve further investigation. Although the non-random behaviour of some stocks is highlighted, it does not confirm that this dependent relationships are consistent over time. Therefore, the same analysis could be applied to more samples and to longer periods, so as to trace the development of patterns of share price changes.

(Table 7.10) Summary results of frequency distribution and weak form tests

Samples	Frequency distribution A	B	S C C C	Runs test D	Spectrum E
1978-1980					
30 Co.s(x)	1.356	-0.0735	0.193	Reject	Reject
(y)	1.398	-0.0703	0.197	Reject	-
KCSPI	0.950	-0.1288	-	Reject	Accept
1986-1988					
34 Co.s(x)	1.260	-0.0260	0.176	Reject	Reject
(y)	1.286	-0.0238	0.168	Reject	-
KCSPI	1.028	-0.0469	-	Reject	Reject

(Notes)
A: Percentage of AN/EN over two standard deviations of extreme tail areas.
B: Comparison of empirical frequency distributions with normal distribution in one standard deviation.
C: Percentage of number of serial correlation coefficients significant at the 95% level (total 10 lags).
D: Standard variable at the 95% level.
E: Spectral analysis.
SCC: Serial correlation coefficient.

CHAPTER VIII. THE SEMI-STRONG FORM EMPIRICAL TESTS OF THE EFFICIENT MARKET HYPOTHESIS.

8.1 Introduction.

In testing semi-strong form efficiency, we are concerned with whether share prices 'fully reflect' all of the information accompanying firm specific events (e.g., stock splits, earnings reports, right issues etc.). A major concern in those 'event' studies has been to assess the extent to which security price performance around the time of the event has been abnormal - that is, the extent to which security returns were different from those which would have been appropriate, given the model determining equilibrium expected returns.

Past empirical research on splits by FFJR(1969), and then later by Bar-Yosef and Brown(1977), and Charest(1978), among others, presents evidence which is interpreted as a split announcement effect. Also Chottiner and Young(1971), Foster and Vickrey(1978), Woolridge(1983), Eades, Hess, and Kim(1984), French and Dubofsky(1986), and recently Karpoff and Walkling (1988), Ball and Torous(1988), and Heath and Jarrow(1988) have analysed stock price behaviour around the declaration dates or the ex-right dates for stock splits or stock dividend.

Grinblatt, Masulis and Titman (henceforth GMT,1984) show that, even in clean cases where no other firm-specific event coincides with a split announcement, stock splits generate a positive abnormal return of close to 3.44% upon announcement and an additional 1% abnormal return on the ex-day. Ohlson and Penman (1985) find that the volatility of stock returns after the ex-split date is significantly higher than the presplit volatility, for stock splits larger than two-for-one (one hundred percent). Dravid(1987) extends the work of Ohlson and Penman to all types of stock distributions and supports GMT's conclusions that stock splits and stock dividends are 'different' types of event.

Copeland(1979) finds that liquidity decreases following a split, but Lamoureux and Poon(1987) argue that the number of shareholders in a firm actually tends to increase after a split. Lakonishok and Lev(1987) report that the earnings of firms that split subsequently grow faster than the earnings of a control sample of nonsplitting firms and they argue, however, that it is the presplit volume that is abnormally high and the postsplit volume is quite similar to that of their control sample of nonsplitting firms. Recently Brennan and Copeland(1988) estimated a signaling model using a large sample and explained a substantial fraction of the split-announcement returns. Healy and Palepa(1988), and Venkatesh(1989) analysed the dividend and earnings information on returns.

For the Korean accounting procedures, stock splits are not normally practised by the listed companies. Par value for the listed companies is fixed at 5,000 Won per share by the Law. During the past several years, no company split its stock. Instead, like many British firms, they issue bonus shares. Although bonus issues are procedurally different from stock splits, they are identical from the financial point of view. In this paper, therefore, a model of market reaction to bonus issues is presented and tested. We employ similar models to those used by Woolridge(1983) and GMT(1984) with a slight change. Stock price behaviour around the announcement dates of bonus issues for 62 cases of the Korea Stock Exchange during 1985-1988 are analysed in two stages.

First, ex-right day opening prices are compared with theoretical opening prices. In addition, the magnitude of the overnight price adjustment is analysed using the prior day closing to ex-day closing stock returns. Second, announcement effects are examined using the closing prices around the announcement dates and adjusting for the payment of the dividend. These returns are compared to the mean daily return of a representative period around the event day for inference purposes.

The declaration of a bonus issue, in itself, creates no wealth since it produces no extra future stream of income. Rather the distribution merely cuts the corporate pie into more pieces. Accordingly, a company's shares should theoretically have the same total value immediately before as immediately after the issuance of the stock distribution. Thus, after the announcement of a bonus issue, security prices should not on an average provide higher than normal returns. The market can therefore be said to be very efficient in terms of information on bonus issues. The situation in Korea, however, gives the impression that investors do not seem to understand fully the meaning of a bonus issue. Western investors would be amazed by the amount of press coverage and general interest generated by rumours or news of an impending bonus issue. This is very much in contrast to the way American investors treat the news of an impending stock split. It is, thus, conceivable that the Korean market may not treat the news of bonus issues as efficiently as the US market treats news of a stock split. It is therefore proposed that the information effects on stock splits or stock dividend is replicated as closely as possible in Korea.

8.2 Models for measuring information effects on security prices.

8.2.1 Ex-right day effects.

With the above hypothesis, a company with N shares selling at price P_{it-1} immediately before the bonus issue and thus having total market value NP_{it-1} should have the same market value after the issue. However, after the payment of a B % stock distribution, it has N(1+B/100) shares outstanding. In order to have the same total market value, the price immediately after the issue, P_{it}, will have to be lower than P_{it-1}. P_{it} is found as follows.

Market value after issue = Market value before issue

$(N)(1+B/100)P_{it} = NP_{it-1}$

$$P_{it} = \frac{NP_{it-1}}{(N)(1+B/100)} = \frac{P_{it-1}}{1+B/100} \qquad \text{or}$$

$$(8\text{-}1) \qquad P_{it} = \frac{P_{it-1}}{1+b}$$

where b is the bonus issue expressed in decimal form.

General market movement may be considered for adjustment. In Korea, Composite Stock Price Index (KCSPI) for all shares is the best index. KCSPI is computed by a total market value index which is composed of total listed companies as follows.

$$KCSPI = \frac{\text{Current market value}}{\text{Base market value}} \cdot 100$$

(Base date and base index : 4th January 1980 = 100).

Consequently, the adjusted theoretical price, T_{it}, is:

$T_{it} = P_{it}(KCSPI_t/KCSPI_{t-1})$

where $KCSPI_{t-1}$ is Composite Stock Price Index on prior day and $KCSPI_t$ is Composite Stock Price Index on ex-date. Or

$$(8\text{-}2) \qquad T_{it} = \frac{P_{it-1}}{(1+b)} \cdot \frac{KCSPI_t}{KCSPI_{t-1}}$$

For the closing Composite Stock Price Index, this model will be applied. However, the opening Composite Stock Price Index in Korea is not recorded. Therefore, for the comparison of opening prices, we will use the original data,

$$P_{it} = \frac{P_{it-1}}{1+b}$$

After calculating the adjusted theoretical opening price(P_{it}),

P_{it} was compared to the actual opening price (P_0) on the ex-date. Observations were grouped by the distribution percentage and for each percentage with five or more observations the following was determined:

n = the number of observations.
n(+) = the number of times the market price opened higher than the adjusted theoretical value ($P_0 > P_{it}$).
n(-) = the number of times the market price opened lower than the adjusted theoretical value ($P_0 < P_{it}$).

$\bar{p}$ = n(+)/n = the proportion of higher than theoretical openings to total observations.

For the ex-right day, the daily returns (R_{it}) are computed in the following manner.

$$(8\text{-}3) \qquad R_{it} = \frac{P_{it}(1+b)}{P_{it-1}} - 1, \quad \text{or } R_{it} = \frac{T_{it}(1+b)}{T_{it-1}} - 1$$

where

P_{it} = closing price on the ex-date
P_{it-1} = closing price on the day prior to the ex-date
b = bonus issue size
T_{it} = adjusted closing price on the ex-date.
T_{it-1} = adjusted closing price on the day prior to the ex-date.

To test the null hypothesis, that the proportion (p) of times the opening price is above the theoretical price is .5, the normal approximation of the binomial distribution is employed. To test the size of the price adjustment on the event day, the close-to-open returns (R_{it}) are calculated using equation (8-3) and substituting the event day open price for P_{it}. Under the null hypothesis that the close-to-open stockholder return is zero, a t-statistic can be constructed in which $\bar{R}_{it} \approx N(0, \sigma^2/N)$:

$$(8\text{-}4) \qquad t = \frac{\bar{R}_{it}}{\sqrt{s^2/N}}$$

where s^2 is an estimate of σ^2 (Woolridge 1983).

The sample data and the results of this research are

continued in sections 8.3.1 and 8.3.2.

8.2.2 Announcement day effects.

A basic question which this study seeks to answer is whether or not an announcement of bonus issue has any measurable impact on its securities' prices. Portfolios were formed for this analysis in event time to represent an average of security returns for a common event date as each portfolio daily rate of return. The event date is defined as the number of trading days before or after the announcement date under scrutiny, where day 0 is the actual announcement date. In order to assess security price changes or rates of returns, a variant of the Comparison Period Returns Approach(CPRA) is used (Masulis 1980, Brown and Warner 1980, Woolridge 1983, GMT 1984). The CPRA may be specified as follows.

Assuming stationarity, a security's return (R_{it}) over time can be specified as

(8-5) $$\tilde{R}_{it} = U_{it} + \tilde{e}_{it}$$

where U_{it} is the expected return of security i,

$\tilde{e}_{it}$ is a stochastic error term which has $E(\tilde{e}_{it}) = 0$ and $Cov(\tilde{e}_{it}, \tilde{e}_{it-1}) = 0$ for all i and all t.

The serially uncorrelated stochastic disturbance term, $\tilde{e}_{it}$ represents both marketwide influences and security specific effects. The non-stochastic term U_{it} is a market determined function of the assumed asset pricing model and security specific attributes. This general formulation of security returns process is clearly consistent with the well known variants of the Capital Asset Pricing Model.

The impact of new information on security prices can be discovered through the examination of e_{it}'s. The conventional approach to estimating U_{it} is to first estimate a variant of the market model which specifies a statistical relationship between

contemporaneous security and market returns (the most widely used formulation being $\tilde{R}_{it} = \alpha_i + \beta_i \tilde{R}_{mt} + \tilde{e}_{it}$). The market's announcement period return is then substituted into the estimated relationship to yield $\hat{U}_{it} = \hat{\alpha}_i + \hat{\beta}_i R_{mt}$. An alternative approach for estimating U_{it}, termed the Comparison Period Returns approach (CPRA), is employed in this study(Masulis 1980, Woolridge 1983, GMT 1984). A security's mean return $\bar{U}_{it}$ is estimated from a time series of the security's returns over a representative period (not including the announcement period) which is defined as the comparison period. This yields an unbiased estimate of U_{it} given that the security's return process is stationary over the period of observation.

To establish if the e_{it}'s around an event date are nonzero, a test is conducted to determine if the mean daily return of the event period (observation period) is statistically different from the mean daily return of some other representative time period (the comparison period). The mean daily return for the comparison period is actually an estimate of U_{it}, the expected daily return in equation(8-5). To minimize error in the estimation of U_{it}, portfolios of securities are formed in event time around announcement dates. If security returns are independent and stationary over time with finite variances, portfolio daily returns in large samples approach normal distributions. Therefore, a student-t for the difference in population means can be employed to test for equality of event period and comparison period mean returns.

The sample data and the results of this research are generated in sections 8.3.1 and 8.3.3.

8.3 The sample data and results.

8.3.1 Sample data and adjustment.

Appendix 8.1 presents the samples used in the semi-strong form empirical tests and table (8.1) describes the sample selection procedure. The initial announcements of proposed whole bonus issues (except simultaneous issues of rights and bonus issues) for the years from Jan. 1985 to Dec. 1988 were independently collected from the Korea Stock Exchange. It would seem that Korean listed companies tend to make a greater number of 'small' splits. That is different from U.S. companies which have a greater tendency to make 'large' stock splits - thus 'two for one' splits are very common in the U.S.

When the listed company decides a bonus issue at the board meeting, it has to notify immediately the Stock Exchange and the Stock Exchange announces that information directly to all of the nationwide branches of securities houses through wired radio and computer screen. Also the information is printed at 'The Securities Market' which is published daily including securities prices and trading volumes and other important news.

The stock returns after tax for this study were calculated by equation (8-3) with slight change for dividend tax. In Korea, there is no capital gains tax for portfolio investment, but investors pay fixed income tax of 16.75% for cash dividend or interest income. Therefore, the returns after tax will be

$R_{it} = [P_{it}(1+b)+(1-0.1675)D]/P_{it-1} - 1$ for the opening -to-closing prices (unadjusted data)

or $R_{it} = [T_{it}(1+b)+(1-0.1675)D]/T_{it-1} - 1$ for the closing -to-closing prices (adjusted data).

where, D is the amount of cash dividend.

For this sample, the event date is defined as the number of trading days before or after the announcement date under

scrutiny, where day 0 is the actual announcement date on which the market becomes aware of the firm's intention to expand the number of shares. "Dividend simultaneous" here was presumed to be simultaneous event of bonus issue and cash dividend.

(Table 8.1) Sample classifications of semi-strong form EMH

a. Pure and contaminated sample breakdown.

Pure event	41
Dividend simultaneous	21
Total	62

b. Sample breakdown by percentage of distributions.

<15%	21
≥15% <25%	19
≥25%	22
Total	62

8.3.2 The Ex-date effects.

Table(8.2) contains the results for the comparisons of the ex-date effects. For the prices, equations (8-1) and (8-2) were used respectively. Generally, the results which used unadjusted prices cover higher mean returns and more significant levels than the results which used adjusted prices. Overall 77.42% of the unadjusted opening prices and 61.29% of the adjusted closing prices are above the theoretical prices. For the entire sample, the unadjusted mean return of 4.86% is significantly above zero at the .01 level. The unadjusted mean returns of all subsamples classified by distribution percentage are also significant at .01 level. Subsample with cash dividend simultaneous is significant at .10 level. However, among the mean returns of adjusted prices, entire samples and subsamples except smaller issues under 15% are not significant even at .10 level. The main consideration to test here is the adjusted returns. Hence the bonus issue could be said not having significant impact on the ex-day.

(Table 8.2) Comparison of Ex-date effects

Remarks	n	Sign differential			Portfolio returns		
		n(+)	n(-)	$\bar{p}$(%)	$\bar{R}_{it}$(%)	S.D.	t
PANEL 1. Comparison of Ex-date opening prices and prior day closing prices (unadjusted prices).							
a. Pure	41	33	8	80.49	5.30	5.66	4.876**
b. Div. simult	21	15	6	71.43	3.99	11.36	1.611
c. All	62	48	14	77.42	4.86	6.52	5.869**
d. ≥25%	22	19	3	86.36	7.36	9.02	3.828**
e. ≥15% <25%	19	14	5	73.68	3.39	1.54	9.617**
f. <15%	21	15	6	71.43	3.56	6.83	2.389*
PANEL 2. Comparison of Ex-date closing prices and prior day closing prices (adjusted returns).							
a. Pure	41	29	12	70.73	5.30	44.70	0.759
b. Div. simult	21	9	12	42.86	2.16	22.84	0.434
c. All	62	38	24	61.29	4.24	45.76	0.729
d. ≥25%	22	13	9	59.09	7.06	42.94	0.771
e. ≥15% <25%	19	12	7	63.16	3.00	17.00	0.770
f. <15%	21	13	8	61.90	2.39	7.61	1.439

(Notes)
** Significant at .01 level.
* Significant at .05 level.
n : the number of observations for its category.
n(+) : the number of times the market price opened (or closed) higher than the theoretical value for its category.
n(-) : the number of times the market price opened (or closed) lower than the theoretical value for its category.

$\bar{p}$(%) = n(+)/n : the proportion of higher than theoretical prices to total observations for its category.
S.D. : Standard deviation.
Div. simult : Cash dividend simultaneously.
Pure : Bonus issue only.

$\bar{R}_{it}$: The mean of daily return.
t: t statistics.

8.3.3 Initial announcement effects on share prices.

A basic question which this study seeks to answer is whether or not an announcement of firm's bonus issue has any measurable impact on its share price. The results to this question are contained in table(8.3) for unadjusted prices and in table(8.4) for adjusted prices for the Korea Composite Stock Price Index. The portfolio daily return(PDR), the cumulative portfolio daily return(CPDR), and the percent of daily returns greater than zero are given in tables for seventy one days around the ex-dates for the entire bonus issues. The portfolio daily returns on various days around the announcement are compared with the average daily return for a subsequent benchmark period of 52 trading days through days -40 to -10 and days +10 to +30. As a comparison period, several different periods can be considered. After comparing the portfolio daily returns with the mean portfolio daily return for the entire 71 days, a comparison period was selected of 52 days.

The observed announcement date price adjustments in the share prices are dramatic. The portfolio four day return through day-1 to day +2 using unadjusted data is 5.296%, the average percent of greater than zero is 58.87%. If the data are adjusted by the market index, the portfolio daily return is 4.384%, average percent of greater than zero is 64.92% (table 8.4). The market appears to have prior knowledge from about day -22 that a bonus issue is coming such that the price tends to move up more sharply than previously. There appears to be some degree of speculative buying based on the prior knowledge of the impending bonus issue. Also high PDRs of 1.19% and 1.065% respectively on prior day show that the market or some internal investors knew the information of bonus issue before announcement. This means that the news only became general knowledge very much later, probably only after the official announcement although there is some amount of leakage in the three weeks before the official announcement. After the announcement of the bonus issue, the share price advances for another three days and then it declines.

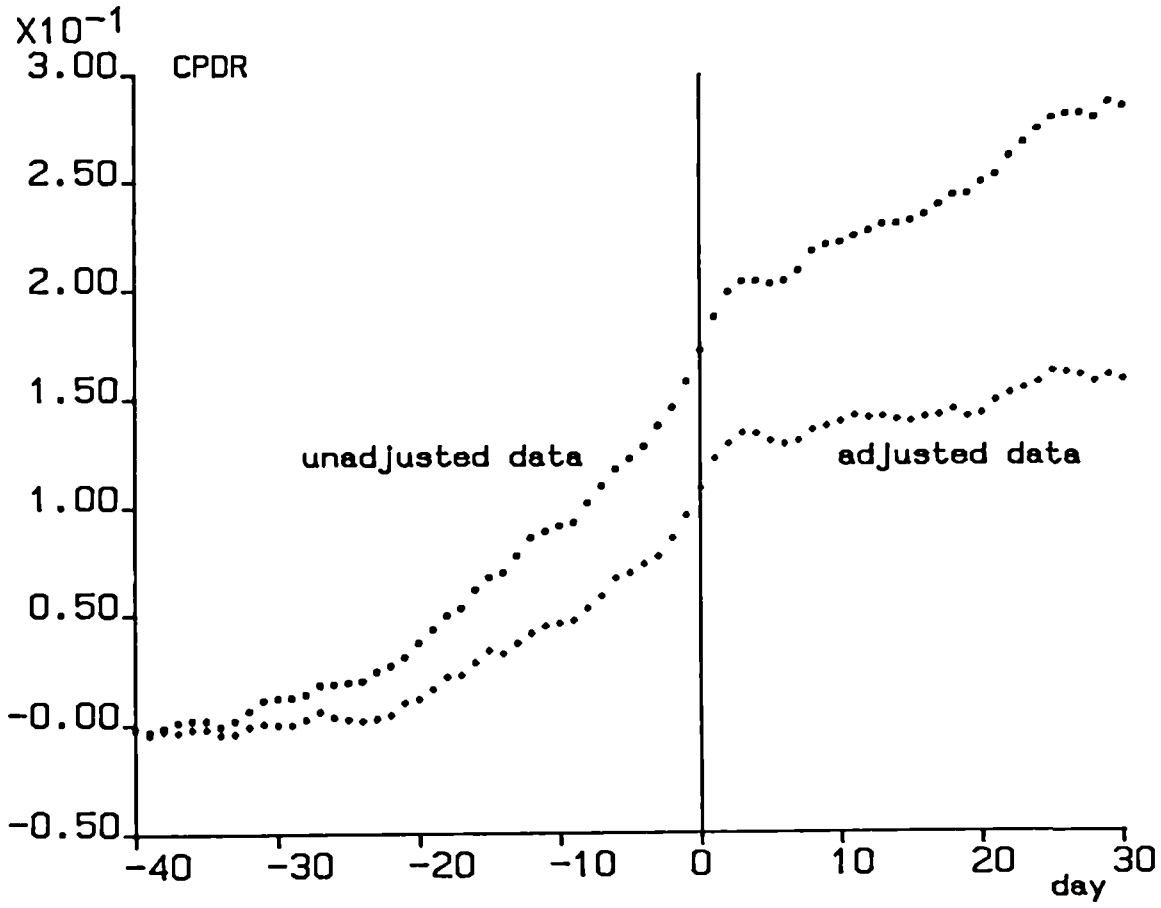
This means that the price reaction period is a little longer in Korea than in other markets. In the previous chapter, we saw that the price limit system did not affect significantly to the share price returns, using the weak form effcient market models. Korean investors seemed to believe the bonus issues as good news. Also the news of bonus stock issue did not seem to be disseminated rapidly to the investors.

If we compare this result with other research, the portfolio four day return and percentage of greater than zero through day 0 to day +3 of Korea (unadjusted data) are larger than the New York Stock Exchange samples (table 8.5). To test the significance of the announcement return, both day 0 and day +1 are examined. Because the announcements sometimes become public after the close of trading on day 0, the price limit on fluctuations within a day in the Korean market does not allow the information effects to be reflected fully on the security prices until the following day. The standardised t-test can be used to test the null hypothesis that each of the two announcement period returns has the same mean as a comparison period return. The average returns on the days subsequent to the announcement are appropriate benchmarks for the expected returns of these securities if mean returns are stationary and if the market is informationally efficient. If these returns are different systematically from their expected returns, investors can get abnormal returns by trading on the bonus issue announcements.

In the tables (8.3) and (8.4), the mean two-day return around the announcement date for the entire samples is 2.979% for unadjusted data and 2.647% for market index adjusted data. The mean two-day returns for a benchmark period of 52 trading days subsequent to the announcement are only 0.601% and 0.259% for unadjusted and adjusted data respectively. The standardised t-statistic indicates that day 0 and day 1 returns are significantly higher than the benchmark.

Figure 8.1 plots the cumulative return for the sample. It

highlights abnormal returns around the announcement date with large jumps at days through -1 to +2. Investors correctly infer an increased probability of a near-term cash dividend rise at the announcement of a bonus issue.



(Figure 8.1) Cumulative Portfolio Daily Return

(Table 8.3) Announcement effects of bonus issues on portfolio returns (unadjusted prices)

ED	PDR	CPDR	% returns>0	ED	PDR	CPDR	% returns>0
-40	-0.194	-0.194	32.26	-4	0.557	12.835	48.39
-39	-0.124	-0.318	24.19	-3	0.947	13.781	48.39
-38	0.193	-0.125	33.87	-2	0.837	14.618	53.23
-37	0.227	0.102	37.10	-1	1.190	15.809	66.13
-36	0.101	0.203	22.58	0	1.448	17.257	59.68
-35	-0.001	0.202	25.81	+1	1.531	18.788	58.06
-34	-0.271	-0.069	20.97	+2	1.127	19.915	51.61
-33	0.240	0.171	35.48	+3	0.468	20.383	43.55
-32	0.455	0.626	32.26	+4	0.020	20.403	32.26
-31	0.480	1.105	40.32	+5	-0.122	20.281	38.71
-30	0.106	1.212	35.48	+6	0.144	20.425	45.16
-29	0.011	1.222	30.65	+7	0.460	20.885	41.94
-28	0.141	1.363	29.03	+8	0.908	21.793	51.61
-27	0.448	1.811	37.10	+9	0.277	22.070	40.32
-26	0.031	1.842	29.03	+10	0.123	22.193	22.58
-25	0.066	1.909	29.03	+11	0.291	22.484	37.10
-24	0.074	1.983	32.26	+12	0.240	22.724	30.65
-23	0.425	2.407	35.48	+13	0.307	23.031	35.48
-22	0.276	2.683	35.48	+14	0.027	23.058	33.87
-21	0.377	3.060	37.10	+15	0.148	23.206	29.03
-20	0.658	3.718	37.10	+16	0.273	23.480	41.94
-19	0.619	4.337	41.94	+17	0.464	23.944	41.94
-18	0.645	4.982	37.10	+18	0.443	24.387	50.00
-17	0.339	5.321	32.26	+19	0.056	24.443	30.65
-16	0.861	6.182	46.77	+20	0.558	25.001	46.77
-15	0.571	6.753	45.16	+21	0.350	25.351	33.87
-14	0.222	6.976	37.10	+22	0.870	26.222	48.39
-13	0.798	7.774	43.55	+23	0.636	26.858	43.55
-12	0.834	8.608	45.16	+24	0.621	27.479	41.94
-11	0.295	8.902	32.26	+25	0.504	27.983	40.32
-10	0.251	9.154	37.10	+26	0.191	28.174	37.10
-9	0.150	9.304	33.87	+27	0.033	28.206	35.48
-8	0.932	10.236	46.77	+28	-0.184	28.022	24.19
-7	0.779	11.015	40.32	+29	0.732	28.754	41.94
-6	0.776	11.792	51.61	+30	-0.213	28.541	29.03
-5	0.486	12.277	38.71				

Mean of daily return from day -40 through day -10 and from day +10 through day +30 = 0.3005% (Standard deviation 0.4591%)

SPR_t statistics: Day -1 return SPR_t = 1.9378
Day 0 return SPR_t = 2.4998
Day +1 return SPR_t = 2.6806
Day +2 return SPR_t = 1.8005
Day +3 return SPR_t = 0.3650

$$SPR_t = \frac{R_t - \bar{R}_t}{\left\{ \sum_{t=-40}^{-10} [(R_t-\bar{R}_t)^2/30] + \sum_{t=+10}^{+30} [(R_t-\bar{R}_t)^2/20] \right\}^{1/2}}$$

where R_t is PDR at t, $\bar{R}_t$ is the mean return of comparison period.

