School of Economics and Finance

THE CHINESE STOCK MARKET AND ECONOMIC ACTIVITY

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ABSTRACT

The primary purpose of this research is to perform an empirical test using Arbitrage Pricing Theory (APT) in order to investigate the relationship between the Chinese stock market performance and domestic economic activity.

China's stock market was established in early 1990s and has operated through a period of strong economic growth. Generally, it has been recognized that the development of a sound financial market is necessary to sustain and support a high growth economy. In turn, a growing economy will drive financial market growth. This research is designed to shed light on this unique relationship by investigating the links between China's booming national economy and the domestic stock returns.

Using both time-series and cross-section regressions, several identified macro economic variables are shown to be significant in their influence on stock returns. These variables include the growth rate of industrial production, the growth rate of total social retail sales, the growth rate of terms of trade and the growth rate of total social saving deposits. Stock market indexes are found significantly related to the stock portfolio returns in time-series regressions.

Overall, the empirical results suggest that the rapid growth of the Chinese economy is factored into stock returns by the market. It also indicates that the market index has strong explanatory power over the time-series returns, providing empirical support for the market model Capital Asset Pricing Model (CAPM). However, the explanations of cross-section returns need to be further explored.

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Chapter I
Introduction

China's economic reform and open-door policy was launched in 1979. This reform has provided one of the world's fastest growing economies. By 1996, the Chinese economy (including Hong Kong, Taiwan), in terms of trade, was ranked third in the world (Hsiao 1996). The World Trade Organization has projected that by the year 2020, Mainland China, Hong Kong and Taiwan will form the world's largest economy (Hsiao 1996).

Coinciding with this growing economy, the Chinese expanding equities market has attracted significant attention from domestic investors and from abroad. As one of the emerging equities market, its unique behavior and contribution to the economic growth has provided a new research area in the finance literature. Since the development of the capital market is of critical importance for economic growth, understanding the Chinese stock market is necessary for a greater understanding of the Chinese economy.

I. Background

One of the most interesting and challenging questions in finance literature is the measurement of asset values. Based on the Modern Portfolio Theory represented by Markowitz (1952), the valuation of assets rests on two aspects of the assets, that is, the risk and the return. Additionally, instead of evaluating each asset singly, the Modern Portfolio Theory takes an investor's point of view and evaluates assets in terms of the investor's portfolio (Harrington 1987, p.2).

The Modern Portfolio Theory presumes the perfect market efficiency. Market efficiency theory suggests that all market knowledge of investors will be incorporated into the price of the security, which provides the validity of the securities' technical analysis. An important implication of an efficient capital market is that the stock market reflects fundamental values of macro-economic information. The asset prices are commonly believed to react sensitively to economic changes (Fama 1990).

Empirically, the market efficiency must be tested jointly with an equilibrium-pricing model. It has been mentioned in Fama (1990) that we can only test whether information is properly reflected in prices in the context of a pricing model that defines the meaning of "properly". There are two major types of equilibrium pricing theories that have been advocated in the finance literature. They are Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT).

Generally speaking, the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT) fully adapt the Modern Portfolio theory and explain the asset returns from different angles. The CAPM stresses the co-variance between asset returns and the endogenous market portfolio, while the APT emphasizes the role of the co-variance between asset returns and exogenous factors (Kwon 1994). However, neither of these original models can offer satisfactory explanations of security valuation.

The CAPM rests on a stringent set of assumptions that underlie the Efficient Market Hypothesis and Modern Portfolio Theory (Lee et al. 1990). Those assumptions include the investor's rational behavior, risk-free asset and free transaction, which makes this model restrictive and unrealistic. Theoretically and empirically, one of the most troubling problems for academics and money managers has been that the CAPM's single source of risk is the market (Fama 1990).

Arbitrage Pricing Theory (APT) is an equilibrium-pricing model that expands the original CAPM from the one-factor model to a multi-factor model. It offers many advantages over and above the traditional CAPM in terms of less stringent assumptions while retaining a higher degree of generality. Its intuitive content and

formulations are quite appealing for empirical researchers in finance field. However, the model only describes the factors that are important for a statement about the relationship between expected returns of securities and the common features of those securities (Fama 1990). It says nothing about either the magnitudes or the signs of the factor coefficients, or what the factors themselves might be. It gives the researchers the empirical challenge to determine the number of factors and identify the various economics underlying each factor.

It has been suggested by Fama (1990) that the future research direction should point to the links between time-varying expected returns and business conditions, especially on the relations between the financial market variables that track expected returns and the behavior of output, investment, and saving.

The empirical research of APT has identified two forms. The first form is the proposal derived by Roll and Ross (1980) which involves using statistical techniques to isolate the unobservable factors from share returns time-series and test whether these factors are priced. The second form is an equilibrium model which requires the arbitrary choice of a range of variables that proxy the unobservable factors that determine prices (Chen, Roll and Ross 1986).

Although Roll and Ross (1980) find a number of factors that are significant in pricing, it has been argued that the extracted factors are short of economic meaning (Fama 1990). The most influential empirical test of the APT therefore has been that of Chen, Roll and Ross (1986). Since there is no satisfactory theory to argue the relationship between financial markets and the macro economy, they employ a simple theoretical guide to help choose likely candidates for pervasive state variables. They argue that the systematic forces that influence returns are those which change the discount factors and expected cash flows.

Chen et al. (1986) examine a range of business condition variables that might be related to returns because they are related to shocks to expected future cash flows or discount rates. According to Chen et al. (1986), the most significant variables are the growth rate of industrial production, changes in the risk premium and twists in the

yield curve. Unanticipated inflation and changes in expected inflation play a weaker role.

Chen (1991) relates the stock returns to the state variables and the recent and future growth rates of economic activity. His evidence suggests that the expected excess market return is negatively related to the recent growth of GNP and positively related to its future growth. State variables that are positively (negatively) related to the recent growth of the economy are negatively (positively) related to the expected excess market return, and state variables that are positively (negatively) related to the future growth rates of the economy are positively (negatively) related to the expected excess market return.

Chen's work gives a more complete explanation that relates the ability of the state variables to forecast the market premium to their ability to forecast recent and future growth of the economy. In this way, Chen's work provides a new framework for a market equilibrium model termed as a macro-economic factor model.

Numerous studies have focused on the linkage between stock returns and macro-economic factors: Hung and Kracaw (1984), Fama (1981), Fama (1990), Balvers, Cosimano, and McDonald (1990) emphasize the relationship between economic growth, production and stock returns; Miller and Scholes (1982), Keim (1985), Ferson and Harvey (1991) have stressed the effect of dividend yields on stock returns; Fogler, John, and Tipton (1981), French, Schwert, and Stambaugh (1987) and Campbell (1987) focused on the inter-relationship of interest rate and stock returns. Other works such as those by Fama and Schwert (1977), Fama (1981), Fama and Gibbons (1982), and Pearce and Roley (1985) document the effects of inflation and money on stock returns.

II. International Perspective

The empirical tests of the macro-factor model have been carried out on different economies. For example, Hamao (1988) shows that those changes in expected

inflation, unanticipated changes in risk premium and unanticipated changes in the slope of term structure appear to have had a significant effect on the Japanese stock market. However, Kwon (1994) argues that inflation and interest rate related variables are not important to the Korean stock market. Instead, those variables related to real activities are significant factors, which are different from the US and Japan security market. Fung and Lie (1990) utilize these tests to examine the economic role of the Taiwan stock market in response to changes in economic activities such as GNP and money supply. Their results show that the Taiwan stock market is inefficient because it fails to capture information regarding changes in these economic variables. Groenewold and Fraser (1997) found that the inflation rate was consistently priced in the monthly Australian sectoral share-price index returns, but the significance of other factors depended on their choice of sample period and estimating model. Additionally, Asprem (1989) found that the associations between stock prices and macro-economic variable were strong in Europe.

III. Motivation

Studies on the relationship between stock market returns and fundamental economic activities in the developed countries have been well developed. However, the economic role of the stock markets in relatively less developed Asian countries is less clear. It has been argued that since Asian countries are growing rapidly through economic expansion in international trade and domestic markets, their stock markets are appreciating to reflect their booming economies (Kwon 1994). China is one of these cases.

During the last few years, the Chinese mainland stock market has experienced tremendous growth in both trading volume and market value in accordance with rapid economic development. By the end of June 1998, the total market value of two stock exchanges was about 21,412.14 million-yuan, which accounted for about thirty

per cent of GDP[1](based on 1997) (*The Securities Times* 8th and 9th July 1998). However, due to its short history and lack of data, there is an absence of research into the Chinese mainland stock markets.

Since the development of the capital market is of critical importance for economic growth, understanding the Chinese stock market is necessary for a greater understanding of the Chinese economy. Hence, this research will not only contribute to the empirical tests of the Macro-economic Factor Model; it will also make a significant contribution to the paucity of the research into the Chinese financial markets. Additionally, since this research will question the proper economic functions of the Chinese stock markets and consider the relevance of a more active regulatory environment, it has an important policy implication to the Chinese government.

IV. Objectives and Significance

The main purpose of this research is to examine whether the variability of Chinese stock returns can be explained by the current macro-economy innovations. This study can serve as a paralleling test of the Arbitrage Pricing Theory with macro-factors.

This research will build a standard database for the study of the Chinese stock market. The performance of macro-factors model will be tested by using the Chinese stock market data. By finding the explanatory power of macro-variables over the stock returns, we will get an indication of the relationship between the fast growing economy and the development of the stock market. The empirical results will also show the efficiency of the Chinese stock market by testing whether it is consistent with the growth of the national economy. Furthermore, by incorporating the stock market indexes into the analysis, the performance of APT with macro-factors will be

[1] According to the official exchange rate of 2nd July, 1US dollar=8.28 Yuan, the total market value of two stock exchanges counts about 2,589.13 million US dollars, which is including the Shanghai Stock

compared to the traditional CAPM. The results will help us to build or choose the goodness-of-fit model for the Chinese stock market.

Different responses of the financial market to the innovations of macro-economy might indicate the different behavior of the financial markets. This research will serve as a guide to future research involving exploration of the common and the different features determining the stock returns in different markets.

V. Data and Methodology

There are many important econometric problems involved in the tests of asset pricing models. One of the prominent problems is that the individual stock's estimate of systematic risk[2] and the average return are affected by the errors. It was argued that the errors might come from the undiversified risk of the individual stocks and the possible skewness in *ex* post individual security's return distributions (Miller and Scholes 1972). To overcome these problems, the usual procedure employs the grouped security portfolios to reduce the inefficiency associated with the individual risk estimated and to obtain the maximal dispersion in the independent variables (Sinclair 1987).

Most studies have used a two-stage procedure proposed by Fama and MacBeth (1973) and Roll and Ross (1980). In the first stage, measures of sensitivity to the risks are obtained by performing time-series regression for each security portfolio. Cross-sectional regressions are typically performed in the second stage, with conclusions about a premium based on those results. The present study will follow this methodology.

Exchange 11,547.86 million yuan and Shenzhen Stock Exchange 9,864.28 million yuan. The GDP of 1997 was 74772.4 million yuan (http://cedb.cei.gov.cn/ydata/caaa.htm).

[2] The risks in finance literature are identified as systematic risks and unsystematic risks. The systematic risks are caused by socio-economic and political events, which cannot be avoided, while the unsystematic risks are caused by changes specific to the firm issuing the security, which can be eliminated by diversification of the portfolio's formation.

Data used in this research are monthly stock return data of Shanghai and Shenzhen stock exchanges during the period from January 1993 to June1998. The stocks will be sorted and grouped into portfolios according to their size. The indexes chosen were Shanghai Stock Exchange Index and Shenzhen Stock Exchange Composite Index. The macro-economic variable data are monthly major national economic indicators in China for the same period, which are the Industrial Production (IP), the Total Social Investment of Fixed Assets (IV), the Total Imports and Exports, the Consumer Price Index (CPI) and the Total Value of Saving Deposits (TSA).

In the first stage, we will use the classical time-series regressions to obtain the factor coefficients of the macro variables. Furthermore, the obtained factor coefficients will be regressed cross sectionally over the last year of the sample period. To test the pricing influence on the market indices, the returns of Shanghai Stock Exchange Index (SSEA) and Shenzhen Stock Exchange Composite Index (SZEC) will be added into regressions as one of the independent variables.

Thus, this study has explored a set of economic state variables as systematic influence on the Chinese stock returns. The overall performance of the study will depend upon the test significance of the time-series and cross-section analysis.

VI. Thesis Structure

The remainder of this thesis is organized as follows: Chapter II presents a review of the literature related to asset pricing theory. The major empirical work and international perspectives are also explored. Chapter III gives an introduction of the Chinese economic reform and the development of securities markets. Chapter IV explains the data and methodology to be used in this study and the empirical results are presented in Chapter V. The conclusions and some discussions are given in Chapter VI.

Chapter II
Literature Review

I. Introduction

How the assets are priced in the capital markets has been one of the most popular but controversial topics in finance literature for decades. The main streams of capital market pricing theories are based on the Modern Portfolio Theory of Markowitz (1952), and developed within the framework of Fama's Market Efficiency Theory (1970).

Modern Portfolio Theory deals with the two dominant characteristics of a portfolio: expected return and risks. It was assumed that rational investors would choose to hold efficient portfolios with maximizing expected returns for a given degree of risk or, alternatively and equivalently, minimizing risk for a given expected return. It is theoretically possible to identify efficient portfolios by the proper analysis of information for each security on its expected return, the variation or variance in that return, and the relationships between the return for each security and that for every other security (Markowitz 1952). That is, the expected return of a portfolio can be calculated according to individual return of every security in this portfolio and the correlations among them.

Modern Portfolio Theory is premised on market efficiency. Market efficiency suggests that all that is known and knowable by investors is incorporated into the price of the stock (or bond or other asset) (Fama 1990). However, it has been argued that the market efficiency must be tested jointly with an equilibrium-pricing model (Fama 1990). As a result, when academics find anomalous evidence on the behavior of returns, it is hard to say if it is due to the market inefficiency or a bad model of market equilibrium.

Fama (1990) mentions that even asset pricing theory does not place itself in the realm of tests of market efficiency, but this just means that efficiency is a maintained hypothesis. Depending on the emphasis desired, the efficiency must be tested conditional on an asset-pricing model or that asset-pricing model must be tested conditional on efficiency. Such tests are always joint evidence on efficiency and an asset-pricing model.

This chapter will present the literature review of the asset pricing theory. The theoretical background of the study is given in section II, which include the Capital Asset Pricing Model (CAPM) and the Arbitrage Pricing Theory (APT). Section III reviews the major empirical work of the APT, and the summary is provided in section IV.

II. Theoretical Background

II.A Capital Asset Pricing Model (CAPM) and associated problems

The most practical and dominant portfolio version is the Capital Asset Pricing Model (CAPM) introduced by Sharpe (1964), Lintner (1965) and Mossin (1966). In CAPM, the portfolio return calculation process was simplified by correlating each asset's expected return with the expected returns of a weighted average or index of all the assets under consideration instead of calculating all the correlations among securities. This market-value-weighted portfolio or index is the defined market portfolio. Additionally, CAPM also adapt another asset known as the risk-free asset. To obtain the improved return, the risk-averse investor would have to purchase portions of the market portfolio and the risk-free security in a combination that suited his or her tolerance for risk (Lorie and Hamilton 1973). The CAPM defines risk as the covariability of the security's returns with the market's returns; i.e. risk is the volatility of the security's returns relative to the volatility of the market portfolio's

returns. The unsystematic, non-market-related risks can be eliminated by diversification of portfolios, which is caused by changes specific to the firm issuing the security. The systematic or market-related risks cannot be diversified away, which is caused by socio-economic and political events.

The CAPM designates systematic risk as beta (β). The beta of market is 1.0. For any asset, beta is calculated as follows (Harrington 1987):

$$\beta = \text{covariance } (R_m, R_j) / \text{variance } (R_m).$$

Where R_m is the expected returns from the market portfolio, R_j is the expected returns from a given investment, and the covariance (R_m, R_j) is the correlation between *m* and *j*, which is the standard deviation of R_m times the standard deviation of R_j.

In the CAPM, the beta for a portfolio is the weighted average of the betas for each asset contained in the portfolio. The return is also the weighted average of the expected returns of the assets in the portfolio. For assets with risk, the investor would expect the risk-free rate of return plus extra compensation for the systematic risk of the asset. This extra compensation is known as the market price of the risk. For the average asset, the market price of the risk would be the difference between the risk-free rate of return and the return from the market ($R_m - R_f$).

Thus, the expected returns from a given asset or portfolio is as follows:

$$R_j = R_f + \beta_j (R_m - R_f).$$

Where R_j is the expected return from the asset or portfolio, R_f is the expected return from the risk-free security, R_m is the expected return from the market, and β_j is the volatility of asset or portfolio relative to that of the market *m*.

The CAPM rests on a set of stringent assumptions. The first five assumptions are those underlying the efficient-market hypothesis and thus underlie both Modern

Portfolio Theory and the CAPM. The last three assumptions are necessary to create the CAPM from MPT. The assumptions are:

1. Investors make choices on the basis of risk and return. Return is measured by the mean return expected from a portfolio of assets; risk is measured by the variance of these portfolio's returns.
2. Investors will attempt to obtain the maximized return from the asset with given risks.
3. Investors have homogeneous expectations of risk and return.
4. Investors have the same time horizons.
5. Information is freely and simultaneously available to investors.
6. It is possible for the investors to borrow and lend unlimited amounts at the risk-free rate.
7. There are no taxes, transaction costs, restrictions on selling short, or other market restrictions.
8. Total asset quantity is fixed, and all assets are marketable and divisible (Harrington 1987).

As we see, the assumptions behind the CAPM make this model restrictive and unrealistic. Ross (1977) mentioned that none of these assumptions was particularly appealing on intuitive economic grounds. Furthermore, Roll (1977) argued that the definitive tests of the CAPM could not be performed because the return on the market portfolio could not be measured, which included all securities, each in proportion to total value outstanding. Furthermore, he argued that if the market portfolio used to test the CAPM were really efficient, there should be no abnormal returns when measured as a departure from the security market line.

Theoretically and empirically, one of the most troubling problems for academics and money managers has been that the CAPM's single source of risk is the market (Fama 1990). Basu (1977) argues that the low price-earnings ratio portfolios have higher rates of return than what can be explained by the CAPM. Banz (1981) and Reinganum (1981) point out that the size of a firm is important to the particular returns, i.e. average returns on small stocks with low market value are higher than their β estimates, and that average returns on large stocks are lower than their β estimates. Other anomalies include the seasonality, book-to-market. Keim (1983,

1985) argues that the higher stock returns in January cannot be explained by the market β. Statman (1980) states that average returns on US stocks are positively related to the ratio of a firm's book value of common equity to its market value. Fama and French (1992) argue that β may be useless and that the ratio of stock price to book value is the most powerful factor for explaining the differences in average stock returns. Those anomalies imply that the market is not the only factor that is important in determining the return of an asset. The necessity of a multi-factor model should be considered.

II.B Development of Arbitrage Pricing Theory (APT)

Arbitrage Pricing Theory (APT) is derived by Ross (1976), which is based on two concepts. The first one is the generation of returns. A number of factors are assumed to generate the returns on risky assets. These factors are systematic in nature, i.e. they affect all risky assets to some extent. Another concept of the APT is the principle of arbitrage. It is argued that in a well-fuctioning capital market any two assets that offer identical returns and risks will sell for the same price (Stewart 1991). If the assets were to sell at different prices then risk-free profits would be available to those investors who engage in arbitrage operations between the two assets, i.e. simultaneously buy one asset and sell the other. As a result of this arbitrage activity the two prices will be driven to equality eventually.

The arbitrage, or Arbitrage Pricing Theory, relates the expected return of an asset to the return from the risk-free asset and a series of other common factors that systematically enhance or detract from that expected return, which can be formulated as:

$$E[R_j] = R_f + \beta_{j1} (E[RF_1] - R_f) + \ldots + \beta_{jk} (E[RF_k] - R_f).$$

Where R_j = the return on an asset,

R_f = the risk-free rate of return,

β_j = the sensitivity of the asset to a particular factor - that is, the covariance of the asset's returns with the changes in the particular factor,

RF_k = the expected return on a portfolio with an average (1.0) sensitivity to a factor, *k*, that systematically affects returns, a factor common to all asset returns,

j = an asset,

k = a factor,

E = an expected variable (Harrington 1987).

The APT is not only an *ex*-ante, expectation model, just like the CAPM, but also the model can be written in *ex*-post, realized terms. Realized returns, the returns the investor receives, are the sum of the returns expected as a result of that asset's sensitivity to the common factors, the returns that result from unexpected changes in the common factors, and others that arise from asset-specific, or idiosyncratic events, i.e., unsystematic risks:

$$R_j = E[R_j] + \beta_{j1}(RF_1 - E[RF_1]) + \ldots + \beta_{jk}(RF_k - E[RF_k]) + \varepsilon_j$$

Where

$E[R_j]$ = the returns expected as a result of that asset's sensitivity to the common factors,

$\beta_{j1}(RF_1 - E[RF_1]) \ldots \beta_{jk}(RF_k - E[RF_k])$ = the returns result from unexpected changes in the common factors, which compensate the systematic risks,

ε = the returns that arise from asset-specific, or idiosyncratic events, assumed to be mutually independent over time and negligible for large numbers of assets (Harrington 1987).

The APT has fewer assumptions than the CAPM:

1. Investors are risk-averse and seek to maximize their terminal wealth.
2. Investors can borrow and lend at the risk-free rate.
3. There are no market frictions such as transaction costs, taxes, or restrictions on short selling.

4. Investors agree on the number and identity of the factors that are important systematically in pricing assets.
5. Riskless profitable opportunities above the risk-free rates are immediately arbitraged away (Harrington 1987).

As the APT expands the original CAPM from the one-factor model to a multi-factor model, it offers many advantages over the traditional CAPM in terms of less assumptions and higher generality.

APT's intuitive content and formulation are quite appealing for empirical researchers. However, it says nothing about either the magnitudes or the signs of the factor coefficients, or what the factors themselves might be. It only describes the factors that are important for a statement about the relationship between expected returns of securities and the common features of those securities. What it says is that, by active trading of securities with different sensitivities to the important factors, investors trade away opportunities for excessive gains. In efficient markets, trading eliminates excess returns, and investors cannot, on average or over time, find opportunities to arbitrage for profits.

Generally speaking, the APT emphasizes the role of the covariance between asset returns and exogenous factors, while the CAPM stresses the covariance between asset returns and the endogenous market portfolio (Kwon 1994). Both of them are derived under restrictive assumptions. None of them can provide satisfactory explanations of security valuation since the market value in the CAPM is unmeasurable and the APT specifies neither the number of important factors nor identify what they are.

II.C Model Implementing

The initial and probably the most prominent assumption made by APT concerns the return-generating process for assets. Specifically, individuals are assumed to believe

that a multi-factor-generating model governs the random returns on the set of assets being considered.

Ross (1976) set forth a rigorous basis for the arbitrage relation and arguments in the APT model. He suggested that some conditions sufficient to support the APT had some intuitive appeal. The assumption that investors have identical anticipations has been weakened.

Huberman (1982) clarified and simplified the APT model. Huberman argues that for most of the assets in a large economy, the mean return on an asset is approximately linearly related to the covariances of the asset's returns with economy-wide common factors. As the number of assets become large, the linear approximation improves and most of the assets' mean returns are almost exact linear functions of the appropriate covariances.

Wei (1988) shows that one needs to add the market portfolio as an extra factor to the factor model in order to obtain an exact asset-pricing relation. He has also proved that the new approach can be applied to generalize the empirical APT with some factors omitted from the econometric model. This generalized theory is shown to be an integrated model of the CAPM and APT. If all factors are omitted, the new model reduces to the CAPM. When none of the factors are omitted, the new model becomes either the Ross APT in an infinite economy or the unified asset-pricing theory in a finite economy.

Cox et al. (1985) use an inter-temporal model to integrate real markets and financial markets. They formulate the multi-factor model in a continuous time framework. Their model endogenously determines the stochastic process followed by the equilibrium price of any financial asset and shows how this process depends on the underlying real variables. This model is fully consistent with rational expectations and maximizing behavior on the part of all agents.

The general implication of these modern financial theories is that an additional component of long-term return is required and obtained whenever a particular asset is influenced by systematic economic news and that no extra reward can be earned

by bearing diversified risk (Chen et al. 1986). However, a rather embarrassing gap still exists between the theoretically exclusive importance of systematic state variables and their identity.

King (1966) presents evidence for the existence of industry influences. King argues that in addition to an overall market factor, various factors relating to industry-type indexes are significant in explaining the returns-generating process for a particular security. Other potential additional indexes could be related to interest-rate movements and firm capitalization size. Furthermore, Sharpe (1984) investigates quite a wide array of these additional factors, which he classifies as either a systematic influence or a sector influence. The systematic influences are including the beta (the slope of the regression of excess return for the security against excess return on the market index), dividend yield, size, bond beta and risk-free interest rate. The significant sector influences include basic industries factor, capital goods, construction, consumer goods, energy, finance, transportation and utilities.

Several financial economists have suggested that the future research should point to the links between time-varying expected returns and business conditions, especially on the relations between the financial market variables that track expected returns and the behavior of output, investment, and saving (Fama 1990, Tallman 1989).

III. Major empirical work in APT

The empirical research of APT has been defined in two forms. The first form is the Factor Loading Model (FLM) derived by Roll and Ross (1980), which involves using statistical technique factor analysis[3] to isolate the unobservable factors from share returns time series and test whether these factors are priced. The estimated

[3] The statistic technique is factor analysis, in which "common factors" are unobservable hypothetical variables that contribute to the variance of a vector of dependent variables. The factor analysis is a method to describe the variation of a set of variables without explicit explanatory variables. A data series then, will be described as a linear function of a set of common factors and one unique factor that contributes variance only to that series. In the set of dependent variables, each variable has one unique

covariance matrix of returns is employed to determine the factor structure that underlies asset return behavior. Estimates of the factors are determined in accordance with arbitrage pricing theory; i.e. factors are estimated from the characteristics observed in the set of returns. The second form is an equilibrium model called the Macro-economic Variable Model (MVM), which requires the arbitrary choice of a range of variables by economic intuition. Therefore, the method uses the prespecified factors to estimate factor loadings and then tests whether the loadings are associated with significant risk premia.

Chen and Jordan (1993) observe that the differences in test results between the two models are generally relatively small. Given the economically interpretable factors of MVM, the factor analysis may be unnecessary in implementing the APT. Their results also show that inflation and industrial production are insignificantly related to the derived factor, but the remaining macro-economic variables are highly significant. The five-factor model explains about seventy three percent of the variation in returns across the sixty nine industry groups.

Through numerous empirical tests, it seems that the APT, which has been developed to the multi-factor model does better than the simple CAPM. While the APT provides little guidance concerning the identity of the priced factors and the relationships between expected returns and the systematic factors, it gives researchers the empirical challenges to determine the number and identify the factors.

Burmeister and Wall (1986) construct four macro-economic measures of factors that affect asset returns in the APT framework, which include: unexpected change in the risk or default premium, unexpected changes in the term structure, unexpected inflation and unanticipated change in the growth rate of real final sales. Their results show that the estimated factor sensitivities are significant in time-series regressions and across securities as well. Thus, it is shown that estimates of factor sensitivities for both portfolios and individual securities can be obtained using time-series data.

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factor that is uncorrelated with all other unique factors. The coefficients, or factor loadings, for each common factor provide the estimates of β_j in the APT (Connor and Korajczyk 1988).

McGowan and Dobson (1993) use a combination of factor analysis and canonical correlation to identify the arbitrage pricing theory factors. The results of their study indicate that the first factor of industry returns is strongly related to the market index S&P 500, while the remaining four factors are highly correlated with the term structure of interest rate, the rate of inflation, the default premium, and the industrial production respectively.

The work of Chen, Roll and Ross (1986) has been the most influential test of the multi-factor model. Since there is no satisfactory theory to argue the relationship between financial markets and the macro economy, they employ a simple theoretical guide to help choose likely candidates for pervasive state variables. They argue that the systematic forces that influence returns are those factors that change discount rates and expected cash flows. Stock prices can be written as expected discounted dividends:

$$p = E(c)/k$$

Where c is the dividend stream and k is the discount rate. This implies that actual returns in any period are given by:

$$dp/p + c/p = d[E(c)]/E(c) - dk/k + c/p$$

Where k is the discount factors and E(c) is the expected cash flows.

The discount rate changes with both the level of the rates and the term structure spreads across different maturities. It also depends on the risk premium. On the demand side, changes in the indirect marginal utility of real wealth will influence pricing. Such effects should also show up as unanticipated changes in risk premium (Chen et al. 1986). Expected cash flows change because of both real and nominal factors. Changes in the expected rate of inflation and real production would influence stock returns through cash flows. They examine a range of business condition variables that might be related to returns because they are related to shocks to expected future cash flows or discount rates. The most significant variables they have found are the growth rate of industrial production, changes in the risk premium and

twists in the yield curve. Unanticipated inflation and changes in expected inflation play a weaker role. The consumption variable is not significant. The striking result in their study is that even if a stock market index explains a significant portion of the time-series variability of stock returns, it has an insignificant influence on pricing when compared against the economic state variables. This approach has been the most fruitful way to use multi-factor models to improve understanding of asset pricing. It is also very useful in the critical task of modelling the links between expected returns and the real economy.

Furthermore, Chen (1991) relates the state variables to the recent and future growth rates of economic activity, and additionally, they relate the growth rates of economic activity to the expected market premium. They find that the state variables are indeed related to changes in the macro economy. The current market dividend yield and a measure of the default premium are indicators of the current health of the economy as measured by the recent growth rate of GNP. The current short-term interest rate, the current term structure, and the lagged industrial production growth rate forecast changes in the future growth rates of GNP. They also find that the state variables relate to the conditional variance of the GNP growth rate. Their evidence suggest that the expected excess market return is negatively related to the recent growth of GNP and positively related to its future growth. State variables that are positively (negatively) related to the recent growth of the economy are negatively (positively) related to the expected excess market return, and state variables that are positively (negatively) related to the future growth rates of the economy are positively (negatively) related to the expected excess market return. Chen's work gives a more complete explanation that relates the ability of the state variables to forecast the market premium to their ability to forecast recent and future growth of the economy.

IV. Macro-economic Variables and Stock Returns

The development of a macro-economic factor model has become the major empirical work of market equilibrium model in asset pricing theory during the last two

decades. The robustness of the macro-economic factor model is due to its outstanding performance compared to the traditional CAPM and APT. It offers a means to overcome the CAPM problems of testability and empirical ambiguity while at the same time reducing the difficulty of applying the APT model by producing interpretable factors.

IV.A. Economic growth, production and stock returns

Based on Chen, Roll and Ross (1986), stock returns can be traced to forecasts of macro-economic variables especially GNP growth, industrial production and investment, which are important determinants of the expected cash flows to firms. Hung and Kracaw (1984) use Granger causality framework[4] to test the relationship between the variability of stock market returns and fluctuations in real economic activity. Their results show that changes in the log of real GNP and unemployment are Granger caused by the variation of stock market returns. It can be interpreted as being supportive of the notion that the arrival of information relevant to production decisions impacts real output and employment slowly through time (Nelson 1981).

Fama (1981) discusses the anomalous stock return-inflation relations. The data are consistent with the hypothesis that the negative relations between stock returns and inflation are proxying for positive relations between stock returns and real variables, which are more fundamental determinants of equity values. His results show that capital expenditures are led by both the average real rate of return on capital and industrial production. Additionally, stock returns lead to the real variables, since these real variables are presumed to be the fundamental determinants of stock returns. These findings show that in a rational expectation market, securities set

[4] Granger causality is defined as follows: Let $(\hat{Y}|\ YX)$ be the unbiased prediction of Y_t, made at t-1, based on information in the time series Y and X. Then let e_t be the prediction error at t, or, $e_t = Y_t - (\hat{Y}|\ YX)$. The variance of this error series is labeled $\sigma^2(\hat{Y}|\ YX)$. If a similar error series is generated based only upon information in time series Y, then the variance of that error series is $\sigma^2(\hat{Y}_t|\ Y)$. If $\sigma^2(\hat{Y}_t|\ Y) > \sigma^2(\hat{Y}|\ YX)$, variable X is said to Granger-cause variable Y. In other words, variable X is informative in predicting variable Y based on the reduced forecast error variance (Granger 1969).

current prices on the basis of forecasts of relevant real variables. Consistent with the findings of Fama (1981), Mandelker and Tandon (1985) also found a positive relationship between stock returns and activity variables in six major industrial nations. They argued that the real sector explained real stock returns as a function of anticipated inflation, money growth rates, and real activity growth rates.

Benderly and Burton (1985) provide stronger support than Fama for his argument that, given future output growth, inflation exerts no independent effect on real stock returns. The inverse output-inflation relationship runs from current inflation to future output via a real balance effect.

Fama (1990) measures the total return variation, which is explained by shocks to expected cash flows, time varying expected returns, and shocks to expected returns. His finding shows that variables that proxy for expected returns and expected return shocks capture thirty per cent of the variance of annual New York Stock Exchange value-weighted returns. Growth rates of production, used to proxy for shocks to expected cash flows, explain forth three per cent of the return variance. And the combined explanatory power of the variables is about fifty eight per cent of the variance of annual returns. Schwert (1990) uses different data to investigate the stability of the relations estimated by Fama (1990). His analysis shows that Fama's findings are robust for a much longer period - future production growth rates explain a large fraction of the variation in stock returns.

Balvers, Cosimano, and McDonald (1990) use an inter-temporal general equilibrium model to relate financial asset returns to movements in aggregate output. They argue that changes in aggregate output lead to attempts by agents to smooth consumption, which affects the required rate of return on financial assets. Since aggregate output is serially correlated and hence predictable, the theory suggests that stock returns can be predicted based on rational forecasts of output. Their empirical results confirm that stock returns are a predictable function of aggregate output and also support the accompanying implications of the model. The generality of their model provides a foundation with the potential for a variety of extensions through explicit linkages between macro-economic variables and share pricing. Extensions of the model could provide direct specifications of factors in arbitrage pricing or possibly greater

insights into the predictability phenomenon. The temporal variability in the model also provide partial explanations for temporal anomalies found in stock returns or the excess volatility of returns.

Cochrane (1991) uses the production-based model to explain the links between stock returns and economic fluctuations. He argues that there are a number of important variables in forecasting stock returns, which include the term premium, the default premium, lagged returns, dividend-price ratios, and investment. Many of the same variables, and stock returns in particular, forecast measures of economic activity, such as investment and growth in gross national product growth. The *ex* post investment returns and stock returns are highly correlated.

Canova and De (1995) analyze the relationship between stock returns and real activity from the point of view of a general equilibrium, multi-country model of the business cycle. They examined a model with two sources of disturbances and three mechanisms of transmission across countries. Their results show that the strength of association between stock returns and output growth depends on how future expected cash flows respond to the disturbance. Also, international linkages emerge because foreign variables contain information about the future path of domestic variables.

Hamilton and Lin (1996) investigate the joint time-series behavior of monthly stock returns and growth in industrial production. They find that these two changes are driven by related unobserved variables. The economic recessions are the primary factors that drive fluctuations in the volatility of stock returns.

IV.B. Dividend yields and returns

Dividends are signals of the assessment of a company's performance and prospects. Normally it is thought as a vehicle for transforming the information from the issuing

company to shareholders. Thus there is a positive relationship between dividend yield and stock returns (Kwon 1994).

Miller and Scholes (1982) argue that yield-related effects associated with short-term definitions of dividend yield are due to information biases and not tax. Their evidence show that the positive relationship between equity returns and dividend yields is due to information effects introduced by their dividend yield measure.

Keim (1985) examines the relation between stock returns and long-run dividend yields. He confirms the positive relation between raw returns and dividend yields by finding a non-linear relation between long-run yields and returns. In Keim (1986), it is argued that abnormal returns are related to dividend yields after controlling for market capitalization, and that the biggest abnormal returns tend to accrue to smaller firms that either pay zero dividends or that have high dividend yields.

Ferson and Harvey (1991) suggest that the expected compensation for stock market risk is larger or smaller depending on economic conditions. They find that the premium is positively related to the dividend yield and negatively related to the short-term bill rate and unexpected inflation. Furthermore, they estimate that the common variation in expected returns is about eighty per cent of the predictable time-series variation in the returns on government bonds, corporate bonds, and common-stock portfolio formed on industry and size.

Kothari and Sharken (1997) find the reliable evidence that both book-to-market (B/M) ratio and the dividend yields track time-series variation in expected real stock returns over the period 1929-1991 and the sub-period 1941-1991 in US.

Gombola and Liu (1993a) study the time-varing relationship between stock returns and dividends yields in bull and bear markets and also the short-term and long-term horizon (Gombola and Liu 1993b) respectively. All of their results strongly suggest the correlation between returns and dividends.

There are also various empirical tests in different countries, such as Japan (Rao et al. 1992) and New Zealand (Raj and Thurston 1995), which provide the evidence of the

dividend yield effect in the examinations of stock returns in the Tokyo stock market and New Zealand stock market.

IV.C. Interest rate and stock returns

In general the interest rates represent the opportunity cost of holding an asset, so there is a negative relationship between the value of financial instruments and the level of interest rates. There are numerous studies that have examined the empirical sensitivity of stock returns of financial institutions to changes in market interest rates (Martin and Keown 1977, Kane and Unal 1988, Choi, Elyasiani and Kopecky 1992).

Fogler, John and Tipton (1981) show that the returns from stock groups such as stables-stocks, cyclical-stocks, and growth-stocks relate to returns in the government bond market and to corporate bonds with default risk. They conclude that interest rate variables are important causes of the different movements of stock groups.

French, Schwert, and Stambaugh (1987) suggest that part of the variation in stock returns can be traced to a "discount rate effect", which means shocks to expected returns and discount rates that generate opposite shocks to stock prices.

Campbell (1987) uses the monthly US data for 1959-1979 and 1979-1983 to document the state of the term structure of interest rates and to predict excess stock returns, as well as excess returns on bills and bonds. His study suggests that there are forecastable movements through time in excess returns on bills, bonds, and stocks. These movements are partially captured by a variety of term structure variables, which is the predictive power of short-term interest rates. Campbell and Hamao (1992) also suggest that the dividend-price ratio and interest rate variable help to forecast excess returns in the US and Japan.

Titman and Warga (1989) reveal the statistically significant positive relations between future inflation, interest rate changes and stock returns. They find that these positive relations are stronger when the stock price reaction of real estate investment trusts, which are particularly interest and inflation sensitive securities, is used in place of a broad-based market index. Most of the evidence supporting the forecasting ability of stock returns occurs in the October 1979 to October 1982 period, when the Federal Reserve Board was not counteracting interest rate changes in the US.