(Notes)
ED : Event day.
PDR(%) : Entire portfolio daily return(%).
CPDR(%) : Cumulative portfolio daily return(%). This statistic reflects the CPDR for the entire 71 days around the ex-dates.
SPR_t : Standardised portfolio return at t.

(Table 8.4) Announcement effects of bonus issues on portfolio returns (adjusted prices)

ED	PDR	CPDR	% returns>0	ED	PDR	CPDR	% returns>0
-40	-0.153	-0.153	50.00	-4	0.406	7.365	56.45
-39	-0.322	-0.475	30.65	-3	0.361	7.726	53.23
-38	0.194	-0.282	54.84	-2	0.861	8.587	69.36
-37	-0.084	-0.362	48.39	-1	1.065	9.652	72.58
-36	0.143	-0.219	46.77	0	1.261	10.913	72.58
-35	0.008	-0.211	43.55	+1	1.386	12.298	66.13
-34	-0.255	-0.466	37.10	+2	0.672	12.970	48.39
-33	0.058	-0.408	45.16	+3	0.476	13.446	51.61
-32	0.311	-0.097	58.07	+4	-0.021	13.425	37.10
-31	0.144	0.047	48.39	+5	-0.331	13.095	37.10
-30	-0.049	-0.001	48.39	+6	-0.154	12.940	37.10
-29	-0.013	-0.014	43.55	+7	0.171	13.112	50.00
-28	0.238	0.224	53.23	+8	0.478	13.590	56.45
-27	0.361	0.585	61.29	+9	0.178	13.767	51.61
-26	-0.263	0.322	43.55	+10	0.206	13.973	45.16
-25	-0.089	0.234	43.55	+11	0.276	14.249	45.16
-24	-0.073	0.161	48.39	+12	-0.101	14.148	40.32
-23	0.093	0.254	45.16	+13	0.063	14.211	48.39
-22	0.177	0.431	51.61	+14	-0.148	14.063	40.32
-21	0.554	0.985	69.36	+15	-0.080	13.983	41.94
-20	0.175	1.159	46.77	+16	0.204	14.187	50.00
-19	0.449	1.609	59.68	+17	0.084	14.271	48.39
-18	0.552	2.161	58.07	+18	0.265	14.535	53.23
-17	0.076	2.236	43.55	+19	-0.339	14.197	40.32
-16	0.559	2.795	59.68	+20	0.149	14.345	53.23
-15	0.554	3.349	58.07	+21	0.590	14.935	59.68
-14	-0.134	3.215	41.94	+22	0.334	15.270	50.00
-13	0.485	3.700	59.68	+23	0.234	15.503	54.84
-12	0.448	4.148	51.61	+24	0.259	15.763	58.07
-11	0.348	4.496	48.39	+25	0.515	16.278	51.61
-10	0.122	4.618	56.45	+26	-0.064	16.214	38.71
-9	0.133	4.751	48.39	+27	-0.109	16.105	53.23
-8	0.554	5.305	53.23	+28	-0.301	15.804	38.71
-7	0.564	5.869	51.61	+29	0.293	16.097	59.68
-6	0.841	6.710	61.29	+30	-0.204	15.893	43.55

Mean of daily return from day -40 through day -10 and from day +10 through day +30 = 0.1297%
(Standard deviation = 0.4277%)

SPR_t statistics : Day -1 return SPR_t = 2.1876
Day 0 return SPR_t = 2.6449
Day +1 return SPR_t = 2.9368
Day +2 return SPR_t = 1.2674
Day +3 return SPR_t = 0.8105

(Table 8.5) Comparison with other research

ED	PDR				% of returns>0			
	Korea1	Korea2	W	GMT	Korea1	Korea2	W	GMT
-2	0.837	0.861	0.633	0.45	48.4	69.4	48.1	48.
-1	1.190	1.065	0.605	0.55	53.2	72.6	48.7	49.
0	1.448	1.261	0.968	1.84	66.1	72.6	58.9	67
+1	1.531	1.386	0.081	1.57	59.7	66.1	39.2	64
+2	1.127	0.672	0.061	0.67	58.1	48.4	41.1	53
+3	0.468	0.476	0.238	0.22	51.6	51.6	38.9	46
CA	4.574	3.815	1.348	4.30	58.9	59.7	44.5	57.5

(Notes)
ED: Event day.
PDR: Portfolio daily return.
% of returns>0: The percentage of returns greater than zero.
Korea1 : unadjusted returns for 62 samples.
Korea2 : adjusted returns for 62 samples.
W : Woolridge(1983) for 317 NYSE samples.
GMT: Grinblatt, Masulis, and Titman(1984) for 1762 NYSE samples.
CA: Cumulative PDR or average percentage of return greater than zero through day 0 to day +3.

8.4 Conclusion.

This study has performed an empirical test of the semi-strong form of the EMH. The valuation effects of bonus stock issue announcements were found to react to share prices in a relatively short period. However, on average, there is a significant increase in a firm's stock price at the announcement in the Korean stock market and the average magnitude of these announcement returns exceeds that found previously for NYSE samples. Post-announcement returns, particularly around the ex-dates of bonus issues, have been also documented. Portfolio returns at the ex-date are significantly larger for unadjusted

data than those of adjusted data. The result using adjusted data, however, was not found significant. These results mean that the Korean stock market is relatively efficient with respect to the information of bonus issues, e.g., investors on average cannot get significant abnormal returns.

However, some sources showed innormative. The 'family character' of most of the Korean corporations allows a limited numbers of market participants to use 'internal information' profitably. Investors need to understand the meaning of the bonus stock issues exactly. The declaration of a bonus issue, in itself, creates no wealth since it produces no extra future stream of income, as explained at the beginning of this chapter. Also information did not seem to be disseminated in a short period to all the investors.

The following strategies are recommended for the market efficiencies: strengthening fair transaction activities and establishing a firmer public notifying system; strenthening the external audit system and applying the international standard audit system; revising or eliminating the price limit system of fluctuation within a day; improving investor protection system; revising the securities transaction act and other laws to promote the capital market; operating specialised financial department independently from the family management profit centre of listed companies; expanding the range of institutional investors.

CHAPTER IX. THE STRONG FORM EMPIRICAL TESTS OF EMH.

9.1 Introduction.

Strong form tests of market efficiency are concerned with whether given investors or groups have monopolistic access to (nonpublic) information relevant to price formation (Fama 1970). Accordingly, if the market were strongly efficient, even an insider would not be able to profit from his privileged position. Obviously the semi-strong form and weak form hypothesis are special cases of the strong form hypothesis. Historic stock price data and publicly available information about a company can be 'known' extremely easily. Numerous studies of strong form empirical tests are published on the advanced markets, as summarised in chapter 6.5. These tests consist of examinations of the performance of analysts' recommendations or professionally managed funds and insider trading. Research in this area on the emerging markets, however, is very limited, due to the difficulties of getting a database or internal information.

In this chapter, the value of verbal recommendations, using the unpublished, confidential lists of approved stocks which are produced each week will be investigated. Several studies of the performance of stock recommendations, in the US, Britain, Canada, Australia, and Hong Kong, have in fact been published. They, as summarised in Table 9.1, almost universally have examined published recommendations (Dimson and Marsh 1984). Their results generally indicate a small degree of forecasting ability, at least before dealing costs are taken into account.

(Table 9.1)Performance of brokers' and analysts' recommendations

Name	Country	NS	NR	Type	PRRP PD	PRRP +1D	PRRP +1W	PRRP Long
Cowles(1933)	USA	45	7500	Published				-1.4
Cowles(1944)	USA	11	6904	Published				0.2
Ferber(1958)	USA	4	345	Published	0.5		1.1	0.7
Ruff(1963)	USA	1	31	Published			4.0	
Colker(1963)	USA	1	1054	Published				3.8
Stoffels(1966)	USA	3	264	Published	0.7	1.0	1.5	1.4
Money Which(1968)	UK	6	90	Published				11.9
Cheney(1969)	USA	4	n.a.	Published				2.0
Brealey(1971)	UK	1	360	Published				4.1
Diefenbach(1972)	USA	24	1209	Published				2.7
Firth(1972)	UK	4	1100	Published			-1.0	-3.0
Black(1973)	USA	1	500	Published				10.0
Logue & Tuttle(1973)	USA	6	304	Published			3.0	
Fitzgerald(1975)	UK	35	635	Unpublished	0.5	1.0	1.5	0.5
Bidwell(1977)	USA	11	99	Published				2.6
Shepperd(1977)	USA	7	1008	Published				-3.0
Davies & Canes(1978)	USA	8	785	Published	1.3	1.6	1.7	
Fitzgerald(1978)	UK	11	467	Published	3.1	3.2	3.5	1.0
Groth et al.(1979)	USA	1	6014	Published			1.8	2.6
Stanley et al.(1981)	USA	1	4461	Published			0.7	
Dawson(1982)	Hong Kong	1	300	Published		0.4	1.2	2.9
Garmaise(1982)	Canada	10	6968	Unpublished				-2.0
Copeland & Mayers(1982)	UK	1	3840	Published	0.2		0.4	3.4
Finn(1983)	Australia	1	361	Published				2.0
Bjerring et al.(1983)	Canada & USA	1	92	Published	1.5	2.1	1.2	
Hanna(1983)/Holloway(1981 1983)	USA	1	1500	Published				3.6
Dimson & Marsh(1984)	UK	35	4187	Unpublished				1.2
Dimson & Fraletti(1986)	UK	1	1649	Unpublished		0.07	0.22	-0.8
Elton et al.(1986)	USA	34	9977	Unpublished				0.18

(Notes)
NS: Number of services.
NR: Number of recommendations.
PRRP: Percentage return on pre-recommendation price.
PD: Publication day.
+1D: After one day.
+1W: After one week.
Long: Longer term.
(Source)
Dimson and Marsh(1984) with updates.

Among others, Bjerring, Lakonishok, and Vermaelen(1983) evaluate the recommendations of a Canadian brokerage house by a numbers of techniques. They use the market model for calculating

abnormal returns. The results reveal that an investor following the recommendations would have achieved significantly positive abnormal returns, even after allowing for transaction costs. Dimson and Marsh(1984) describe an empirical study of over 4,000 specific share return forecasts made by 35 UK brokers and by the internal analysts of a large UK investment institution, using the CAPM model as comparison. They found that after the date of forecast there was a significant degree of out-(under-) performance by those stocks with positive (negative) predictions of abnormal return. These observations conflict with the usual outcome from following the published recommendations of brokers and other advisors, whose performance from the date of receiving the recommendation is approximately neutral. Evidently the unpublished forecasts, collected by the institution which provided the data, had some real, albeit limited, economic value.

In another paper, Dimson and Fraletti(1986) examine the profitability of following the telephone recommendations given daily during 1983 by a leading UK stockbroker, using the CAPM model. They tried to reduce the risk of a type II error when unpublished forecasts are investigated, as seen in the Dimson and Marsh study (1984). Their study reminds us that in a competitive market only a very few investment advisors can consistently be successful. Even those analysts closest to the market can rarely expect to do a great deal better than picking stocks with a pin. Elton, Gruber, and Grossman(1986) study the information content in analysts' recommendations which are made on a five-point buy, hold, or sell scale. They find that approximately 4.5% extra return can be earned by purchasing new buys rather than new sells.

Major Korean securities houses each have a committee meeting regularly once in a week and a general committee meeting once in a quarter. The participants are limited to research analysts, sales managers of branches in Seoul, and general managers of business related departments at the head office. Research institutions which are affiliated companies of securities houses

analyse worldwide and domestic economic trends and industries, and forecast market trends. They concentrate on the long-term trends usually. The research results are published in periodicals such as weekly, monthly, and quarterly, and irregular publications. The Sales Promotion Department of securities companies, however, concentrates on information surrounding the market. As a result, its managers pay more attention to the short-term investment strategy. Because the brokerage commission is the biggest source of company income, (42% average in 1988), frequent buying and selling is preferred by them. Short-term forecasting ability is very important for their business. They don't publish research papers, but they prepare internal circulations for short-term market trends and recommended stocks. They don't usually recommend stocks to sell or to hold, but only to buy. Stocks which are recommended are expected to provide favorable abnormal returns after purchase. This information is usually used promptly for discretionary fund managers and for major clients by telephone. About 70 of each firm's staff are regular users of the recommended list.

Although similar in scope, this study differs in two ways from previous studies in this area. First, the brokerage house recommendations cover Korean stocks, on which no previous research has been found. Second, as the samples of recommendations, only new buys are included. If the same stock is recommended in the following week, it is excluded in that following week. But after stopping the recommendation, when the stock appears again on the list, it is included on that week. This is to study brokers' ability to choose the new list of recommendations. The stocks whose listing periods are less than one year are also excluded.

9.2 Models for an analysis of brokers' unpublished recommendations.

9.2.1 The CAPM Model and the Simple Model.

To examine the potential gains from following the brokers' recommendations, the return on recommended stock j in day t is calculated as follows,

(9-1) $R_{jt} = (P_{jt} - P_{jt-1} + D_{jt}) / P_{jt-1}$

where

P_{jt} = stock price at day j

P_{jt-1} = stock price at the previous day

D_{jt} = dividend payment after tax.

Also appropriate adjustments are made for right issues and bonus issues. No adjustment is made for commissions. There is no tax for capital gains on portfolio investment in Korea.

The abnormal return on a security is the difference between the realised return and an appropriate benchmark. The abnormal returns e_{jt} on recommended stock j in day t are defined as

(9-2) $e_{jt} = R_{jt} - E(R_{jt})$.

Using the Sharpe(1964)-Lintner(1965) Capital Asset Pricing Model (CAPM), the unconditional return $E(R_{jt})$ is

(9-3) $E(R_{jt}) = (1-\beta_j)R_{ft} + \beta_j R_{mt}$,

where

R_{ft} is the return on risk free government bonds, represented in Korea by Short-term Government Bond yield.

R_{mt} is the return on the market portfolio, using the return on the Korea Composite Stock Price Index.

$\beta_j = Cov(R_j, R_m) / Var(R_m)$, the beta or systematic risk of stock j. β_js are calculated from the 52 weekly transaction prices and returns data of 1987.

Substituting for equation (9-3) in equation (9-2), the abnormal return on stock j in day t is therefore given by

(9-4) $e_{jt} = R_{jt} - (1 - \beta_j) R_{ft} - \beta_j R_{mt}$.

For convenience in this empirical work with daily data, a beta is

assumed stationary.
The simple model
(9-5) $e_{jt} = R_{jt} - R_{mt}$,
i.e., a straight difference between the return on the stock and the return on the market index will be used again.

Market Model was tested, but the results were not appropriate to accept. As Dimson and Marsh(1984) commented, Sharpe's market model would be particularly inappropriate when estimating correlations for specific security returns.

$$R_{jt}=\alpha_j+\beta_j R_{mt}+V_{jt}.$$

For stocks which performed well(poorly) during the estimated period, α_j will be projected to be positive(negative); and since favourable (unfavourable) performance doesnot persist in weak-form efficient markets, the V_{jt} can be predicted to be negative (positive). The market model would thus provide a quite inappropriate benchmark, since analysts who simply predict trend reversals will always appear to have positive forecasting skills.

9.2.2 Event time portfolio method.

The abnormal returns are monitored in event time. Event time represents the day which appeared first on the recommended list. If the same company is recommended at the following week, it is excluded. But if it is recommended again after stopping the recommendation, it is included. The mean recommendation periods are 2.18 weeks for broker 1, 1.21 weeks for broker 2, 1.31 weeks for broker 3, and 1.62 weeks for broker 4. Broker 2, and 3 changed recommended stocks almost every week, but broker 1 kept recommended stocks for 2.18 weeks. For each of the 467 cases, the abnormal return in the t-th day of listing for t=-10,-9, . . 0, +1,+2 . . .+47 is computed. Total data used are huge, 32,472 share prices and index (248,952 characters). Included in the abnormal return for individual securities are the effects of firm specific events occuring during the time period. If the stock recommendations provide information with economic value, then the

mean abnormal return for period t, AAR_t, will be positive. If, however, the markets are efficient, one can expect that the AAR_t will be equal to, or not statistically different from, zero. A cross sectional average can reduce this disturbance as follows:

$$(9\text{-}5) \qquad AAR_t = \frac{1}{N} \sum_{j=1}^{N} e_{jt}$$

where

AAR_t = the mean abnormal return for period t.

N: the number of recommended stocks.

The cumulative abnormal return at T is then computed as follows:

$$(9\text{-}6) \qquad CAR_T = \Sigma\, AAR_t,$$

where the cumulation runs from t=0 to t=T.

The null hypothesis of zero abnormal performance on day t is tested with the t-statistic using Crude Dependence Adjustment (Brown and Warner 1980), even though this method was criticised by Dimson and Marsh(1986) for the size effect.. Because the samples in this research are relatively frequently traded stocks with large capitalisation, the size effect can be disregarded. The standard deviation of the day "0" average performance measure is estimated from the values of the average performance measure in days +16 through +46.

$$(9\text{-}7) \qquad t = \frac{AAR_t}{\sigma / N}$$

where

$$\sigma = \left[\sum_{j=1}^{N} \left[\frac{1}{29} \sum_{t=+16}^{+46} (e_{jt} - \overline{AAR_t})^2 \right] \right]^{\frac{1}{2}}$$

$$\overline{AAR_t} = \sum_{t=+16}^{+46} AAR_t \,/\, 30$$

This test statistic is distributed student-t distribution with 28 degrees of freedom.

9.3 The sample data and results.

9.3.1 The sample data.

As samples, four subsets of recommendations by four leading Korean securities houses are used. The data consist of new recommendations made by the broker for 25 weeks during January 1988 - June 1988. Because of using an unpublished recommendation list, longer term lists couldn't be found. The market situation is changing continuously and investors need to get new information. Old information or record does not so much affect share prices. Thus, a relatively short-term period data were used in this research. The numbers of new recommendations of each broker are 102, 132, 118, and 115 respectively. In total during this period, there are 467 recommendations for 149 different companies, and an average of 4.67 companies appeared as new recommendations each week by each broker. The recommendations are not clustered very much in time, which are different from other research (Bjerring et al.1983, Dimson and Marsh 1984, Dimson and Fraletti 1986). If a stock is known to be recommended in a particular week, it is not usually recommended in the following week.

The numbers of brokers' recommendations each week are limited, but they cover broadly all industries of the Korean stock market. That is similar to UK research by Dimson and Fraletti(1986). This is because the list is used to identify stocks which could reasonably be proposed both to active clients who already hold an equity portfolio, and to new investors who wish to construct a portfolio de novo. As seen in Table 9.2, machinery & equipment, banking & finance, and chemical & pharmaceutical industries are frequently recommended stocks in numbers. But as the ratio to KCSPI, wholesale & retail(1.47), banking & finance(1.45), and machinery & equipment industries(1.30) are favoured.

(Table 9.2) Distribution of sample across industry groups

Industry	No.of recomm. (a)	% (b)	% of KCSPI (c)	(b)/(c) (d)
Foods & Beverage	28	6.0	9.6	0.62
Textile, Apparel, & Leather	18	3.9	10.1	0.39
Wood & Paper	10	2.1.	3.7	0.56
Chemical, Petroleum, & Pharmacy	60	12.8	18.7	0.68
Nonmetallic mineral products	25	5.4	4.6	1.17
Basic Metals	36	7.7	6.6	1.17
Machinery & Equipment	95	20.3	15.6	1.30
Construction	41	8.8	7.7	1.14
Wholesale & Retail	43	9.2	6.3	1.47
Banking, Finance & Insurance	93	19.9	13.7	1.45
Transport & Others	18	3.9	5.3	0.74
Total or average	467	100.0	100.0	1.00

9.3.2 Results.

9.3.2.1 The naive results.

The first approach involves measuring the average total returns(ARs) to the stock recommendations made in calendar day t (t=-10, -9, . . . , 0, +1, . . . +47). In each calendar day, an equally weighted portfolio was constructed from all recommended stocks. The daily cumulative average returns(CARs) were then calculated. These daily CARs were then organised in event time, where event day zero is the recommendation day. The equally weighted mean of the CARs on all the recommendation portfolios was then calculated for event days -10 to +47.

Appendix 9.1 shows the average total returns for the recommended stocks by Korean stockbrokers and it is summarised in Table 9.3. Three brokerage houses have meetings in the morning between 8:00-9:00 before the market opens at 10:00PM. The pre-recommendation price over the prior 10 days indicates that the market already recognised that these stocks were good investments. The average pre-recommendation return over 10 days was 5.48%. Broker 2 was the highest as 6.40%, broker 3 was the

lowest as 4.86%. It was similar to the results of other research (Hong Kong market by Dawson 1982, UK market by Dimson and Fraletti 1986). It could be that the price increase attracted the information analysts' attention so that the company became the subject of a recommendation report. In any case, there was no sudden price change on average when the recommendation was made, nor was it necessary for the investor to act quickly before the price increase stopped, since these stocks continued to rise throughout the research period. The CAR over 47 days after recommendation was 5.86% on average, 7.86% for broker 4 which was the highest and 4.15% for broker 3 which was the lowest.

Let us look at the t-test, for determining whether the stock returns from a group of stocks with returns are different from zero. The asterisks in the table indicate that most of the observations during days -5 to +3 have a 0.01, or 0.05 level of statistical significance. This means that there is just one chance in a hundred, or twenty, that the average recommended stocks of analysts' forecasts came from a group of stocks that did not change in price. The results in Table 8.3 indicate that the stock recommendations under study were reliable. The stocks with a buy recommendation gained in value in the short-term. Broker 1 and broker 4 outperformed broker 2 and broker 3.

(Table 9.3) Average return of recommended stocks
(unadjusted data)

Time period	Total		Broker 1		Broker 2		Broker 3		Broker 4	
	AR	CAR	AR	CAR	AR	CAR	AR	CAR	AR	CAR
-10	0.50	-5.48	0.58	-5.73	0.67	-6.40	-0.17	-4.86	0.90	-5.20
-5	0.21	-2.91	0.08	-2.66	0.20	-3.49	0.42	-2.85	0.78	-2.54
-1	0.60	-0.60	0.61	-0.61	0.85	-0.85	0.66	-0.66	0.23	-0.23
0	0.28	0.28	0.18	0.18	0.47	0.47	0.46	0.46	-0.03	-0.03
1	0.45	0.73	0.36	0.54	0.95	1.42	0.21	0.67	0.20	0.17
2	0.71	1.44	1.02	1.56	1.06	2.48	0.13	0.80	0.64	0.81
3	0.30	1.74	0.28	1.84	-0.11	2.37	0.79	1.59	0.27	1.08
5	0.03	2.00	0.45	2.85	-0.58	1.86	0.13	1.61	0.25	1.81
10	0.04	2.65	0.33	3.95	-0.31	2.09	0.16	1.98	0.06	2.89
15	0.26	3.43	0.50	4.50	0.29	2.80	-0.05	2.72	0.34	4.03
20	0.07	3.89	-0.08	5.45	-0.07	2.91	0.64	3.31	-0.24	4.31
25	0.48	4.95	0.80	6.96	0.46	4.06	0.18	3.55	0.52	5.71
30	0.07	5.06	-0.06	7.24	0.24	3.59	-0.05	3.96	0.13	6.03
35	-0.09	5.18	-0.18	6.72	-0.16	3.86	-0.35	4.01	0.17	6.61
40	-0.29	4.91	-0.15	6.65	-0.51	3.52	-0.26	4.00	-0.14	6.02
45	0.17	5.79	0.23	7.44	0.25	4.61	-0.03	4.04	0.25	7.56
47	0.23	5.86	0.35	7.65	-0.07	4.64	-0.10	4.15	0.76	7.86

(Note)
AR: Average total return.
CAR: Cumulative average total return. Meeting is held in the morning before the market opens. Accordingly the closing price of recommended day is calculated on day 0 and the closing price of previous day is seen on day -1.
Absolute means and absolute t-values during day -10 to +47.

	AR	t(AR)	CAR	t(CAR)
Total	0.235	2.342*	3.288	15.783*
Broker 1	0.313	1.469	4.451	7.627*
Broker 2	0.329	1.783	2.596	7.980*
Broker 3	0.259	1.293	2.579	7.360*
Broker 4	0.310	1.543	3.874	8.274*

9.3.2.2 Adjusting for market changes.

The first performance test made no adjustment for changes in the market's level. If the market rises, for instance by 25%, some critics of stock recommendations point out that a stock that does not also increase by 25%, assuming it is of average risk, is a poor investment. Looking at the market, the Korea Composite Stock Price Index(KCSPI), which explains the average movement of

the market well, has risen 38.7% during the first five months of the research period and then the index declined. Accordingly, tables 9.4-9.8 present another test, which adjusts the stock returns for changes in the market as measured by two models. One is the simple model which assumes the systematic risk is always one. The other is the CAPM model which uses different betas of the systematic riskiness of the samples, their variabilities relative to the market. The mean beta of total 467 samples was 0.9744.

Using the same methods as the naive model in 9.3.2.1, the calendar time portfolios are analysed. These calendar time portfolios therefore correspond to the holdings of an investor who, each day, allocates the same amount of money to all stocks recommended by the broker, with an equal investment in each stock. Instead of ARs, the average abnormal returns(AARs) are calculated. Because of adjusting for the market index, daily abnormal returns were computed for each of the 58 days around recommendation day, and the daily cumulative abnormal returns(CARs) were then calculated. They are expressed relative to the portfolio value for the day(t) in which the portfolio was recommended.

As seen in Tables 9.4-9.8, the pre-recommendation price over the prior 10 days also indicates that the market already recognised that these stocks were good investment as in the naive results. The average pre-recommendation returns over 10 days were 2.47% from CAPM model and 2.43% from simple model (table 9.8). The pre-recommendation returns of each broker are 2.94% and 2.87% for broker 1, 2.93% and 2.95% for broker 2, 1.82% and 1.86% for broker 3, and 2.18% and 2.03% for broker 4. Also the meeting has an immediate positive impact on stocks recommended to some clients. During days 0 to +4, the CARs of total samples have the quickest impact on broker 2. The degree of stock price impact over 47 days on recommended stocks is much different among brokers. The recommendations by broker 1 and broker 4 have positive impacts of around 2.8% and 3.0% respectively. However,

the result by broker 2 shows performance which is strikingly close to zero and the result by broker 3 exhibit negative performance. Over 47 days following formation of the portfolio the mean CARs are 1.120% and 1.108% by the CAPM model and the simple model respectively. And the t-statistics for CARs show significant. For the two models, the results using the CAPM model are more significantly out-(under-)performed for total samples and broker 1, 2, and 3 than the results using the simple model. However, the result for broker 4 using CAPM is less outperformed than the result using the simple model.