Ehrhardt (1991) shows that when using monthly returns for common stocks over the period 1969-1985 the interest rate factors provide significant additional explanatory power for stock returns and beyond that afforded by the CAPM.

Domain et al. (1996) document a long-lived asymmetrical relationship between interest rate changes and subsequent stock returns. Their results show that drops in interest rates are followed by twelve months of excess stock returns, while increases in interest rates have little effect.

IV.D. Inflation, money, and stock returns

Generally speaking, assets are regarded as hedges against the inflation. It is accepted that real stock returns are negatively related to expected inflation, unexpected inflation, and changes in expected inflation. Fama and Schwert (1977) find that during period of 1953 - 1971, the US government bonds and bills are complete hedges against expected inflation. The common stock returns are negatively related to the expected component of the inflation rate, and probably also to the unexpected component. Fama (1981) also discusses the return-inflation relations. He suggests that the negative relations between stock returns and inflation are proxying for positive relations between stock returns and real variables, which are more fundamental determinants of equity values. Negative relations between inflation and real activity induce the negative stock return-inflation relations, which in turn are

explained by a combination of money demand theory and the quantity theory of money.

Mandelker and Tandon (1985) conduct the test of inverse relation between stock returns and inflation in six major industrial nations over the period 1966-1979. A consistently negative relationship between inflation and real activity growth rates has been found in the six nation studies, which is consistent with the findings of Fama (1981).

Fama and Gibbons (1982) also provide the evidence to show the positive relation between expected real returns and real activity, which comes out of the real sector. It combines with a negative relation between expected inflation and real activity, which is traced to the monetary sector, thus inducing the negative relation between expected inflation and expected real returns.

Pearce and Roley (1985) find a negative response of daily stock prices to unexpected money supply announcements. Furthermore, Pearce and Roley (1988) re-examine the relationship between unanticipated inflation and an individual stock's rate of return. Their results are consistent with the relationship they have found before.

Loo (1988) shows that the return on common stocks is significantly affected by expected inflation, and stocks whose returns are positively correlated with expected inflation have lower expected returns.

Abdullah and Hayworth (1993) use the Granger causality tests to explain the fluctuations in monthly stock returns within a vector autoregressive framework. The results show that past money growth, budget deficits, inflation, and short and long-term interest rates are Granger causal prior to stock returns. These variables also explain a substantial proportion of the forecast error variance of stock returns. It has been found that stock returns are related positively to inflation and money growth and negatively to budget deficits, trade deficits, and both short and long-term interest rates, as economic theory would predict.

Post-War evidence from the US, Canada, the UK and Germany provide a consistent empirical explanation for stock return-inflation relations across different countries with apparently similar economies in Kaul (1987).

IV.E. International Perspective

There are more and more scholars focusing on the applications of macro factor models in different economies following the framework of Chen et al. (1986). Hamao (1988) presents an empirical investigation of the APT in the Japanese equity market using Japanese macro-economic factors. The factors examined in his study included industrial production, inflation, investor confidence, interest rates, foreign exchange, and oil prices. He found that changes in expected inflation, unanticipated changes in risk premium and unanticipated changes in the slope of term structure appeared to have a significant effect on the Japanese stock market. Weaker evidence of the presence of a risk premium existed in changes in monthly production and changes in terms of trade.

Mukherjee and Naka (1995) use vector error correction model to investigate whether co-integration exists between the Tokyo Stock Exchange index and six Japanese macro-economic variables, namely the exchange rate, money supply, inflation, industrial production, long-term government bond rate and call money rate. They found that a co-integration relation indeed existed and that stock prices contributed to this relation. The signs of the long-term elasticity coefficients of the macro-economic variables on stock prices were generally consistent with the hypothesized equilibrium relations.

Fung and Lie (1990) use the Granger causality test to examine the economic role of the Taiwan stock market in response to changes in economic activities such as GNP and money supply. Their results indicate that the Taiwan stock market is inefficient

because the information captured in the stock market does not reflect changes in the macro information variables.

Kwon (1994) uses co-integration, factor models and causality analysis to test the relationship between macro-economic variables and stock market returns in Korea. He found that the Korean stock market reflected some macro-economic information in its stock prices, but it was different from the US and Japanese security markets. The inflation and interest rate related variables were not important to the Korean stock market, instead, those variables related to real activities were significant factors. This suggests that the Korean market is more sensitive to international trading activities than to inflation or interest rate variables. His results also suggest that stock prices are co-integrated with the set of macro-economic variable, i.e., foreign exchange rates, trade balance, production level, and money supply. This co-integration relationship indicates direct long run, and equilibrium relationships with those variables.

Clare and Thomas (1994) examine whether the macro-economic sources of risk priced in the UK stock market between 1983 and 1990 using monthly data on 840 stocks to form both beta-sorted and market value sorted portfolios. They found that several intuitively plausible macro-economic variables were priced over this period using the beta sorted portfolios and that once these variables were included there was little role for the return on the market. However, when the market value sorted portfolios were used, only inflation and one of the measures of market risk was priced. In addition, with the market value sorted portfolio, a role for the market return was found.

Poon and Taylor (1991) carried out a similar set of tests using the UK stock market data from1965 to 1984. However, they did not find the consistent results of macro variables. Therefore they argued that either the macro-factor model was inadequate for detecting such pricing relationship, or possibly other macro-economic factors were at work.

Koutoulas and Kryzanowski (1996) tested the APT in Canada. They estimated that the risk premia vary in proportion to the conditional volatilities of the macro-

economic innovations which follow an autoregressive specification. For size-ranked portfolios of all the shares traded on the Toronto Stock Exchange over the period from March 1962 through March 1988, five macro factors have time-varying and period risk premia. Schmitz (1996) provided the support to the proposition that the expected equity market risk premiums were correlated negatively with recent lags of output growth rates and correlated positively with future output growth rates.

Groenewold and Fraser (1997) tested the macro-factor model in Australia. They used monthly Australian sectoral share-price indexes for the period 1980 to 1994. It was found that the inflation rate was consistently priced. The significance of other factors depends on their choice of sample period and estimating model. Both the macro-factor model of APT and the factor analysis derived artificial-factor version of APT were found to clearly outperform the CAPM. However, none of them was clearly superior to the other in terms of both within- and out-of-sample explanatory power.

There is also a similar study done in Europe by Asprem (1989). He has found that the associations between stock prices and macro-economic variables are strong in UK, Germany, Netherlands and Switzerland.

V. Summary

The empirical work surveyed in the asset pricing literature indicates that researchers have become increasingly sophisticated in the analyses employed over the past decade. Increasing attention has turned from a focus on risk arising from a single market portfolio to consideration of the role played by general economic conditions in the domestic economy. By adopting a multi-factors approach, the macro factor model offers a means to overcome the problems of both CAPM and the original APT.

By examining the relationship between the stock return and macro economic variables, the generating process of stock return is explored. This also serves as an

indirect test of market efficiency. If there is no significant relationship existing, it implies either the market is inefficient or there are other economic variables at work. Additionally, the return generating process should share common features across the different securities and markets. However, the factors affecting the variance of returns will be influenced by individual economic circumstances. Thus, a study of an individual economy will not only contribute to the evaluation of the asset-pricing model, but also provide an empirical guide to the market participants and supervisors.

Chapter III
The Chinese Economy and Securities Market

The critical role of financial market in supporting and facilitating economic growth is widely recognized. Since financial markets are intimately linked to every other market and every individual in the economy, an effective financial market not only facilitates the capital needs for economic growth, but also greatly promotes the efficient use of social resources (Han 1997). Therefore, the development of financial markets is a necessary measure to ensure sustained economic growth.

In a transitional economy like China, the emergence of a securities market is an indication of the progress being made towards a developed market economy. The further development of an effective securities market will promote economic growth as well as supporting on going economic reform. Over the last ten years in China, strong economic growth has been accompanied by a rapid development of domestic financial markets.

In the following section, this study will review recent Chinese economic reform experience and the development of the securities market.

I. Review of Chinese National Economic Reform

At this juncture, it is necessary to give a brief overview of the Chinese economic background to add clarity to the research, which concentrates on the Chinese stock market. The development of the country accentuated with the opening up of the economy with its major economic reforms.

I.A. Reform and Opening of the Chinese economy 1979-1990

China switched its policy focus in the late 1970s. Under the leadership of Deng Xiaoping, China moved to incorporate a more market-oriented economic system in order to achieve the desired economic modernization.

Before this period of economic reform, the Chinese economy had been a centrally planned economy. The central government managed all aspects of the production activity of individual economic units. All surplus funds were handed over to the Treasury as government revenue and the Treasury reallocated them (Shen 1993). The only financial institution was the People's Bank of China, which was highly dependent on the Treasury. The People's Bank of China was responsible for all government credit loans, income and expenses. In the international trade sector, the government controlled imports and exports through the Ministry of Foreign Economic Relations and Trade. The government also fixed the foreign exchange rate according to the national foreign exchange plan.

The centralized allocation of financial resources not only resulted in the waste of limited resources but also provided no incentives for economic units to work efficiently (Li 1986). From 1979, China started to reform its economy gradually from liberalizing the centrally planned system to developing a market-oriented economy.

The first stage of the economic reform focused on fiscal reform from late 1970s to the middle of 1980s (Shen 1993). To decentralize authority and provide incentives, the Treasury allowed the industrial enterprises and the agricultural households to keep some profits and also delegated its authority to levy tax to the local governments. In the finance sector, most of the specialized banks that had been abolished prior to 1978 were resumed, such as the Agriculture Bank of China, the People's Construction Bank of China, and the Bank of China. These banks were encouraged to take more deposits so that they could lend more as a quasi-financial intermediary. These specialized banks started to play an increasing role in indirectly financing the economy (Byrd 1983).

During the late 1980s the reform focused on business behavior of enterprises and agricultural households by introducing the responsibility contract system (Shen 1993). The responsibilities for revenue and expenditure were negotiated between the production unit and government through the contract. Under this system, economic units gained more authority, benefits, and incentives since their contributions to the government were fixed. In the financial sector, the centralized allocation of loans and deposits was replaced by a bank-based arrangement of linking deposits with loans (Qiu 1988).

The reforms of the first and second stage before 1990 were effective in increasing the incentives of the enterprise and the flexibility of the financial system. However, the contract between the government and the economic unit was not efficient enough to solve the responsibility problem. Additionally, the process of negotiation was complicated and there was also a lack of standard to decide the proportion of the responsibility (Shen 1993). As a result, the revenue of the central government fell dramatically. Additionally, the limited financing channels created a high deficit in the government budget (see Table 3.1). By 1989, the government budget deficit was at 15,888 million yuan - the highest peak for ten years. Meanwhile the momentum gathered by the enterprise and price reforms in the early stage drove inflation to an all-time record. During 1988 and 1989, the Consumer Price index was around eighteen per cent. Oversimplified financing channels caused the whole economic system to face a high pressure of risk. The necessity of further reforms in the finance sector, which include the banking sector reform and introducing the capital market, has become the main issue since 1990.

Table 3.1. Major National Economy Indicators (a)

Year	GDP Growth (%)	Investment Growth(%)*	Trade Balance (100million $US)	CPI (Previous Year 100)	FDI ($US) (100million)	Budget Deficit (Yuan) (100million)
1978	11.7	-	-11.4	-	-	10.17
1979	7.6	-	-20.1	-	-	-135.41
1980	7.8	-	-19	-	-	-68.9
1981	5.2	-10.5	0	-	-	37.81
1982	9.1	26.6	30.3	-	11.66**	-17.65
1983	10.9	12.6	8.4	-	6.36	-42.57
1984	15.2	24.5	-12.7	-	12.58	-58.16
1985	13.5	38.8	-149	109.3	16.61	0.57
1986	8.8	22.7	-119.7	106.5	18.74	-82.9
1987	11.6	21.5	-37.7	107.3	23.14	-62.83
1988	11.3	25.4	-77.6	118.8	31.94	-133.97
1989	4.1	7.22	-66	118	33.92	-158.88
1990	3.8	-2.4	87.4	103.1	34.87	-146.49
1991	9.2	23.9	80.5	103.4	43.66	-237.14
1992	14.2	44.4	43.5	106.4	110.07	-258.83
1993	13.5	61.8	-122.2	114.7	275.15	-293.35
1994	12.6	30.4	54	124.1	337.67	-574.52
1995	10.5	17.5	167	117.1	375.21	-581.52
1996	9.6	14.8	122.2	108.3	417.26	-529.56
1997	8.8	10.1	403.40	102.8	452.57	-555.10

Note: "-" represents the non-available data. *Investment here is the total social fixed investment. **The number is the accumulated value of 1978-1982.

Source: China Statistical Abstract-1998, State Statistical Bureau, Beijing, 1998.

Table 3.2. Major National Economy Indicators (b)

Year	Money Supply * (100 million Yuan)			Foreign Exchange Reserve (billion $US)	Foreign Exchange Rate** ($100US)
	M2	M1	M0		
1990	15293.4	6950.7	2644.4	110.9	478.38
1991	19349.9	8633.3	3177.8	217.1	532.27
1992	25402.2	11731.5	4336.0	194.4	551.49
1993	34879.8	16280.4	5864.7	212.0	576.19
1994	46923.5	20540.7	7288.6	516.2	861.87
1995	60750.5	23987.1	7885.3	736.0	835.07
1996	76094.9	28514.8	8802.0	1050.3	831.42
1997	90995.3	34826.3	10177.6	1398.9	828.98

Note: *M0 is the currency in circulation; M1=M0+Demand Deposits; M2 = M1+Quasi-Money (time deposits, savings deposits and other deposits). **Foreign Exchange Rates here are the official annual average rates.

Source: China Statistical Abstract-1998, State Statistical Bureau, Beijing, 1998.

II.B. National Economic Management Between 1990-1997

Decentralizing reforms before the 1990s were effective in increasing the incentives of the enterprises and the flexibility of the financial system. However, the fiscal decentralization could not solve the fundamental problem of the relationship between the government, enterprise and individuals. The fear of overheating and political events that happened in 1989 also caused the economic growth to slow down. However, encouraged by the establishment of a socialist market economy as the ultimate goal of economic reform, the most important macro economic reforms in the fiscal, financial, foreign exchange and trade sections have started from 1990. Meanwhile, the effective macro economic management during this period has provided a steady economic environment towards this end.

The new cycle of enterprise, price, finance, and trade reforms began in 1991 (Yusuf 1994). The great demand for capital goods had been released after being controlled during 1988-1990, which caused investment to grow rapidly. On the other hand, new financial tools such as stocks and bonds in the capital markets developed quickly. The booming domestic situation combined with highly growing foreign direct investment drove up the domestic investment growth above twenty per cent after (see Table 3.1).

The investment growth caused by the expansion of the industrial sector led to the growth of the whole economy. In the financial sector, the money supply has kept on increasing since 1988 and by the end of 1991, the growth rate of the money supply has been above twenty per cent. Moreover, the expansion of the domestic credit has exceeded the limit of the credit plan (Hua 1997). The increase in consumption goods prices indicated the pressure of inflation (see Table 3.1). Additionally, encouraged by the new expansion of open cities and industrial areas by the Chinese government[5], the foreign direct investment in 1992 has increased to 11,007 million US dollars,

[5] In June 1992, the Chinese government announced that the open-policy expanded from east-coast cities to 28 cities along the Change Jiang River, and also applied to 13 boundary cities in northeast, southwest and northwest area.

which has exceeded the total of the past thirteen years (see Table 3.1). However, due to the government control, the interest rate was not adjusted according to the strong aggregate demand in the economic system[6]. Therefore, the growth of deposits in banks has slowed - even showing a negative growth in some regions by the middle of 1993. The banking sector was losing its credit ability and the inflation rate was at ten per cent (Hua 1997). In the foreign trade sector, the trade balance started to decrease (see Table 3.1) and the Chinese currency, Ren Min Bi, was under depreciation pressure.

To control the overheating economy, in October 1993, the government issued a series plan to reduce the growth of investment and inflation. The 16-point plan included promotion of the interest rate, decreasing the money supply and strengthening the independence of the central bank. The plan was also to include some administrative policies to reduce investment and to rectify the finance sector (Yusuf 1994, p.89).

The "one basket" plan effectively reduced the money supply and economic growth by the end of 1993. However, it did not hold down the increasing inflation rate and the CPI was still above ten per cent. Additionally, the trade balance was deteriorating and showing a trade balance of minus 122,200 million US dollars (see Table 3.1).

To restrain the inflation, policy objectives were set up to create a steady national economic environment in 1994. The government issued a conservative investment plan and attempted to use administrative and economic tools to achieve the macro-economic target. Besides currency policy, there were also fiscal reforms which included the reform of income taxes and the expansion of government bonds issuing (Hua 1997).

In the foreign exchange sector, trade transactions by state sectors used an official rate before 1994, while transactions by foreign companies and some domestic companies were conducted at the "swap" market rate, which was closer to the market rate. In 1994, the authority unified the swap and official rate and set up China's first inter-

[6] From 1991 to 1997, the interest rate was adjusted six times, which happened in April 1991, May and July 1993, May and August 1996 and October 1997.

bank foreign exchange market. The reform of the foreign exchange rate system effectively devalued the currency by thirty three per cent against the US dollar and improved the balance of trade greatly. From August 1994, the national trade balance had recovered to a surplus after the deficit in 1993 (see Table 3.1).

In September 1994, the government issued its policy objectives: restraint on inflation; increase agriculture production; control social fixed asset investment, and enhance price management (Hua 1997). To be consistent with these policy objectives, the government continued to restrain economic growth and the inflation rate in 1995. During this period, the government-owned enterprises started to face the deficits due to the contracting currency and fiscal policies. However, the government maintained its "anti-inflation" policy through 1995 regardless of the increasing unemployment and high deficits of public-owned enterprises.

In 1996, the growth rate of aggregate demand has slowed and the annual GDP growth was about 9.7 per cent. The fixed investment growth has slowed to 12.5 per cent, and the consumption growth was at about seven per cent. The inflation rate of consumer goods and services has been restrained to less than ten per cent (see Table 3.1). As a further step towards the government's long-term goal of full currency convertibility, Beijing eased foreign exchange controls on trade transactions and debt service in April 1996, making the currency convertible for current accounts. Even the contribution of the public-owned enterprises has kept on decreasing in the international trade sector, the town and village-owned enterprises and the joint ventures have expanded their export. The foreign exchange reserve has kept on increasing 20-30 billion US dollars monthly. Due to the substantial inflow of foreign direct investment, the foreign exchange reserve has increased to 1,050 million US dollars (see Table 3.2). After several years' adjustment and reform, the Chinese national economy has successfully gained the "soft-landing" (Hua 1997).

The term "soft-landing" is used to indicate that the economy has entered a phase of low inflation while maintaining a sustainable rate of growth in the range of 8-10 per cent (Hua 1997). By May 1997, it was reported that the inflation had dropped to below 2.8 per cent per annum while the economy was still growing at 9.0-9.5 per cent (see Table 3.1). The last time inflation was as low as 2.8 per cent was 1990-

1991 when the economy grew only at less than half of this pace. Thus, by taming the high inflation of 1993-1995, China has successfully avoided the boom-and-bust cycles featured in the post-reform period (Yusuf 1994). The critical implication of the good macro-economic environment during this period was that it had created the necessary conditions for the government to deepen reforms and address the deep-seated structural problems in the economy. Moreover, the well performing macro economic management encouraged further progress towards a market economy system.