This study of recommended portfolios gives a hint of a few exploitable stock selection skills in the very short-term, for instance two months. Analysis of the recommended sample stocks does not support the hypothesis that the Korean markets are efficient in the strong form. It is possible, however, that, since the Korean market is less developed and more regulated than the New York or London Stock Exchange, areas of greater and lesser efficiency may exist. But the level of stock selection skills among brokers in Korean market varies widely.

9.4 Summary and conclusion.

This part has examined the profitability of following the recommendations given weekly during the first six months of 1988 by four leading Korean stockbrokers. In all, 467 recommendations were provided for 149 different companies during 25 weeks. The results in this paper show that some brokerage houses provided valuable services to their clients in selecting stocks which achieved positive abnormal returns during the recommendation period. However, amongst the brokers there were large differences of predictive ability. The total recommended lists show 1.1% average additional profit margin. And the t-values for CARs are significant. But considering transactions costs of 0.2-0.4% brokerage commission and 0.5% transaction tax, the abnormal gain is close to zero. There is no capital gains tax currently in

Korea. Also no spread between bid and ask prices is applied, not like some other markets, because securities are traded automatically by computerisation. Thus, we may conclude that the Korean brokerage houses on average do not provide valuable services to their clients in selecting stocks, even some brokerage houses provide valuable services.

A few words of caution. First, the research periods of recommendation are shorter than the other studies, because unpublished data were not available for longer periods in the Korean stock market in which the market environment is changing very quickly. Also analysts seem to believe that getting new information is more important than keeping old records. Second, past success is not a guarantee of future success. And third, investors need to select stockbrokers for their better performance because the levels of stock selection abilities among brokers is different from each other.

(Table 9.4) Performance of recommended list - Broker 1

	CAPM Model				Simple Model			
Day	AAR	t(AAR)	CAR	t(CAR)	AAR	t(AAR)	CAR	t(CAR)
-10	0.255	1.24			0.214	1.04		
-9	0.493	2.39*			0.495	2.42*		
-8	0.385	1.87			0.370	1.81		
-7	0.433	2.10*			0.349	1.70		
-6	0.059	0.29			0.020	0.10		
-5	0.110	0.53			0.172	0.84		
-4	0.022	0.10			0.025	0.12		
-3	0.328	1.59			0.299	1.46		
-2	0.524	2.54*			0.578	2.82*		
-1	0.335	1.63			0.347	1.69		
0	0.613	2.98*	0.613	2.07*	0.628	3.06*	0.628	2.13*
1	0.241	1.17	0.854	2.88*	0.157	0.77	0.785	2.67*
2	0.473	2.30*	1.327	4.48*	0.470	2.29*	1.255	4.27*
3	0.185	0.90	1.512	5.10*	0.189	0.92	1.444	4.91*
4	0.293	1.43	1.805	6.09*	0.286	1.40	1.730	5.88*
5	0.391	1.90	2.196	7.41*	0.429	2.09*	2.160	7.34*
6	0.239	1.16	2.436	8.22*	0.310	1.51	2.470	8.40*
7	-0.033	-0.16	2.402	8.11*	-0.004	-0.02	2.466	8.38*
8	-0.061	-0.30	2.341	7.90*	-0.009	-0.05	2.457	8.35*
9	-0.369	-1.79	1.972	6.66*	-0.326	-1.59	2.131	7.25*
10	0.090	0.44	2.061	6.96*	0.099	0.48	2.230	7.58*
11	-0.155	-0.75	1.907	6.44*	-0.208	-1.01	2.022	6.87*
12	-0.228	-1.11	1.679	5.67*	-0.203	-0.99	1.819	6.18*
13	-0.172	-0.84	1.507	5.09*	-0.231	-1.13	1.588	5.40*
14	-0.069	-0.33	1.438	4.85*	-0.141	-0.69	1.447	4.92*
15	0.047	0.23	1.485	5.01*	0.031	0.15	1.478	5.03*
16	0.099	0.48	1.583	5.35*	0.031	0.15	1.510	5.13*
17	0.078	0.38	1.662	5.61*	0.151	0.73	1.660	5.64*
18	0.014	0.07	1.676	5.66*	-0.024	-0.12	1.636	5.56*
19	0.044	0.21	1.720	5.81*	0.112	0.55	1.749	5.94*
20	0.146	0.71	1.866	6.30*	0.123	0.60	1.871	6.36*
21	-0.339	-1.65	1.527	5.16*	-0.393	-1.92	1.478	5.02*
22	0.175	0.85	1.702	5.75*	0.247	1.20	1.725	5.86*
23	0.269	1.31	1.971	6.65*	0.209	1.02	1.934	6.57*
24	0.033	0.16	2.004	6.76*	0.014	0.07	1.947	6.62*
25	0.417	2.03	2.421	8.17*	0.362	1.76	2.309	7.85*
26	0.088	0.43	2.509	8.47*	0.082	0.40	2.391	8.13*
27	0.063	0.31	2.572	8.68*	0.107	0.52	2.498	8.49*
28	0.074	0.36	2.645	8.93*	0.069	0.34	2.567	8.73*
29	-0.075	-0.36	2.570	8.68*	-0.053	-0.26	2.514	8.55*
30	-0.268	-1.30	2.303	7.77*	-0.302	-1.47	2.212	7.52*
31	0.220	1.07	2.523	8.52*	0.238	1.16	2.451	8.33*
32	-0.357	-1.73	2.166	7.31*	-0.418	-2.04*	2.033	6.91*
33	0.173	0.84	2.339	7.89*	0.127	0.62	2.159	7.34*
34	-0.286	-1.39	2.052	6.93*	-0.322	-1.57	1.838	6.25*
35	-0.195	-0.94	1.858	6.27*	-0.213	-1.04	1.624	5.52*
36	-0.025	-0.12	1.833	6.19*	0.042	0.20	1.666	5.66*
37	0.323	1.57	2.156	7.28*	0.287	1.40	1.953	6.64*
38	0.064	0.31	2.220	7.50*	0.106	0.51	2.058	7.00*
39	0.161	0.78	2.382	8.04*	0.218	1.06	2.276	7.74*
40	0.025	0.12	2.407	8.13*	0.012	0.06	2.288	7.78*
41	-0.156	-0.76	2.251	7.60*	-0.164	-0.80	2.124	7.22*
42	0.265	1.29	2.516	8.49*	0.233	1.13	2.357	8.01*
43	0.058	0.28	2.573	8.69*	0.067	0.33	2.424	8.24*
44	0.040	0.20	2.614	8.82*	0.031	0.15	2.455	8.35*
45	-0.016	-0.08	2.598	8.77*	0.016	0.08	2.472	8.40*
46	0.072	0.35	2.670	9.01*	0.099	0.48	2.570	8.74*
47	0.205	1.00	2.875	9.70*	0.185	0.90	2.755	9.37*
Avrg	0.197	0.96		5.84*	0.201	0.98		5.60*

Mean Beta = 0.9922

(Notes)
AAR: Average abnormal return.
t(AAR): t-statistics for AAR.
*: Significant at 5% level.
CAR: Cumulative abnormal return.
t(CAR): t-statistics for CAR.
*: Significant at 5% level.
Avrg: The average of absolute values.

(Table 9.5) Performance of recommended list - Broker 2

	CAPM Model				Simple Model			
Day	AAR	t(AAR)	CAR	t(CAR)	AAR	t(AAR)	CAR	t(CAR)
-10	0.182	1.00			0.188	1.03		
-9	0.003	0.02			-0.032	-0.18		
-8	0.447	2.45*			0.382	2.10*		
-7	-0.097	-0.53			-0.044	-0.24		
-6	0.124	0.68			0.115	0.63		
-5	0.256	1.40			0.306	1.68		
-4	0.475	2.60*			0.507	2.79*		
-3	0.553	3.03*			0.525	2.89*		
-2	0.456	2.50*			0.495	2.72*		
-1	0.530	2.90*			0.506	2.78*		
0	0.421	2.31*	0.421	2.29*	0.424	2.33*	0.424	2.29*
1	0.417	2.28*	0.838	4.55*	0.411	2.26*	0.835	4.51*
2	0.577	3.16*	1.416	7.69*	0.594	3.27*	1.429	7.72*
3	-0.412	-2.26*	1.003	5.45*	-0.403	-2.21*	1.026	5.54*
4	-0.145	-0.79	0.859	4.66*	-0.120	-0.66	0.906	4.89*
5	-0.479	-2.62*	0.379	2.06*	-0.503	-2.77*	0.402	2.17*
6	-0.155	-0.85	0.224	1.22	-0.143	-0.78	0.260	1.40
7	0.113	0.62	0.338	1.84	0.112	0.62	0.372	2.01
8	0.477	2.61*	0.815	4.43*	0.439	2.42*	0.812	4.38*
9	0.201	1.10	1.016	5.52*	0.250	1.37	1.061	5.73*
10	-0.264	-1.45	0.752	4.08*	-0.300	-1.65	0.761	4.11*
11	0.193	1.06	0.945	5.13*	0.178	0.98	0.939	5.07*
12	-0.324	-1.77	0.621	3.37*	-0.290	-1.60	0.649	3.51*
13	-0.226	-1.24	0.394	2.14*	-0.161	-0.89	0.488	2.64*
14	-0.240	-1.31	0.155	0.84	-0.223	-1.23	0.265	1.43
15	-0.058	-0.31	0.097	0.53	-0.029	-0.16	0.236	1.27
16	-0.389	-2.13*	-0.292	-1.58	-0.340	-1.87	-0.104	-0.56
17	0.143	0.78	-0.148	-0.81	0.125	0.69	0.021	0.11
18	-0.051	-0.28	-0.200	-1.09	-0.034	-0.19	-0.014	-0.07
19	0.096	0.53	-0.103	-0.56	0.105	0.58	0.092	0.49
20	0.078	0.43	-0.025	-0.14	0.102	0.56	0.194	1.05
21	-0.072	-0.40	-0.097	-0.53	-0.032	-0.18	0.162	0.87
22	-0.092	-0.50	-0.189	-1.03	-0.127	-0.70	0.034	0.19
23	0.437	2.39*	0.247	1.34	0.465	2.56*	0.499	2.70*
24	0.104	0.57	0.351	1.91	0.133	0.73	0.632	3.41*
25	0.026	0.14	0.377	2.05*	-0.006	-0.03	0.626	3.38*
26	-0.510	-2.79*	-0.133	-0.72	-0.557	-3.06*	0.069	0.38
27	0.013	0.07	-0.120	-0.65	0.021	0.12	0.091	0.49
28	-0.069	-0.38	-0.189	-1.02	-0.110	-0.60	-0.019	-0.10
29	0.227	1.24	0.038	0.21	0.185	1.02	0.166	0.90
30	0.110	0.60	0.148	0.80	0.119	0.66	0.286	1.54
31	-0.177	-0.97	-0.030	-0.16	-0.172	-0.94	0.114	0.61
32	0.190	1.04	0.161	0.87	0.211	1.16	0.324	1.75
33	0.221	1.21	0.382	2.08*	0.227	1.25	0.551	2.98*
34	-0.234	-1.28	0.148	0.81	-0.286	-1.57	0.266	1.43
35	-0.259	-1.42	-0.111	-0.60	-0.295	-1.62	-0.030	-0.16
36	-0.075	-0.41	-0.186	-1.01	-0.125	-0.69	-0.155	-0.84
37	0.239	1.31	0.053	0.29	0.235	1.29	0.080	0.43
38	-0.213	-1.17	-0.160	-0.87	-0.244	-1.34	-0.164	-0.88
39	0.308	1.69	0.148	0.80	0.295	1.62	0.131	0.71
40	-0.551	-3.02*	-0.404	-2.19*	-0.632	-3.48*	-0.502	-2.71*
41	0.078	0.42	-0.326	-1.77	0.008	0.04	-0.494	-2.67*
42	0.049	0.27	-0.277	-1.51	0.028	0.15	-0.467	-2.52*
43	0.169	0.92	-0.108	-0.59	0.156	0.86	-0.310	-1.67
44	0.276	1.51	0.167	0.91	0.279	1.54	-0.031	-0.17
45	0.224	1.23	0.392	2.13*	0.218	1.20	0.187	1.01
46	0.241	1.32	0.633	3.44*	0.233	1.28	0.419	2.26*
47	-0.448	-2.45*	0.185	1.00	-0.426	-2.34*	-0.006	-0.03
Avrg	0.245	1.34		1.57	0.245	1.35		1.69

Mean Beta = 0.9479

(Table 9.6) Performance of recommended list - Broker 3

	CAPM Model				Simple Model			
Day	AAR	t(AAR)	CAR	t(CAR)	AAR	t(AAR)	CAR	t(CAR)
-10	-0.626	-2.79*			-0.636	-2.89*		
-9	0.311	1.39			0.293	1.33		
-8	0.395	1.76			0.458	2.08*		
-7	0.188	0.84			0.171	0.78		
-6	-0.225	-1.00			-0.285	-1.29		
-5	0.480	2.14*			0.479	2.18*		
-4	0.056	0.25			0.109	0.49		
-3	0.127	0.57			0.113	0.51		
-2	0.692	3.09*			0.713	3.24*		
-1	0.419	1.87			0.444	2.02		
0	0.589	2.63*	0.589	2.60*	0.544	2.47*	0.544	2.40*
1	0.157	0.70	0.746	3.30*	0.202	0.92	0.746	3.30*
2	-0.299	-1.33	0.447	1.97	-0.257	-1.17	0.489	2.16*
3	0.733	3.27*	1.180	5.22*	0.842	3.82*	1.331	5.88*
4	-0.296	-1.32	0.884	3.91*	-0.278	-1.26	1.053	4.66*
5	0.116	0.52	1.000	4.42*	0.190	0.86	1.243	5.50*
6	-0.341	-1.52	0.659	2.91*	-0.333	-1.51	0.910	4.02*
7	-0.092	-0.41	0.567	2.50*	-0.161	-0.73	0.749	3.31*
8	-0.411	-1.83	0.156	0.69	-0.443	-2.01	0.307	1.36
9	0.310	1.38	0.465	2.06*	0.351	1.59	0.658	2.91*
10	0.174	0.78	0.639	2.83*	0.185	0.84	0.843	3.73*
11	-0.130	-0.58	0.510	2.25*	-0.067	-0.30	0.776	3.43*
12	-0.461	-2.05*	0.049	0.22	-0.479	-2.18*	0.297	1.31
13	0.199	0.89	0.248	1.10	0.277	1.26	0.574	2.54*
14	0.377	1.68	0.625	2.76*	0.334	1.51	0.907	4.01*
15	-0.363	-1.62	0.263	1.16	-0.293	-1.33	0.614	2.71*
16	0.429	1.91	0.692	3.06*	0.377	1.71	0.991	4.38*
17	-0.340	-1.52	0.352	1.56	-0.341	-1.55	0.650	2.88*
18	-0.751	-3.35*	-0.399	-1.76	-0.711	-3.23*	-0.061	-0.27
19	-0.201	-0.89	-0.599	-2.65*	-0.193	-0.88	-0.254	-1.12
20	0.560	2.49*	-0.039	-0.17	0.596	2.71*	0.342	1.51
21	-0.089	-0.40	-0.129	-0.57	-0.061	-0.28	0.281	1.24
22	0.600	2.68*	0.472	2.08*	0.646	2.93*	0.927	4.10*
23	-0.463	-2.06*	0.008	0.04	-0.466	-2.11*	0.461	2.04*
24	-0.345	-1.54	-0.337	-1.49	-0.330	-1.50	0.131	0.58
25	-0.310	-1.38	-0.647	-2.86*	-0.354	-1.61	-0.223	-0.98
26	0.496	2.21*	-0.152	-0.67	0.496	2.25*	0.273	1.21
27	-0.273	-1.22	-0.425	-1.88	-0.249	-1.13	0.025	0.11
28	0.049	0.22	-0.376	-1.66	-0.036	-0.16	-0.011	-0.05
29	0.121	0.54	-0.255	-1.13	0.092	0.42	0.081	0.36
30	-0.322	-1.43	-0.577	-2.55*	-0.368	-1.67	-0.287	-1.27
31	0.323	1.44	-0.254	-1.12	0.330	1.50	0.043	0.19
32	0.172	0.77	-0.082	-0.36	0.185	0.84	0.228	1.01
33	-0.076	-0.34	-0.158	-0.70	-0.091	-0.41	0.137	0.60
34	0.102	0.46	-0.056	-0.25	0.041	0.19	0.178	0.78
35	-0.557	-2.48*	-0.613	-2.71*	-0.558	-2.53*	-0.381	-1.68
36	0.204	0.91	-0.409	-1.81	0.227	1.03	-0.153	-0.68
37	0.088	0.39	-0.321	-1.42	0.129	0.58	-0.025	-0.11
38	0.175	0.78	-0.146	-0.65	0.192	0.87	0.167	0.74
39	0.183	0.82	0.037	0.16	0.184	0.83	0.351	1.55
40	-0.243	-1.08	-0.206	-0.91	-0.286	-1.30	0.065	0.29
41	-0.046	-0.21	-0.252	-1.11	-0.002	-0.01	0.063	0.28
42	-0.122	-0.54	-0.374	-1.65	-0.112	-0.51	-0.050	-0.22
43	-0.055	-0.25	-0.430	-1.90	-0.039	-0.18	-0.088	-0.39
44	-0.156	-0.70	-0.586	-2.59*	-0.143	-0.65	-0.231	-1.02
45	-0.173	-0.77	-0.759	-3.35*	-0.201	-0.91	-0.432	-1.91
46	0.238	1.06	-0.521	-2.30*	0.238	1.08	-0.194	-0.86
47	-0.400	-1.78	-0.922	-4.07*	-0.357	-1.62	-0.551	-2.44*
Avrg	0.297	1.32		1.57	0.303	1.37		1.55

Mean Beta = 1.0114

(Table 9.7) Performance of recommended list - Broker 4

	CAPM Model				Simple Model			
Day	AAR	t(AAR)	CAR	t(CAR)	AAR	t(AAR)	CAR	t(CAR)
-10	0.547	2.57*			0.507	2.42*		
-9	0.224	1.05			0.166	0.79		
-8	0.033	0.16			-0.024	-0.12		
-7	0.349	1.64			0.330	1.58		
-6	-0.181	-0.85			-0.205	-0.98		
-5	0.143	0.67			0.141	0.68		
-4	0.440	2.07*			0.503	2.41*		
-3	0.607	2.85*			0.593	2.83*		
-2	-0.144	-0.68			-0.049	-0.23		
-1	0.162	0.76			0.070	0.33		
0	-0.071	-0.33	-0.071	-0.31	-0.104	-0.50	-0.104	-0.46
1	-0.003	-0.02	-0.075	-0.32	-0.027	-0.13	-0.131	-0.58
2	0.030	0.14	-0.044	-0.19	0.069	0.33	-0.063	-0.28
3	0.037	0.17	-0.007	-0.03	-0.032	-0.15	-0.095	-0.41
4	0.295	1.39	0.288	1.24	0.289	1.38	0.194	0.85
5	-0.024	-0.11	0.264	1.13	0.015	0.07	0.210	0.92
6	-0.016	-0.08	0.248	1.06	-0.058	-0.28	0.151	0.66
7	0.413	1.94	0.661	2.84*	0.410	1.96	0.561	2.46*
8	-0.122	-0.57	0.539	2.32*	-0.162	-0.78	0.399	1.75
9	-0.062	-0.29	0.477	2.05*	-0.032	-0.16	0.367	1.61
10	-0.025	-0.12	0.452	1.94	-0.045	-0.22	0.321	1.41
11	-0.076	-0.36	0.376	1.61	-0.104	-0.50	0.218	0.96
12	0.082	0.38	0.457	1.96	-0.008	-0.04	0.210	0.92
13	0.175	0.82	0.632	2.72*	0.238	1.14	0.447	1.96
14	-0.049	-0.23	0.584	2.51*	-0.036	-0.17	0.411	1.80
15	-0.178	-0.84	0.406	1.74	-0.088	-0.42	0.323	1.42
16	0.142	0.67	0.548	2.36*	0.168	0.80	0.491	2.16*
17	-0.003	-0.02	0.545	2.34*	-0.029	-0.14	0.462	2.03
18	-0.121	-0.57	0.424	1.82	-0.075	-0.36	0.387	1.70
19	0.348	1.63	0.772	3.31*	0.332	1.59	0.720	3.16*
20	0.130	0.61	0.902	3.87*	0.114	0.54	0.833	3.66*
21	0.379	1.78	1.281	5.50*	0.379	1.81	1.212	5.32*
22	-0.432	-2.03	0.849	3.65*	-0.447	-2.14*	0.765	3.36*
23	-0.026	-0.12	0.823	3.54*	0.065	0.31	0.830	3.64*
24	0.231	1.09	1.054	4.53*	0.284	1.36	1.114	4.89*
25	0.225	1.06	1.279	5.49*	0.171	0.82	1.285	5.64*
26	0.341	1.60	1.620	6.96*	0.342	1.64	1.627	7.14*
27	0.350	1.65	1.971	8.47*	0.340	1.62	1.967	8.63*
28	-0.339	-1.59	1.632	7.01*	-0.311	-1.49	1.656	7.27*
29	0.061	0.28	1.693	7.27*	0.059	0.28	1.715	7.53*
30	0.044	0.21	1.736	7.46*	0.059	0.28	1.774	7.78*
31	0.162	0.76	1.899	8.16*	0.135	0.65	1.909	8.38*
32	0.359	1.69	2.257	9.70*	0.428	2.04*	2.336	10.26*
33	-0.217	-1.02	2.041	8.77*	-0.216	-1.03	2.120	9.31*
34	0.463	2.18*	2.504	10.76*	0.442	2.11*	2.562	11.25*
35	-0.029	-0.14	2.475	10.63*	-0.034	-0.16	2.528	11.10*
36	-0.247	-1.16	2.229	9.57*	-0.220	-1.05	2.308	10.13*
37	0.133	0.62	2.361	10.14*	0.143	0.68	2.451	10.76*
38	0.028	0.13	2.389	10.26*	-0.030	-0.14	2.421	10.63*
39	-0.435	-2.04*	1.954	8.40*	-0.396	-1.89	2.024	8.89*
40	-0.056	-0.26	1.898	8.15*	-0.117	-0.56	1.907	8.37*
41	0.323	1.52	2.221	9.54*	0.327	1.56	2.234	9.81*
42	0.172	0.81	2.394	10.28*	0.179	0.86	2.413	10.59*
43	0.240	1.13	2.634	11.31*	0.263	1.26	2.676	11.75*
44	-0.032	-0.15	2.602	11.18*	-0.016	-0.08	2.660	11.67*
45	0.139	0.65	2.741	11.77*	0.166	0.79	2.826	12.40*
46	-0.379	-1.78	2.362	10.15*	-0.364	-1.74	2.462	10.81*
47	0.579	2.72*	2.941	12.63*	0.587	2.81*	3.050	13.39*
Avrg	0.201	0.94		4.33*	0.199	0.951		4.69*

Mean Beta = 0.9459

(Table 9.8) Performance of recommended list (Total 467 samples)

	CAPM Model				Simple Model			
Day	AAR	t(AAR)	CAR	t(CAR)	AAR	t(AAR)	CAR	t(CAR)
-10	0.081	0.71			0.064	0.57		
-9	0.230	2.01			0.214	1.90		
-8	0.325	2.85*			0.298	2.64*		
-7	0.191	1.67			0.182	1.61		
-6	-0.076	-0.66			-0.079	-0.70		
-5	0.277	2.43			0.280	2.48*		
-4	0.287	2.51*			0.300	2.65*		
-3	0.403	3.54*			0.388	3.44*		
-2	0.414	3.62*			0.434	3.84*		
-1	0.341	2.98*			0.348	3.08*		
0	0.319	2.80*	0.319	2.64*	0.369	3.26*	0.369	3.05*
1	0.194	1.70	0.513	4.24*	0.194	1.72	0.563	4.66*
2	0.256	2.24*	0.769	6.36*	0.222	1.96	0.785	6.50*
3	0.121	1.06	0.890	7.36*	0.134	1.18	0.918	7.61*
4	0.043	0.38	0.933	7.71*	0.030	0.26	0.948	7.85*
5	-0.006	-0.06	0.927	7.66*	0.004	0.04	0.952	7.89*
6	-0.098	-0.86	0.829	6.85*	-0.071	-0.63	0.881	7.30*
7	0.071	0.63	0.900	7.44*	0.079	0.70	0.960	7.96*
8	-0.020	-0.17	0.881	7.28*	-0.030	-0.27	0.930	7.70*
9	0.066	0.58	0.947	7.83*	0.080	0.71	1.010	8.37*
10	-0.020	-0.18	0.926	7.66*	-0.027	-0.24	0.984	8.15*
11	-0.020	-0.18	0.906	7.49*	-0.038	-0.33	0.946	7.84*
12	-0.240	-2.10*	0.666	5.51*	-0.231	-2.04*	0.715	5.93*
13	0.015	0.13	0.681	5.63*	0.012	0.10	0.727	6.02*
14	-0.034	-0.30	0.648	5.35*	-0.033	-0.29	0.694	5.75*
15	-0.054	-0.48	0.593	4.90*	-0.097	-0.86	0.597	4.95*
16	0.051	0.45	0.645	5.33*	0.048	0.43	0.645	5.35*
17	-0.058	-0.50	0.587	4.85*	-0.026	-0.23	0.619	5.13*
18	-0.220	-1.93	0.367	3.03*	-0.214	-1.89	0.406	3.36*
19	0.076	0.66	0.443	3.66*	0.087	0.77	0.493	4.09*
20	0.223	1.95	0.665	5.50*	0.240	2.13*	0.734	6.08*
21	-0.029	-0.25	0.636	5.26*	-0.023	-0.20	0.711	5.89*
22	0.051	0.45	0.688	5.68*	0.071	0.63	0.782	6.48*
23	0.078	0.68	0.766	6.33*	0.075	0.66	0.857	7.10*
24	0.020	0.18	0.786	6.50*	0.027	0.24	0.883	7.32*
25	0.075	0.65	0.861	7.11*	0.030	0.27	0.914	7.57*
26	0.058	0.51	0.919	7.60*	0.071	0.63	0.985	8.16*
27	0.054	0.47	0.973	8.04*	0.050	0.44	1.035	8.58*
28	-0.091	-0.80	0.882	7.29*	-0.101	-0.90	0.934	7.74*
29	0.090	0.79	0.973	8.04*	0.079	0.70	1.013	8.39*
30	-0.102	-0.89	0.871	7.20*	-0.111	-0.99	0.901	7.47*
31	0.122	1.07	0.993	8.21*	0.121	1.07	1.022	8.47*
32	0.115	1.01	1.108	9.16*	0.120	1.06	1.142	9.46*
33	0.004	0.03	1.112	9.19*	0.015	0.13	1.157	9.58*
34	0.000	0.00	1.111	9.19*	-0.032	-0.28	1.125	9.32*
35	-0.279	-2.45*	0.832	6.88*	-0.279	-2.47*	0.846	7.01*
36	0.004	0.04	0.836	6.91*	-0.023	-0.20	0.823	6.82*
37	0.184	1.61	1.020	8.43*	0.196	1.74	1.020	8.45*
38	-0.011	-0.10	1.009	8.34*	0.005	0.04	1.024	8.49*
39	0.056	0.49	1.066	8.81*	0.074	0.65	1.098	9.10*
40	-0.297	-2.61*	0.768	6.35*	-0.284	-2.51*	0.814	6.75*
41	0.037	0.32	0.805	6.65*	0.024	0.22	0.839	6.95*
42	0.048	0.42	0.853	7.05*	0.068	0.60	0.907	7.51*
43	0.078	0.69	0.931	7.70*	0.073	0.64	0.980	8.12*
44	0.047	0.41	0.978	8.09*	0.039	0.35	1.019	8.44*
45	0.091	0.79	1.069	8.83*	0.052	0.46	1.071	8.87*
46	0.051	0.45	1.120	9.26*	0.052	0.46	1.123	9.30*
47	0.000	0.00	1.120	9.26*	-0.014	-0.13	1.108	9.18*
Avrg	0.119	1.04		5.72*	0.120	1.06		6.00*

Mean Beta = 0.9744

CHAPTER X. CONCLUSIONS.