As the national economy shows steady growth with low inflation, the government has switched its attention to the industrial structure and enhanced reform of public-owned enterprises in 1997 and 1998.

II. The Growth of Securities Market

II.A. Bond Market

The appearance of a securities market in China was originally associated with the government bond issue, which was used to finance the deficit of the government budget. The first government bond was issued in 1981 and was not allowed to trade in the secondary market until May 1985. The first financial bond was approved by the People's Bank of China and jointly issued by the Industrial and Commercial Bank of China and the Agriculture Bank of China in July 1985. The Shenyang Trust and Investment Company was the first to start the over-the-counter trading of enterprise bonds in May 1985 (Li and Jiang 1992).

Since the 1980s, within the bond category, there were about thirteen types of bonds being issued (Shen 1993). These bonds are government bonds, treasury bills, government key construction bonds, government construction bonds, capital construction bonds, special government bonds, inflation-adjusted financial bonds, transferable certificates of deposit, key enterprises bonds, local enterprise bonds, short-term enterprise bonds, and internally issued enterprise bonds[7].

The Securities Trading Automated Quotations System (STAQ) was established in August 1990 and started working in December 1990. This system was designed by nine national non-bank financial institutions and was established in March 1989. The aim of building this system was to promote the national unified computerized securities market for government bonds. The system is based on automated quotation from members nationwide and it deals mainly with government bonds and legal

[7] Government bonds refer to the bonds with maturity more than one year while treasury bills refer to the short-term bonds up to one year. Government also issues some classified bonds for financing the specific construction plan, such as the key construction bonds, the general construction bonds, capital construction bonds and the special government bonds. The inflation-adjusted financial bonds refer to those bonds issued by the financial company with the compensation for the inflation. The transferable certificates of deposit are issued by the financial institution, which can be transferred to the long-term bonds. Some enterprises also can issue bonds such as the key enterprises bonds, local enterprise bonds and the short-term enterprise bonds. The internally issued enterprise bonds are the bonds issued only to the employees of the enterprises.

person shares[8]. At the end of 1990, given the establishment of Shanghai Stock Exchange and Shenzhen Stock Exchange, bonds started to be traded in two stock exchanges. From1981-1987 the annual bonds issuing were about 5,950 million-yuan, which increased to 28,400 million-yuan per year after 1988 (Lan 1997, p.12). Compared to other financial tools, the development of the bonds market was easily accepted by Chinese investors and government due to its "safety" characteristic. However, the main function of bonds market was limited within the financing of government budget deficit.

II.B. Development of Stock Market

Compared to the bonds market, the building of a stock market in China had gone through a quite long-term debate either in academic area or government managing field. As early as the 1980s the Chinese government has been searching for a way of simulating the effect of privatization while retaining public ownership. It had been gradually recognized that the share holding system could be incorporated into a socialist economy without affecting socialism (Li 1986). Share ownership could well determine the proportion of responsibility for the revenue and expenditure between the government and economic units. The transformation of public ownership to share holding ownership would greatly encourage the independence of the economic units, and solve the problem of rights, responsibility and interest.

Some Chinese scholars have argued that to match with share holding system, issuing shares to the public could transfer the social surplus funds into the production sector, which mobilizes the social excess resources (Han 1997, Li 1986). Therefore, the development of a capital market is an efficient way to satisfy the need of large amounts of funds, which is necessary for the speedy growth of the national economy. The "direct financing" from the capital market not only improves the risk structure of

[8] Legal person shares stand for the holdings of enterprises that are allowed to trade only between legal persons or companies.

the national economic system, but also expands the capital scale needed for economic growth.

As the experiment of building the market-oritented economy developed, the Beijing Tian Qiao Market Company issued the first informal share in July 1984. The first formal share was issued by Shanghai Feile Sound System Company in November 1984, and was first traded over the counter at the Jin An Securities Department of the Shanghai Trust and Investment Company of the Industrial and Commercial Bank of China in September 1986. China's first securities firm, Shenzhen Special Economic Zone Securities Firm, was established in September 1987. Although the informal and unorganized securities markets appeared in Beijing, Shenyang and Shanghai as early as 1985, the formal and organized stock markets did not appear until 1990 when two stock exchange were established in Shanghai and Shenzhen (Li and Jiang 1992).

The Shanghai Securities Exchange was established in November 1990 and started to operate in December 1990. In 1990, there were thirty one listed securities for trading, which were six government bonds, nine financial bonds, eight enterprise bonds, and eight shares. The Shenzhen Stock Exchange was established in April 1991 and put into operation in July 1991. In April 1991 the Shenzhen Stock Exchange had ten member companies and six listed stocks. The China Securities Trading System (CSTS) was established in April 1993 and was situated in Beijing. This system is supported by satellite communication technology and a computer network system, which operates without a trading floor (Li and Jiang 1992).

The organizational structure of the two exchanges are similar: an executive council, a managing director and a supervisory council govern them both. The managing director is appointed for three years and is responsible to the executive council. The president and vice-president of the executive council, along with the managing director, comprise the standing members of the executive council. The supervisory council supervises the work of the executive council and the operation of the exchange. The president and vice-president of the supervisory council must be non-member representatives appointed by the People's Bank of China (Shen 1993). Both exchanges trade via a computerized auto-matching system. New issues are

distributed by price auctions. The stock companies that are listed in an exchange are not necessarily listed in another exchange.

There were five types of shares being issued: government shares, legal person shares, individual shares (also called "A shares"), internal shares and special "B shares" (Li and Jiang 1992). Government shares represent the holding of government-owned assets in an incorporated company, which are not allowed to trade. Individual shares are also called public shares or "A shares", which are issued to the domestic investors. Internally issued shares are only issued to employees of a company at the time of incorporation and they are not tradable. Special "B shares" are the shares which are available only to foreign investors and denominated in Chinese currency but listed in US dollars (Shen 1993).

Concerned government departments determine the percentage composition of the shares in a company. The government share holding is about fifty per cent, which upholds the dominant position of the socialist public ownership and protects the government assets from being inflicted upon (Lin 1993). As a result, the government share holding is overstated.

After the establishment of the two stock exchanges, their trading value and market scale experienced dramatic growth. By the end of June 1998, there were total 959 financial securities listed in the two stock exchanges. The total capital value of the listed securities was 2,113.48 billion-yuan. The tradable capital value was 652.78 billion-yuan. The total market value was 21,412.14 billion-yuan, which accounted 28.64 per cent of GDP (based on 1997). The market value of tradable securities was 6,297.87 billion-yuan. There were also forty companies listed abroad. Table 3.3 shows the market scale of the two stock exchanges by the end of June 1998.

In 1996, the Chinese government removed the authority of local city governments to manage the Shanghai Stock Exchange and the Shenzhen Stock Exchange, as a part of a strategy to improve the regulatory climate and make the regulatory authorities independent from government bodies. In a separate move, the Shanghai Stock Exchange set up a special department with a computerized monitoring system for day-to-day surveillance of trades.

Table 3.3. The Market Scale of Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZE) By 30th June 1998

		SSE	SZE
The Number Of Listed Securities	A Shares	406	381
	B Shares	52	54
	Government Bonds Spot	7	7
	Government Bonds Repurchase	8	8
	Enterprise Bonds	4	2
Market Value	Total Market Value (billion-yuan)	11547.86	9864.28
	Total Market Value/GDP	15.44%	13.2%
E/P Ratio	A share/B share (weighted average)	40.18/8.37	37.62/8.08
Category of Listed Companies	Industrial Company	243	264
	Commercial Company	49	37
	Financial Company	0	3
	Estate Company	9	18
	Public Facilities Company	37	25
	Others	80	48
	Number of Members	470	322

Source: *Securities Times*, 8th and 9th July 1998, Shenzhen.

II.C. The Overview of Stock Price Movements

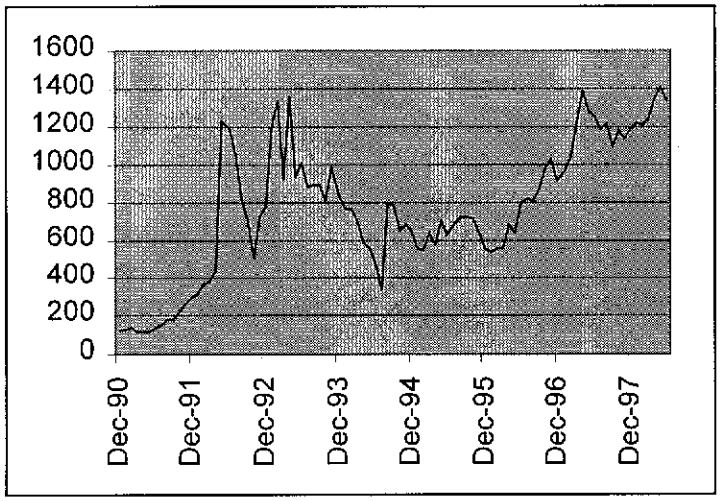
Within the last ten years', the Chinese stock market has experienced dramatic growth and, according to Wang (1994, p.12) experienced the "fastest growth in the world financial market". However, as it was a completely new product in China and was set up as an experiment originally, it exhibited great volatility due to the degree of uncertainty and lack of depth in trading. Figure 3.1 and 3.2 below show the historical movements of the Shanghai Stock Exchange Index and the Shenzhen Stock Exchange Composite Index[9].

The development of the Chinese stock market experienced four stages (Wang 1994). The first stage was the starting period, which was from the late 1980s to the middle of 1990. In the first stage, the stocks were traded as one of the experiments of a market economy in China. Most people had little knowledge of it and there was even some compulsory purchasing of the stocks in some regions. The market trading was very small and isolated.

[9] There are also classified indexes such as industrial index, commercial index, and estate index and public utilities index. The Shanghai Stock Exchange Index and Shenzhen Stock Exchange Composite Index are general indexes which are calculated on all stocks be listed including both "A Shares" and "B Shares".

Figure 3.1. The Movement of the Shanghai Stock Exchange Index

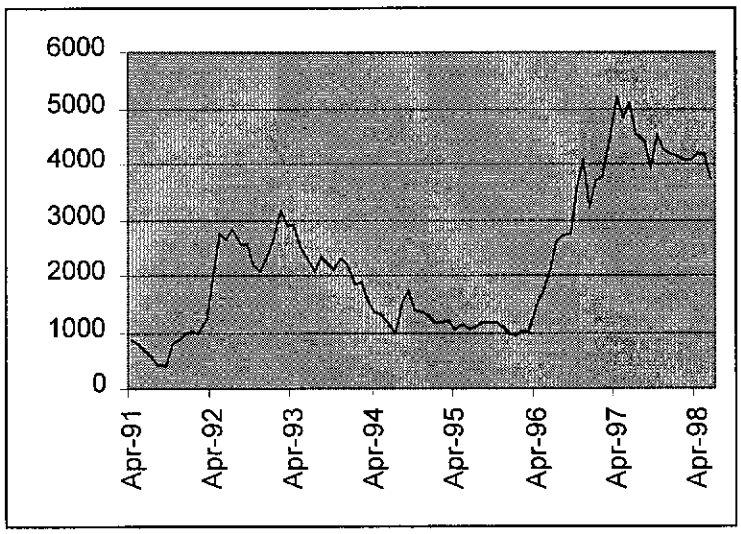
December 1990 - June 1998



Data source: China Finance and Securities Investment Information Network, http://www.homeway.cn.net.

Figure 3.2. The Movement of the Shenzhen Stock Exchange Composite Index

April 1991 - June 1998



Data source: China Finance and Securities Investment Information Network, http://www.homeway.cn.net.

The second stage is the price-limiting period, which was from mid 1990 to mid 1992 (Wang 1994). During this stage, stimulated by the high dividends distributed by some companies, the Chinese investors started to discover the potential profitability of the stocks. Most importantly, because of the limited supply of stocks the demand from new investors grew rapidly. The stocks were suddenly perceived as "Paper Gold" by the new Chinese investors. The characteristic of higher demand chasing a limited supply caused the small market to overheat. The stock indexes got their first peak during this stage. The Chinese financial supervisors had to use the price limit to control the insane behavior of the market[10]. However, the rigid administration control could not solve the dilemma of high demand and low supply in the stock market. The pricing limit control was finally released in the third stage.

The third stage was the speculation and intervention period, which was roughly from mid 1992 to end of 1994 (Wang 1994). The market began its highly volatile development during this period. On one hand, the government struggled to rationalize the market by speeding up the issue of new shares and administrative orders. On the other hand, the less mature investors and security firms were purposely chasing profitable opportunities in the short-term. As a result, there was more intervention by the government creating an atmosphere of higher volatility. More importantly, during this stage the comprehension of the government for stocks was superficial, which caused the frequent and rigid intervention into the market. Every piece of "news" from the government caused a high side effect in the market.

Particularly in the middle of 1994, the government issued a series policies "to save the dying stock market", which included suspension of new share issues and building joint venture management funding (Wang 1994, p.41). Within two months, from July to September 1994, the Shanghai stock indexes climbed to1052 from 333, the Shenzhen stock composite index climbed to 234 from 94. One month later, in October, both markets experienced about a forty per cent drop. The average earnings of prices ratio of Shanghai Stock Exchange got to a peak level of 310 in May 1992 and dropped to 12.65 in July 1994. Shenzhen Stock Exchange's earnings of prices

[10] Shenzhen city government issued the price-limit policy on 20th November 1990 and Shanghai Stock Exchange started to use the price-control in 1992.

ratio got to 106 in February 1993 and dropped to 7.22 in July 1994 (see Table 3.4). The heart-breaking movements of the stock prices not only astonished the domestic investors, but also attracted the attention of foreign financial institutions. These activities prompted the comments that investing in the Chinese stock market was not science but art (Wang 1994, p.22).

Table 3.4 The average of Earnings/Price ratios of Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZE) December 1990-April 1996.

	12-1990	09-1991	05-1992	11-1992	02-1993	07-1994	04-1996
SSE	28.05	50.57	310.30	96.47	181.15	12.65	29.88
SZE	58.65	11.38	48.34	41.17	106.18	7.22	14.39

Source: Zhen Zhenlong, 1996, *The Comparative Study of Stock Markets in Various Countries*, p.301.

After several years' researching and experimenting, it has been recognized that the market needs "market-adjustment" rather than the administrative intervention (Han 1997). Moreover, the Chinese investors now understand the stock market more comprehensively. They have now started to buy stocks according to the issuing company's performance and the national economic situation. The Chinese government switched its managerial focus to building a regulatory environment for the growth of the stock market instead of the administrative management.

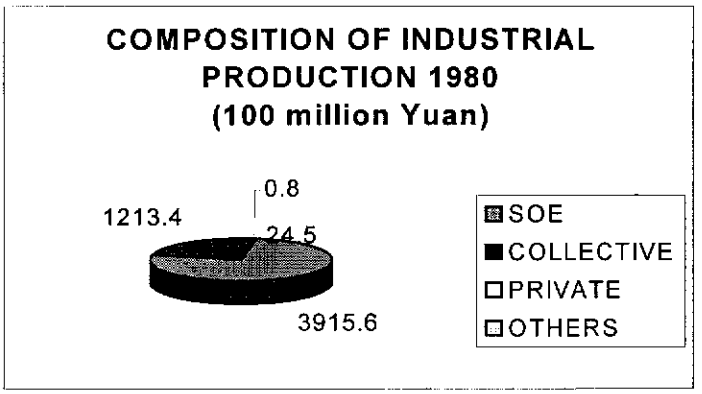
Especially after 1997, the legislating of the Securities Law has become a major task for the Chinese government. The Prime Minister listed one of the objectives of policies in the Government Working Report 1997 was that "regulating the securities market and enhancing the risk management"(*Securities Times* 24th April 1997, p.1-2). This has indicated that the development of a steady and mature securities market has become an important part of the Chinese economic reform.

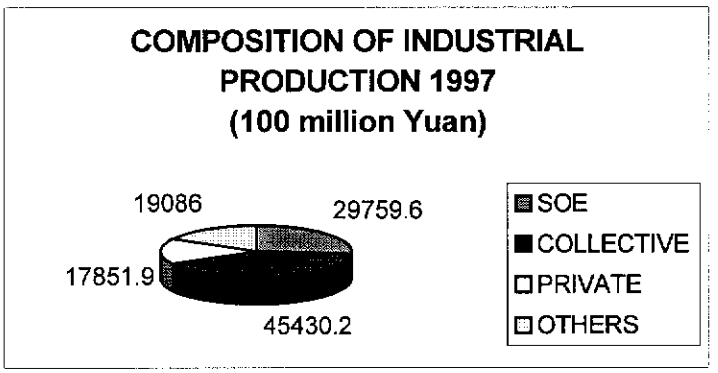
III. Potential and problems of the Chinese securities market

During ten years' economic reform, industrial production has largely driven China's economic expansion. Industrial output grew at a real compound rate of eleven per cent from the 1980s, more than double the five per cent growth rate for agricultural output (UBS 1997). During this period, China's industrial production underwent a structural shift. Before economic reform, more than eighty per cent of industrial output flowed from state-owned enterprises (SOEs). Since reforms were instituted, much of the growth in industrial output had come from the collective enterprises owned by townships and villages, private enterprises and foreign joint ventures. By the end of 1997, SOEs were responsible for only 26.5 per cent of output. At the same time, the services sector boomed, climbing from 20 per cent of GDP in 1980 to 32 per cent of GDP by 1997 (see figure 3.3 below). The low efficiency and high deficit of state-owned enterprises has become the Chinese government's "dilemma" (Han 1997). The focus of further economic reform has been switched to adjust the industrial structure and enhance the reform of the public-owned enterprises in 1997 and 1998 (Han 1997).

To solve the SOE's problem, the transformation of public-owned properties to the share holding system has become the main measure to deepen the economic reform. By introducing the share holding system, some of the public-owned enterprises have been re-organized to enter the market. By the end of 1997, there has been sixty-four large-scale state-owned enterprises going through share-ownership reform and listed in two stock exchanges (*Securities Times*, 5th January 1998). Through direct financing from the capital market, these enterprises have been transforming to the independent economic unit to gain their efficiency and profitability.

Figure 3.3 Composition of Industrial Production





Data source: China Economic Information Network, http://www.cei.gov.cn.

It has been reported that by May 1997, the 5,049 share-holding industrial enterprises have shown strong advantages in the structure of assets and their profitability. Their average economic targets are increasing, which are much higher than the average level of other industrial enterprises (Xu 1997). The securities market has become an important tool to improve the capital structure and investment mechanism of state-owned enterprises, which is the critical part of further economic reforms.

Beginning from 1996, the securities market had experienced another new cycle of "bull" market, which was consistent with the new cycle of growing national economy. Even the market itself still showed high volatility due to the floating capitals and the intervention of "news", the overall increasing trend was led by the movement of the macro economy (Han 1997). The year of 1997 was named as the "Year of Risk Prevention" by the China Securities Regulatory Commission and the year of 1998 was called the "Year of Capital Reorganizing" (*Securities Times* 24th April, 5th January, 1998), which showed further progress of government heading towards a market-oriented economy.

However, due to its short history, the current Chinese securities market is not yet mature compared to other developed countries. There is a large amount of floating capital within the economic system due to the underdeveloped financial market. The floating capitals have a significant effect on the stability of the securities and the estate market. The large amount of surplus income, rigid interest rate mechanism and the lack of investment channels have led to the quick movement of excessive speculative capitals within the financial markets in order to seek high returns (Han 1997).

One main problem of the Chinese securities market is that the government's persistence in upholding the public (government) ownership of property has affected the development of the market. This situation makes it necessary to broaden and deepen the transformation of public ownership to a share holding system.

Another problem comes from the traditional economic system. There are too many administrative measures involved in the present management of the stock market. The government "news" seriously affects the market. The self-expanding, self-

choosing, self-encouraging and self-restricting functions of the securities market have not been established properly (Han, 1997).

Lastly, the regulatory environment is not complete. The fundamental law of securities "The Securities Law" is still under formulation, which has caused the problem of standardizing the market behavior of listed companies and securities firms. The investors' and market supervisors' comprehension of the market needs to be improved substantially.

However, the current securities market has promoted the formation of a new financial system in China. Budget financing has become less dominant while direct financing has expanded greatly. Some statistics show that in the construction of the Chinese enterprise financing during the last two years, the proportion of direct financing has increased. By 1997 the enterprise direct financing had accounted for 23 per cent of new increasing enterprise capitals, which was only 12 per cent in 1995 (*China Economic Information Network*, 5th August 1998).

Overall, the development of a securities market has become an important part of the Chinese national economy. Building a regulatory financial market is one of the objectives of China's further economic reform, and it will also strengthen further economic transformation. The close inter-relationship between financial markets and national economy need to be recognized.

Chapter IV
Data and Methodology

There were two approaches used in the empirical tests of the Arbitrage Pricing Theory. Roll and Ross (1980) founded one of them by using the factor analysis to extract systematic factors influencing stock returns. Although this technique enables us to find a number of factors that are significant in pricing, it has been argued that the extracted factors are short of economic meaning (Hamao 1988). The more fruitful way was to pre-specify the factors, derive time-series of these factors and examine their significance in a pricing relationship, which was pioneered by Chen, Roll and Ross (1986).

This study followed Chen, Roll and Ross' work by investigating the possible factors priced in the Chinese stock returns. Several derived macro economic variables were chosen as the proxies of the growth of national economy. Time-series and cross-section regressions were used to test whether the derived variables have been factored into stock returns.

The details of the data and the derived variables will be given in section I. Section II will present the methodology and the empirical design of the study.

I. Data and derived variables

I.A. Stock data and returns

The stock market data in this research are daily stock trading quotations of Shanghai and Shenzhen stock exchanges during the period January 1993 to June 1998. The data were obtained from the two stock exchanges. However, there was no available stock return database, therefore, the monthly capital returns were computed from the stock price quotations.

The closing price at the end of the last day of each month was used as the price of that month. The monthly returns of the individual stocks were calculated as follows:

$R_S = \ln (P_t / P_{t-1})$.

Where R_S is the return of individual stocks and P_t and P_{t-1} are the closing prices of the individual stock at the end of day in the current month and previous month respectively.

Due to the lack of dividend data, the returns here refer to capital returns only. Lo and MacKinlay (1988) have found that since dividends are generally reported only annually or semi-annually the inclusion of dividends would not affect the overall variability and time-series structure of the data significantly. Groenewold and Kuay (1993) have supported this argument by finding their market efficiency test results do not depend on whether they use the price indexes or the accumulation indexes to calculate the returns. Moreover, this study also has to ignore the capital structure change of the issuing company due to non-availability of the statistics. Since the Chinese stock market has emerged recently, the capital structure has not changed very often. We assume that the capital structure changes have not had significant effects on returns.

Given the limited availability of data, the stocks employed are 432 "A" shares[11] listed in the Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZE) within the sample period. The stocks were sorted by size, which was calculated using the outstanding volume times the closing price at the end of the sample period. The individual stocks (including SSE and SZE) were grouped into 20 portfolios according to their sizes.

The main aim of grouping is to reduce the errors-in-variables problem. Errors-in-variables problem refers to the measurement error of the variable. One type of error is the recording error, while another type of error might be due to using an imperfect measure of the true variable (Maddala 1992, p.448). The errors-in-variables problem should not be a factor as long as the portfolio contains a reasonable number of securities (Black, Jensen and Scholes 1972, p.116). Additionally, since the unsystematic risk will be significantly priced into stock returns as well, in order to get the efficient systematic factor loading, grouping the stocks is a method to diversify away the unsystematic risk of individual stocks. Fama (1981) suggests that the benefits of diversification can be achieved by the time a portfolio contains fifteen stocks.

It is also possible to group the stocks by their market beta[12] values or group the stocks arbitrarily. The objective to group the stocks in this way is to spread the returns over a wide range in an effort to improve the discriminatory power of the cross-sectional regression tests. Chen, Roll and Ross (1986) found that grouping by size is a preferred approach when compared to grouping by beta or residual variability in this type of study.

The grouping method is the classic Fama and MacBeth (1973) technique which is expressed as follows: Let N be the total number of securities to be allocated to portfolios and let *int(N/20)* be the largest integer equal to or less than *N/20*. The middle eighteen portfolios each has *int(N/20)* securities. If N is even, the first and last

[11] "A share" is available to the domestic investors only, while "B share" is restricted to foreign investors, see Chapter III. In this study only 432 "A" shares are used which include Shanghai and Shenzhen stock exchanges.

[12] A stock's beta is the calculated covariability of the stock's returns with the market's returns within the framework of CAPM, see Chapter II.

portfolios each has $Int\{(N/20)+1/2[N-20int(N/20)]\}$ securities. The last portfolio gets an additional security if N is odd. Thus the middle eighteen portfolios each has twenty one stocks, and the first and last portfolios have twenty seven stocks each.

The return of each portfolio group was calculated as the market value weighted average return of stocks within that portfolio. However, after aggregating each group, it had been found that group twelve and group fifteen did not have complete observations from January 1993 to June 1998. So these two groups were dropped. The following analysis is therefore based on eighteen groups.

The indexes chosen here are Shanghai Stock Exchange Index and Shenzhen Stock Exchange Composite Index. Each stock exchange also has the classified indexes, which are calculated based on the sample of the specified stock categories. Those indexes include the "A" share index, the "B" share index, the industrial index, the commercial index, the estate index, the public utility index and some component indexes. The Shanghai Stock Exchange Index and Shenzhen Stock Exchange Index are the general indexes calculated on all stocks listed in two exchanges respectively. The base time for Shanghai Stock Exchange Index is December 19th 1990 and the base value is 100. While the base time for Shenzhen Stock Exchange Composite Index is April 3rd 1991 and the base value is 1000.

The stock index capital returns were calculated as:

$DSSEA = \ln (SSEA_t / SSEA_{t-1})$ and

$DSZEC = \ln (SZEC_t / SZEC_{t-1})$,

Where the SSEA and SZEC are the closing indexes on the last day of each month,
DSSEA = return on the market value weighted Shanghai Stock Exchange Index, and
DSZEC = return on the market value weighted Shenzhen Stock Exchange Composite Index.

II.B Macro economic data and derived variables

Several economic factors were chosen as the proxies of systematic factors to influence the asset pricing by economic interpretation and intuition. Obviously the difficulty in performing a similar study to Chen et al. (1986) is the lack of availability of macro economic variables that exactly parallel the United States series. The purpose here is to identify the factors that are significantly influencing the Chinese stock returns. Therefore, in addition to those basic economic variables suggested by Chen, Roll and Ross (1986), this study also consider other factors closely related to the Chinese stock market as other previous studies (Hamao 1988, Kwon 1994).

The macro economic data are major monthly macro economic indicators in China during the same period, which are selected from various issues of the China Monthly Statistics. These indicators are the Industrial Production (IP), the Total Investment in Fixed Assets of Society (IV)[13], the Total Imports and Exports, the Consumer Price Index, the Total Social Retail Sales (RS) and the Total Value of Saving Deposits (SA).

The derived macro variables were calculated within the framework of Chen, Roll and Ross (1986) as follows:

1. The growth rate of industrial production

Industrial production is one of the most representative indicators to reflect the booming Chinese economy. It has been recognized that the growth of the Chinese economy is largely driven by the industrial growth (UBS 1997). IP (t) denotes the index of industrial production in month *t*. The lagged production growth is expressed as IP (t-1), then the monthly growth rate is

DIP (t) = ln IP (t) - ln IP (t-1).

2. The growth rate of trade balance

As most Asian economies grow by the expansion of international trade, the trade balance and exchange rate are regarded as important factors in the studies that have been done in Asian countries (Hamao 1988, Kwon 1994). The rate of change in trade balance is calculated as

DTB (t) = ln Export (t) – ln Import (t-1).

3. Unanticipated inflation (UI) and change in expected inflation (DEI)

The unanticipated component of inflation is defined in Fama and Gibbons (1984) as

UI (t) = I (t) – E [I (t) | t-1],

Where I (t) is the realized monthly first difference of the logarithm of the consumer price index for period t.

The change in expected inflation is

DEI (t) = E [I (t+1) | t] – E [I (t) | t-1].

The series of expected inflation E [I (t) | t-1] was derived from an interest rate model by using the risk-free rate of Treasury bills[14]. Unfortunately, there is no counterpart of the US Treasury bill in the Chinese financial markets. We could use the inter-bank loan rate as the proxy for market interest rate, but it did not appear until 1996. Due to

[13] It includes two major components, capital construction and technical updating and transformation, which includes state owned units, collective and individual owned units.

[14]The realized short-term risk free interest rate can be broken down into two components: an expected real return and expected inflation rate. The estimate of expected real return is given by the past returns and estimated from Box-Jenkins method (Box and Jenkins, 1976).

the characteristics of a centrally planned economy, there was no proper market interest rate proxy before 1996, which make it impossible to derive the expected inflation rate through an interest rate model. We can only obtain it through a simple mathematical calculation based on the past Consumer Price Index, that is,

$$E[I(t+1) \mid t] = 1/(t+1)\sum_{i=1}^{t+1} I_i, \text{ and } E[I(t) \mid t-1] = 1/t\sum_{i=1}^{t} I_i.$$

4. The growth rate of total social retail sales

The Total Social Retail Sales is one of the main macro economic indicators in China. We incorporate this variable here as a proxy for social consumption. Given the fixed income of individuals, there is a negative relationship between consumption and investment for individuals. Therefore, we doubt that there might be a negative relationship between the total retail sales and stock price returns. The growth rate of this variable is measured as

$$DRS(t) = \ln RS(t) - \ln RS(t-1).$$

5. The growth rate of investment of fixed assets

Similar to industrial production, we use the monthly growth rate of investment of fixed assets as

$$DIV(t) = \ln IV(t) - \ln IV(t-1).$$

During the economic reform over the last two decades, the high investment growth has sustained the growing economy (see Table 3.1). As the Chinese stock market has become more and more important for financing the domestic investment, we could expect that there is a positive relationship between the change in investment and stock returns.

6. The growth rate of total value of savings deposit

Generally it is believed that there is a negative relationship between savings and securities investment since interest rates affects the stock market either through the opportunity cost of the investors or through the expectations for a given economic period. Due to the underdeveloped financial market and sociology tradition, high levels of savings accompanied the high economic growth in China just as other Asian countries. From 1991 to 1995, the annual growth of national saving deposit was 4,500 hundred million-Yuan and the annual growth rate was around 33 per cent (Liu 1996). After economic reforms, there was more and more income surplus flowing to the stock market rather than to bank savings account. Moreover, it is argued that the Chinese stock market is sensitive to the changes in interest rates (Han 1997). Unfortunately, the data for monthly deposit interest rates are not available. Therefore, we use the value of savings deposit as a proxy variable.

We might expect a negative relationship between the growth of savings deposits and the stock market expansion. The monthly growth rate of savings deposit is

$$DSA(t) = \ln SA(t) - \ln SA(t-1).$$

Though risk premium is normally regarded as a dominant factor determining the stock return, it is unfortunately not available in China. The monthly money supply data are also not available. Most of the previous studies such as Hamao (1988), Kwon (1994) incorporate the exchange rate as one of the macro economic variables, however, due to the government control, the Chinese currency RMB has not been made fully convertible[15]. Therefore, we have to ignore this variable as well.

[15]By April 1996, the RMB are convertible only for current accounts.

II. Methodology and empirical design

The technique of the test here is a two-step method, which follows the common tests of the APT (Chen et al. 1986, Hamao 1988). The first step uses the time-series data to estimate a set of factor loadings for each stock portfolio return, and the second step is to regress the sets of factor loadings in cross-section returns.

II.A. The correlations and autocorrelations for macro economic variables.

The correlation matrix will be computed over the sample period. A correlation coefficient has a maximum value of 1 and minimum value of -1. A value of 1 indicates that two variables move in perfectly same direction, while a value of -1 implies that their movements are exactly opposite. If highly correlated variables are used together, these pairs may result in multicollinearity and weaken the individual impact of these variables on the response return variable (Apte 1990, p.296). The resulting multicollinearity will also cause the instability of coefficients (Apte 1990, p.298). If there is perfect correlation between any two variables, they can be substituted for each other.

It is expected that there is a strong correlation between two index variables, which are the returns of the Shanghai Stock Exchange Index and the Shenzhen Stock Exchange Composite Index. The resulting collinearity might weaken the unique effects of each index on the stock returns.

The autocorrelations for the stock returns and macro variables will partially reflect the time-series structures since the autocorrelation function shows how much inter-dependency there is between neighboring data points in the series, which provides the visual inspection of stationarity of the variables. The autocorrelations will also provide the information about the seasonality of a time-series.

Existing autocorrelations in independent variables will imply the presence of errors in the variables. This will bias estimates of the loadings of variables on those returns and will bias downward estimates of statistical significance (Chen et al. 1986).

II.B. Unit root tests

When dealing with time-series data, it is important to investigate the stationarity of variables being employed. Assume we have the collection of random variables $X(t)$, this time series is said to be strictly stationary if the joint distribution of any set of n observations $X(t_1)$, $X(t_2)$, ..., $X(t_n)$ is the same as the joint distribution of $X(t_1+k)$, $X(t_2+k)$,..., $X(t_n+k)$ for all n and k. If the mean $\mu(t) = E(X_t)$ and the variance $\sigma^2(t) = var\ (X_t)$, the stationary time series has the constant mean and variance for all time t (Maddala 1992, p.528).

Shocks to a stationary time series are necessarily temporary over time, that is, the effects of the shocks will dissipate and the series will revert to its long-run mean level. On the other hand, a nonstationary series necessarily has permanent components (Enders 1995, p.212). The mean and/or variance of a nonstationary series are time-dependent. That is, if the variables are nonstationary, the effects of a temporary shock will not tend to dissipate after several years, but will be permanent. Consider the model

$$y_t = y_{t-1} + \varepsilon_t,$$

Where ε_t is a zero-mean stationary process. If in some time period t, there is a jump C in ε_t. Then y_T, y_{T+1},y_{T+2}... all increase by C. Thus the effect of the shock C is permanent.

The assumptions of the classical regression model necessitate that both the independent and dependent variables are stationary. When we run regression with the

presence of the nonstationary variables, the conventional significant tests might indicate a relationship between the variables when one does not exist in fact. This "spurious regression" has a high R^2 and *t*-statistics would be significant, but the results are without any economic meaning (Ender 1995, p.216). Therefore, in the following model the root α is equal to 1 or <1, that is, whether there is a unit root or not, is very important to the regression analysis (Maddala 1992, p.581).

$$y_t = \alpha\, y_{t-1} + \varepsilon_t \qquad |\alpha|<1$$

Though the correlogram offers a visible inspection concerning the time-series structure, the unit root test provides a formal test of the stationarity of the variables. The classic unit roots test, the Dickey Fuller test, (Dickey and Fuller 1979, 1981) is as follows:

$$y_t = \alpha + \beta T + \rho y_{t-1} + \varepsilon_t.$$

Where α is the drift term, T is the time trend and ε_t is the white noise disturbance with mean *0* and variance σ^2.

The following form of the Augmented Dickey-Fuller test will be incorporated when ε_t is not white noise:

$$y_t = \alpha + \beta T + \rho y_{t-1} + \sum_{j=1}^{m} \lambda i \;\; \Delta y_{t-i} + e_t.$$

Where y_t is the logarithm of the variable in period *t* and e_t is the white noise disturbance with mean *0* and variance σ^2.

The null hypothesis is H_0: $\rho=0$, that is, there is a unit root.

We will use the Augmented Dickey-Fuller tests to investigate the stationarity of all macro economic variables and stock returns in this study. Since we are using the growth rates for all macro variables, which are the logarithmic first differences of

respective variables, it is expected that all macro variables would be stationary. Otherwise further differencing or cointegration techniques[16] need to be considered.

II.C. Time series regressions

The time-series regressions are run across 60 months from January 1993 to December 1997 for 18 groups. The following model is employed:

$$R_S = \gamma_S + \gamma_{S1}\,DIP + \gamma_{S2}DRS + \gamma_{S3}\,DSA + \gamma_{S4}\,DTB + \gamma_{S5}UI + \gamma_{S6}\,DEI + \varepsilon_S.$$

Where R_S is the return of portfolio *s* during the sample period, $\gamma_{S1}\cdots\ \gamma_{S6}$ are the factor coefficients of each derived macro variables, ε_S is the residual error for portfolio *s*. The macro variables here are:

DIP = growth rate of industrial production;
DRS = growth rate of total social retail sales;
DSA = growth rate of total social saving deposit;
DTB = growth rate of trade balance;
UI = unanticipated inflation;
DEI = change in expected inflation.

Testing Hypothesis H_0: $\gamma_{S1}\cdots\ \gamma_{S6} = 0$.

If the coefficients are statistically significant, then the variables have the significant effects on stock portfolio returns.

To test the pricing influence on the market indexes, the return of Shanghai Stock Exchange Index (DSSEA) and Shenzhen Stock Exchange Composite Index

[16] The concept of cointegration appeared as one solution to avoid the loss of information from differencing. If the linear combination of two nonstationary variables is stationary, these two variables

(DSZEC) will be added to the model as one of the independent variables. The market indexes are included because they are normally believed to capture unexpected shocks to the economy more rapidly than smoothed averaged monthly series of macro variables (Hamao 1988). The effect of this is to guarantee that market returns will be, at best, weakly related and very noisy relative to innovations in macro economic factors (Chen et al. 1986). It is also consistent with the past effort to test the efficiency of a market index, which is relevant to the market model CAPM tests. Therefore, the model becomes:

$R_S = \rho_S + \rho_{S1}$ DIP + ρ_{S2}DRS+ ρ_{S3} DSA + ρ_{S4} DTB + ρ_{S5}UI + ρ_{S6} DEI +ρ_{S7} DSSEA + ρ_{S8} DSZEC + σ_S.

Where $\rho_{S1} \cdots \rho_{S8}$ are the factor coefficients of each variables, σ_S is the residual error for portfolio *s*.

DSSEA = the return of Shanghai Stock Exchange Index and
DSZEC = the return of Shenzhen Stock Exchange Composite Index.

Testing Hypothesis H_O: $\rho_{S1} \cdots \rho_{S8} = 0$.

The significance of index returns will shed light on the explanatory power of the market index over stock returns, which partially support the market model CAPM. We would also get indications of whether the market indexes contain some missing priced factors, that is, if the conclusion of market indexes reduce the significance of other coefficients, this would imply that the market indexes do not contain missing priced factors (Hamao, 1988).

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are cointegrated (Maddala 1992, p.262).

II.D. Cross section analysis

One of the APT's empirical usefulness is the ability to permit cross-sectional tests by using the factor coefficients estimated from time-series data on individual asset returns. This study will conduct the cross-section regressions following the time-series regressions above. We would expect that the significant factors found in the time-series analyses could be used to explain the cross-sectional returns.