10.1 Summary and conclusions.

The purpose of this study was to evaluate the Korean capital market internationalisation and to examine the efficiency of the Korean stock market comprehensively. Hence, this research was concentrated on the following three areas, as mentioned in the abstract and in section 1.2.

(a) The evaluation of the capital market liberalisation by examining the internal market mechanism and conducting geographical comparisons.

(b) The effects of inflation / real variables on stock returns.

(c) The ability of the Korean stock market to help investors to 'correctly price' the shares in the market.

The main results obtained can be summarised as the following:

1. The internationalisation plan of the Korean capital market should be gradual and balanced with general economic conditions. Several measures were recommended to enhance the functions of the domestic securities market. In that way, Korea would take positive step towards establishing a strategic framework of capital market liberalisation.

2. The market economies of the Far East - Korea, Japan, Taiwan, and Hong Kong - have experienced rapid development and growth in international trade flows. These four countries have all experienced the nearest thing to an economic miracle in the post-war period, emerging from being the lesser developed of the 1950s to become industrial nations in the 1980s. And yet, they illustrate a wide diversity of financial systems, ranging from a high degree of centralisation and government control (Korea) to economies where market mechanisms are the prevalent means of allocating resources (Hong Kong). The undergoing fundamental changes in the world financial system have forced policy makers

in the Far East to review existing understandings and theories on the issues related to financial liberalisation.

3. This thesis examined the relationship between the macro economic activities and the capital market in Korea. 12 variables were used in two different periods. One is the longer term period of 173 months from January 1975 to June 1989, using three different sets of monthly, quarterly, and semi-annual data. The other is the recent short-term period of 66 months from January 1984 to June 1989, using monthly data. Using the interest rate model in the period of January 1975 to June 1989, the expected inflation was uniformly positively related to inflation as measured by the CPI and the WPI. The relations between stock returns and expected inflation, and between stock returns and unexpected inflation showed negative. Also stock returns and the changes in expected inflation were negatively related. These results did not coincide with the Fisher Hypothesis that common stocks, as claims against real assets, should be a good hedge against inflation. The hypothesis regarding the real stock return-real activity relations is that, given efficient capital markets, these relations should be positive. The results indicated positive relations, with the current rate of change in IPI explaining slightly more than the variations of past and future changes in the industrial production index. The government bond yield was negatively related to real; stock returns. The money supply(M2) was not uniformly related to the real stock returns among monthly, quarterly, and semi-annual data.

In another attempt, we examined whether real stock return-inflation relations varied over time. For this purpose, the most recent 66 months' data were examined, using the same model as for the longer term data. There were some respects in which these empirical results are less supportive. We found that these real stock return - inflation relations varied over time. The results of the most recent five and half years period show positive relation or no relation between real stock returns and inflation. M2 and the balance on the current account were found to be more

powerful in explaining the stock return / inflation relation than M1. Some of the dissimilarity in the behavior of short-term expected and unexpected inflation rates is probably due to specific stock market structural changes in recent years.

4. This thesis examined the efficiency of the Korean stock market at three different levels. They are weak form, semi-strong form, and strong form empirical tests of the efficient market hypothesis. For this research, the daily share price changes of two different periods of January 1978-December 1980 and January 1986-December 1988 were examined. The KCSPIs at the same periods analysed seperately. Also to check the effect of the daily price limit system the trimmed data were examined, using same models.

The results of the Korean stock market efficiency tests manifest mixed behavior. In the frequency distribution model before doing empirical tests of the EMH, the average results of two different set of data in each two different periods indicate relatively fat tails combined with peakedness or leptokurtosis. In the weak form empirical test, three different models were used. In the serial correlation analysis, large numbers of significant serial correlation coefficients for lags under four were found. The significance levels of the standardised variables in the runs test were larger and the market seemed to have a tendency in price movements, not to follow a random walk. Similar results were found in spectral analysis. Some samples exhibited random walk behavior, but large numbers appeared to deviate from a random walk. Their presence in the pattern of dependence relationships is sufficient to reject the weak form efficient market hypothesis. Comparing the two different sub-periods, deviation from a random walk in 1986-1988 is smaller than in 1978-1980. This can be interpreted as the effect of relevant information in the stock market recently, which is disseminated more rapidly due to the development of sophisticated communication technology, hordes of analysts, large numbers of business journals and market regulation favouring transparency.

5. In the semi-strong form test, stock price behaviour around the announcement dates of bonus issues was examined. Samples of 62 cases of the Korea Stock Exchange for 4 years during 1985-1988 were used in two stages. First, ex-right day opening prices were compared with theoretical opening prices. In addition, the magnitude of the overnight price adjustment was analysed using the prior day closing to ex-day closing stock returns. Second, announcement effects were examined using the closing prices around the announcement dates and adjusting for the payment of dividend. These returns were compared to the mean daily return of a representative period around the event day for inference purposes.

The valuation effects of bonus stock issue announcements were found to react to share prices in a relatively short period. Portfolio returns at the ex-date are significantly larger for unadjusted data than those of adjusted data by KCSPI. The results using adjusted data, however, were not found significant. The Korean stock market could be said to be relatively efficient with respect to the information of bonus issues. Thus, investors on average could not get significant abnormal returns. However, the family character of the most Korean corporations was found to provide a limited numbers of market participants with the opportunity to use internal information profitably.

6. In the strong form test, the excess returns from following the 467 recommendations made by the four Korean stockbrokers turned out to be significant before deducting transaction costs. The brokerage houses on average provided valuable services to their clients in selecting stocks for superior returns. However, amongst the brokers reviewed there were large differences of predictive ability. Considering transactions costs of brokerage commission and transaction tax, they on average did not provide valuable services to their clients in selecting stocks, even some brokerage houses showed large abnormal gains.

In summary, the results show that the Korean stock market in

its early stages did not have the ability to help investors to 'relatively correctly price' the shares. More recent evidence shows improved efficiency which is likely to continue as the capital market expands.

10.2 Suggestions for further research.

Given the limited resources available for this research, this work has to be ended at a more or less arbitrary point. Clearly, many areas remain requiring further and better research. Conditions in the market place change over time. Many suggestions have emerged, which can be useful to both academic researchers and government policy makers. This research has identified three general areas where it is thought that useful further research may be carried out:

(a) Liberalisation effects on the capital markets.

The Korean capital market is undergoing a process of expansion, liberalisation, and internationalisation. However, many regulations and underdeveloped market segments remain. Also, the changing world economic and financial environment influences the market. The effects of opening the capital market to international investors as well as the optimal degree of openness of the stock market would be investigated. Also the liberalisation policies on interest rates and foreign exchange can be studied. The degree of openness of the Far Eastern four countries is quite different, thus one could compare the real effects to the economy. Comparisons with other countries, for instance south America, could further broaden the number of country-specific case studies.

(b) Macro economic variables and the capital markets.

In this research the relationship between real stock

returns and inflation / real variables was carried out for two different periods: 173 months and 66 months. This can be extended to the periods of 1975-1983. Also the results using quarterly or yearly data can be compared to establish whether they are consistent with this research. From the standpoint of stock price behaviour, for instance, the adjustment patterns of the stock market in relation to macro-information can be examined in Korea. The actual changes of foreign interest rates, and foreign exchange rates are good examples.

(c) Extending / modifying the efficient market tests.

With respect to micro-information specific to individual firms, one can also investigate the reaction of stock prices to accounting information, mergers and acquisitions, seasonality, market performance of initial public offers or underwritings, portfolio performance measurement etc.

Usually, EMH is a fairly limited concept. It says that the prices of securities instantaneously and fully reflect all available relevant information, but it does not imply that product markets are perfectly competitive or that information is costless. However, some recent papers have shown that a sensible asset market equiliblium must have some room for analysis. These articles make the alternative assumption that information acquisitin costly (e.g., Grossman and Stiglitz 1976, 1980, Seyhun 1986, etc.). Also joint hypotheses with CAPM are tested. Therefore, such empirical tests can be applied to the Korean market.

A P P E N D I C E S

Appendix 7.1 Samples of stocks and adjustment factors used in the weak-form tests.
(1st January 1978 - 31st December 1980)

number	company	observations	adjustment factors		
			date	remark	ratio
1	Korea Tungsten	857	31/12/78	bonus	0.2
			31/12/78	dividend	0.25
			31/12/79	bonus	0.12
			31/12/79	dividend	0.27
2	Cheil Sugar	638	10/04/78	right	0.555555
			31/12/78	dividend	0.25
			23/05/79	right	0.3928571
			31/12/79	dividend	0.22
3	Oriental Brewery	813	31/12/78	dividend	0.2
			23/03/79	right	0.225
			23/03/79	bonus	0.5
			31/12/79	dividend	0.24
			24/04/80	right	0.428
4	Haitai Confectionery	776	30/06/78	dividend	0.1
			30/06/79	dividend	0.23
			30/06/80	dividend	0.2
5	Doosan Foods	643	31/12/78	dividend	0.2
			22/03/79	bonus	0.5
			31/12/79	dividend	0.24
6	Tongyang Nylon	385	31/12/78	bonus	0.2287
			31/12/78	dividend	0.23
			01/06/79	rev-splt	2 to 1
			31/12/79	dividend	0.25
7	Hanil Synthetic Fib.	806	31/03/78	bonus	0.5
			31/03/78	dividend	0.25
			31/03/80	dividend	0.25
8	Hanyang Chemical	870	31/03/78	dividend	0.1641
			05/09/78	right	0.1644376
			31/03/79	dividend	0.076
			31/03/80	dividend	0.1
			31/03/80	bonus	0.25
9	Lucky Ltd.	839	17/06/78	split	1 to 2
			27/11/78	bonus	0.58
			27/11/78	right	1.17
			31/12/78	dividend	0.25
			31/12/79	dividend	0.25
10	Pacific Chemical	863	31/12/78	dividend	0.25
			31/12/79	dividend	0.25
11	Hankook Tire	719	31/12/78	dividend	0.22
			31/12/79	dividend	0.22
			05/03/80	right	0.6
12	Yuhan Corp.	659	31/12/78	dividend	0.2
			31/12/78	bonus	0.2
			31/12/79	dividend	0.3
13	Dong-A Pharmacy	740	08/05/78	right	0.3
			31/12/78	dividend	0.3
			04/06/79	right	0.3
			31/12/79	dividend	0.3
14	Hankuk Glass	656	30/06/78	dividend	0.25
			30/06/78	right	0.2
			30/06/78	bonus	0.28
			31/01/79	right	0.132191
			30/06/79	dividend	0.25
			30/06/79	right	0.137357
			30/06/80	dividend	0.25
			30/06/80	right	0.22
15	Asia Cement	811	10/06/78	right	0.183432
			31/12/78	dividend	0.2
			31/12/79	dividend	0.2
16	Ssangyong Cement	851	29/09/78	right	0.1333333
			31/12/78	dividend	0.22
			31/12/78	bonus	0.1764705
			29/10/79	right	0.25
			31/12/79	dividend	0.23
			31/12/79	bonus	0.125

17	Pusan Steel Pipe	819	31/12/78	- dividend	- 0.22
			31/12/78	- right	- 0.2
			31/12/79	- bonus	- 0.1666
			31/12/79	- dividend	- 0.1
18	Daewoo Heavy Ind.	871	06/10/78	- right	- 0.3
			31/12/78	- dividend	- 0.2
			31/12/79	- dividend	- 0.18
19	Korea Machinery	750	07/04/78	- right	- 0.629699
			07/04/78	- bonus	- 0.25
			31/12/78	- dividend	- 0.23
			25/08/79	- right	- 0.6
			31/12/79	- dividend	- 0.1
20	Gold Star	870	03/07/78	- bonus	- 0.32625
			03/07/78	- right	- 1.197
			31/12/78	- right	- 0.4353
			31/12/78	- dividend	- 0.25
			31/12/79	- dividend	- 0.22
21	Oriental Precision	869	24/04/78	- right	- 0.3
			27/07/78	- right	- 0.3
			31/12/78	- dividend	- 0.25
			31/12/79	- dividend	- 0.22
22	Kia Motors	818	20/06/78	- bonus	- 0.285714
			20/06/78	- right	- 0.385714
			31/12/78	- dividend	- 0.25
			30/10/79	- right	- 0.225
			31/12/79	- dividend	- 0.25
23	Hyundai Motors	872	17/05/78	- right	- 0.45
			22/09/78	- right	- 0.63
			31/12/78	- dividend	- 0.22
			31/12/79	- dividend	- 0.2
24	Samwhan Corp.	851	23/11/78	- bonus	- 0.12
			23/11/78	- right	- 0.18
			31/12/78	- dividend	- 0.3
			31/12/79	- dividend	- 0.3
			03/06/80	- right	- 0.4
			03/06/80	- bonus	- 0.29
25	Dong-Ah Construction	861	20/06/78	- right	- 0.5873015
			31/12/78	- dividend	- 0.3
			07/11/79	- bonus	- 0.35
			31/12/79	- dividend	- 0.3
26	Samsung	846	31/12/78	- dividend	- 0.2
			31/12/79	- dividend	- 0.2
27	Korean Air	852	01/04/78	- right	- 0.2399793
			15/11/78	- right	- 0.349968
			31/12/78	- dividend	- 0.25
			31/12/79	- bonus	- 0.25
			31/12/79	- dividend	- 0.2
28	The Commercial Bank	852	31/12/78	- dividend	- 0.23
			04/08/79	- right	- 0.35
			31/12/79	- dividend	- 0.23
29	Cho-Hung Bank	847	31/12/78	- dividend	- 0.21
			16/07/79	- right	- 0.35
			31/12/79	- dividend	- 0.21
30	Dongsan Construction	824	28/07/78	- bonus	- 0.6666667
			31/12/78	- dividend	- 0.2
			07/04/79	- right	- 0.076923
			07/04/79	- bonus	- 0.3
			31/12/79	- right	- 0.4285
			31/12/79	- dividend	- 0.24
91	KCSPI	880	31/12/78	- dividend	- 0.132
			31/12/79	- dividend	- 0.194

(Notes)
1)Adjustment factors are adapted from 'The Securities Market' (daily) published by the Korea Stock Exchange.
Daily returns of adjusted days are calculated as in the following examples (R for ratio).
a. Cash dividend:

$$U_t = \log(P_{t+1} + R1) - \log P_t,$$

where P_{t+1} is the closing price at ex-right day,
P_t is the closing price at the previous day,
RI is the cash dividend ratio of par value(5,000 Won).

b. Right issue / bonus issue:

$$U_t = \log [P_{t+1} (1+R2+R3) - R3A] - \log P_t$$

where R2 is the ratio of bonus issue,
R3 is the ratio of right issue,
A is the right issuing price (par value of 5,000 Won in 1978-1980 or 15-40% discounted level of market price in 1986-1988.

c. stock split or rev-split:

$$U_t = \log(P_{t+1} \times Rs) - \log P_t$$

where Rs is 2 in the case of stock split,
Rs is 0.5 in the case of rev-split.

2) KCSPI : Korea Composite Stock Price Index.
3) observations : total number of price changes or differences(Ut) = trading days - 1.

Appendix 7.2 Samples of stocks and adjustment factors used in the weak-form tests. (1st January 1986 - 31st December 1988)

number	company	observations	adjustment factors		
			date	- remark	- ratio
51	Korea Tungsten	873	31/12/86	- dividend	- 0.11
			31/12/87	- dividend	- 0.07
52	Cheil Sugar	811	18/11/86	- right	- 0.25
			31/12/86	- dividend	- 0.1
			31/12/87	- dividend	- 0.1
			31/08/88	- right	- 0.21333
53	Oriental Brewery	789	17/05/86	- right	- 0.1333333
			31/12/86	- dividend	- 0.1
			16/11/87	- right	- 0.1058
			31/12/87	- dividend	- 0.1
			30/06/88	- right	- 0.1052
			15/11/88	- right	- 0.03839
54	Haitai Confectionery	859	30/06/86	- dividend	- 0.064
			30/06/87	- dividend	- 0.0938
			30/06/88	- dividend	- o.1088
			26/11/88	- right	- 0.333253
55	Doosan Foods	696	31/12/86	- dividend	- 0.05
			24/07/87	- right	- 0.18
			31/12/87	- dividend	- 0.07
56	Tongyang Nylon	795	31/12/86	- dividend	- 0.15
			13/07/87	- right	- 0.09968985
			28/10/87	- bonus	- 0.190424
			31/12/87	- dividend	- 0.15
			10/06/88	- right	- 0.1166057
57	Hanil Synthetic Fib.	851	31/03/86	- dividend	- 0.13
			14/07/86	- right	- 0.18
			31/03/87	- dividend	- 0.16
			31/03/88	- dividend	- 0.2
			31/08/88	- right	- 0.08888
58	Hanyang Chemical	876	31/12/86	- dividend	- 0.12
			30/11/87	- right	- 0.363157
			31/12/87	- dividend	- 0.12
59	Lucky Ltd.	876	31/12/86	- dividend	- 0.12
			17/03/87	- right	- 0.09
			24/08/87	- right	- 0.09
			31/12/87	- dividend	- 0.12
			31/03/88	- right	- 0.2
			31/03/88	- bonus	- 0.1
			31/08/88	- right	- 0.187654

60	Pacific Chemical	867	11/11/86	right	0.15
			31/12/86	dividend	0.13
			10/08/87	bonus	0.230145
			10/08/87	right	0.119086
			31/12/87	dividend	0.14
			03/05/88	right	0.096
			03/05/88	bonus	0.1565957
			05/08/88	right	0.12
61	Hankook Tire	778	14/08/86	bonus	0.32403
			31/12/86	dividend	0.12
			17/11/87	right	0.224733
			31/12/87	dividend	0.12
62	Yuhan Corp.	793	31/12/86	dividend	0.12
			31/12/87	dividend	0.12
			31/12/87	bonus	0.0666667
63	Dong-A Pharmacy	874	31/03/86	dividend	0.1
			01/04/86	bonus	0.1
			31/03/87	dividend	0.12
			25/06/87	right	0.27
			31/03/88	dividend	0.13
64	Hankuk Glass	814	30/06/86	dividend	0.12
			27/10/86	right	0.14907975
			27/10/86	bonus	0.18404907
			30/06/87	dividend	0.13
			30/09/87	bonus	0.113636
			30/06/88	dividend	0.14
65	Asia Cement	851	31/12/86	dividend	0.15
			01/01/87	bonus	0.149333
			01/01/87	right	0.285
			31/12/87	dividend	0.15
66	Ssangyong Cement	873	17/09/86	bonus	0.1
			17/09/86	right	0.21
			31/12/86	dividend	0.15
			31/12/87	dividend	0.15
			31/03/88	right	0.0894136
			31/03/88	bonus	0.056
67	Pusan Steel Pipe	866	31/12/86	dividend	0.1
			01/01/87	bonus	0.106383
			31/12/87	dividend	0.1
			01/01/88	bonus	0.105769
			14/10/88	right	0.16161
68	Daewoo Heavy Ind.	876	31/12/86	dividend	0.08
			21/08/87	right	0.45
			31/12/87	dividend	0.08
			15/07/88	right	0.24
69	Korea Machinery	852	31/12/86	dividend	0.12
			02/07/87	bonus	0.05
			02/07/87	right	0.555
			31/12/87	dividend	0.13
70	Gold Star	876	03/09/86	right	0.27
			31/12/86	dividend	0.12
			14/08/87	right	0.3
			31/12/87	dividend	0.12
			09/05/88	bonus	0.1
			09/05/88	right	0.2
71	Oriental Precision	876	20/11/86	right	0.27
			31/12/86	dividend	0.1
			25/11/87	right	0.17308
			31/12/87	dividend	0.1
72	Kia Motors	876	27/10/86	right	0.180555
			31/12/86	dividend	0.12
			23/10/87	right	0.3181819
			31/12/87	dividend	0.12
73	Hyundai Motors	873	22/11/86	right	0.16263884
			31/12/86	dividend	0.12
			31/12/87	dividend	0.12
			30/06/88	right	0.21925925
74	Samwhan Corp.	873	31/12/86	dividend	0.1
			31/12/87	dividend	0.08
			30/06/88	right	0.32
75	Dong-Ah Construction	852	31/12/86	dividend	0.08
			14/08/87	right	0.27
			31/12/87	dividend	0.1

76	Samsung	860	27/10/86	- right	- 0.252
			31/12/86	- dividend	- 0.1
			31/12/87	- dividend	- 0.12
			25/04/88	- right	- 0.125
77	Korean Air	876	20/10/86	- bonus	- 0.2
			20/10/86	- right	- 0.1111111
			31/12/86	- dividend	- 0.1
			25/09/87	- bonus	- 0.125
			25/09/87	- right	- 0.1125
			31/12/87	- dividend	- 0.12
			22/06/88	- right	- 0.096
78	The Commercial Bank	870	02/10/86	- right	- 0.2167
			31/12/86	- dividend	- 0.04
			01/01/87	- bonus	- 0.05882
			29/07/87	- right	- 0.35
			31/12/87	- dividend	- 0.03
			14/03/88	- right	- 0.48
79	Cho-Hung Bank	873	27/10/86	- right	- 0.240876
			31/12/86	- dividend	- 0.05
			01/01/87	- bonus	- 0.0588
			02/09/87	- right	- 0.35
			31/12/87	- dividend	- 0.03
			16/03/88	- right	- 0.48
80	Dongsan Construction	855	31/12/86	- dividend	- 0.07
			23/05/87	- right	- 0.1384
			31/12/87	- dividend	- 0.08
81	The Bank of Pusan	739	25/09/86	- right	- 0.5175
			28/11/86	- bonus	- 0.111111
			31/12/86	- dividend	- 0.05
			17/11/87	- right	- 0.38571
			31/12/87	- dividend	- 0.03
			30/06/88	- right	- 0.48
82	Korea Inv't & Fin.	700	30/06/86	- dividend	- 0.12
			30/06/87	- dividend	- 0.12
			30/06/88	- dividend	- 0.15
83	Dongsuh Securities	833	31/03/86	- dividend	- 0.05
			31/03/86	- bonus	- 0.03
			23/06/86	- right	- 0.5
			12/01/87	- right	- 0.265
			31/03/87	- dividend	- 0.12
			28/01/88	- right	- 0.45
			31/03/88	- dividend	- 0.15
			15/06/88	- right	- 0.4
84	Ankuk F & M Insuran	635	31/03/86	- dividend	- 0.1
			30/09/86	- bonus	- 0.5
			30/09/86	- right	- 0.9
			31/03/87	- dividend	- 0.12
			31/03/88	- bonus	- 0.1
			31/03/88	- right	- 0.16
			31/03/88	- dividend	- 0.13
92	KCSPI	876	31/12/86	- dividend	- 0.037
			31/12/87	- dividend	- 0.024

(Notes)

1) Ratios of adjusted factors are calculated as in the same methods as appendix 7.1 (see p.221 Notes).
   bonus 0.2: 20% additional bonus stock issues to shareholders.
   right 0.3: 30% additional right issues to shareholders at par value or at 60%-85% of market price.
   dividend 0.15: 15% cash dividend of par value.
2) KCSPI: the Korea Composite Stock Price Index.

Appendix 7.3(1) Trading days, means, and standard deviations of KCSPIs

INDEX	OBSRVN	MEAN	CHANGE	POSIT	CONST	NEGAT	S.D.
91	880	0.000012	422	423	2	455	0.0114268
92	876	0.002155	355	515	5	356	0.0129627

(Notes)
91: Korea Composite Stock Price Index(KCSPI) in period of 1978-1980.
92: Korea Composite Stock Price Index(KCSPI) in period of 1986-1988.
OBSRVN: Observations = trading days - 1.
S.D.: Standard deviation.
MEAN: The mean of observations, i.e., daily share price returns.
CHANGE: The number of runs.
POSIT: The number of positive share price changes.
CONST: The number of no share price change.
NEGAT: The number of negative share price changes.