The following cross-section regressions are run for each month from June 1997 to June 1998 using estimates of the coefficients γ_S obtained by the time-series regressions as the independent variables. The cross-section regression model to be employed is:

$$R_{St} = \beta_{0t} + \beta_{1t}\,\gamma_{S1} + \beta_{2t}\,\gamma_{S2} + \beta_{3t}\,\gamma_{S3} + \beta_{4t}\,\gamma_{S4} + \beta_{5t}\,\gamma_{S5} + \beta_{6t}\,\gamma_{S6} + \varepsilon_t.$$

Where R_{St} are the cross-sectional returns in each month t, and ε_t is the random term which represents pure chance factors in the determination of R_{St}. $\gamma_{S1}\cdots\gamma_{S6}$ are the coefficients of derived macro-variables obtained from time-series analysis above.

Testing Hypothesis H_O: $\beta_{1t}\cdots\ \beta_{6t} = 0$.

This generates a time-series of estimates of the βs associated with each macro variable. When βs are statistically significant the macro variables that are associated with the γ_S have significant effects on cross-section returns.

The coefficients of index returns will also be incorporated in the cross-section regressions as two of the independent variables:

$$R_{St} = \eta_{0t} + \eta_{1t}\,\rho_{S1} + \eta_{2t}\,\rho_{S2} + \eta_{3t}\,\rho_{S3} + \eta_{4t}\,\rho_{S4} + \eta_{5t}\,\rho_{S5} + \eta_{6t}\,\rho_{S6} + \eta_{7t}\,\rho_{S7} + \eta_{8t}\,\rho_{S8} + \varepsilon_S.$$

Testing Hypothesis H_O: $\eta_{1t} \cdots \eta_{8t} = 0$.

The $\rho_{S1} \cdots \rho_{S8}$ are the coefficients obtained from the time-series regressions when two indexes are incorporated. R_{St} are cross-sectional returns at the month *t* and ε_S is the random term.

According to the *t*-statistics of ηs, we could get indications of whether the market indexes are significant in explanation of the cross-sectional returns. It would provide the empirical support to the market model CAPM if the indexes are significant in cross-section analysis as well as time-series analysis. Chen et al. (1986) argue that running the cross-section regressions using the estimated coefficients from the time-series regressions gives each macro-variable an a priori equal opportunity to be significant, which means the design treat the variables in a symmetric fashion.

Chapter V
Empirical results

This chapter presents the results of the empirical test. The statistical characteristics of the variables will be provided in section I. Time-series regression results are given in section II. Section III presents the cross-section regression results while the summary of this chapter is at the end.

I. Statistical characteristics of the variables

The summary statistics for all variables used in this study are given in Table 5.1 and 5.2. The non-zero skewness values of all variables show their non-normal asymmetrical distributions. The negative values of the growth rate of industrial production DIP, the growth rate of total social retail sales DRS, the growth rate of terms of trade DTB and unanticipated inflation UI show that the distributions of these variables are slightly skewed to the left. The positive values of the change of saving deposits DSA, expected inflation DEI, and the two stock index returns DSSEA and DSZEC show that their distributions are slightly skewed to the right. The distributions of all stock groups' returns are slightly skewed to the right except group fifteen. All the variables have non-zero Kurtosis-3 values, which shows that their distributions have thicker tails than normal. The departure from the normality distributions of the variables indicates the violation to the assumption of the Ordinary Least Square (OLS) regression. However, it has been argued that the *t* procedures are quite robust against non-normality of the population and it can be used even for clearly skewed distributions when the sample is over forty (Moore and McCabe 1993, p.510).

The autocorrelations of macro economic variables computed by software MICROFIT were listed in Table 5.3. The sample period is from January 1993 to December 1997. The results show that the growth rate of saving deposits DSA, two inflation variables UI and DEI and the returns of the Shenzhen Stock Exchange Composite Index DSZEC have no autocorrelations over twelve lags. The retail sales and terms of trade variables DRS and DTB only show the significant correlations at the twelfth lag. The return of the Shanghai Stock Exchange Index DSSEA has the autocorrelation at the first lag. There are autocorrelations in the growth rate of industrial production DIP and the investment variable DIV. Overall, the coefficients of DIP, DIV, DRS and DTB at the twelfth lag are quite high, which shows the high annual seasonality of those variables. The seasonality and the existing serial correlations of the macro variables imply the possible errors-in-variables problem which may bias estimates of the loadings of the stock returns on these variables and will bias downward estimates of statistical significance (Apte 1990, p.182).

The seasonality of the variables DIP, DIV, DRS and DTB is reflected in higher values during the end of financial year and the Chinese New Year period. There are few techniques to "deseasonalize" the data such as using the moving average of data or differencing. However, "deseasonalization" will cause loss of information. Since the aim of this research is to investigate the influence of the macro economic movements on the stock market, these seasonal changes might be reflected in the stock market. Hence keeping the "seasonality" characteristics of the macro data might be more appropriate in this study.

Table 5.4 shows the correlation matrix of macro economic variables over the sample period. Relatively high correlations exist among the DIP, DIV, DRS and DTB variables. The DIV has especially a high correlation with the other three macro-economic variables. It has been mentioned by the previous study of Chen et al. (1986) that the resulting collinearity tends to weaken the individual impact of these variables. In order to get a more precise estimator we dropped the DIV in the regression model to reduce the possible collinearity. There is no significant correlation among UI, DEI and the two stock index variables. As expected there is a high correlation between two index variables DSSEA and DSZEC. Since the sample of stocks covers both shares listed in Shanghai and Shenzhen, we incorporate both of

them into the multiple regression. However, we should bear in mind that the high correlation between them could bias the significance of each of the variables downwards.

The results of the classic unit roots test, Augmented Dickey-Fuller test, are listed in the Table 5.5. Enders (1995, p.227) has argued that including more lags in the test will decrease the degrees of freedom because the number of parameters estimated has increased while the number of usable observations has decreased. Thus, too many lags will reduce the power of the test to reject the null of a unit root, since the increased number of lags necessitates the estimation of additional parameters and a loss of degrees of freedom. Since the data we are using are the monthly data and the total number of observations is sixty, we started with 12 lags. To pick up the optimum number of lags, by checking the *t*-statistics and the diagnostic results, we gradually reduced the lags to 9[17]. The calculated values of Augmented Dickey-Fuller test results for all the variables reject the null of a unit root. Therefore, all the variables are shown to be stationary.

II. Time-series regressions results

The Ordinary Least Square regressions are run across sixty months from January 1993 to December 1997. The return of each stock portfolio, which is obtained by size grouping the individual shares, is used as the dependent variables. The derived macro variables are employed as the independent variables. Since we have eighteen stock groups, the total regressions are therefore eighteen. The results are listed in Table 5.6.

Table 5.7 shows the significance of macro variables' coefficients of eighteen stock groups. All macro variables show significance in some groups except two inflation

[17] The general way to choose lags for ADF test is to start with long lag and pare down by the usual *t*-test and/or *F*-tests. If the *t*-statistic on the last lag is insignificant at some specific critical value, start to

variables UI and DEI. The significant variables are the growth rate of industrial production DIP, the growth rate of total retail sales DRS and the growth rate of saving deposits DSA, which are significant in most of the groups. The growth rate of terms of trade DTB shows significance in nine groups.

As to the signs of macro variable coefficients, even though there are no developed theoretical foundations for it, it is worth noting whether their signs have economic implications. Most of the signs of significant coefficients are consistent with our expectations. There are positive relationships between the change of industrial production DIP, the change of terms of trade DTB and stock returns, and negative relationships between the change of social retail sales DRS, the change of saving deposits DSA and stock returns.

Though this study did not involve the specification analysis and model building, it is worth checking the model adequacy and appropriateness of stochastic assumptions through the diagnostics tests. The violations to assumptions of homoskedasticity and non-serial correlation would make the regression coefficients inefficient even though the OLS estimators are still unbiased (Apte 1990, pp.231-263). The results of diagnostic tests are listed in Table 5.8. For most of the groups, the calculated values of serial correlations are not significant, which shows the acceptance of null of no-serial correlations. The R-squared numbers are quite low, which implies that most of the information has not been captured by the model. However, the functional form indicators are not significant, which implies the acceptance of the null hypothesis of correct-functional form. Most of the groups do not have the heteroscedasticity problems as well since the coefficients are not significant, which implies the acceptance of no-heteroscedasticity hypothesis. The only highly significant result of the diagnostic tests is the normality test, which implies the rejection of normality hypothesis. It has been argued that the rejection of normality hypothesis could be due to the non-normal distributions, incorrect transformation of the variables, structural change, outliers and heteroscedasticity (McAleer, 1994). Since other diagnostic indicators do not show the violations to the OLS assumptions, it is doubted that the non-normal distributions of the residuals might be due to the departure from the

reduce the lag length until the lag is significantly different from zero. Meanwhile the diagnostic checking should also be considered (Enders 1995, p.227).

normal distributions of the data being employed here. Hence, the linear relationship between the stock returns and macro variable innovations is plausible.

In the case of including the returns of stock indexes as two additional independent variables, both the returns of Shanghai Stock Exchange Index DSSEA and the Shenzhen Stock Exchange Composite Index DSZEC show statistically significant. DSSEA is significant in every group while DSZEC is significant in fifteen groups. Compared to DSSEA, DSZEC seems to be less significant, which might be due to the under-representation of the Shenzhen Stock Exchange. As the Shanghai exchange is dominated by former State-owned enterprises, whereas the Shenzhen market features more joint venture companies, many involving Hong Kong Chinese investors, the Shanghai Stock Exchange tends to have more large companies. It is not surprising that when the index variables are included, some of the significance and signs of macro variables are altered since stock index variables are highly significant. It was argued that including the index variables would lessen the ability of the other variables to show up as significant in pricing merely through their correlation with measurement errors (Chen et al. 1986).

The high significance of market index variable show that the market portfolios have a strong explanatory power to the stock returns, which is consistent with the market model CAPM. When the index variables are included, the R-squared indicators in all groups are highly improved and ranged between 0.7 to 0.9. For most of the groups, when the index variables are included in the model the normality test results improve, which implies improvement in the overall model's performance. Other diagnostic indicators show that there is no serial correlation and heteroscedasticity, and the functional form is correct for most cases.

Overall, most of the derived macro variables, the growth rate of industrial production, the growth rate of social retail sales, the growth rate of saving deposits and the terms of trade and the market indexes have been priced in the time-series stock returns, and the model performs reasonably well.

III. Cross-section regressions results

The coefficients of the derived macro variables obtained from the time-series regressions were used as the independent variables in the following cross-section regressions. The dependent variables are the cross-sectional stock returns. The regressions are run across eighteen stock groups in each month from June 1997 to June 1998. The total regressions are thirteen.

The results are still encouraging, which are shown from Table 5.9. Even though the factor coefficients show little significance from June 1997 to December 1997, they are significant in most of the months in 1998. The industrial production coefficient DIPC shows significance in January, February, April and June in 1998. The total social retail sales coefficient DRSC shows significance in August, November 1997, February, April and June 1998. The terms of trade coefficient DTBC shows significance in February, April and June 1998.

As the index variables are added in the cross-section analysis, the number of months in which there are significant factors increase to ten. The improvement of the results implies that there might be some missing factors that have been captured by the market indexes (see Table 5.10). The industrial production coefficient shows significance in September 1997 and all months in 1998 except May 1998. The social retail sales coefficient shows the significance in August, September, November 1997 and February, April in 1998. The terms of trade coefficients show significance in October 1997 and all months of 1998 except May 1998. However, contrary to the time-series regressions, the index coefficients themselves fail to show significance except in September and October 1997.

All the cross-section models perform well except August and December 1997, which have slightly heteroscedasticity (see Table 5.11). The model in March 1998 has a serial correlation problem at ten per cent level. All the other diagnostic indicators are not significant. It should be noted that the diagnostic tests show that the cross-section regression models perform better than the time-series regression models, which might be due to the advantage of obtaining the coefficients from the time-series

regressions. It imposes the assumption of stronger stationarity on estimates of time-series coefficients. The independent variables in the cross-section part might involve less errors-in-variables problem. The improvements of R-squared indicators are not so obvious as those in time-series regressions, which imply the very possibility of other factors existing in determination of cross-section returns.

Overall, the growth rate of industrial production, the growth rate of the social retail sales, the growth rate of the saving deposits and the growth rate of terms of trade show significant effects in both time-series and cross-section analysis. The market indexes do not have explanatory power over the cross-section returns even though they are highly significant in time-series part.

IV. Summary

The preliminary data analysis shows the departure from the normal distribution of the derived macro variables and stock returns. However, the unit root tests show that all variables are stationary.

Both time-series and cross-setion results show that the derived macro economic variables are significant in explaining the stock returns. The significant macro variables are the growth rate of industrial production, the growth rate of terms of trade, the growth rate of total social retail sales and the growth rate of total saving deposits. Additionally, the stock returns are positively related with the growth rate of industrial production and the growth rate of terms of trade, while negatively related with the growth rate of total social retail sales and the growth rate of total values of saving deposits.

As to the stock market indexes, both the returns of the Shanghai Stock Exchange Index and the Shenzhen Stock Exchange Composite Index are significant in time-series regressions, but fail to show any explanatory power in the cross-section regressions. This might suggest that although stock market indexes "explain" much

of the inter-temporal movements in other stock portfolios, their estimated exposures do not explain cross-sectional differences in stock returns. Chen et al. (1986) argue that the "explanatory power" of the market indexes may have less to do with economics and more to do with the statistical observation that large, positively weighted portfolios of random variables are correlated.

Table 5.1. Summary Statistics for macro variables

Sample period	:1993M1 to 1997M12					
Variable(s)	DIP	DRS	DSA	DTB	DSSEA	DSZEC
Maximum	.53874	.25974	.068051	.59736	.85517	.4467
Minimum	-.48678	-.26258	-0.01746	-1.3218	-.37328	-.2376
Mean	.015523	.013591	.022528	.10959	.00723	.009905
Std. Deviation	.17642	.090790	.016514	32450	.18606	.1381
Skewness	-.067778	-.36991	.76723	-1.8083	1.5526	.8466
Kurtosis - 3	1.3631	2.6459	1.4932	5.5508	6.1942	1.071
Coef of Variation:	11.3650	6.6802	.73303	2.9610	25.7346	13.943

Sample period	:1993M1 to 1997M12		
Variable(s)	DIV	UI	DEI
Maximum	2.1618	.050472	.0043313
Minimum	-3.8965	-.074270	-.0019545
Mean	.033712	-.0045064	-.3127E-4
Std. Deviation	1.0934	.016907	.8973E-3
Skewness	-1.8045	-1.1342	1.8780
Kurtosis - 3	4.3239	6.5752	8.2398
Coef of Variation:	32.4343	3.7518	28.6947

Notes:
DIP = the change rate of industrial production;
DRS = the change rate of total social retail sales;
DSA = the change rate of total social saving deposit;
DTB = the change rate of trade balance;
UI = the unanticipated inflation;
DEI = the change of expected inflation;
DIV = the change rate of total social investment;
DSSEA = the return of Shanghai Stock Exchange Index;
DSZEC = the return of Shenzhen Stock Exchange Composite Index.

Table 5.2. Summary statistics for stock returns

Sample period	:1993M1 to 1997M12					
Variable(s)	: RM1	RM2	RM3	RM4	RM5	RM6
Maximum	: .89497	.80528	.76179	.70855	.83195	.7949
Minimum	: -.45233	-.36917	-.47580	-.70021	-.42321	-.3698
Mean	: -.017580	-.012990	-.019200	-.040805	-.012256	-.02176
Std. Deviation	: .19568	.17494	.19528	.19637	.20201	.1746
Skewness	: 1.4495	1.6579	1.0083	.34239	1.1451	1.475
Kurtosis - 3	: 6.8809	6.4680	3.6558	4.4215	3.9497	6.377
Coef of Variation:	11.1308	13.4674	10.1712	4.8124	16.4821	8.024

Sample period	:1993M1 to 1997M12					
Variable(s)	: RM7	RM8	RM9	RM10	RM11	RM12
Maximum	: .70430	.89311	.84993	.73823	.83682	.7870
Minimum	: -.44922	-.48567	-.61036	-.44230	-.38449	-.6256
Mean	: -.012022	-.018307	-.0073005	-.021901	-.014705	-.01231
Std. Deviation	: .18022	.21038	.21241	.17816	.20550	.2007
Skewness	: .90721	1.2022	.88644	1.0221	1.4370	.6824
Kurtosis - 3	: 3.0727	5.1723	4.0577	4.3550	4.1721	4.137
Coef of Variation:	14.9914	11.4921	29.0950	8.1349	13.9744	16.292

Sample period	:1993M1 to 1997M12					
Variable(s)	: RM13	RM14	RM15	RM16	RM17	RM18
Maximum	: .59805	.75501	.64566	.81498	.77044	.6417
Minimum	: -.33512	-.34143	-1.1941	-.50669	-.39905	-.3773
Mean	: -.015370	-.010147	-.020588	-.0041810	-.0085908	-.01224
Std. Deviation	: .16810	.17561	.23049	.20919	.16694	.1547
Skewness	: .67966	1.3801	-1.8151	.92250	1.5992	1.084
Kurtosis - 3	: 1.6671	4.6704	10.3522	3.5945	6.6028	4.354
Coef of Variation:	10.9366	17.3054	11.1953	50.0326	19.4320	12.64

Table 5.3. Autocorrelations of economic variables.

ORDER	DIP	DIV	DRS	DSA	DTB	DSSEA	DSZEC	UI	DEI
1	-.27638 *4.81(.032)*	-.32078 *6.49(.011)*	-.22841 *3.28(.070)*	.006317 *.0025(.960)*	-.01152 *.0084(.927)*	-.29038 *5.32(.021)*	.09758 *.600(.438)*	-.17688 *1.97(.160)*	-.0917 *.530(.467)*
2	-.20701 *7.56(.023)*	-.18084 *8.59(.014)*	-.09605 *3.88(.144)*	-.05011 *.163(.921)*	-.0934 *.567(.753)*	-.02676 *5.36(.068)*	.01765 *.620(.733)*	.02251 *2.01(.367)*	.21504 *3.50(.174)*
3	-.03151 *7.63(.054)*	.12147 *9.55(.023)*	.05916 *4.11(.250)*	-.0600 *.399(.941)*	.21977 *3.72(.293)*	.09038 *5.90(.117)*	.20457 *3.35(.341)*	-.14461 *3.37(.338)*	-.12122 *4.46(.216)*
4	-.08524 *8.11(.088)*	-.07428 *9.92(.042)*	-.20165 *6.81(.146)*	.24112 *4.26(.372)*	.09172 *4.28(.370)*	-.13014 *7.02(.135)*	-.04514 *3.49(.480)*	.22371 *6.69(.153)*	.06710 *4.75(.313)*
5	-.07451 *8.49(.131)*	-.12906 *11.04(.051)*	-.10619 *7.57(.181)*	-.083884 *4.74(.449)*	.10818 *5.07(.407)*	-.05773 *7.25(.203)*	-.10921 *4.29(.508)*	.03380 *6.77(.238)*	.00202 *4.75(.447)*
6	.33267 *16.11(.013)*	.22268 *14.46(.025)*	.23289 *11.31(.079)*	.18457 *7.08(.313)*	.05258 *5.26(.511)*	-.02025 *7.27(.296)*	.21187 *7.39(.287)*	-.05174 *6.96(.325)*	.01837 *4.78(.573)*
7	-.06617 *16.42(.037)*	-.07407 *14.84(.038)*	-.10299 *12.05(.099)*	.074532 *7.47(.381)*	.10104 *5.98(.542)*	.12628 *8.39(.299)*	.00954 *7.39(.389)*	.14142 *8.36(.302)*	.1057 *5.56(.592)*
8	-.00305 *16.42(.037)*	-.06428 *15.14(.057)*	-.19634 *14.81(.063)*	.07160 *7.84(.449)*	.01215 *5.99(.649)*	-.21380 *11.66(.167)*	-.08549 *7.91(.442)*	.08067 *8.83(.357)*	-.03083 *5.63(.689)*
9	.07181 *16.80(.052)*	.13609 *16.49(.057)*	.07605 *15.23(.085)*	-.18686 *10.39(.320)*	.06837 *6.33(.707)*	.23315 *15.63(.075)*	.27656 *13.49(.141)*	.05011 *9.01(.436)*	.05541 *5.85(.754)*
10	-.31171 *24.02(.008)*	-.12741 *17.70(.060)*	-.17156 *17.42(.065)*	-.0090193 *10.39(.407)*	-.13780 *7.74(.654)*	-.04054 *15.75(.107)*	-.0576 *13.74(.185)*	.00668 *9.01(.531)*	-.02918 *5.92(.822)*
11	-.08193 *24.53(.011)*	-.37829 *28.56(.003)*	-.15369 *16.74(.116)*	.011929 *10.40(.495)*	-.30700 *14.90(.187)*	.03885 *15.87(.146)*	.08133 *14.24(.220)*	.00942 *9.02(.620)*	.11378 *6.90(.807)*
12	.44812 *40.10(.000)*	.68680 *65.12(.000)*	.73264 *60.82(.000)*	.28544 *16.72(.161)*	.49595 *33.96(.001)*	.01883 *15.89(.196)*	.16257 *16.29(.178)*	-.15983 *11.00(.529)*	-.12539 *8.12(.776)*

Note: the italic numbers in each row are the Ljung-Box statistics, numbers in brackets refer to the probability of falsely rejecting the null hypothesis of no serial correlation.

Table 5.4. Estimated Correlation Matrix of Variables

	DIP	DIV	DRS	DSA	DTB	UI
DIP	1.0000	.63338	.53662	.16195	.52059	.16697
DIV	.63338	1.0000	.73994	.01881	.73619	.086132
DRS	.53662	.73994	1.0000	-.13998	.65957	.16273
DSA	.18880	.37686	.12648	1.0000	.020592	-.051031
DTB	.52059	.73619	.65957	-.14461	1.0000	.097966
UI	.16697	.086132	.16273	-.018629	.097966	1.0000
DEI	-.22372	-.15709	-.071009	-.08225	-.090105	-.049643
DSSEA	.13935	-.13439	-.12215	-.04831	.062752	.051088
DSZEC	-.046526	-.073189	-.11592	-.04423	.12205	.0034713

Estimated Correlation Matrix of Variables

	DEI	DSSEA	DSZEC
DIP	-.22372	.13935	-.046526
DIV	-.15709	-.13439	-.073189
DRS	-.071009	-.12215	-.11592
DSA	-.08225	-.04831	-.04423
DTB	-.090105	.062752	.12205
UI	-.049643	.051088	.0034713
DEI	1.0000	.13812	.082060
DSSEA	.13812	1.0000	.73427
DSZEC	.082060	.73427	1.0000

Notes:

DIP = the change rate of industrial production;
DSA = the change rate of total social saving deposit;
UI = the unanticipated inflation;
DIV = the change rate of total social investment;
DSZEC = the return of Shenzhen Stock Exchange Composite Index.
DRS = the change rate of total social retail sales;
DTB = the change rate of trade balance;
DEI = the change of expected inflation;
DSSEA = the return of Shanghai Stock Exchange Index;

Table 5.5. The Dickey-Fuller regressions include an intercept but not a trend

Variables	DF	ADF(1)	ADF(2)	ADF(3)	ADF(4)	ADF(5)	ADF(6)	ADF(7)	ADF(8)	ADF(9)
DIP	-8.8935	-8.6119	-5.6187	-7.0438	-6.8646*	-4.9136	-4.1859	-2.9178	-1.8189	-1.8652
DRS	-8.8773*	-6.2764	-4.5882	-4.6773	-4.8765	-3.5712	-3.3521	-4.0946	-4.2027	-4.8997
DSA	-7.1871*	-5.2131	-4.3061	-2.6027	-2.5479	-1.6236	-1.1823	-.96991	-1.1195	-1.2984
DTB	-7.2008*	-5.6501	-3.3927	-2.6343	-1.9308	-1.6417	-1.2899	-1.1788	-.92748	-1.3425
UI	-8.6604*	-5.6707	-5.2437	-3.5111	-2.8144	-2.6982	-2.0446	-1.6897	-1.5435	-1.4008
DEI	-7.3193*	-4.9585	-5.0273	-4.1565	-3.8087	-3.1320	-1.9270	-1.4523	-1.1406	-1.1264
DSSEA	-8.4968*	-6.2504	-4.3871	-4.0962	-4.0480	-3.6840	-2.8075	-3.1611	-2.2867	-2.1406
DSZEC	-6.3086*	-4.6378	-2.9245	-2.9445	-2.8685	-2.1703	-2.0806	-2.0553	-1.5053	-1.6670
RM1	-8.7104	-6.9009*	-4.9256	-4.7939	-4.5960	-4.1432	-2.9644	-3.4550	-2.6341	-2.7947
RM2	-7.4968*	-6.1335	-4.5980	-4.4007	-4.1106	-3.3258	-2.6864	-3.0124	-2.2785	-2.3378
RM3	-7.6260*	-5.9376	-4.3066	-4.1819	-3.9920	-3.4429	-2.6351	-3.0718	-2.4346	-2.4220
RM4	-7.5031	-6.4206*	-4.2804	-4.2452	-3.7898	-3.0324	-2.9769	-2.9517	-2.7190	-2.7701
RM5	-7.3956*	-6.3119	-4.7588	-4.8803	-4.4584	-3.7368	-3.1638	-3.7597	-2.8114	-2.6475
RM6	-7.9289*	-6.2243	-4.5595	-4.1826	-3.7476	-3.0683	-2.4705	-2.7011	-1.9300	-2.0441
RM7	-7.1507*	-5.9522	-3.9482	-3.8908	-3.9513	-3.3032	-2.7926	-2.9371	-2.2878	-2.4086
RM8	-8.1442*	-6.4580	-5.0661	-4.4824	-4.0450	-3.6408	-2.6110	-3.0043	-2.4157	-2.3587
RM9	-8.3454*	-6.6361	-4.5361	-4.2419	-3.7992	-3.2125	-2.4726	-2.7675	-1.9591	-2.1323
RM10	-7.5435	-6.5773*	-4.1261	-3.7528	-3.5386	-2.8143	-2.7193	-2.5261	-1.9106	-1.9575
RM11	-7.8390*	-6.4088	-4.3328	-3.8795	-3.4861	-2.7067	-2.1566	-2.4900	-1.8889	-1.9987
RM12	-7.3689*	-6.0639	-4.1515	-4.2876	-3.8388	-3.0237	-2.4150	-2.8598	-1.9917	-2.0456
RM13	-7.1315*	-5.8171	-3.7366	-3.7112	-3.4942	-2.7755	-2.4148	-2.5586	-1.8441	-1.8229
RM14	-7.7109*	-6.0797	-3.8274	-3.6667	-3.4682	-2.7850	-2.3062	-2.4971	-1.7600	-1.8041
RM15	-7.5974	-6.1123	-3.4261*	-3.5095	-3.6633	-2.9275	-2.5348	-2.7152	-2.3570	-2.1347
RM16	-7.3240*	-5.8119	-4.1723	-3.8378	-3.5669	-2.8478	-2.2316	-2.5989	-2.2466	-2.1545
RM17	-7.8395*	-6.0113	-4.1939	-3.7815	-3.8806	-2.8599	-2.5898	-2.6542	-2.0716	-1.9924
RM18	-6.9545*	-5.0442	-3.1374	-3.0306	-3.0417	-2.4628	-2.3129	-2.2220	-1.7143	-1.7030

* Represents the calculated value by maximizing the AIC, SBC and HQC. 95% critical value for the ADF statistic = -2.9202.

Table.5.6. Time-series regressions results (a)

	DIP	DRS	DSA	DTB	UI	DEI	DSSEA	DSZEC
RM1	.29934	-.66628	-.33381	.05258	.86505	-9.2440		
	1.6939#	*-1.7224#*	*-1.8218#*	*.49440*	*.57697*	*-.25141*		
	-.03480	.02913	.01280	-.01911	.59406	-5.9115	1.0291	-.01647
	-.57115	*.23299*	*.20754*	*-.54705*	*1.2688*	*-.51253*	*14.3268**	*-.17992*
RM2	.19616	-.53380	-.10005	.08396	.99329	16.719		
	1.1919	*-1.4817*	*-.58627*	*.84763*	*.71136*	*.48822*		
	-.06404	.12720	.18099	-.00579	.72345	17.199	.82423	.19301
	-1.0906	*1.0558*	*3.0459**	*-.17198*	*1.6035*	*1.5474*	*11.9081**	*2.1884**
RM3	.27617	-.64500	-.40365	.06910	.55676	-10.781		
	1.5933	*-1.6999#*	*-2.2458**	*.66241*	*.37859*	*-.29893*		
	.00633	.04706	-.11159	-.02584	.27368	-10.400	.85601	.21150
	.096804	*.35052*	*-1.6853#*	*-.68884*	*.54441*	*-.83979*	*11.0992**	*2.1522**
RM4	-.32566	-.46033	-.36011	.27579	-.53867	-27.018		
	*-1.9479**	*-1.2578*	*-2.0773**	*2.7410**	*-.37976*	*-.77668*		
	-.50760	.09263	-.15515	.18727	-.77205	-28.289	.59370	.29135
	*-4.2524**	*.37820*	*-1.2843*	*2.7367**	*-.84178*	*-1.2521*	*4.2193**	*1.6250*
RM5	.30050	-.59055	-.33552	.05393	.43281	3.4093		
	1.6402#	*-1.4725*	*-1.7661#*	*.48910*	*.27843*	*.089431*		
	.02108	.12487	-.03319	-.04403	.14028	3.8262	.88621	.21686
	.26310	*.75969*	*-.40946*	*-.95877*	*.22792*	*.25235*	*9.3854**	*1.8024#*
RM6	.10831	-.74053	-.09637	.17144	.79093	3.0076		
	.66769	*-2.0855**	*-.57298*	*1.7562#*	*.57471*	*.089111*		
	-.13780	-.09020	.17178	.07942	.52332	3.0164	.78439	.22588
	*-2.2860**	*-.72926*	*2.8161**	*2.2984**	*1.1299*	*.26438*	*11.0393**	*2.4948**
RM7	.21664	-.54694	-.19147	.10875	.79976	4.8520		
	1.2967	*-1.4955*	*-1.1053*	*1.0816*	*.56423*	*.13958*		
	.02111	.11856	.03545	-.00661	.51387	2.2246	.65169	.43582
	.30365	*.83109*	*.50387*	*-.16576*	*.96198*	*.16905*	*7.9520**	*4.1736**
RM8	.40136	-.72807	-.34117	.02557	.39063	-6.2399		
	*2.1195**	*-1.7564#*	*-1.7375#*	*.22436*	*.24313*	*-.15837*		
	.03680	-.00526	.03364	-.04245	.11265	-1.9687	1.1159	-.07980
	.47380	*-.032975*	*.42803*	*-.95353*	*.18877*	*-.13392*	*12.1883**	*-.68407*
RM9	.31983	-.88301	-.39581	.10323	.91498	-6.8781		
	1.7128#	*-2.1602**	*-2.0443**	*.91857*	*.57754*	*-.17703*		
	.02119	-.13733	-.07446	.00391	.61165	-6.0974	.94352	.19916
	.30654	*-.96829*	*-1.0645*	*.098683*	*1.1517*	*-.46606*	*11.5804**	*1.9184#*
RM10	.03384	-.56216	-.14608	.17829	.07624	5.5877		
	.20336	*-1.5431*	*-.84654*	*1.7801#*	*.053999*	*.16137*		
	-.09416	.09124	.02276	.04096	-.21812	.01367	.46832	.66038
	-1.2857	*.60715*	*.30714*	*.97569*	*-.38760*	*.9859E-3*	*5.4247**	*6.0032**
RM11	.11143	-.83586	-.41566	.16968	.57957	-8.9487		
	.62054	*-2.1264**	*-2.2324**	*1.5701*	*.38041*	*-.23950*		
	-.17166	-.12047	-.11025	.07310	.28783	-8.3602	.89601	.20353
	*-2.5131**	*-.85954*	*-1.5950*	*1.8671#*	*.54845*	*-.64665*	*11.1286**	*1.9838**

Table 5.6. (Continued)

	DIP	DRS	DSA	DTB	UI	DEI	DSSEA	DSZEC
RM12	.09471	-.77851	.34063	.15237	1.2488	-11.184		
	.52601	*-1.9752**	*-1.8245#*	*1.4061*	*.81750*	*-.29854*		
	-.19727	-.06587	-.02972	.05992	.96034	-10.131	.91933	.16645
	*-2.8072**	*-.45686*	*-.39334*	*1.4875*	*1.7786#*	*-.76163*	*11.0984**	*1.5770*
RM13	.09474	-.73675	-.19205	.16896	.82259	3.3652		
	.62329	*-2.2143**	*-1.2185*	*1.8470#*	*.63786*	*.10640*		
	-.05483	-.13754	-.01006	.05513	.55952	-.23987	.51578	.48863
	-.81616	*-.99769*	*-.14802*	*1.4315*	*1.0839*	*-.018862*	*6.5128**	*4.8422**
RM14	.11411	-.80936	-.22310	.16851	.54749	11.617		
	.72978	*-2.3646**	*-1.3760*	*1.7907#*	*.41269*	*.35706*		
	-.0620	-.17478	-.01545	.05462	.27268	8.6277	.59368	.45316
	-1.0894	*-1.4971*	*-.26840*	*1.6747#*	*.62374*	*.80114*	*8.8519**	*5.3027**
RM15	.00809	-.68279	-.40277	.14978	.16373	-54.351		
	.037958	*-1.4634*	*-1.8224#*	*1.1677*	*.090543*	*-1.2255*		
	-.31818	.07847	-.05667	.05643	-.14136	-52.552	1.0206	.12560
	*-2.5199**	*.30288*	*-.44347*	*.77967*	*-.14570*	*-2.1989**	*6.8568**	*.66228*
RM16	.35880	-.80824	-.35171	.05676	.95384	-12.190		
	1.9175#	*-1.9732**	*-1.8127#*	*.50398*	*.60081*	*-.31308*		
	.06183	-.05679	-.03123	-.04483	.64732	-11.589	.94014	.21517
	.92771	*-.41526*	*-.46303*	*-1.1732*	*1.2640*	*-.91862*	*11.9661**	*2.1493**
RM17	.00661	-.37878	-.14313	.11680	.32366	23.361		
	.042433	*-1.1103*	*-.88575*	*1.2453*	*.24479*	*.72044*		
	-.15589	.25082	.05260	-.79E-3	.04839	19.823	.55628	.49399
	*-2.6534**	*2.0806**	*.88461*	*-.023506*	*.10721*	*1.7826#*	*8.0324**	*5.5979**
RM18	.05725	-.41776	-.09033	.10933	-.22207	-2.2603		
	.38619	*-1.2874*	*-.58766*	*1.2255*	*-.17657*	*-.073284*		
	-.05295	.18687	.05896	-.02085	-.49623	-7.8044	.41125	.64106
	-1.109	*1.9072#*	*1.2201*	*-.76183*	*-1.3525*	*-.86349*	*7.3064**	*8.9382**

NOTE: in each row, numbers in the top rows represent the coefficients of macro variables and the numbers in the third rows represent the coefficients of all variables when the indexes are included in the regressions. The smaller and italic numbers underneath are t-statistics. * Represents the 5% level significance, and # represents the 10% level significance. RM1...RM18 are returns of each stock group. The independent variables in the regressions are as following:
DIP = the change rate of industrial production;
DRS = the change rate of total social retail sales;
DSA = the change rate of total social saving deposit;
DTB = the change rate of trade balance;
UI = the unanticipated inflation;
DEI = the change of expected inflation;
DSSEA = the return of Shanghai Stock Exchange Index;
DSZEC = the return of Shenzhen Stock Exchange Composite Index.

Table 5.7. Time-series regressions results (b)

	DIP	DRS	DSA	DTB	UI	DEI	DSSEA	DSZEC
RM1	#	#	#					
							*	
RM2								
			*				*	*
RM3		#	*					
			#				*	*
RM4	*		*	*				
	*			*			*	
RM5	#		#					
							*	#
RM6		*		#				
	*		*	*			*	*
RM7								
							*	*
RM8	*	#	#					
							*	
RM9	#	*	*					
							*	#
RM10				#				
							*	*
RM11		*	*					
	*			#			*	*
RM12		*	#					
	*				#		*	
RM13		*		#				
							*	*
RM14		*		#				
				#			*	*
RM15			#					
	*					*	*	
RM16	#	*	#					
							*	*
RM17								
	*	*				#	*	*
RM18								
		#					*	*

NOTE: The top signs in each row represent the significance of the Macro variables and the second line represents the significances when the indexes are included. * Represents the 5% level significance, and # represents the 10% level significance. RM1...RM18 are returns of each stock group.
DIP = the change rate of industrial production;
DRS = the change rate of total social retail sales;
DSA = the change rate of total social saving deposit;
DTB = the change rate of trade balance;
UI and DEI= the unanticipated inflation and the change of expected inflation;
DSSEA = the return of Shanghai Stock Exchange Index;
DSZEC = the return of Shenzhen Stock Exchange Composite Index.