Appendix 7.3(2) Frequency distributions of KCSPIs in two different periods

INDEX	INTERVALS							
	0.5SD	1.0SD	1.5SD	2.0SD	3.0SD	4.0SD	5.0SD	>5.0SD
NORMAL	0.3830	0.6826	0.8664	0.9545	0.9973	0.999938	0.9999994	0.000000
91	0.5455	0.8114	0.9148	0.9568	0.9875	0.990909	0.9931818	0.006818
92	0.4224	0.7295	0.8881	0.9532	0.9920	0.998858	0.9988585	0.001141
AVRAGE	0.4839	0.7704	0.9015	0.9550	0.9898	0.994884	0.9960201	0.003979

(Note)
NORMAL: Normal distribution.
AVRAGE: Average.
SD: Standard deviation.

Appendix 7.3(3) Trading days, means, and standard deviations of samples in period of 1978-1980

COMPANY	OBSRVN	MEAN	CHANGE	POSIT	CONST	NEGAT	S.D.
1	857	-0.000143	326	327	201	329	0.0166374
2	638	0.000332	239	240	192	206	0.0206770
3	813	0.000701	349	350	142	321	0.0242374
4	776	0.000818	331	332	200	244	0.0172179
5	643	0.000744	273	263	106	274	0.0294132
6	385	0.000311	120	139	125	121	0.0320772
7	806	0.000320	149	150	375	281	0.0139646
8	870	-0.000312	381	382	67	421	0.0293702
9	839	0.000962	369	370	76	393	0.0278803
10	863	0.000116	361	362	161	340	0.0180209
11	719	-0.001358	271	272	105	342	0.0278134
12	659	0.000257	206	258	207	194	0.0196266
13	740	0.000492	263	273	203	264	0.0206205
14	656	0.000337	274	275	132	249	0.0238544
15	811	-0.000924	314	315	171	325	0.0242588
16	851	-0.000106	351	352	72	427	0.0255596
17	819	-0.000810	313	314	146	359	0.0245714
18	871	-0.000734	353	354	63	454	0.0285266
19	750	-0.001493	293	294	123	333	0.0292446
20	870	0.000471	411	412	31	427	0.0297156
21	869	-0.001088	370	371	47	451	0.0307717
22	818	-0.001644	327	328	76	414	0.0284650
23	872	-0.001228	356	357	50	465	0.0291683
24	851	-0.000766	400	401	41	409	0.0274045
25	861	-0.000690	388	389	46	426	0.0249279
26	846	-0.000272	392	354	99	393	0.0273525
27	852	-0.000880	439	356	56	440	0.0296120
28	852	0.001025	191	382	192	278	0.0103376
29	847	0.000877	278	346	222	279	0.0116786
30	824	-0.000936	405	360	58	406	0.0317190

(Notes)
OBSRVN: The number of observations.
MEAN: The mean value of each sample.
CHANGE: The number of runs.
POSIT: The number of positive share price changes.
CONST: The number of no share price change.
NEGAT: The number of negative share price changes.
S.D.: Standard deviation.

Appendix 7.3(4) Frequency distributions in periods Of 1978-1980

CMPNY	INTERVALS							
	0.5SD	1.0SD	1.5SD	2.0SD	3.0SD	4.0SD	5.0SD	>5.0SD
NM	0.3830	0.6826	0.8664	0.9545	0.9973	0.999938	0.9999994	0.0000006
1	0.5461	0.7760	0.8798	0.9253	0.9778	0.997666	1.0000000	0.
2	0.6411	0.8025	0.8762	0.9232	0.9687	0.995298	0.9984326	0.0015674
3	0.5092	0.7454	0.8475	0.9287	0.9951	1.000000	1.0000000	0.
4	0.6534	0.8454	0.9098	0.9433	0.9639	0.996134	0.9974227	0.0025773
5	0.5241	0.7372	0.8476	0.9238	0.9953	1.000000	1.0000000	0.
6	0.7039	0.8312	0.8831	0.9273	0.9792	0.987013	0.9974026	0.0025974
7	0.7246	0.8610	0.9342	0.9541	0.9814	0.986352	0.9913151	0.0086849
8	0.4529	0.7230	0.8368	0.9368	0.9989	1.000000	1.0000000	0.
9	0.4386	0.6937	0.8343	0.9499	0.9988	0.998808	1.0000000	0.
10	0.5122	0.7567	0.8737	0.9293	0.9838	0.996524	1.0000000	0.
11	0.5132	0.7510	0.8623	0.9374	0.9903	0.997218	0.9986092	0.0013908
12	0.6707	0.8270	0.8983	0.9363	0.9712	0.990895	0.9969651	0.0030349
13	0.5865	0.7905	0.8932	0.9270	0.9730	0.997297	1.0000000	0.
14	0.5564	0.7820	0.8643	0.9405	0.9817	0.995427	0.9969512	0.0030488
15	0.5647	0.7608	0.8816	0.9285	0.9790	0.998767	1.0000000	0.
16	0.5006	0.7568	0.8696	0.9318	0.9871	1.000000	1.0000000	0.
17	0.5324	0.7534	0.8730	0.9206	0.9902	0.997558	1.0000000	0.
18	0.4466	0.7268	0.8542	0.9311	0.9954	1.000000	1.0000000	0.
19	0.5373	0.7560	0.8787	0.9400	0.9813	0.996000	0.9986666	0.0013333
20	0.3333	0.7000	0.8644	0.9632	0.9989	0.998851	0.9988506	0.0011494
21	0.4350	0.7054	0.8596	0.9344	0.9988	1.000000	1.0000000	0.
22	0.4548	0.7066	0.8716	0.9462	0.9939	1.000000	1.0000000	0.
23	0.4323	0.7282	0.8681	0.9335	0.9966	1.000000	1.0000000	0.
24	0.4853	0.6733	0.8543	0.9471	0.9988	0.998825	1.0000000	0.
25	0.4762	0.6794	0.8362	0.9640	0.9954	1.000000	1.0000000	0.
26	0.4953	0.7530	0.8629	0.9385	0.9835	1.000000	1.0000000	0.
27	0.4225	0.7289	0.8709	0.9319	0.9977	1.000000	1.0000000	0.
28	0.6268	0.8122	0.9038	0.9484	0.9859	0.992958	0.9953052	0.0046948
29	0.6541	0.8335	0.9067	0.9410	0.9752	0.990555	0.9964581	0.0035419
30	0.3835	0.6857	0.8653	0.9515	0.9951	1.000000	1.0000000	0.
AV	0.5271	0.7561	0.8721	0.9378	0.9871	0.997072	0.9988797	0.0011207
CP	0.5455	0.8114	0.9148	0.9568	0.9875	0.990909	0.9931818	0.0068182

(Notes)
AV: Average.
CP: Korea Composite Stock Price Index.
NM: Normal distribution.
SD: Standard deviation.

Appendix 7.3(5) Trading days, means, and standard deviations of samples in period of 1986-1988

COMPANY	OBSRVN	MEAN	CHANGE	POSIT	CONST	NEGAT	S.D.
51	873	0.001797	382	383	93	397	0.0241518
52	811	0.001415	323	324	187	300	0.0172607
53	789	0.001339	320	321	209	259	0.0177062
54	859	0.001764	380	381	122	356	0.0201257
55	696	0.001115	289	290	166	240	0.0219439
56	795	0.001978	326	327	147	321	0.0213737
57	851	0.001663	357	358	127	366	0.0227345
58	876	0.001373	380	418	77	381	0.0221289
59	876	0.001867	389	410	76	390	0.0209633
60	867	0.001861	348	384	134	349	0.0206938
61	778	0.001740	286	306	185	287	0.0217869
62	793	0.000955	198	302	199	292	0.0202961
63	874	0.001251	353	360	160	354	0.0198090
64	814	0.001345	315	316	213	285	0.0171720
65	851	0.001735	103	402	104	345	0.0237323
66	873	0.002019	366	419	87	367	0.0226176
67	866	0.002258	111	373	112	381	0.0249386
68	876	0.001331	406	399	70	407	0.0236361
69	852	0.000906	359	379	113	360	0.0206816
70	876	0.001678	392	416	67	393	0.0208615
71	876	0.001289	419	397	59	420	0.0244977
72	876	0.000951	414	391	70	415	0.0206568
73	873	0.000715	394	395	83	395	0.0202203
74	873	0.001469	391	397	84	392	0.0240491
75	852	0.002430	398	397	56	399	0.0289029
76	860	0.002035	354	386	119	355	0.0227196
77	876	0.002457	391	416	68	392	0.0238672
78	870	0.002490	99	394	100	376	0.0244884
79	873	0.002526	375	400	97	376	0.0256094
80	855	0.002206	115	377	116	362	0.0277466
81	739	0.003581	344	345	75	319	0.0286471
82	700	0.002632	135	299	136	265	0.0258844
83	833	0.004252	430	431	43	359	0.0276136
84	635	0.005119	309	310	87	238	0.0270792

Appendix 7.3(6) Frequency distributions in period of 1986-1988

CMPNY	INTERVALS 0.5SD	1.0SD	1.5SD	2.0SD	3.0SD	4.0SD	5.0SD	>5.0SD
NM	0.3830	0.6826	0.8664	0.9545	0.9973	0.999938	0.9999994	0.0000006
51	0.4330	0.7079	0.8534	0.9462	0.9966	1.000000	1.0000000	0.
52	0.5314	0.7411	0.8434	0.9174	0.9951	1.000000	1.0000000	0.
53	0.5475	0.7440	0.8606	0.9265	0.9937	1.000000	1.0000000	0.
54	0.4761	0.7113	0.8591	0.9290	0.9977	1.000000	1.0000000	0.
55	0.5057	0.7457	0.8592	0.9325	0.9899	0.998563	1.0000000	0.
56	0.4855	0.7057	0.8453	0.9447	0.9975	0.998742	0.9987422	0.0012579
57	0.4548	0.7286	0.8449	0.9553	0.9953	0.998825	0.9988249	0.0011751
58	0.4178	0.7112	0.8584	0.9441	1.0000	1.000000	1.0000000	0.
59	0.4178	0.7112	0.8596	0.9338	0.9989	1.000000	1.0000000	0.
60	0.4625	0.7232	0.8593	0.9285	0.9988	1.000000	1.0000000	0.
61	0.5283	0.7314	0.8368	0.9473	0.9936	0.996144	0.9987146	0.0012853
62	0.4943	0.7491	0.8562	0.9243	0.9937	0.997478	1.0000000	0.
63	0.4462	0.7323	0.8501	0.9233	0.9989	1.000000	1.0000000	0.
64	0.5160	0.7396	0.8649	0.9324	0.9889	1.000000	1.0000000	0.
65	0.4501	0.7227	0.8531	0.9448	0.9941	0.998825	1.0000000	0.
66	0.4570	0.6953	0.8442	0.9370	0.9989	1.000000	1.0000000	0.
67	0.4376	0.6963	0.8360	0.9446	0.9965	1.000000	1.0000000	0.
68	0.4441	0.7226	0.8413	0.9406	0.9966	0.998858	1.0000000	0.
69	0.4272	0.7183	0.8568	0.9272	1.0000	1.000000	1.0000000	0.
70	0.4110	0.6952	0.8447	0.9498	1.0000	1.000000	1.0000000	0.
71	0.4007	0.6815	0.8607	0.9498	0.9966	1.000000	1.0000000	0.
72	0.4155	0.7180	0.8379	0.9372	1.0000	1.000000	1.0000000	0.
73	0.4570	0.7056	0.8305	0.9336	1.0000	1.000000	1.0000000	0.
74	0.4250	0.6816	0.8270	0.9622	0.9989	1.000000	1.0000000	0.
75	0.4366	0.6890	0.8486	0.9660	0.9953	1.000000	1.0000000	0.
76	0.4209	0.7023	0.8465	0.9384	0.9988	1.000000	1.0000000	0.
77	0.4521	0.7032	0.8470	0.9463	0.9989	1.000000	1.0000000	0.
78	0.4644	0.7080	0.8391	0.9391	0.9989	1.000000	1.0000000	0.
79	0.4903	0.7033	0.8431	0.9301	0.9966	1.000000	1.0000000	0.
80	0.4363	0.6865	0.8409	0.9544	0.9977	1.000000	1.0000000	0.
81	0.3992	0.6468	0.8525	0.9689	0.9973	0.998647	1.0000000	0.
82	0.4686	0.6986	0.8243	0.9743	0.9929	0.997143	1.0000000	0.
83	0.3974	0.6639	0.8727	0.9604	0.9976	0.998800	0.9987995	0.0012005
84	0.4189	0.6724	0.9071	0.9748	0.9906	0.996850	0.9984252	0.0015748
AVR	0.4537	0.7086	0.8502	0.9431	0.9966	0.999379	0.9998094	0.0001910
CP	0.4224	0.7295	0.8881	0.9532	0.9920	0.998858	0.9988585	0.0011416

Appendix 7.3(7) Comparison of empirical frequency distributions with normal distribution

INDEX	INTERVALS 0.5SD	1.0SD	1.5SD	2.0SD	3.0SD	4.0SD	5.0SD	>5.0SD
91	-0.1625	-0.1288	-0.0484	-0.0023	0.0098	0.009029	0.0068175	-0.0068176
92	-0.0394	-0.0469	-0.0217	0.0013	0.0053	0.001079	0.0011409	-0.0011410
AVRG	-0.1009	-0.0878	-0.0351	-0.0005	0.0075	0.005054	0.0039792	-0.0039793

Appendix 7.3(8) Comparison of empirical frequency distributions with normal distribution in period of 1978-1980

CMPNY	INTERVALS 0.5SD	1.0SD	1.5SD	2.0SD	3.0SD	4.0SD	5.0SD	>5.0SD
1	-0.1631	-0.0934	-0.0134	0.0292	0.0195	0.002272	-0.0000007	0.0000006
2	-0.2581	-0.1199	-0.0098	0.0313	0.0286	0.004640	0.0015668	-0.0015668
3	-0.1262	-0.0628	0.0189	0.0258	0.0022	-0.000062	-0.0000007	0.0000006
4	-0.2704	-0.1628	-0.0434	0.0112	0.0334	0.003804	0.0025766	-0.0025767
5	-0.1411	-0.0546	-0.0188	-0.0307	0.0020	-0.000062	-0.0000007	0.0000006
6	-0.3209	-0.1486	-0.0167	0.0272	0.0181	0.012925	0.0025967	-0.0025968
7	-0.3416	-0.1784	-0.0678	0.0004	0.0159	0.013586	0.0086842	-0.0086843
8	-0.0699	-0.0404	0.0296	0.0177	-0.0016	-0.000062	-0.0000007	0.0000006
9	-0.0556	-0.0111	0.0321	0.0046	-0.0015	0.001130	-0.0000007	0.0000006
10	-0.1292	-0.0741	-0.0073	0.0252	0.0135	0.003414	-0.0000007	0.0000006
11	-0.1302	-0.0684	0.0041	0.0171	0.0070	0.002720	0.0013902	-0.0013902
12	-0.2877	-0.1444	-0.0319	0.0182	0.0261	0.009043	0.0030342	-0.0030343
13	-0.2035	-0.1079	-0.0268	0.0275	0.0243	0.002641	-0.0000007	0.0000006
14	-0.1734	-0.0994	0.0021	0.0140	0.0156	0.004511	0.0030481	-0.0030482
15	-0.1817	-0.0782	-0.0152	0.0260	0.0183	0.001171	-0.0000007	0.0000006
16	-0.1176	-0.0742	-0.0032	0.0227	0.0102	-0.000062	-0.0000007	0.0000006
17	-0.1494	-0.0708	-0.0066	0.0339	0.0071	0.002380	-0.0000007	0.0000006
18	-0.0636	-0.0442	0.0122	0.0234	0.0019	-0.000062	-0.0000007	0.0000006
19	-0.1543	-0.0734	-0.0123	0.0145	0.0160	0.003938	0.0013327	-0.0013327
20	0.0497	-0.0174	0.0020	-0.0087	-0.0016	0.001087	0.0011488	-0.0011488
21	-0.0520	-0.0228	0.0068	0.0201	-0.0015	-0.000062	-0.0000007	0.0000006
22	-0.0718	-0.0240	-0.0052	0.0083	0.0034	-0.000062	-0.0000007	0.0000006
23	-0.0493	-0.0456	-0.0017	0.0210	0.0007	-0.000062	-0.0000007	0.0000006
24	-0.1023	0.0093	0.0121	0.0074	-0.0015	0.001113	-0.0000007	0.0000006
25	-0.0932	0.0032	0.0302	-0.0095	0.0019	-0.000062	-0.0000007	0.0000006
26	-0.1123	-0.0704	0.0035	0.0160	0.0138	-0.000062	-0.0000007	0.0000006
27	-0.0395	-0.0463	-0.0045	0.0226	-0.0004	-0.000062	-0.0000007	0.0000006
28	-0.2438	-0.1296	-0.0374	0.0061	0.0114	0.006980	0.0046942	-0.0046942
29	-0.2711	-0.1509	-0.0403	-0.0135	0.0221	0.009383	0.0035412	-0.0035413
30	-0.0005	-0.0031	0.0011	0.0030	0.0022	-0.000062	-0.0000007	0.0000006
AVRG	-0.1441	-0.0735	-0.0057	0.0167	0.0102	0.002866	0.0011200	-0.0011201
KCSP	-0.1625	-0.1288	-0.0484	-0.0023	0.0098	0.009029	0.0068176	0.0068176

Appendix 7.3(9) Comparison of empirical frequency distributions with normal distribution in period of 1986-1988

CMPNY	INTERVALS							
	0.5SD	1.0SD	1.5SD	2.0SD	3.0SD	4.0SD	5.0SD	>5.0SD
51	-0.0500	-0.0253	0.0130	0.0083	0.0007	-0.000062	-0.0000007	0.0000006
52	-0.1484	-0.0585	0.0230	0.0371	0.0022	-0.000062	-0.0000007	0.0000006
53	-0.1645	-0.0614	0.0058	0.0280	0.0036	-0.000062	-0.0000007	0.0000006
54	-0.0931	-0.0287	0.0073	0.0255	-0.0004	-0.000062	-0.0000007	0.0000006
55	-0.1227	-0.0631	0.0072	0.0220	0.0074	0.001375	-0.0000007	0.0000006
56	-0.1025	-0.0231	0.0211	0.0098	-0.0002	0.001196	0.0012572	-0.0012573
57	-0.0718	-0.0460	0.0215	-0.0008	0.0020	0.001113	0.0011744	-0.0011745
58	-0.0348	-0.0286	0.0080	0.0104	-0.0027	-0.000062	-0.0000007	0.0000006
59	-0.0348	-0.0286	0.0068	0.0207	-0.0016	-0.000062	-0.0000007	0.0000006
60	-0.0795	-0.0406	0.0071	0.0260	-0.0015	-0.000062	-0.0000007	0.0000006
61	-0.1453	-0.0488	0.0296	0.0072	0.0037	0.003794	0.0012847	-0.0012847
62	-0.1113	-0.0665	0.0102	0.0302	0.0036	0.002460	-0.0000007	0.0000006
63	-0.0632	-0.0497	0.0163	0.0312	-0.0016	-0.000062	-0.0000007	0.0000006
64	-0.1330	-0.0570	0.0015	0.0221	0.0084	-0.000062	-0.0000007	0.0000006
65	-0.0671	-0.0401	0.0133	0.0097	0.0032	0.001113	-0.0000007	0.0000006
66	-0.0740	-0.0127	0.0222	0.0175	-0.0016	-0.000062	-0.0000007	0.0000006
67	-0.0546	-0.0137	0.0304	0.0099	0.0008	-0.000062	-0.0000007	0.0000006
68	-0.0611	-0.0400	0.0251	0.0139	0.0007	0.001079	-0.0000007	0.0000006
69	-0.0442	-0.0357	0.0096	0.0273	-0.0027	-0.000062	-0.0000007	0.0000006
70	-0.0280	-0.0126	-0.0217	0.0047	-0.0027	-0.000062	-0.0000007	0.0000006
71	-0.0177	0.0011	0.0057	0.0047	0.0007	-0.000062	-0.0000007	0.0000006
72	-0.0325	-0.0354	0.0285	0.0173	-0.0027	-0.000062	-0.0000007	0.0000006
73	-0.0740	-0.0230	0.0359	0.0209	-0.0027	-0.000062	-0.0000007	0.0000006
74	-0.0420	0.0010	0.0394	-0.0077	-0.0016	-0.000062	-0.0000007	0.0000006
75	-0.0536	-0.0064	0.0178	-0.0115	0.0020	-0.000062	-0.0000007	0.0000006
76	-0.0379	-0.0197	0.0199	0.0161	-0.0015	-0.000062	-0.0000007	0.0000006
77	-0.0691	-0.0206	0.0194	0.0082	-0.0016	-0.000062	-0.0000007	0.0000006
78	-0.0814	-0.0254	0.0273	0.0154	-0.0016	-0.000062	-0.0000007	0.0000006
79	-0.1073	-0.0207	0.0233	0.0244	0.0007	-0.000062	-0.0000007	0.0000006
80	-0.0533	-0.0039	0.0255	0.0001	-0.0004	-0.000062	-0.0000007	0.0000006
81	-0.0162	0.0358	0.0139	-0.0144	0.0000	0.001291	-0.0000007	0.0000006
82	-0.0856	-0.0160	0.0421	-0.0198	0.0044	0.002795	-0.0000007	0.0000006
83	-0.0144	0.0187	-0.0063	-0.0059	-0.0003	0.001138	0.0011998	-0.0011999
84	-0.0359	0.0102	-0.0407	-0.0203	0.0067	0.003088	0.0015742	-0.0015742
AVRG	-0.0707	-0.0260	0.0162	0.0114	0.0007	0.000559	0.0001903	-0.0001904
KCSP	-0.0394	-0.0469	-0.0217	0.0013	0.0053	0.001080	0.0011409	0.0011410

Appendix 7.3(10) Analysis of extreme tail areas in terms of number of observations rather than relative frequencies(KCSPIs)

		INTERVALS							
INDX	OBSRN	>2SD		>3SD		>4SD		>5SD	
		EN	AN	EN	AN	EN	AN	EN	AN
91	880	40.0	38	2.4	11	0.06	8	0.0005	6
92	876	39.9	41	2.4	7	0.06	1	0.0005	1
TOTALS		79.9	79	4.7	18	0.11	9	0.0011	7

(Notes)
OBSRN: The number of observations.
EN: Expected numbers.
AN: Actual numbers.
SD: Standard deviation.

Appendix 7.3(11) Analysis of extreme tail areas in terms of number of observations rather than relative frequencies in period of 1978-1980

		INTERVALS							
CMPY	OBSRN	>2SD		>3SD		>4SD		>5SD	
		EN	AN	EN	AN	EN	AN	EN	AN
1	857	39.0	64	2.3	19	0.05	2	0.0005	0
2	638	29.0	49	1.7	20	0.04	3	0.0004	1
3	813	37.0	58	2.2	4	0.05	0	0.0005	0
4	776	35.3	44	2.1	28	0.05	3	0.0005	2
5	643	29.3	49	1.7	3	0.04	0	0.0004	0
6	385	17.5	28	1.0	8	0.02	5	0.0002	1
7	806	36.7	37	2.2	15	0.05	11	0.0005	7
8	870	39.6	55	2.3	1	0.05	0	0.0005	0
9	839	38.2	42	2.3	1	0.05	1	0.0005	0
10	863	39.3	61	2.3	14	0.05	3	0.0005	0
11	719	32.7	45	1.9	7	0.05	2	0.0004	1
12	659	30.0	42	1.8	19	0.04	6	0.0004	2
13	740	33.7	54	2.0	20	0.05	2	0.0004	0
14	656	29.8	39	1.8	12	0.04	3	0.0004	2
15	811	36.9	58	2.2	17	0.05	1	0.0005	0
16	851	38.7	58	2.3	11	0.05	0	0.0005	0
17	819	37.3	65	2.2	8	0.05	2	0.0005	0
18	871	39.6	60	2.4	4	0.05	0	0.0005	0
19	750	34.1	45	2.0	14	0.05	3	0.0004	1
20	870	39.6	32	2.3	1	0.05	1	0.0005	1
21	869	39.5	57	2.3	1	0.05	0	0.0005	0
22	818	37.2	44	2.2	5	0.05	0	0.0005	0
23	872	39.7	58	2.4	3	0.05	0	0.0005	0
24	851	38.7	45	2.3	1	0.05	1	0.0005	0
25	861	39.2	31	2.3	4	0.05	0	0.0005	0
26	846	38.5	52	2.3	14	0.05	0	0.0005	0
27	852	38.8	58	2.3	2	0.05	0	0.0005	0
28	852	38.8	44	2.3	12	0.05	6	0.0005	4
29	847	38.5	50	2.3	21	0.05	8	0.0005	3
30	824	37.5	40	2.2	4	0.05	0	0.0005	0
TOTALS		1079.6	1464	64.1	293	1.49	63	0.0142	25

Appendix 7.3(12) Analysis of extreme tail areas in terms of number of observations rather than relative frequencies in period of 1986-1988

		INTERVALS							
CMPY	OBSRN	>2SD		>3SD		>4SD		>5SD	
		EN	AN	EN	AN	EN	AN	EN	AN
51	873	39.7	47	2.4	3	0.05	0	0.0005	0
52	811	36.9	67	2.2	4	0.05	0	0.0005	0
53	789	35.9	58	2.1	5	0.05	0	0.0005	0
54	859	39.1	61	2.3	2	0.05	0	0.0005	0
55	696	31.7	47	1.9	7	0.04	1	0.0004	0
56	795	36.2	44	2.1	2	0.05	1	0.0005	1
57	851	38.7	38	2.3	4	0.05	1	0.0005	1
58	876	39.9	49	2.4	0	0.06	0	0.0005	0
59	876	39.9	58	2.4	1	0.06	0	0.0005	0
60	867	39.4	62	2.3	1	0.05	0	0.0005	0
61	778	35.4	41	2.1	5	0.05	3	0.0005	1
62	793	36.1	60	2.1	5	0.05	2	0.0005	0
63	874	39.8	67	2.4	1	0.06	0	0.0005	0
64	814	37.0	55	2.2	9	0.05	0	0.0005	0
65	851	38.7	47	2.3	5	0.05	1	0.0005	0
66	873	39.7	55	2.4	1	0.05	0	0.0005	0
67	866	39.4	48	2.3	3	0.05	0	0.0005	0
68	876	39.9	52	2.4	3	0.06	1	0.0005	0
69	852	38.8	62	2.3	0	0.05	0	0.0005	0
70	876	39.9	44	2.4	0	0.06	0	0.0005	0
71	876	39.9	44	2.4	3	0.06	0	0.0005	0
72	876	39.9	55	2.4	0	0.06	0	0.0005	0
73	873	39.7	58	2.4	0	0.05	0	0.0005	0
74	873	39.7	33	2.4	1	0.05	0	0.0005	0
75	852	38.8	29	2.3	4	0.05	0	0.0005	0
76	860	39.1	53	2.3	1	0.05	0	0.0005	0
77	876	39.9	47	2.4	1	0.06	0	0.0005	0
78	870	39.6	53	2.3	1	0.05	0	0.0005	0
79	873	39.7	61	2.4	3	0.05	0	0.0005	0
80	855	38.9	39	2.3	2	0.05	0	0.0005	0
81	739	33.6	23	2.0	2	0.05	1	0.0004	0
82	700	31.8	18	1.9	5	0.04	2	0.0004	0
83	833	37.9	33	2.2	2	0.05	1	0.0005	1
84	635	28.9	16	1.7	6	0.04	2	0.0004	1
TOTALS		1289.3	1624	76.5	92	1.79	16	0.0170	5

Appendix 7.3(13) Analysis of extreme tail areas in terms of number of observations rather than relative frequencies in period of 1978-1980 (trimmed data)

COMPANY	N*	>2SD		>3SD		>4SD		>5SD	
		EN	AN	EN	AN	EN	AN	EN	AN
1	857	39.0	64	2.3	19	0.05	2	0.0005	0
2	637	29.0	51	1.7	19	0.04	3	0.0004	0
3	813	37.0	58	2.2	4	0.05	0	0.0005	0
4	776	35.3	44	2.1	28	0.05	3	0.0005	2
5	642	29.2	51	1.7	2	0.04	0	0.0004	0
6	377	17.2	33	1.0	7	0.02	0	0.0002	0
7	804	36.6	42	2.2	17	0.05	12	0.0005	7
8	870	39.6	55	2.3	1	0.05	0	0.0005	0
9	838	38.1	45	2.3	0	0.05	0	0.0005	0
10	863	39.3	61	2.3	14	0.05	3	0.0005	0
11	715	32.5	48	1.9	4	0.05	0	0.0004	0
12	658	29.9	46	1.8	19	0.04	5	0.0004	4
13	740	33.7	54	2.0	20	0.05	2	0.0004	0
14	654	29.8	42	1.8	11	0.04	2	0.0004	0
15	811	36.9	58	2.2	17	0.05	1	0.0005	0
16	851	38.7	58	2.3	11	0.05	0	0.0005	0
17	818	37.2	65	2.2	7	0.05	1	0.0005	0
18	871	39.6	60	2.4	4	0.05	0	0.0005	0
19	746	33.9	50	2.0	11	0.05	0	0.0004	0
20	869	39.5	35	2.3	0	0.05	0	0.0005	0
21	868	39.5	56	2.3	0	0.05	0	0.0005	0
22	818	37.2	44	2.2	5	0.05	0	0.0005	0
23	872	39.7	58	2.4	3	0.05	0	0.0005	0
24	850	38.7	45	2.3	0	0.05	0	0.0005	0
25	861	39.2	31	2.3	4	0.05	0	0.0005	0
26	846	38.5	52	2.3	14	0.05	0	0.0005	0
27	852	38.8	58	2.3	2	0.05	0	0.0005	0
28	851	38.7	51	2.3	12	0.05	7	0.0005	3
29	847	38.5	50	2.3	21	0.05	8	0.0005	3
30	823	37.4	42	2.2	3	0.05	0	0.0005	0
TOTALS		1078.3	1507	64.0	279	1.49	49	0.0142	19

Appendix 7.3(14) Analysis of extreme tail aresa in terms of number of observations rather than relative frequencies in period of 1986-1988 (trimmed data)

COMPANY	N*	>2SD		>3SD		>4SD		>5SD	
		EN	AN	EN	AN	EN	AN	EN	AN
51	873	39.7	47	2.4	3	0.05	0	0.0005	0
52	811	36.9	67	2.2	4	0.05	0	0.0005	0
53	789	35.9	58	2.1	5	0.05	0	0.0005	0
54	859	39.1	61	2.3	2	0.05	0	0.0005	0
55	696	31.7	47	1.9	7	0.04	1	0.0004	0
56	794	36.1	47	2.1	1	0.05	0	0.0005	0
57	850	38.7	44	2.3	3	0.05	0	0.0005	0
58	876	39.9	49	2.4	0	0.06	0	0.0005	0
59	876	39.9	58	2.4	1	0.06	0	0.0005	0
60	867	39.4	62	2.3	1	0.05	0	0.0005	0
61	776	35.3	49	2.1	4	0.05	1	0.0005	0
62	793	36.1	60	2.1	5	0.05	2	0.0005	0
63	874	39.8	67	2.4	1	0.06	0	0.0005	0
64	814	37.0	55	2.2	9	0.05	0	0.0005	0
65	850	38.7	51	2.3	4	0.05	0	0.0005	0
66	873	39.7	55	2.4	1	0.05	0	0.0005	0
67	866	39.4	48	2.3	3	0.05	0	0.0005	0
68	876	39.9	52	2.4	3	0.06	1	0.0005	0
69	852	38.8	62	2.3	0	0.05	0	0.0005	0
70	876	39.9	44	2.4	0	0.06	0	0.0005	0
71	876	39.9	44	2.4	3	0.06	0	0,0005	0
72	876	39.9	55	2.4	0	0.06	0	0.0005	0
73	873	39.7	58	2.4	0	0.05	0	0.0005	0
74	873	39.7	33	2.4	1	0.05	0	0.0005	0
75	851	38.7	32	2.3	6	0.05	0	0.0005	0
76	860	39.1	53	2.3	1	0.05	0	0.0005	0
77	876	39.9	47	2.4	1	0.06	0	0.0005	0
78	870	39.6	53	2.3	1	0.05	0	0.0005	0
79	873	39.7	61	2.4	3	0.05	0	0.0005	0
80	855	38.9	39	2.3	2	0.05	0	0.0005	0
81	737	33.5	25	2.0	0	0.05	0	0.0004	0
82	698	31.8	18	1.9	3	0.04	1	0.0004	0
83	833	37.9	33	2.2	2	0.05	1	0.0005	1
84	633	28.8	23	1.7	5	0.04	1	0.0004	0
TOTALS		1288.8	1657	76.5	85	1.78	8	0.0170	1

Appendix 7.4(1) Daily Serial Correlation Coefficients for lag k=1,2,3,...10 in period of 1978-1980

CMPY	LAG 1	2	3	4	5	6	7	8	9	10
1	0.128*	0.013	-0.067	-0.036	-0.033	-0.078*	-0.029	-0.019	0.022	-0.024
2	0.096*	-0.103*	0.018	-0.032	0.036	0.049	-0.012	-0.094*	-0.011	-0.015
3	0.162*	-0.046	-0.027	-0.014	-0.061	-0.018	0.029	0.029	-0.034	-0.028
4	0.035	0.031	0.006	-0.054	0.010	-0.010	0.016	0.037	0.066	-0.020
5	0.153*	-0.069	-0.063	-0.044	0.015	-0.031	-0.035	0.039	0.035	0.038
6	0.067	-0.050	-0.021	-0.051	-0.006	-0.099	-0.032	0.013	-0.073	0.007
7	0.124*	0.024	0.036	0.044	-0.035	-0.069	-0.041	-0.028	0.010	-0.036
8	0.097*	-0.007	-0.104*	-0.072*	-0.074*	-0.002	-0.034	-0.018	0.081	0.094*
9	0.216*	0.051	-0.062	-0.051	-0.046	0.009	0.050	-0.007	0.029	0.000
10	0.002	-0.099*	-0.018	-0.032	0.001	0.027	-0.057	-0.004	0.027	-0.029
11	0.146*	-0.057	-0.124*	-0.097*	-0.077	-0.001	-0.003	0.007	0.009	0.012
12	0.083*	0.025	0.069	-0.061	0.021	0.036	0.016	0.026	0.061	0.034
13	0.058	-0.070	-0.037	-0.040	0.042	-0.022	-0.008	-0.083*	-0.037	-0.001
14	0.193*	-0.046	-0.094*	-0.101*	-0.020	0.048	0.023	-0.038	-0.022	-0.039
15	-0.095*	-0.022	-0.015	-0.052	0.015	-0.012	-0.021	-0.003	0.012	-0.089*
16	-0.020	-0.094*	0.020	-0.007	-0.032	0.015	0.028	0.005	0.004	0.059
17	0.086*	-0.126*	-0.075*	-0.079*	-0.065	-0.050	0.014	0.011	-0.013	0.018
18	0.067	-0.093*	-0.027	-0.003	-0.025	-0.013	-0.008	0.013	0.051	0.045
19	0.064	-0.049	-0.041	-0.013	-0.001	-0.093*	-0.094*	0.010	0.040	0.004
20	0.206*	0.032	-0.036	-0.050	-0.055	-0.003	-0.045	0.033	0.068	0.056
21	0.099*	-0.120*	-0.066	-0.071*	-0.035	0.008	-0.019	-0.010	0.029	0.062
22	0.101*	-0.093*	-0.100*	-0.016	-0.021	0.009	0.005	0.026	0.104*	-0.009
23	0.055	-0.106*	-0.069*	-0.016	-0.024	0.019	-0.022	-0.017	0.061	0.055
24	0.140*	0.050	0.011	0.017	-0.029	-0.042	0.003	-0.057	0.023	-0.072
25	0.181*	-0.010	-0.039	0.011	-0.043	-0.030	-0.010	-0.053	-0.019	-0.049
26	0.113*	-0.138*	-0.132*	-0.049	-0.026	0.097*	0.028	0.015	-0.032	-0.013
27	0.089*	-0.088*	-0.036	0.002	-0.030	0.007	-0.017	-0.010	0.045	0.002
28	-0.017	-0.081*	0.031	-0.015	-0.053	0.014	0.018	-0.026	-0.038	-0.036
29	0.060*	-0.053	-0.130*	-0.054	-0.018	0.002	0.003	-0.019	-0.020	-0.039
30	0.241*	0.075*	0.022	0.024	-0.031	-0.021	0.049	0.007	0.024	-0.019
N	20	12	8	5	2	3	1	2	2	3
%	66.667	40.000	26.667	16.667	6.667	10.000	3.333	6.667	6.667	10.000
AV	0.098*	-0.044	-0.039	-0.034	-0.023	-0.008	-0.007	-0.007	0.017	-0.001
CP	-0.008	0.003	-0.062	-0.035	-0.014	-0.027	-0.037	-0.004	0.031	0.054

(Notes)
- * : More than twice their standard error.
- N : Numbers of *.
- % : Percentage of serial correlation coefficients more than twice their standard error.
- CP: Korea Composite Stock Price Index.
- AV: Average value.

Appendix 7.4(2) Daily Serial Correlation Coefficients for lag k=1,2,3,...10 in period of 1986-1988

CMPY	LAG 1	2	3	4	5	6	7	8	9	10
51	0.078*	-0.035	-0.003	-0.003	0.055	0.010	-0.093*	-0.019	0.034	0.009
52	0.125*	0.048	-0.052	0.026	-0.014	0.029	-0.004	0.013	0.028	-0.055
53	0.083*	-0.070	-0.030	-0.016	-0.093*	-0.035	-0.047	0.039	0.000	-0.021
54	0.051	-0.028	-0.028	-0.028	0.010	0.017	-0.050	0.049	0.049	0.015
55	0.138*	-0.029	-0.018	0.006	-0.007	0.060	-0.003	-0.080*	-0.069	-0.031
56	0.329*	0.138*	0.069	0.022	-0.097*	-0.090*	-0.088*	-0.046	-0.024	-0.006
57	0.176*	-0.029	-0.074*	0.052	0.045	0.007	-0.010	0.024	0.031	0.020
58	0.082*	-0.016	-0.099*	-0.018	-0.006	-0.022	-0.003	-0.010	0.059	-0.004
59	0.052	-0.074*	-0.082*	-0.010	0.013	-0.007	-0.018	-0.003	0.047	-0.029
60	0.161*	-0.009	-0.037	-0.086*	-0.051	-0.039	-0.023	0.026	0.026	0.012
61	0.151*	-0.011	-0.001	-0.021	-0.075*	-0.017	-0.015	-0.051	0.031	-0.011
62	0.097*	-0.061	-0.022	-0.053	-0.061	-0.011	0.006	-0.076*	-0.008	0.036
63	0.109*	-0.100*	-0.103*	-0.042	-0.034	0.029	0.024	-0.015	0.105*	0.032
64	0.142*	0.011	-0.046	-0.024	-0.036	-0.019	-0.064	-0.032	-0.012	0.033
65	0.051	-0.064	-0.084*	-0.002	-0.033	-0.066	0.011	0.061	0.033	0.017
66	0.000	-0.087*	0.025	0.003	-0.050	0.008	-0.005	0.017	0.048	0.003
67	0.058	-0.006	0.023	0.021	0.027	0.047	-0.021	0.023	0.049	-0.048
68	0.049	-0.046	-0.017	-0.013	0.004	-0.019	0.015	-0.006	0.007	-0.081*
69	0.069*	-0.025	0.022	-0.017	-0.079*	-0.037	-0.017	0.026	0.047	0.006
70	0.070*	-0.065	-0.048	-0.004	-0.003	-0.005	0.010	-0.054	0.010	-0.036
71	-0.027	-0.049	0.022	-0.010	-0.075*	0.045	-0.025	0.009	0.078*	-0.049
72	0.083*	-0.072*	-0.049	-0.065	-0.002	0.005	0.005	-0.039	0.015	-0.037
73	0.118*	-0.042	-0.044	-0.024	-0.028	0.008	0.002	-0.017	-0.004	-0.037
74	0.115*	-0.009	-0.026	-0.073*	-0.013	0.017	-0.037	-0.003	0.028	0.016
75	0.050	0.068	0.040	-0.049	0.024	0.013	0.013	-0.014	-0.046	0.003
76	0.134*	-0.019	-0.041	-0.035	0.030	-0.015	-0.019	-0.013	0.066	0.002
77	0.047	-0.034	-0.045	-0.031	0.013	0.080*	0.016	-0.009	0.109*	-0.029
78	0.057	0.029	0.000	-0.042	-0.050	0.016	0.024	0.062	0.019	-0.058
79	0.093*	-0.008	0.014	-0.012	-0.026	0.001	-0.020	0.062	0.042	-0.056
80	0.101*	0.046	0.027	-0.010	-0.018	-0.006	0.009	-0.008	0.001	0.001
81	0.104*	0.128*	0.025	0.075*	-0.006	0.012	-0.031	0.027	0.041	0.002
82	0.211*	0.056	-0.015	-0.070	0.020	0.049	0.007	0.035	-0.025	-0.030
83	0.265*	0.136*	0.015	0.026	0.009	0.025	-0.020	-0.016	0.021	0.026
84	0.323*	0.200*	0.144*	0.095*	0.101*	0.077	0.059	0.0*^*	0.052	0.116*
N	24	8	6	4	6	2	2	3	3	2
%	70.588	23.529	17.647	11.765	17.647	5.882	5.882	8.824	8.824	5.882
AV	0.110*	-0.004	-0.016	-0.013	-0.015	0.005	-0.012	0.001	0.026	-0.008
CP	0.100	0.029	0.010	0.046	0.008	0.035	0.008	0.012	0.043	-0.032

Appendix 7.4(3) Daily serial correlation coefficients for lags k=1,2,3,...,10 in period of 1978-1980 (trimmed data)

CMPY	LAG 1	2	3	4	5	6	7	8	9	10
1	0.128*	0.013	-0.067	-0.036	-0.033	-0.078*	-0.029	-0.019	0.022	-0.024
2	0.090*	-0.105*	0.018	-0.035	0.037	0.074	-0.011	-0.084*	-0.007	-0.002
3	0.162*	-0.046	-0.027	-0.014	-0.061	-0.018	0.029	0.029	-0.034	-0.028
4	0.035	0.031	0.006	-0.054	0.010	-0.010	0.016	0.037	0.066	-0.020
5	0.150*	-0.071	-0.057	-0.040	0.017	-0.043	-0.054	0.033	0.033	0.032
6	0.101	0.036	-0.123*	-0.089	-0.004	-0.032	0.013	-0.008	-0.011	-0.034
7	0.168*	0.042	0.037	0.068	-0.054	-0.105*	-0.050	-0.030	0.013	-0.054
8	0.097*	-0.007	-0.104*	-0.072*	-0.074*	-0.002	-0.034	-0.018	0.081*	0.094*
9	0.219*	0.056	-0.060	-0.054	-0.051	0.006	0.045	-0.007	0.034	0.008
10	0.002	-0.099*	-0.018	-0.032	0.001	0.027	-0.057	-0.004	0.027	-0.029
11	0.186*	-0.035	-0.140*	-0.092*	-0.074	-0.037	-0.027	0.034	-0.014	0.024
12	0.053	0.007	0.085*	-0.078	-0.004	0.039	0.019	0.030	0.072	0.048
13	0.058	-0.070	-0.037	-0.040	0.042	-0.022	-0.008	-0.083*	-0.037	-0.001
14	0.221*	0.004	-0.108*	-0.061	-0.002	0.031	0.019	-0.041	-0.033	-0.043
15	-0.095*	-0.022	-0.015	-0.052	0.015	-0.012	-0.021	-0.003	0.012	-0.089*
16	-0.020	-0.094*	0.020	-0.007	-0.032	0.015	0.028	0.005	0.004	0.059
17	0.084*	-0.131*	-0.081*	-0.076*	-0.062	-0.053	0.006	0.011	-0.021	0.013
18	0.067	-0.093*	-0.027	-0.003	-0.025	-0.013	-0.008	0.013	0.051	0.045
19	0.081*	-0.022	-0.035	-0.047	-0.023	-0.100*	-0.091*	0.017	0.046	-0.028
20	0.213*	0.040	-0.038	-0.050	-0.041	0.004	-0.055	0.029	0.076*	0.055
21	0.093*	-0.122*	-0.064	-0.069*	-0.038	0.005	-0.014	-0.013	0.023	0.063
22	0.101*	-0.093*	-0.100*	-0.016	-0.021	0.009	0.005	0.026	0.104*	-0.009
23	0.055	-0.106*	-0.069*	-0.016	-0.024	0.019	-0.022	-0.017	0.061	0.055
24	0.146*	0.054	0.018	0.019	-0.025	-0.034	-0.006	-0.060	0.017	-0.059
25	0.181*	-0.010	-0.039	0.011	-0.043	-0.030	-0.010	-0.053	-0.019	-0.049
26	0.113*	-0.138*	-0.132*	-0.049	-0.026	0.097*	0.028	0.015	-0.032	-0.013
27	0.089*	-0.088*	-0.036	0.002	-0.030	0.007	-0.017	-0.010	0.045	0.002
28	0.045	-0.093*	-0.055	-0.041	-0.050	0.013	0.021	-0.030	-0.035	-0.041
29	0.060	-0.053	-0.130*	-0.054	-0.018	0.002	0.003	-0.019	-0.020	-0.039
30	0.244*	0.074*	0.022	0.027	-0.020	-0.012	0.048	-0.010	0.016	-0.007
N	20	12	10	4	1	4	1	2	3	2
%	66.667	40.000	33.333	13.333	3.333	13.333	3.333	6.667	10.000	6.667
AV	0.104	-0.038	-0.045	-0.035	-0.024	-0.008	-0.008	-0.008	0.018	-0.002
CP	-0.008	0.003	-0.062	-0.035	-0.014	-0.027	-0.037	-0.004	0.031	0.054

Appendix 7.4(4) Daily serial correlation coefficients for lags k=1,2,3,...10 in period of 1986-1988 (trimmed data)

CMPY	LAG 1	2	3	4	5	6	7	8	9	10
51	0.078*	-0.035	-0.003	-0.003	0.055	0.010	-0.093*	-0.019	0.034	0.009
52	0.125*	0.048	-0.052	0.026	-0.014	0.029	-0.004	0.013	0.028	-0.055
53	0.083*	-0.070	-0.030	-0.016	-0.093*	-0.035	-0.047	0.039	0.000	-0.021
54	0.051	-0.028	-0.028	-0.028	0.010	0.017	-0.050	0.049	0.049	0.015
55	0.138*	-0.029	-0.018	0.006	-0.007	0.060	-0.003	-0.080*	-0.069	-0.031
56	0.328*	0.144*	0.074*	0.034	-0.061	-0.068	-0.072*	-0.020	0.001	0.015
57	0.201*	-0.024	-0.065	0.031	0.039	-0.011	-0.010	0.022	0.049	0.008
58	0.082*	-0.016	-0.099*	-0.018	-0.006	-0.022	-0.003	-0.010	0.059	-0.004
59	0.052	-0.074*	-0.082*	-0.010	0.013	-0.007	-0.018	-0.003	0.047	-0.029
60	0.161*	-0.009	-0.037	-0.086*	-0.051	-0.039	-0.023	0.026	0.026	0.012
61	0.166*	-0.012	0.006	-0.041	-0.090*	-0.022	-0.012	-0.056	0.028	-0.010
62	0.097*	-0.061	-0.022	-0.053	-0.061	-0.011	0.006	-0.076*	-0.008	0.036
63	0.109*	-0.100*	-0.103*	-0.042	-0.034	0.029	0.024	-0.015	0.105*	0.032
64	0.142*	0.011	-0.046	-0.024	-0.036	-0.019	-0.064	-0.032	-0.012	0.033
65	0.082*	-0.065	-0.087*	-0.011	-0.020	-0.090*	-0.003	0.068	0.039	0.008
66	0.000	-0.087*	0.025	0.003	-0.050	0.008	-0.005	0.017	0.048	0.003
67	0.058	-0.006	0.023	0.021	0.027	0.047	-0.021	0.023	0.049	-0.048
68	0.049	-0.046	-0.017	-0.013	0.004	-0.019	0.015	-0.006	0.007	-0.081*
69	0.069*	-0.025	0.022	-0.017	-0.079*	-0.037	-0.017	0.026	0.047	0.006
70	0.070*	-0.065	-0.048	-0.004	-0.003	-0.005	0.010	-0.054	0.010	-0.036
71	-0.027	-0.049	0.022	-0.010	-0.075*	0.045	-0.025	0.009	0.078*	-0.049
72	0.083*	-0.072*	-0.049	-0.065	-0.002	0.005	0.005	-0.039	0.015	-0.037
73	0.118*	-0.042	-0.044	-0.024	-0.028	0.008	0.002	-0.017	-0.004	-0.037
74	0.115*	-0.009	-0.026	-0.073*	-0.013	0.017	-0.037	-0.003	0.028	0.016
75	0.068	0.067	0.032	-0.059	0.009	0.008	0.032	-0.022	-0.053	-0.007
76	0.134*	-0.019	-0.041	-0.035	0.030	-0.015	-0.019	-0.013	0.066	0.002
77	0.047	-0.034	-0.045	-0.031	0.013	0.080*	0.016	-0.009	0.109*	-0.029
78	0.057	0.029	0.000	-0.042	-0.050	0.016	0.024	0.062	0.019	-0.058
79	0.093*	-0.008	0.014	-0.012	-0.026	0.001	-0.020	0.062	0.042	-0.056
80	0.101*	0.046	0.027	-0.010	-0.018	-0.006	0.009	-0.008	0.001	0.001
81	0.136*	0.136*	0.035	0.071	-0.017	0.005	-0.040	0.043	0.046	0.014
82	0.201*	0.043	-0.013	-0.063	0.030	0.043	0.000	0.046	-0.034	-0.036
83	0.265*	0.136*	0.015	0.026	0.009	0.025	-0.020	-0.016	0.021	0.026
84	0.320*	0.154*	0.115*	0.079	0.066	0.059	0.044	0.081*	0.067	0.086*
N	25	8	6	2	4	2	2	3	3	2
%	73.529	23.529	17.647	5.882	11.765	5.882	5.882	8.824	8.824	5.882
AV	0.113	-0.005	-0.016	-0.015	-0.016	0.003	-0.012	0.003	0.028	-0.009
CP	0.100	0.029	0.010	0.046	0.008	0.035	0.008	-0.012	0.043	-0.054

Appendix 7.5(1) Runs Analysis in period of 1978-1980

CMPY	RA	RE	STNDRD ERR	(RA-RE)/RE	STNDSD VARBL
1	444	559.78	13.684	-0.205	-8.352*
2	323	424.42	11.860	-0.237	-8.426*
3	420	511.78	13.254	-0.177	-6.811*
4	393	506.69	12.949	-0.222	-8.664*
5	326	402.19	11.792	-0.187	-6.334*
6	209	257.20	9.217	-0.184	-5.067*
7	391	506.65	13.070	-0.226	-8.734*
8	456	494.39	13.930	-0.076	-2.648*
9	397	485.86	13.625	-0.181	-6.412*
10	506	548.17	13.670	-0.075	-2.975*
11	367	439.09	12.376	-0.162	-5.704*
12	342	436.86	12.029	-0.215	-7.761*
13	409	490.41	12.765	-0.164	-6.261*
14	309	420.64	11.916	-0.263	-9.243*
15	476	523.36	13.278	-0.089	-3.453*
16	493	486.06	13.655	0.016	0.618
17	449	516.22	13.285	-0.128	-4.947*
18	460	486.92	13.809	-0.053	-1.841
19	393	467.73	12.712	-0.158	-5.761*
20	408	465.21	14.289	-0.121	-3.899*
21	448	475.00	13.991	-0.055	-1.823
22	418	470.89	13.305	-0.110	-3.862*
23	474	476.01	13.890	-0.002	-0.037
24	391	464.50	14.015	-0.156	-5.137*
25	384	473.02	14.027	-0.186	-6.239*
26	459	504.72	13.568	-0.089	-3.259*
27	448	473.34	13.749	-0.051	-1.734
28	463	547.75	13.487	-0.153	-6.173*
29	435	556.57	13.592	-0.217	-8.834*
30	372	463.59	13.581	-0.195	-6.634*
AVRG	393	477.83	13.146	-0.144	-5.214*
KCSPI	363	442.41	14.771	-0.177	-5.275*

(Notes)
RA : The actual number of runs.
RE : The expected number of runs.
STNDRD ERR : Standard error.
(RA-RE)/RE : Fractional difference.
STNDSD VARBL : Standardised variable.
* : Over the critical value at the 5% level.
AVRG: The average value.
KCSPI: The Korea Composite Stock Price Index.
CMPY: the sample company.