Table 5.8. Time-series regressions diagnostic results

Regression	R-square	Serial Correlation[a]	Function form[b]	Normality[c]	Heteroscedasticity[d]
1	.15970	12.6013(.399)	.17373(.677)	322.1543(.000)	.10411(.747)
	.92123	*13.7784(.315)*	*.023276(.879)*	*12.8276(.002)*	*.4606E-3(.983)*
2	.088173	7.6370(.813)	.11236(.737)	177.6307(.000)	.61304(.434)
	.90849	*18.0514(.114)*	*.17630(.675)*	*.088886(.957)*	*.38197(.537)*
3	.18828	8.0859(.778)	.086981(.768)	103.6141(.000)	.080963(.776)
	.90882	*11.5173(.485)*	*1.4474(.229)*	*.82949(.661)*	*.19890(.656)*
4	.25320	9.4411(.665)	7.1257(.008)	165.0280(.000)	.11258(.737)
	.69986	*18.4804(.102)*	*5.2751(.022)*	*375.2993(.000)*	*.051313(.821)*
5	.15250	10.3580(.585)	.0059789(.938)	104.7174(.000)	.18684(.666)
	.87228	*21.5500(.043)*	*.16553(.684)*	*6.0516(.049)*	*.53690(.464)*
6	.11113	8.5023(.745)	.72394(.395)	242.2667(.000)	.52613(.468)
	.90323	*22.9571(.028)*	*1.3661(.242)*	*1.1434(.565)*	*.42243(.516)*
7	.11464	8.1726(.772)	.76971(.380)	54.6656(.000)	.17551(.675)
	.87912	*6.8141(.870)*	*1.2497(.264)*	*5.6153(.060)*	*.065885(.797)*
8	.16526	7.8396(.798)	.2686E-3(.987)	176.8569(.000)	.055891(.813)
	.88929	*11.6292(.476)*	*.10169(.750)*	*7.3645(.025)*	*.56938(.451)*
9	.20375	9.8943(.625)	.63016(.427)	115.8336(.000)	.079347(.778)
	.91399	*11.8454(.458)*	*1.7958(.180)*	*11.2826(.004)*	*.24654(.620)*

Table 5.8. (Continued)

Regression	R-square	Serial Correlation[a]	Function form[b]	Normality[c]	Heteroscedasticity[d]
10	.10103	8.5808(.738)	.46801(.494)	109.7920(.000)	.30649(.580)
	.86274	*15.2734(.227)*	*1.0317(.310)*	*4.9557(.084)*	*1.2373(.266)*
11	.21330	8.2758(.763)	.20275(.653)	177.2600(.000)	.16606(.684)
	.91026	*16.2519(.180)*	*.30751(.579)*	*1.8978(.387)*	*.52675(.468)*
12	.17090	7.4713(.825)	.043242(.835)	109.9439(.000)	.20725(.649)
	.90043	*8.5086(.744)*	*3.3194(.068)*	*9.4202(.009)*	*.91162(.340)*
13	.15761	9.6871(.643)	.0061467(.938)	29.2809(.000)	.51803(.472)
	.87025	*19.9136(.069)*	*1.1536(.283)*	*16.2765(.000)*	*.23151(.630)*
14	.18310	10.3274(.587)	.45685(.499)	187.0842(.000)	.27571(.600)
	.91473	*8.1588(.773)*	*2.0905(.148)*	*9.1820(.007)*	*.79845(.372)*
15	.11897	9.0807(.696)	1.1770(.278)	203.4443(.000)	.90252(.342)
	.75623	*11.6292(.476)*	*18.8679(.000)*	*639.1718(.000)*	*10.8954(.001)*
16	.17558	5.1422(.953)	.015807(.900)	81.3426(.000)	.065985(.797)
	.91754	*14.4919(.270)*	*2.6458(.104)*	*.93390(.627)*	*1.1789(.278)*
17	.10212	7.2331(.842)	.1303E-5(1.00)	198.9099(.000)	.22712(.634)
	.89939	*9.4884(.661)*	*2.7139(.099)*	*6.9095(.032)*	*.46146(.497)*
18	.054718	8.1070(.777)	.64492(.422)	97.0528(.000)	.25902(.611)
	.92267	*12.4284(.412)*	*.33037(.565)*	*36.5218(.000)*	*.19108(.662)*

Note: For every regression, the second italic line is the diagnostic test results when the indexes are added in. The numbers in brackets are probabilities.a: Lagrange multiplier test of residual serial correlation; b: Ramsey's Reset test using the square of the fitted values; c: Based on a test of skewness and kurtosis of residuals; d: Based on the regression of squared residuals on squared fitted values.

Table 5.9. Cross-section regressions result without indexes.

	DIPC	DRSC	DSAC	DTBC	UIC	DEIC
RJUN97	-.31266 *-.90341*	-.11816 *-.56033*	.21968 *1.5133*	-.92098 *-1.1079*	.026901 *.72519*	-.4192E-3 *-.40468*
RJUL97	-.090726 *-.31566*	-.13433 *-.76707*	-.083340 *-.69131*	.071047 *.10291*	-.0015872 *-.051523*	.4633E-3 *.53851*
RAUG97	-.32608 *-1.4952*	-.28391 *-2.1366**	.061836 *.67599*	-.67223 *-1.2833*	-.0077142 *-.33001*	-.3394E-3 *-.51990*
RSEP97	.19435 *.65339*	.18338 *1.0118*	-.0096180 *-.077090*	.38600 *.54027*	.2338E-3 *.0073337*	-.7015E-3 *-.78798*
ROCT97	-.15447 *-.54681*	-.16557 *-.96195*	.078625 *.66357*	-.47912 *-.70612*	-.038648 *-1.2764*	.6417E-3 *.75897*
RNOV97	.072886 *.46770*	.17918 *1.8871#*	-.097086 *-1.4853*	.35620 *.95161*	.046372 *2.7762**	-.4701E-3 *-1.0079*
RDEC97	-.15914 *-.73265*	-.062341 *-.47105*	.042526 *.46678*	-.50112 *-.96053*	.016860 *.72422*	-.2499E-3 *-.38433*
RJAN98	.30530 *1.7478#*	.15007 *1.4101*	-.023671 *-.32308*	.72599 *1.7304*	.0013629 *.072795*	-.3599E-3 *-.68829*
RFEB98	.39286 *2.1506**	.27076 *2.4326**	-.092385 *-1.2057*	.92960 *2.1186**	.023826 *1.2168*	-.7234E-3 *-1.3231*
RMAR98	.27140 *.73468*	.16607 *.73783*	.029547 *.19069*	.65120 *.73390*	.028393 *.71708*	.4758E-3 *-.43034*
RAPR98	.88982 *2.7702**	.49085 *2.5079**	-.22191 *-1.6471*	2.0039 *2.5973**	-.0058420 *-.16968*	.2546E-3 *.26481*
RMAY98	.30943 *.54442*	.24884 *.71855*	-.26768 *-1.1228*	.92742 *.67934*	.022649 *.37179*	.7230E-3 *.42497*
RJUN98	-.63996 *-2.8339**	-.26975 *-1.9605#*	-.069189 *-.73047*	-1.2938 *-2.3853**	.037789 *1.5613*	.8090E-3 *1.1968*

NOTE: in each row, The smaller and italic numbers underneath are t-statistics. * Represents the 5% level significance, and # represents the 10% level significance. The independent variables DIPC, DRSC, DSAC, DTBC, UIC, DEIC are the estimated coefficients obtained from the time-series regressions. The dependent variables RJUN97... RJUN98 are the monthly stock returns cross-sectionally.

Table 5.10. Cross-section regressions result with indexes.

	DIPCWI	DRSCWI	DSACWI	DTBCWI	UICWI	DEICWI	DSSEACWI	DSZECWI
RJUN97	-.34768 *-.91555*	-.10936 *-.46657*	.21226 *1.2560*	-.92653 *-.96230*	.026754 *.61693*	-.2398E-3 *-.19041*	-.010778 *-.039750*	.077089 *.33172*
RJUL97	-.046289 *-.15358*	-.14527 *-.78091*	-.075442 *-.56248*	.077589 *.10153*	-.0011505 *-.033426*	.2364E-3 *.23647*	-.088579 *-.41160*	-.10713 *-.58084*
RAUG97	-.29506 *-1.2265*	-.27279 *-1.8373#*	.081681 *.76301*	-.57843 *-.94835*	-.011934 *-.43441*	-.2811E-3 *-.35222*	-.0021996 *-.012806*	-.0017855 *-.012129*
RSEP97	.35086 *2.0329#*	.21734 *2.0403#*	.073514 *.95719*	.75391 *1.7229*	-.015808 *-.80209*	-.6623E-3 *-1.1568*	-.25624 *-2.0793#*	-.37834 *-3.5822**
ROCT97	-.30895 *-1.6785*	-.22147 *-1.9495#*	-.018463 *-.22541*	-.94633 *-2.0278#*	-.017547 *-.83481*	.3461E-3 *.56684*	.087211 *.66357*	.22839 *2.0276#*
RNOV97	.10500 *.62813*	.20267 *1.9644#*	-.068400 *-.91951*	.50907 *1.2011*	.039104 *2.0485#*	-.2718E-3 *-.49017*	.021481 *.17997*	-.015261 *-.14918*
RDEC97	-.13263 *-.55033*	-.053658 *-.36074*	.058874 *.54897*	-.42477 *-.69517*	.013439 *.48832*	-.2091E-3 *-.26155*	-.076151 *-.44254*	-.082692 *-.56070*
RJAN98	.33879 *1.8524#*	.18530 *1.6415*	.013364 *.16419*	.93535 *2.0170#*	-.0086653 *-.41488*	-.3016E-3 *-.049707*	.16811 *1.2873*	.089132 *.79634*
RFEB98	.44222 *2.4061**	.27877 *2.4575**	-.067860 *-.82971*	1.0331 *2.2170**	.019337 *.92131*	-.7418E-3 *-1.2169*	-.036987 *-.28185*	-.12188 *-1.0836*
RMAR98	.47445 *1.8695#*	.27255 *1.7401*	.18091 *1.6019*	1.4208 *2.2081**	-.0071678 *-.24733*	.2930E-3 *.34807*	.079678 *.43971*	-.11697 *-.75319*
RAPR98	1.0338 *4.9838**	.63084 *4.9274**	-.069280 *-.75053*	2.8517 *5.4222**	-.046485 *-1.9624#*	.0015419 *2.2409**	.58036 *3.9184**	.26622 *2.0972#*
RMAY98	.52065 *.96261*	.34112 *1.0218*	-.12511 *-.51978*	1.6389 *1.1951*	-.0098767 *-.15990*	.0013078 *.72896*	.047825 *.12383*	-.19467 *-.58813*
RJUN98	-.62677 *-2.4873**	-.25113 *-1.6147*	-.050882 *-.45375*	-1.1887 *-1.8606#*	.032622 *1.1336*	.9941E-3 *1.1893*	-.014193 *-.078881*	.025423 *.16486*

NOTE: in each row, The smaller and italic numbers underneath are t-statistics. * Represents the 5% level significance, and # represents the 10% level significance. The independent variables DIPCWI, DRSCWI, DSACWI, DTBCWI, UICWI, DEICWI, DSSEACWI and DSZECWI are the estimated coefficients obtained from the time-series regressions when the indexes are added in. The dependent variables RJUN97... RJUN98 are the monthly stock returns cross-sectionally.

Table 5.11. Cross-section regressions diagnostic results.

Regression No.	R-square	Serial Correlation[a]	Function form[b]	Normality[c]	Heteroscedasticity[d]
Jun.97	.34844	.0039835(.950)	3.8946(.048)	1.3881(.500)	.45258(.501)
	.38527	*.034477(.853)*	*.76470(.382)*	*1.5225(.467)*	*.020812(.885)*
July97	.38983	1.4530(.228)	.092869(.761)	.21598(.898)	.028124(.867)
	.47419	*.12352(.725)*	*.53840(.463)*	*.47303(.789)*	*.36593(.545)*
Aug.97	.53522	.0037491(.951)	4.3829(.036)	1.4474(.485)	3.4411(.064)
	.55685	*.6755E-3(.979)*	*6.5339(.011)*	*1.0235(.599)*	*3.7753(.052)*
Sept.97	.19138	.1334E-3(.991)	.60550(.436)	1.7251(.422)	1.3104(.252)
	.78667	*1.9344(.164)*	*.59327(.441)*	*.54510(.761)*	*.96834(.325)*
Oct.97	.20189	1.6634(.197)	2.4304(.119)	.33354(.846)	.010499(.918)
	.73448	*1.1516(.283)*	*.0030432(.956)*	*.27247(.873)*	*.0019282(.965)*
Nov.97	.51152	1.1357(.287)	2.1499(.143)	.98125(.612)	.046220(.830)
	.55955	*2.6005(.107)*	*2.3812(.123)*	*1.4205(.492)*	*.060462(.806)*
Dec.97	.24308	.35395(.552)	4.1491(.042)	1.4104(.494)	2.7869(.095)
	.26979	*1.6071(.205)*	*6.5474(.011)*	*1.2670(.531)*	*2.9340(.087)*

Table 5.11. (Continued)

Regression No.	R-square	Serial Correlation[a]	Function form[b]	Normality[c]	Heteroscedasticity[d]
Jan.98	.22249	.15032(.698)	.96972(.325)	.78020(.677)	1.3724(.241)
	.33200	*.0055079(.941)*	*2.5319(.112)*	*1.5060(.471)*	*.48682(.485)*
Feb.98	.41403	1.7432(.187)	6.9549(.008)	1.1872(.552)	.37915(.538)
	.53519	*.28315(.595)*	*3.9184(.048)*	*1.2912(.524)*	*.031225(.860)*
Mar.98	.11525	5.4701(.019)	.0016946(.967)	.98942(.610)	1.9340(.164)
	.67280	*.093495(.760)*	*2.6980(.100)*	*.27083(.873)*	*3.0739(.080)*
Apr.98	.51367	.15400(.695)	.11836(.731)	.72951(.694)	.49993(.480)
	.84107	*3.2618(.017)*	*1.3402(.247)*	*1.8078(.405)*	*1.2091(.272)*
May98	.12417	2.8982(.089)	6.2632(.012)	1.2548(.534)	.27212(.602)
	.37847	*5.8631(.015)*	*6.8511(.009)*	*.28879(.866)*	*.68705(.407)*
Jun.98	.54681	3.1079(.078)	.18585(.666)	.23253(.890)	.28202(.595)
	.55778	*4.2148(.040)*	*.48446(.486)*	*.39237(.822)*	*.72880(.393)*

Note: For every regression, the second italic line is the diagnostic test results when the indexes are added in. The numbers in brackets are probabilities.a: Lagrange multiplier test of residual serial correlation; b: Ramsey's Reset test using the square of the fitted values; c: Based on a test of skewness and kurtosis of residuals; d: Based on the regression of squared residuals on squared fitted values. Jun.97…Jun.98 is the regression in that month respectively.

Chapter VI
Conclusions and Discussions

The main purpose of this research is to examine whether the variability of Chinese stock returns responds to macro-economic growth. Furthermore, by incorporating the derived variables suggested by previous studies, the factors that have been priced into the Chinese stock returns are explored. This chapter concludes the analysis with the discussion and suggestions for further research.

I. Conclusions

This research has performed the parallel empirical tests of the Arbitrage Pricing Theory with macro economic factors through a two-step time-series and cross-section analysis. Specifically, given the availability of the data, the macro variables used were chosen from a framework provided by Chen, Roll and Ross (1986).

In general the results from time-series and cross-section analysis are consistent with the work of Chen, Roll and Ross (1986). Most of the derived macro variables are significant in two-step analysis, which are the growth rate of industrial production, the growth rate of total social retail sales, the growth rate of total value of saving deposits and the growth rate of terms of trade. The conclusion is that the innovations of macro economy are priced in the Chinese stock returns, which reflects the inter-relationship between them. However, even the derived inflation variables show the weakly significance in Chen et al. (1986), they have not been found to be priced into the Chinese stock returns.

The effects of the market indexes are significant in the time-series part but not cross-sectionally. It seems that the stock indexes have stronger explanatory power over time-series returns, which could be viewed as the empirical support to the market model CAPM. However, it cannot be concluded that the CAPM works better than the macro factor model given its poor explanatory power over the cross-section returns, which might indicate that portfolio betas are not constant throughout the study period. The failure of significant effects of the stock indexes in the cross-section analysis suggests that further research into the explanation of the cross-sectional stock returns in the Chinese stock markets is needed.

II. Discussions

It would be interesting to compare the results of this study with other countries' studies. Table 6.1 shows the comparison of the results in various countries.

It seems that different stock markets respond to different macro factors. The stock markets of the US, Korea and Mainland China seem to be more sensitive to the change of the real economic variable such as industrial production, and less sensitive to the inflation variables. While most of the Asian countries are growing rapidly through economic expansion in international trade and domestic markets, the significant effects of the terms of trade variables in Korea and China are consistent with this issue. However, it is quite surprising that the terms of trade, exchange rate and the oil price variables are not significant in the Japanese stock market given the openness of the Japanese economy, while the same case is the Australian market. It seems that these two countries' stock markets reflect more informations from monetary variables such as inflation. Overall the market indexes do not have the same strength explanatory power in all countries, which implies the weak empirical applications of the CAPM.

However, it should be noted that even though the APT with macro factors seems to perform well in some countries, yet it shows ambiguous results in some other countries. Clare and Thomas (1994) and Poon and Taylor (1991) carried out a similar test in the UK stock market. Clare and Thomas (1994) found that several intuitively plausible macro-economic variables were priced by using the data between 1983 and 1990 and beta-sorted portfolios. However, Poon and Taylor (1991) did not find consistent results for macro variables by using the data from 1965 to 1984. Therefore they concluded that either the macro-factor model was inadequate for detecting such pricing relationship, or possibly other macro-economic factors were at work. It seems the different results of these two studies are due to the different data sets and the stocks' grouping method, which might draw doubt on the performance of the macro-factors model internationally.

Table 6.1 International Comparison.

	US[1]	JAPAN[2]	KOREAN[3]	AUSTRALIA[4]	CHINA[5]
Industrial production	Significant	Significant	Significant	Not significant	Significant
Dividend yields	Significant	-	Significant	Not significant	-
Terms of trade	-	Significant	Significant	Not significant	Significant
Market indexes	Significant (time-series)	Not significant	-	-	Significant (time-series)
The Term structure	Significant	Significant	Significant	-	-
Inflation variables	Significant	Significant	Not significant	Significant	Not significant
Oil price	Not significant	Not significant	Significant	-	-
Exchange rate	-	Not significant	Significant	Not significant	-

Note: "-" represents that the variable is not applied in that country. 1. Based on the work of Chen, Ross and Roll (1986), 2. Based on the work of Hamao (1988), 3. Based on the work of Kwon (1994), 4. Based on the work of Groenewold and Fraser (1997). 5. Based on the results of this study.

III. Limitations of the study and the suggestions for future research

There are some limitations in this study arising from the lack of unified theoretical literature, non-availability of data and other related problems. The first problem of this research stands from the choice of the macro variables. No unified theory exists which clearly identifies the choice of macro economic variables required for examining the stock returns regardless of the location of markets. Chen, Roll and Ross (1986), for example, have developed the proxy variables, which are expected to influence stock returns through their influences on the cash flows and discount rate. However, this lacks a comprehensive theoretical background and involves degrees of "arbitrage" and intuition. Empirically the macro model works well in some countries but not for others. The performance of the model is also sensitive to the estimation period of data and the grouping method of stocks.

The second weakness is from the data used in this study. The data used here are not ideal. This is especially limited by the short of market interest rate, market exchange rate, and dividend data. Another shortcoming of the data analysis is the short observation period, which covers the period 1993 to 1998.

It should be noted that the Chinese stock market is a relatively underdeveloped market, which is more subject to speculative activities and manipulations. Government interventions and imperfections in information markets may distort market behavior, which should be borne in mind when we interpret the results.

Given these weaknesses, there is a need for ongoing research into the influence on stock returns. One possible direction could be to link the specific economic structure with the generating process of stock market returns. The common and different features of the results in various countries provide the new research area of testing the APT with macro factors. Special features of emerging markets might play an important role in the behavior of the financial markets when compared to developed markets. It would be an

interesting topic to investigate the different sensitivities to macro economic innovations between the well-developed markets and the emerging markets.

For the Chinese stock market this research could serve as a reference either to the financial academics or government supervisors. With further and deeper transformation to the market economy, there would be more complete and free data available. Thus, these tests might be re-examined under the consideration of more factors such as dividend, market interest rate and market exchange rate. The researchers could advance the test through analyzing the specific economic structures in order to build a specific model fitting the Chinese stock market. Besides the need for future research focusing on the cross-section returns, the researchers might consider the possible non-linear relationship between stock returns and macro economy as well.

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