Appendix 7.5(2) Runs Analysis in period of 1986-1988

CMPY	RA	RE	STNDRD ERR	(RA-RE)/RE	STNDSD VARBL
51	509	515.53	13.840	-0.011	-0.363
52	462	528.47	13.297	-0.124	-4.886*
53	452	519.02	13.122	-0.127	-4.993*
54	493	526.15	13.642	-0.061	-2.320*
55	377	453.82	12.291	-0.167	-6.128*
56	400	504.71	13.124	-0.205	-7.864*
57	444	525.03	13.580	-0.152	-5.856*
58	493	505.07	13.922	-0.022	-0.759
59	487	504.88	13.945	-0.033	-1.175
60	468	536.73	13.685	-0.126	-4.912*
61	459	508.78	13.036	-0.096	-3.704*
62	477	521.53	13.184	-0.083	-3.264*
63	516	554.04	13.761	-0.067	-2.656*
64	461	536.81	13.362	-0.139	-5.561*
65	485	509.53	13.564	-0.046	-1.698
66	513	509.95	13.821	0.008	0.329
67	507	524.24	13.726	-0.031	-1.146
68	457	500.57	13.988	-0.085	-3.008*
69	491	517.31	13.603	-0.049	-1.824
70	472	498.01	14.000	-0.050	-1.751
71	506	491.74	14.059	0.031	1.121
72	468	500.28	13.979	-0.063	-2.202*
73	470	508.66	13.889	-0.074	-2.676*
74	490	509.36	13.883	-0.036	-1.287
75	470	477.48	13.886	-0.014	-0.430
76	490	524.74	13.648	-0.064	-2.436*
77	489	498.75	13.992	-0.018	-0.590
78	489	518.57	13.788	-0.055	-2.036*
79	476	518.00	13.818	-0.079	-2.931*
80	485	520.76	13.625	-0.067	-2.515*
81	409	433.63	12.736	-0.054	-1.816
82	398	446.54	12.297	-0.106	-3.825*
83	382	454.06	13.732	-0.156	-5.138*
84	299	383.54	11.599	-0.218	-7.159*
AVRG	447	502.54	13.513	-0.078	-2.866*
KCSPI	384	429.53	14.220	-0.104	-3.096*

Appendix 7.5(3) Runs analysis in period of 1978-1980 (trimmed data)

CMPY	RA	RE	STNDRD ERR	(RA-RE)/RE	STNDSD VARBL
1	444	559.78	13.684	-0.205	-8.352*
2	323	423.84	11.851	-0.236	-8.382*
3	420	511.78	13.254	-0.177	-6.811*
4	393	506.69	12.949	-0.222	-8.664*
5	326	401.64	11.783	-0.186	-6.292*
6	206	251.80	9.119	-0.178	-4.858*
7	389	504.97	13.049	-0.228	-8.772*
8	456	494.39	13.930	-0.076	-2.648*
9	397	485.32	13.616	-0.180	-6.376*
10	506	548.17	13.670	-0.075	-2.975*
11	363	437.32	12.352	-0.168	-5.896*
12	342	436.11	12.018	-0.214	-7.706*
13	409	490.41	12.765	-0.164	-6.261*
14	307	419.52	11.899	-0.266	-9.330*
15	476	523.36	13.278	-0.089	-3.453*
16	493	486.06	13.655	0.016	0.618
17	449	515.73	13.278	-0.127	-4.912*
18	460	486.92	13.809	-0.053	-1.841
19	392	465.66	12.681	-0.156	-5.691*
20	408	464.69	14.279	-0.120	-3.865*
21	448	474.59	13.985	-0.054	-1.794
22	418	470.89	13.305	-0.110	-3.862*
23	474	476.01	13.890	-0.002	-0.037
24	389	463.99	14.006	-0.159	-5.247*
25	384	473.02	14.027	-0.186	-6.239*
26	459	504.72	13.568	-0.089	-3.259*
27	448	473.34	13.749	-0.051	-1.734
28	463	547.29	13.482	-0.152	-6.141*
29	435	556.57	13.592	-0.217	-8.834*
30	372	463.14	13.574	-0.195	-6.604*
Avrg	391	477.26	13.137	-0.144	-5.207

Appendix 7.5(4) Runs analysis in period of 1986-1988 (trimmed data)

CMPY	RA	RE	STNDRD ERR	(RA-RE)/RE	STNDSD VARBL
51	509	515.53	13.840	-0.011	-0.363
52	462	528.47	13.297	-0.124	-4.886*
53	452	519.02	13.122	-0.127	-4.993*
54	493	526.15	13.642	-0.061	-2.320*
55	377	453.82	12.291	-0.167	-6.128*
56	400	504.15	13.116	-0.205	-7.826*
57	444	524.51	13.572	-0.152	-5.821*
58	493	505.07	13.922	-0.022	-0.759
59	487	504.88	13.945	-0.033	-1.175
60	468	536.73	13.685	-0.126	-4.912*
61	459	507.56	13.019	-0.094	-3.615*
62	477	521.53	13.184	-0.083	-3.264*
63	516	554.04	13.761	-0.067	-2.656*
64	461	536.81	13.362	-0.139	-5.561*
65	483	509.07	13.558	-0.049	-1.812
66	513	509.95	13.821	0.008	0.329
67	507	524.24	13.726	-0.031	-1.146
68	457	500.57	13.988	-0.085	-3.008*
69	491	517.31	13.603	-0.049	-1.824
70	472	498.01	14.000	-0.050	-1.751
71	506	491.74	14.059	0.031	1.121
72	468	500.28	13.979	-0.063	-2.202*
73	470	508.66	13.889	-0.074	-2.676*
74	490	509.36	13.883	-0.036	-1.287
75	468	476.97	13.877	-0.017	-0.538
76	490	524.74	13.648	-0.064	-2.436*
77	489	498.75	13.992	-0.018	-0.590
78	489	518.57	13.788	-0.055	-2.036*
79	476	518.00	13.818	-0.079	-2.931*
80	485	520.76	13.625	-0.067	-2.515*
81	407	432.66	12.720	-0.057	-1.899
82	398	445.42	12.279	-0.104	-3.740*
83	382	454.06	13.732	-0.156	-5.138*
84	299	382.69	11.587	-0.216	-7.093*
Avrg	446	502.35	13.510	-0.078	-2.866

Appendix 7.6(1) Results of Spectral Analysis.
(1978-1980, 5% significance level)

Sample	N	Autocovar	Upper Lim.	Lower Lim.	Out
1	857	0.00027680	0.00007443	0.00002157	13
2	638	0.00042754	0.00012267	0.00002938	18
3	813	0.00058745	0.00015974	0.00004484	21
4	776	0.00029646	0.00008158	0.00002212	12
5	643	0.00208018	0.00059687	0.00014293	7
6	385	0.00102894	0.00034613	0.00004914	9
7	806	0.00019501	0.00005303	0.00001488	11
8	870	0.00121151	0.00032576	0.00009442	11
9	839	0.00077731	0.00020901	0.00006058	27
10	863	0.00032475	0.00008732	0.00002531	10
11	719	0.00081210	0.00022638	0.00005910	17
12	659	0.00038520	0.00011053	0.00002647	16
13	740	0.00042521	0.00011853	0.00003094	12
14	656	0.00056903	0.00016327	0.00003910	14
15	811	0.00058849	0.00016002	0.00004491	15
16	851	0.00065330	0.00017566	0.00005091	14
17	819	0.00060375	0.00016417	0.00004608	23
18	871	0.00081377	0.00021881	0.00006342	8
19	750	0.00090522	0.00025234	0.00006588	7
20	870	0.00088302	0.00023743	0.00006882	19
21	869	0.00094689	0.00025461	0.00007379	16
22	818	0.00081026	0.00022032	0.00006184	18
23	872	0.00085079	0.00022877	0.00006630	10
24	851	0.00098049	0.00026364	0.00007641	12
25	861	0.00062140	0.00016709	0.00004843	28
26	846	0.00074816	0.00020117	0.00005831	28
27	852	0.00087687	0.00023578	0.00006834	11
28	852	0.00010687	0.00002874	0.00000833	11
29	847	0.00082956	0.00022306	0.00006465	52
30	824	0.00100609	0.00027357	0.00007679	31
KCSPI	880	0.00013057	0.00003474	0.00001037	6

(Notes)
N: The number of observations.
Autocovar: The value of autocovarience.
Upper Lim.: The spectral value of upper limit.
Lower Lim.: The spectral value of lower limit.
Out: The number of observations outside of both limits.

Appendix 7.6(2) Results of Spectral Analysis.
(1986-1988, 5% significance level)

Sample	N	Autocovar	Upper Lim.	Lower Lim.	Out
51	873	0.00058331	0.00015521	0.00004634	13
52	811	0.00029793	0.00008101	0.00002274	12
53	789	0.00031351	0.00008627	0.00002339	20
54	859	0.00040504	0.00010891	0.00003157	7
55	696	0.00048153	0.00013611	0.00003410	19
56	795	0.00045683	0.00012422	0.00003487	45
57	851	0.00051686	0.00013898	0.00004028	23
58	876	0.00048969	0.00013030	0.00003891	12
59	876	0.00043946	0.00011693	0.00003491	13
60	867	0.00042823	0.00011515	0.00003337	21
61	778	0.00047467	0.00013062	0.00003541	13
62	793	0.00041193	0.00011201	0.00003144	11
63	874	0.00039240	0.00010441	0.00003118	27
64	814	0.00029488	0.00008018	0.00002251	19
65	851	0.00078466	0.00021098	0.00006115	16
66	873	0.00051156	0.00013612	0.00004064	9
67	866	0.00062194	0.00016723	0.00004847	5
68	876	0.00055866	0.00014865	0.00004439	11
69	852	0.00042773	0.00011501	0.00003333	7
70	876	0.00053026	0.00014109	0.00004213	11
71	876	0.00060014	0.00015969	0.00004768	14
72	876	0.00042670	0.00011354	0.00003390	19
73	873	0.00040886	0.00010879	0.00003248	14
74	873	0.00061257	0.00016299	0.00004867	9
75	852	0.00087720	0.00023587	0.00006836	11
76	860	0.00051618	0.00013879	0.00004023	16
77	876	0.00056964	0.00015157	0.00004526	22
78	870	0.00059968	0.00016125	0.00004673	12
79	873	0.00065584	0.00017451	0.00005211	8
80	855	0.00076987	0.00020701	0.00006000	7
81	739	0.00082066	0.00022876	0.00005972	12
82	700	0.00067000	0.00018938	0.00004745	19
83	833	0.00076251	0.00020503	0.00005942	34
84	635	0.00198111	0.00056844	0.00013613	13
KCSPI	876	0.00016803	0.00004471	0.00001335	11

Appendix 7.6(3) Results of Spectral Analysis (1978-1980, 10% significance level)

Sample	N	Autocovar	Upper Lim.	Lower Lim.	Out
1	857	0.00027680	0.00006854	0.00002432	21
2	638	0.00042754	0.00011183	0.00003386	31
3	813	0.00058745	0.00014684	0.00005073	34
4	776	0.00029646	0.00007485	0.00002512	25
5	643	0.00208018	0.00054412	0.00016474	15
6	385	0.00102894	0.00030785	0.00006050	18
7	806	0.00019501	0.00004874	0.00001684	20
8	870	0.00121151	0.00029997	0.00010643	23
9	839	0.00077731	0.00019246	0.00006829	40
10	863	0.00032475	0.00008041	0.00002853	15
11	719	0.00081210	0.00020730	0.00006743	26
12	659	0.00038520	0.00010076	0.00003051	21
13	740	0.00042521	0.00010854	0.00003530	23
14	656	0.00056903	0.00014884	0.00004506	25
15	811	0.00058849	0.00014710	0.00005081	23
16	851	0.00065330	0.00016176	0.00005739	29
17	819	0.00060375	0.00015091	0.00005213	37
18	871	0.00081377	0.00020149	0.00007149	15
19	750	0.00090522	0.00023107	0.00007516	16
20	870	0.00088302	0.00021864	0.00007757	30
21	869	0.00094689	0.00023445	0.00008318	24
22	818	0.00081026	0.00020253	0.00006996	31
23	872	0.00085079	0.00021066	0.00007474	20
24	851	0.00098049	0.00024277	0.00008613	16
25	861	0.00062140	0.00015386	0.00005459	37
26	846	0.00074816	0.00018525	0.00006572	45
27	852	0.00087687	0.00021712	0.00007703	23
28	852	0.00010687	0.00002646	0.00000939	21
29	847	0.00082956	0.00020540	0.00007288	68
30	824	0.00100609	0.00025148	0.00008687	36
KCSPI	880	0.00013057	0.00003205	0.00001165	10

Appendix 7.6(4) Results of Spectral Analysis (1986-1988, 10% significance level)

Sample	N	Autocovar	Upper Lim.	Lower Lim.	Out
51	873	0.00058331	0.00014316	0.00005206	19
52	811	0.00029793	0.00007447	0.00002573	23
53	789	0.00031351	0.00007916	0.00002657	28
54	859	0.00040504	0.00010029	0.00003558	10
55	696	0.00048153	0.00012437	0.00003909	25
56	795	0.00045683	0.00011419	0.00003945	65
57	851	0.00051686	0.00012798	0.00004541	34
58	876	0.00048969	0.00012018	0.00004371	25
59	876	0.00043946	0.00010785	0.00003922	29
60	867	0.00042823	0.00010603	0.00003762	28
61	778	0.00047467	0.00011985	0.00004023	22
62	793	0.00041193	0.00010296	0.00003557	25
63	874	0.00039240	0.00009630	0.00003502	42
64	814	0.00029488	0.00007371	0.00002546	27
65	851	0.00078466	0.00019428	0.00006893	23
66	873	0.00051156	0.00012555	0.00004566	17
67	866	0.00062194	0.00015399	0.00005464	15
68	876	0.00055866	0.00013711	0.00004986	19
69	852	0.00042773	0.00010591	0.00003758	16
70	876	0.00053026	0.00013014	0.00004733	18
71	876	0.00060014	0.00014729	0.00005357	23
72	876	0.00042670	0.00010472	0.00003809	33
73	873	0.00040886	0.00010034	0.00003649	25
74	873	0.00061257	0.00015034	0.00005468	21
75	852	0.00087720	0.00021720	0.00007706	16
76	860	0.00051618	0.00012781	0.00004535	28
77	876	0.00056964	0.00013980	0.00005084	29
78	870	0.00059968	0.00014848	0.00005268	20
79	873	0.00065584	0.00016096	0.00005854	19
80	855	0.00076987	0.00019062	0.00006763	12
81	739	0.00082066	0.00020948	0.00006814	22
82	700	0.00067000	0.00017304	0.00005439	36
83	833	0.00076251	0.00018880	0.00006699	45
84	635	0.00198111	0.00051821	0.00015690	25
KCSPI	876	0.00016803	0.00004124	0.00001500	23

Appendix 8.1 Samples used for semi-strong form efficiency tests

No	Company	Announcement-date	Ex-date	Ratio
1	Samhwa Crown & Closure	02/03/85	13/03/85	0.5
2	Sampyo Foods	28/08/85	29/09/85	0.3
3	Chunil Express	05/12/85	20/12/85	0.336
4	Jeil Mool San	30/04/86	01/06/86	0.5
5	Hankook Tire	26/07/86	13/08/86	0.33
6	Dongil Textile	20/08/86	11/09/86	0.33333
7	Gwangduk Moolsan	11/10/86	30/10/86	0.296849
8	Samyoung Electronics	17/11/86	28/11/86	0.7
9	Korea Electronics	08/12/86	21/12/86	0.35
10	Taechang Enterprise	26/01/87	09/02/87	0.3
11	Samhwa Crown & Closure	30/05/87	15/06/87	0.3
12	Chonbang	02/07/87	13/07/87	0.288244
13	Choheung Chemical Ind	19/09/87	14/10/87	0.5
14	Korea Cast Iron Pipe	23/11/87	13/12/87	0.33779
15	Jinyung	05/01/88	14/02/88	0.9
16	Samyoung Electronics	22/01/88	14/02/88	0.5
17	Ilshin Spinning	09/03/88	24/03/88	0.5
18	Paik Kwang Chemical	03/05/88	30/05/88	0.5
19	Dongil Textile	28/07/88	31/08/88	0.25
20	Youlchon Chemical	09/11/88	29/11/88	0.5
21	Sam A Alminium	12/10/88	30/10/88	0.5
22	Shinpoong Paper	03/12/88	01/01/89	0.25
23	Ilyang Pharmacy	08/03/85	31/03/85	0.2
24	Ildong Pharmacy	13/03/85	31/03/85	0.2
25	Hanil Pharmacy	13/03/85	31/03/85	0.15
26	Korea Green Cross	20/03/85	31/03/85	0.15
27	Miwon	25/09/85	14/10/85	0.231527
28	Hanil Development	20/11/85	01/01/86	0.2
29	Maxon Electronics	11/12/85	01/01/86	0.2
30	Samhwa Crown & Closure	05/03/86	14/03/86	0.2
31	Namyeung	03/09/87	29/09/87	0.17647
32	Tongyang Nylon	13/10/87	27/10/87	0.190424374
33	Kyungbang	02/12/87	20/12/87	0.2
34	Jindo	26/03/88	10/04/88	0.24
35	Ilyang Pharmacy	09/06/88	29/06/88	0.1904
36	Sam Mi Steel	23/08/88	14/09/88	0.15
37	Samik Musical Instrume	12/11/88	15/12/88	0.2
38	Choongnam Spinning	05/03/86	29/04/86	0.2
39	Mando Machinery	23/11/88	01/01/89	0.201923
40	Kolon Chemical	03/12/88	01/01/89	0.2
41	Saehan Media	12/12/88	01/01/89	0.2157
42	Tong Yang Cement	08/03/85	31/05/85	0.1
43	Dong-A Pharmacy	13/03/85	31/03/85	0.1
44	Youngjin Pharmacy	18/05/85	28/06/85	0.1454
45	Samsung Electron Devic	21/09/85	31/10/85	0.1
46	Korea Iron & Steel Wor	19/12/85	01/01/86	0.14285
47	Shinpoong Paper	19/12/85	01/01/86	0.1
48	Korea Green Cross	11/03/86	31/03/86	0.065217
49	Dong-A Pharmacy	14/03/86	31/03/86	0.1
50	Samsung Electro-Mechan	17/04/86	25/05/86	0.090909

51	Han Dok Remedia Ind	08/12/86	31/12/86	0.1428571
52	Pusan Steel Pipe	08/12/86	01/01/87	0.1063821
53	Dongwha Pharmacy	09/02/87	31/03/87	0.064516
54	Hankuk Glass	03/09/87	29/09/87	0.11365636
55	Yukong	05/09/87	14/10/87	0.082170971
56	Samhwa Capacitor	21/10/87	12/11/87	0.13037037
57	Hanil Development	02/11/87	29/11/87	0.05
58	Samyang	10/11/87	25/11/87	0.1
59	Yuhan	15/12/87	01/01/88	0.105769
60	Pusan Steel Pipe	15/12/87	01/01/88	0.105769
61	Ildong Pharmacy	09/06/88	28/06/88	0.1
62	Yuhan	12/12/88	01/01/89	0.05

(Note)
Ratio: the ratio of bonus stock issue per share.
0.336, for instance, means the bonus stock distribution of 0.336 shares per each holding share.
Announcement-data: The announcement date of bonus stock issue.
Ex-date: The ex-right date.

Appendix 8.2 PDR, CPDR, % returns greater than zero (unadjusted data)

ED	P D R	C P D R	% returns>0
-40	-0.001942	-0.001942	32.258
-39	-0.001238	-0.003180	24.194
-38	0.001935	-0.001246	33.871
-37	0.002268	0.001022	37.097
-36	0.001008	0.002030	22.581
-35	-0.000011	0.002019	25.806
-34	-0.002713	-0.000694	20.968
-33	0.002405	0.001710	35.484
-32	0.004546	0.006256	32.258
-31	0.004799	0.011055	40.323
-30	0.001063	0.012117	35.484
-29	0.000107	0.012224	30.645
-28	0.001408	0.013633	29.032
-27	0.004479	0.018111	37.097
-26	0.000313	0.018425	29.032
-25	0.000664	0.019088	29.032
-24	0.000740	0.019829	32.258
-23	0.004245	0.024074	35.484
-22	0.002759	0.026833	35.484
-21	0.003768	0.030601	37.097
-20	0.006577	0.037178	37.097
-19	0.006191	0.043368	41.935
-18	0.006451	0.049819	37.097
-17	0.003392	0.053211	32.258
-16	0.008608	0.061819	46.774
-15	0.005713	0.067531	45.161
-14	0.002224	0.069755	37.097
-13	0.007980	0.077735	43.548
-12	0.008341	0.086076	45.161
-11	0.002949	0.089025	32.258
-10	0.002515	0.091539	37.097
-9	0.001498	0.093037	33.871
-8	0.009322	0.102359	46.774
-7	0.007794	0.110153	40.323
-6	0.007763	0.117916	51.613
-5	0.004857	0.122773	38.710
-4	0.005572	0.128345	48.387
-3	0.009469	0.137815	48.387
-2	0.008370	0.146184	53.226
-1	0.011901	0.158086	66.129
0	0.014482	0.172568	59.677
1	0.015315	0.187882	58.065
2	0.011269	0.199151	51.613
3	0.004678	0.203829	43.548
4	0.000203	0.204032	32.258
5	-0.001222	0.202810	38.710
6	0.001441	0.204251	45.161
7	0.004603	0.208854	41.935
8	0.009077	0.217931	51.613
9	0.002772	0.220703	40.323
10	0.001226	0.221929	22.581
11	0.002913	0.224842	37.097
12	0.002403	0.227245	30.645
13	0.003070	0.230315	35.484
14	0.000266	0.230580	33.871
15	0.001480	0.232060	29.032
16	0.002735	0.234795	41.935
17	0.004643	0.239438	41.935
18	0.004434	0.243872	50.000
19	0.000558	0.244431	30.645
20	0.005579	0.250010	46.774
21	0.003502	0.253512	33.871
22	0.008704	0.262216	48.387
23	0.006364	0.268580	43.548
24	0.006207	0.274787	41.935
25	0.005044	0.279831	40.323
26	0.001907	0.281738	37.097
27	0.000325	0.282063	35.484
28	-0.001842	0.280221	24.194
29	0.007319	0.287540	41.935
30	-0.002128	0.285411	29.032
Mean Avr.	0.004020		38.551
Std. Dev.	0.003823		8.993

(Notes)

ED : Event date.

PDR : Portfolio daily return.

CPDR : Cummulative portfolio daily return.

% returns>0 : Percentage of returns greater than zero.

Appendix 8.3 PDR, CPDR, % returns greater than zero (adjusted data)

ED	P D R	C P D R	% returns>0
-40	-0.001534	-0.001534	50.000
-39	-0.003219	-0.004753	30.645
-38	0.001936	-0.002817	54.839
-37	-0.000804	-0.003620	48.387
-36	0.001427	-0.002194	46.774
-35	0.000080	-0.002114	43.548
-34	-0.002545	-0.004659	37.097
-33	0.000579	-0.004079	45.161
-32	0.003109	-0.000971	58.065
-31	0.001444	0.000473	48.387
-30	-0.000487	-0.000014	48.387
-29	-0.000129	-0.000143	43.548
-28	0.002381	0.002238	53.226
-27	0.003608	0.005847	61.290
-26	-0.002626	0.003221	43.548
-25	-0.000885	0.002335	43.548
-24	-0.000731	0.001605	48.387
-23	0.000934	0.002538	45.161
-22	0.001774	0.004312	51.613
-21	0.005536	0.009848	69.355
-20	0.001746	0.011594	46.774
-19	0.004492	0.016087	59.677
-18	0.005518	0.021605	58.065
-17	0.000759	0.022363	43.548
-16	0.005590	0.027953	59.677
-15	0.005537	0.033490	58.065
-14	-0.001343	0.032148	41.935
-13	0.004851	0.036999	59.677
-12	0.004476	0.041475	51.613
-11	0.003482	0.044957	48.387
-10	0.001220	0.046177	56.452
-9	0.001334	0.047511	48.387
-8	0.005541	0.053052	53.226
-7	0.005637	0.058689	51.613
-6	0.008414	0.067104	61.290
-5	0.002486	0.069590	48.387
-4	0.004063	0.073652	56.452
-3	0.003608	0.077260	53.226
-2	0.008606	0.085865	69.355
-1	0.010652	0.096518	72.581
0	0.012608	0.109126	72.581
1	0.013856	0.122983	66.129
2	0.006717	0.129700	48.387
3	0.004763	0.134463	51.613
4	-0.000212	0.134251	37.097
5	-0.003306	0.130945	37.097
6	-0.001542	0.129402	48.387
7	0.001714	0.131116	50.000
8	0.004780	0.135897	56.452
9	0.001776	0.137672	51.613
10	0.002057	0.139730	45.161
11	0.002764	0.142494	45.161
12	-0.001010	0.141483	40.323
13	0.000627	0.142110	48.387
14	-0.001478	0.140632	40.323
15	-0.000800	0.139832	41.935
16	0.002039	0.141871	50.000
17	0.000836	0.142707	48.387
18	0.002647	0.145354	53.226
19	-0.003389	0.141965	40.323
20	0.001489	0.143454	53.226
21	0.005898	0.149352	59.677
22	0.003343	0.152695	50.000
23	0.002339	0.155034	54.839
24	0.002593	0.157627	58.065
25	0.005153	0.162780	51.613
26	-0.000635	0.162145	38.710
27	-0.001089	0.161056	53.226
28	-0.003012	0.158044	38.710
29	0.002932	0.160976	59.677
30	-0.002043	0.158933	43.548
Mean Avr.	0.002238		50.750
Std. Dev.	0.003562		8.582

Appendix 8.4 Standardised portfolio returns.

ED	Unadjusted Data	Adjusted Data
-40	-1.0771364	-0.6619037
-39	-0.9246482	-1.0559646
-38	-0.2340945	0.1494516
-37	-0.1600288	-0.4912546
-36	-0.4345076	0.0304299
-35	-0.6567047	-0.2845450
-34	-1.2448734	-0.8983602
-33	-0.1317096	-0.1678616
-32	0.3366471	0.4237393
-31	0.3911071	0.0344051
-30	-0.4236156	-0.4171291
-29	-0.6305639	-0.3334164
-28	-0.3473715	0.2535079
-27	0.3213982	0.5404227
-26	-0.5869958	-0.9173008
-25	-0.5107517	-0.5101951
-24	-0.4933245	-0.4741847
-23	0.2712950	-0.0848504
-22	-0.0532871	0.1115704
-21	0.1667316	0.9912553
-20	0.7788627	0.1050231
-19	0.6939051	0.7471323
-18	0.7505436	0.9870464
-17	0.0839523	-0.1257714
-16	1.2210786	1.0038824
-15	0.5893418	0.9914892
-14	-0.1709209	-0.6172913
-13	1.0838393	0.8310788
-12	1.1622617	0.7433909
-11	-0.0118974	0.5109596
-10	-0.1077472	-0.0179738
-9	-0.3277659	0.0086833
-8	1.3757453	0.9924246
-7	1.0424496	1.0148727
-6	1.0359143	1.6642307
-5	0.4041775	0.2780605
-4	0.5588441	0.6468173
-3	1.4084213	0.5404227
-2	1.1687969	1.7091268
-1	1.9377732	2.1875520
0	2.4998012	2.6449320
1	2.6806085	2.9367573
2	1.8005337	1.2674137
3	0.3649662	0.8105014
4	-0.6109582	-0.3528246
5	-0.9202914	-1.0763081
6	-0.3408363	-0.6638243
7	0.3475390	0.0975404
8	1.3234636	0.8144765
9	-0.0511087	0.1120381
10	-0.3865827	0.1777456
11	-0.0206110	0.3430665
12	-0.1317096	-0.5394244
13	0.0142434	-0.1566376
14	-0.5957094	-0.6488589
15	-0.3321227	-0.4903193
16	-0.0598223	0.1735365
17	0.3562526	-0.1077662
18	0.3105062	0.3157078
19	-0.5325357	-1.0957165
20	0.5610225	0.0449277
21	0.1079147	1.0759035
22	1.2406843	0.4784566
23	0.7309379	0.2436869
24	0.6982619	0.3030808
25	0.4433888	0.9016967
26	-0.2384513	-0.4517365
27	-0.5826390	-0.5578973
28	-1.0553523	-1.0075608
29	0.9400646	0.3823506
30	-1.1185260	-0.7809753
CPRA	0.003005	0.001297
Std Dev	0.004591	0.004277

Appendix 9.1 Average return of recommended stocks.
(Naive results)

1. Broker 1.

Day	AR	t(AR)	CAR	t(CAR)
-10	0.5844	2.7456		
-9	0.5960	2.8001		
-8	0.8053	3.7834		
-7	0.7439	3.4953		
-6	0.3412	1.6033		
-5	0.0783	0.3677		
-4	0.3672	1.7253		
-3	0.7031	3.3037		
-2	0.8952	4.2062		
-1	0.6147	2.8882		
0	0.1758	0.8260	0.1758	0.3013
1	0.3646	1.7129	0.5404	0.9260
2	1.0199	4.7918	1.5602	2.6736
3	0.2842	1.3355	1.8445	3.1607
4	0.5506	2.5871	2.3951	4.1042
5	0.4518	2.1229	2.8469	4.8784
6	-0.0213	-0.1002	2.8256	4.8419
7	0.1574	0.7394	2.9830	5.1116
8	0.6605	3.1034	3.6435	6.2434
9	-0.0300	-0.1410	3.6135	6.1920
10	0.3322	1.5610	3.9457	6.7613
11	-0.0752	-0.3534	3.8705	6.6324
12	-0.0418	-0.1965	3.8287	6.5607
13	-0.0284	-0.1333	3.8003	6.5121
14	0.2003	0.9410	4.0006	6.8553
15	0.5008	2.3527	4.5014	7.7134
16	0.2514	1.1811	4.7528	8.1442
17	0.0732	0.3438	4.8259	8.2696
18	0.4486	2.1077	5.2745	9.0382
19	0.2551	1.1986	5.5296	9.4754
20	-0.0791	-0.3718	5.4505	9.3398
21	-0.1120	-0.5264	5.3385	9.1478
22	0.0051	0.0238	5.3435	9.1565
23	0.4563	2.1438	5.7998	9.9383
24	0.3645	1.7126	6.1643	10.5630
25	0.7991	3.7544	6.9634	11.9322
26	0.0244	0.1148	6.9878	11.9741
27	0.0737	0.3464	7.0615	12.1004
28	0.2769	1.3010	7.3384	12.5749
29	-0.0396	-0.1860	7.2988	12.5071
30	-0.0574	-0.2695	7.2415	12.4088
31	0.3988	1.8739	7.6403	13.0922
32	-0.4725	-2.2198	7.1679	12.2826
33	0.2288	1.0749	7.3966	12.6746
34	-0.5020	-2.3585	6.8947	11.8145
35	-0.1750	-0.8223	6.7196	11.5146
36	0.0193	0.0909	6.7390	11.5477
37	0.3481	1.6355	7.0871	12.1442
38	-0.2057	-0.9663	6.8814	11.7918
39	-0.0792	-0.3720	6.8022	11.6561
40	-0.1518	-0.7134	6.6504	11.3959
41	-0.1325	-0.6225	6.5179	11.1689
42	0.5546	2.6059	7.0726	12.1193
43	0.1737	0.8161	7.2462	12.4169
44	-0.0370	-0.1740	7.2092	12.3535
45	0.2266	1.0648	7.4358	12.7418
46	-0.1356	-0.6372	7.3002	12.5094
47	0.3513	1.6503	7.6515	13.1113
Average	0.3126	1.4689	4.4510	7.6271

(Notes) AR: Average total return. t(AR): t-statistics for ARs.
CAR: Cumulative average total return.
t(CAR): t-statistics for CARs.

2. Broker 2.

Day	AR	t(AR)	CAR	t(CAR)
-10	0.6749	3.6536		
-9	0.3230	1.7486		
-8	0.9591	5.1920		
-7	0.4210	2.2789		
-6	0.5337	2.8891		
-5	0.1969	1.0661		
-4	0.6995	3.7866		
-3	1.0644	5.7619		
-2	0.6865	3.7163		
-1	0.8495	4.5986		
0	0.4687	2.5371	0.4687	1.4405
1	0.9545	5.1669	1.4231	4.3740
2	1.0604	5.7403	2.4836	7.6332
3	-0.1135	-0.6142	2.3701	7.2845
4	0.0722	0.3909	2.4423	7.5064
5	-0.5774	-3.1258	1.8649	5.7317
6	-0.1788	-0.9677	1.6861	5.1823
7	-0.1515	-0.8202	1.5346	4.7166
8	0.8338	4.5137	2.3684	7.2794
9	0.0253	0.1368	2.3937	7.3570
10	-0.3052	-1.6519	2.0885	6.4191
11	0.3669	1.9864	2.4555	7.5469
12	0.0748	0.4050	2.5303	7.7769
13	0.0272	0.1473	2.5575	7.8605
14	-0.0466	-0.2522	2.5109	7.7173
15	0.2880	1.5590	2.7989	8.6025
16	-0.2064	-1.1171	2.5926	7.9682
17	0.1152	0.6238	2.7078	8.3224
18	0.2906	1.5731	2.9984	9.2155
19	-0.0141	-0.0763	2.9843	9.1722
20	-0.0715	-0.3870	2.9128	8.9525
21	0.0834	0.4513	2.9962	9.2087
22	-0.2098	-1.1356	2.7864	8.5640
23	0.5183	2.8055	3.3046	10.1568
24	0.2980	1.6134	3.6027	11.0728
25	0.4596	2.4878	4.0622	12.4853
26	-0.7319	-3.9620	3.3304	10.2358
27	-0.0766	-0.4145	3.2538	10.0005
28	-0.1340	-0.7256	3.1197	9.5885
29	0.2275	1.2315	3.3472	10.2877
30	0.2392	1.2947	3.5864	11.0228
31	0.1713	0.9275	3.7577	11.5494
32	0.0244	0.1319	3.7821	11.6243
33	0.2802	1.5166	4.0623	12.4854
34	-0.1827	-0.9890	3.8796	11.9239
35	-0.0159	-0.0858	3.8637	11.8752
36	0.0456	0.2466	3.9093	12.0152
37	0.3728	2.0179	4.2821	13.1609
38	-0.4203	-2.2752	3.8618	11.8691
39	0.1700	0.9205	4.0318	12.3918
40	-0.5131	-2.7776	3.5187	10.8147
41	0.1518	0.8217	3.6705	11.2813
42	0.3033	1.6420	3.9738	12.2136
43	0.1236	0.6692	4.0975	12.5935
44	0.2670	1.4451	4.3644	13.4140
45	0.2471	1.3376	4.6115	14.1735
46	0.1069	0.5785	4.7184	14.5019
47	-0.0738	-0.3996	4.6445	14.2750
Average	0.3293	1.7826	2.5964	7.9801

3. Broker 3.

Day	AR	t(AR)	CAR	t(CAR)
-10	-0.1695	-0.8448		
-9	0.5318	2.6509		
-8	0.6492	3.2360		
-7	0.5029	2.5066		
-6	0.1489	0.7424		
-5	0.4167	2.0769		
-4	0.2386	1.1895		
-3	0.5974	2.9779		
-2	0.9415	4.6928		
-1	0.6634	3.3069		
0	0.4599	2.2925	0.4599	1.3126
1	0.2114	1.0537	0.6713	1.9159
2	0.1297	0.6463	0.8010	2.2859
3	0.7941	3.9580	1.5950	4.5521
4	-0.1131	-0.5640	1.4819	4.2292
5	0.1307	0.6513	1.6125	4.6021
6	-0.1973	-0.9835	1.4152	4.0390
7	-0.0775	-0.3861	1.3378	3.8179
8	0.0071	0.0355	1.3449	3.8382
9	0.4764	2.3744	1.8212	5.1977
10	0.1553	0.7741	1.9765	5.6409
11	0.0512	0.2553	2.0278	5.7871
12	-0.1391	-0.6935	1.8886	5.3900
13	0.3349	1.6693	2.2235	6.3458
14	0.5448	2.7157	2.7683	7.9006
15	-0.0506	-0.2524	2.7177	7.7561
16	0.6224	3.1024	3.3401	9.5324
17	-0.4039	-2.0131	2.9362	8.3798
18	-0.1993	-0.9933	2.7369	7.8111
19	-0.0659	-0.3286	2.6710	7.6229
20	0.6412	3.1959	3.3122	9.4528
21	-0.0676	-0.3369	3.2446	9.2598
22	0.4052	2.0198	3.6498	10.4163
23	-0.2396	-1.1944	3.4102	9.7325
24	-0.0456	-0.2271	3.3646	9.6024
25	0.1834	0.9141	3.5480	10.1258
26	0.4724	2.3548	4.0204	11.4741
27	-0.3115	-1.5526	3.7089	10.5851
28	0.2120	1.0565	3.9209	11.1900
29	0.0844	0.4207	4.0053	11.4309
30	-0.0476	-0.2371	3.9577	11.2951
31	0.3616	1.8024	4.3193	12.3271
32	0.1139	0.5676	4.4332	12.6521
33	0.0048	0.0239	4.4380	12.6658
34	-0.0752	-0.3748	4.3628	12.4511
35	-0.3538	-1.7635	4.0090	11.4414
36	0.1581	0.7882	4.1671	11.8927
37	0.1184	0.5900	4.2855	12.2305
38	0.0118	0.0589	4.2973	12.2643
39	-0.0365	-0.1818	4.2608	12.1602
40	-0.2624	-1.3078	3.9985	11.4114
41	0.0560	0.2792	4.0545	11.5712
42	0.1352	0.6737	4.1896	11.9569
43	0.0899	0.4482	4.2795	12.2135
44	-0.2025	-1.0093	4.0770	11.6357
45	-0.0326	-0.1627	4.0444	11.5425
46	0.2018	1.0059	4.2462	12.1184
47	-0.0955	-0.4763	4.1507	11.8457
Average	0.2594	1.2930	2.5790	7.3604

4. Broker 4

Day	AR	t(AR)	CAR	t(CAR)
-10	0.9039	4.5012		
-9	0.4107	2.0454		
-8	0.5231	2.6050		
-7	0.7081	3.5262		
-6	0.1169	0.5819		
-5	0.1490	0.7419		
-4	0.7796	3.8823		
-3	1.1608	5.7808		
-2	0.2146	1.0687		
-1	0.2345	1.1678		
0	-0.0278	-0.1386	-0.0278	-0.0594
1	0.2021	1.0064	0.1743	0.3722
2	0.6404	3.1892	0.8147	1.7401
3	0.2651	1.3199	1.0797	2.3062
4	0.4794	2.3874	1.5591	3.3301
5	0.2470	1.2299	1.8061	3.8576
6	0.1432	0.7132	1.9493	4.1635
7	0.4949	2.4646	2.4443	5.2206
8	0.2867	1.4280	2.7310	5.8330
9	0.1045	0.5205	2.8355	6.0563
10	0.0576	0.2866	2.8931	6.1792
11	0.0389	0.1936	2.9319	6.2622
12	0.3920	1.9520	3.3239	7.0994
13	0.2629	1.3093	3.5868	7.6609
14	0.0993	0.4945	3.6861	7.8730
15	0.3436	1.7113	4.0298	8.6070
16	0.0755	0.3759	4.1052	8.7682
17	-0.2197	-1.0939	3.8856	8.2991
18	0.2050	1.0206	4.0905	8.7368
19	0.4553	2.2671	4.5458	9.7092
20	-0.2359	-1.1750	4.3099	9.2052
21	0.1236	0.6153	4.4334	9.4691
22	-0.3034	-1.5111	4.1300	8.8210
23	0.3609	1.7973	4.4909	9.5919
24	0.7017	3.4945	5.1926	11.0906
25	0.5199	2.5891	5.7125	12.2011
26	0.1334	0.6642	5.8459	12.4859
27	0.1955	0.9733	6.0413	12.9034
28	-0.0746	-0.3713	5.9668	12.7442
29	-0.0606	-0.3020	5.9061	12.6146
30	0.1279	0.6369	6.0340	12.8878
31	0.2637	1.3134	6.2978	13.4511
32	0.2836	1.4121	6.5813	14.0568
33	-0.2912	-1.4499	6.2902	13.4349
34	0.1486	0.7401	6.4388	13.7524
35	0.1742	0.8675	6.6130	14.1244
36	-0.1678	-0.8355	6.4452	13.7661
37	0.1913	0.9526	6.6365	14.1746
38	-0.2751	-1.3698	6.3615	13.5871
39	-0.2028	-1.0102	6.1586	13.1539
40	-0.1404	-0.6990	6.0182	12.8541
41	0.4345	2.1637	6.4527	13.7821
42	0.3923	1.9534	6.8450	14.6199
43	0.3037	1.5125	7.1487	15.2686
44	0.1654	0.8236	7.3141	15.6219
45	0.2455	1.2225	7.5596	16.1462
46	-0.4581	-2.2812	7.1015	15.1678
47	0.7566	3.7678	7.8581	16.7838
Average	0.3099	1.5432	3.8739	8.2740

5. Total samples (467 recommendations).

Day	AR	t(AR)	CAR	t(CAR)
-10	0.4978	4.9679		
-9	0.4573	4.5636		
-8	0.7394	7.3789		
-7	0.5764	5.7520		
-6	0.2979	2.9731		
-5	0.2148	2.1433		
-4	0.5298	5.2877		
-3	0.8909	8.8909		
-2	0.6803	6.7894		
-1	0.5992	5.9802		
0	0.2798	2.7926	0.2798	1.3434
1	0.4515	4.5061	0.7313	3.5111
2	0.7122	7.1078	1.4435	6.9303
3	0.2968	2.9621	1.7403	8.3552
4	0.2305	2.3002	1.9708	9.4617
5	0.0306	0.3055	2.0014	9.6086
6	-0.0695	-0.6940	1.9319	9.2748
7	0.0819	0.8171	2.0138	9.6679
8	0.4519	4.5104	2.4657	11.8376
9	0.1473	1.4703	2.6131	12.5449
10	0.0408	0.4074	2.6539	12.7409
11	0.1096	1.0937	2.7635	13.2670
12	0.0920	0.9186	2.8555	13.7089
13	0.1299	1.2965	2.9854	14.3326
14	0.1785	1.7811	3.1639	15.1894
15	0.2628	2.6226	3.4267	16.4510
16	0.1734	1.7302	3.6000	17.2833
17	-0.1087	-1.0849	3.4913	16.7614
18	0.1798	1.7945	3.6711	17.6247
19	0.1475	1.4725	3.8187	18.3330
20	0.0726	0.7246	3.8913	18.6816
21	0.0067	0.0667	3.8980	18.7137
22	-0.0306	-0.3055	3.8674	18.5667
23	0.2743	2.7371	4.1416	19.8834
24	0.3251	3.2446	4.4667	21.4442
25	0.4791	4.7815	4.9459	23.7444
26	-0.0478	-0.4768	4.8981	23.5150
27	-0.0362	-0.3613	4.8619	23.3412
28	0.0583	0.5822	4.9202	23.6213
29	0.0623	0.6216	4.9825	23.9203
30	0.0739	0.7380	5.0565	24.2753
31	0.2921	2.9155	5.3486	25.6778
32	0.0020	0.0201	5.3506	25.6875
33	0.0580	0.5786	5.4086	25.9658
34	-0.1440	-1.4372	5.2646	25.2745
35	-0.0891	-0.8890	5.1755	24.8468
36	0.0156	0.1560	5.1911	24.9219
37	0.2577	2.5718	5.4488	26.1591
38	-0.2189	-2.1846	5.2299	25.1081
39	-0.0344	-0.3432	5.1955	24.9431
40	-0.2855	-2.8497	4.9100	23.5722
41	0.1132	1.1295	5.0232	24.1156
42	0.3315	3.3081	5.3546	25.7069
43	0.1293	1.2903	5.4839	26.3276
44	0.0506	0.5051	5.5345	26.5706
45	0.1682	1.6784	5.7027	27.3780
46	-0.0668	-0.6670	5.6359	27.0571
47	0.2288	2.2837	5.8647	28.1556
Average	0.2347	2.3421	3.2875	15.7828

APPENDIX 9.2 SAMPLES OF STRONG FORM EMPIRICAL TESTS.

I. General lists of recommended stocks.

(1). Foods and Beverages.

1. Dong Bang Oil & Flour Mills
2. Nhong Shim
3. Hai Tai Confectionery.
4. Tong Yang Confectionery.
5. Mi Won.
6. Oriental Brewery.
132. Miwon Foods.
133. Sun Hill Glucose.
134. Lotte Chilsung Beverage.

(2). Textile, Wearing apparel and Leather industries.

7. Choong Nam Spinning.
8. Cheil Wool Textile.
9. Korea Hapsum.
10. Sun Kyong Industries.
11. Che Il Synthetic Textile
12. Ssang Bang Wool
13. Tae Jon Leather
135. Tongyang Nylon.

(3). Wood and Paper

14. Sun Chang Ind.
15. Chon Ju Paper
16. Se Poong
17. Dong Shin Paper

(4). Chemical Petroleum and Pharmacy

18. Korea Pacific Chemical
19. Lucky
20. Sae Han Media
21. Han Nam Chemical
22. Cho Kwang Paint
23. Pacific Chemical
24. Lucky Advanced Materials
25. Yu Kong
26. Sam Chully Ind.
27. STC Inc.
28. Ssang Yong Oil refining
29. Korea Titanum
30. Kyung In Energy
31. Kum Ho Petroleum & Chemical
32. Kum Ho
33. Dong-A Pharm.
34. Young Jin Pharm
35. Il Sung Corp.
136. Korea Chemical.
137. Hanil Pharmacy.

(5). Nonmetallic Mineral Products

36. Cho Sun Refractories
37. Asia Cement
38. Ssang Yong Cement
39. Hyun Dai Cement
40. Tong Yang Cement
41. Byuck San
42. Keum Kang
43. Jindo
44. Tong Yang Lithography

(6). Basic Metal Industry

45. Kang Won Ind.
46. Dong Bu Steel

47. Pusan Steel Pipe
48. Korea Steel Pipe
49. In Cheon Iron & Steel
50. Sam Mi Steel
51. Lucky Mining & Smelting
52. Dae Han Alminum

(7). Fabricated Metal Products, Machinery & Equipment

53. Daewoo Heavy Ind.
54. Sam Sung Aero Space Ind.
55. Mando Machinery
56. Gold Star Instrument & Electric
57. Gold Star
58. Sam Sung Electronics
59. Daewoo Electronics
60. A-Nam Ind.
61. Orion Electric
62. Tai Han Electric Wire
63. Gold Star Wire
64. Yeon Hab Electric Cable
65. Gold Star Electric Machinery
66. Gold Star Electric
67. Sunny-EMI
68. Daewoo Telecom
69. Ki-A Motors
70. Hyun Dai Motor
71. Dae Won Kang Up
72. Ssangyong Motors
73. Tong Il
74. Han Dock
138. Inkel
139. Nawoo Precision
140. Samsung Telecom.

(8). General Construction

75. Sam Sung Construction
76. Sam Whan Corporation
77. Dong-A Construction
78. Dae Lim Ind.
79. Shin Sung
80. Kuk Dong Construction
81. Han Il Development
82. Poong Lim Ind.
83. Lucky Development
84. Kwang Ju Highway Lines
85. Hyun Dai Eng. & Const.
86. Shinwha Construction
87. Pacific Development
141. Miryung Construction
142. Dongsan Construction

(9). Wholesale and Retail

88. Sam Mi
89. Daewoo
90. Lucky Gold Star Int'l
91. Ssang Yong
92. Sun Kyung
93. Hyun Dai Corp.
94. Hyo Sung
95. Dong Bu Ind.
96. Dae Sung Ind.
97. Kolon International
98. Midopa Department Store
143. Samsung Corp.
144. Shinsaehae Department Store

(10). Banking, Finance and Insurance

146. Long-term Credit Bank
99. The first Bank of Korea
100. Bank of Seoul

101. Hanil Bank
102. Commercial Bank of Korea
103. Cho Hung Bank
104. Pusan Bank
105. Kyunggi Bank
106. Chunbook Bank
107. Daegoo Bank
108. Kyungnam Bank
109. Kwangjoo Bank
110. Choongbook Bank
111. kangwon Bank
112. Korea Investment & Finance
113. Dae Han Investment & Finance
114. Daewoo Investment & Finance
115. Kum Sung Investment & Finance
116. Kwangjoo Inmvestment & Finance
117. Choong Ang Investment & Finance
118. Dong Suh Securities
119. Daewoo Securities
120. Daishin Securities
121. Coryo Securities
122. Lucky Securities
123. Hanshin Securities
124. Ssangyong Securities
125. Shinyoung Securities
126. Hyundai Securities
127. First Fire and Marine Insurance
147. Seoul Investment and Finance
148. Haedong Fire and Marine Insurance

(11). Transport and Others

128. The Korea Express
129. Korean Air
130. Oyang Fisheries
131. Korea Tungsten Mining
149. Hanjin Corp.

II. Weekly recommended stocks.

Week	Broker 1	Broker 2	Broker 3	Broker 4
11/01/88	19,25,87,95 53,59,69,75 89,109	92,59,49,121 81,85,25,106 99,107	130,88,8,77 101,117,92	11,19,37,57 81,101,111, 123
18/01/88	122,9,48,83 118,116	108,109,113 73,60	41,72,85,19 119	9,145,50,68 132,98,122, 147
25/01/88		16,24,83,94 100,110,114 43,120	129,20,79, 120	132,17,103, 19,59,144
01/02/88		53,129,95,59	57,73,81,92 99,13	9,26,48,49 57,141,43, 100,119
08/02/88		5,96,62,32, 36,38	1,18,66,78, 80,109,70	133,38,46, 78,92
15/02/88		75,88,111,25	46,57,92,101	135
22/02/88	12,33,40,72 7,124,63,69	70,129,119, 26,59,17,34	10,25,73,2, 21,48	21,138,89
29/02/89	128,120	122		4,9,19,31,48 68,142,101, 106,119
07/03/88	6,26,42,52, 123,85	91,43,49,29, 33,53	50,57,99,118 5,49,18	10,21,38,145 50
14/03/88	33,32,47,89 125		25,129,106, 119,101,86	9,19,46,138, 129
21/03/88	49,59,105	77,88,105,51 50,57,32	76,90,118,89	48,49,88,107 119,148
28/03/88	44,72,129		5,57,104,112	134,19,139
04/04/88	6,64,42,98	71,129,114,61	49,70,117,124	49,56,70,85,

		69,70,16,49		109,147
11/04/88	4,51,65,68 99	15,28,59,76, 99,115,89	25,77,85,56	28,51
18/04/88	59,60,54,100	16,96,57,68, 72,74,98,63	15,129,119	132,42,55
25/04/88	18,53,69,83, 101		6,18,70,74, 126,99	3,49,66,53
02/05/88	5,45,57,88, 98,85	50,69,76,89 101,123,129	5,31,25,55, 118,127,85	129,101
09/05/88	131,38,59	5,26,41,46, 61,91	3,70,77,89, 117,122	5,33,38,49, 94
16/05/88	12,30,50,53 102,56		5,18,37,49, 92	35,46,93
24/05/88	99,27,36,59 82	36,73,79,93 105,115,103	50,69,85, 99	3,12,136,75 140
30/05/88	5,16,74,64, 98,75	59,108,63,94 85,100		5,38,114,77 140,129
07/06/88	12,18,69,89	11,99,49,95, 23	25,57,101,12 20,61	19,35,59, 146
13/06/88	19,43,53,99	5,6,28,54, 115,86	85,113,119	111,101
20/06/88	3,57,101	14,34,57,63 69,128,129	49,72,89	18,137,38, 48
27/06/88	18,42,58,75 100	10,19,53,60 67	18,22,38,57 75	106,110

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