

AN EMPIRICAL ANALYSIS OF THE CHINESE STOCK MARKET: OVERVALUED/UNDERVALUED

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ABSTRACT

This study examines whether the Chinese stock markets been overvalued using the dividend discount model. We investigate how much have the economic and price-based factors, such as term structure, inflation and price momentum affected the stock market pricing errors. Using a database of daily dividend based index in China from July 2002 to June 2005, our study shows the stocks were undervalued during the sample period, on average, by approximately 0.09% and 1% for Shanghai and Shenzhen composite indexes respectively. The undervaluation can be explained by price momentum and term structure of interest rate. We conclude that the Chinese stock markets do not sufficiently reveal local economic conditions and Chinese investor depend on anecdotal information for momentum profits.

1. INTRODUCTION

The experience of Japan in the 1990s gives rise to the general concern about overvalued stock market. The Japanese economy became stagnant as a result of 60 percent decline of its total value of corporate equity in 1990 (McGrattan and Prescott, 2000). When the market is constantly over optimistic, investors will make adjustment and invest accordingly. As stock

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prices rocket, investors are confident on the outlook of investments. This trend of over optimistic then will affect both investors and speculators. Analysts continue to raise their estimates for the long-run potential earnings growth rates of their companies and the investors keep their “over-exuberance” about high stock prices. Consequently, the stock market is significantly overvalued and is in danger of a drastic fall (Yardeni, 2003).

In the short-run, overvalued stock market can grow to be even more overvalued because of investors’ over confidence and market inefficiency. Most security analysts like to be optimistic in their long-term outlook of the stock market. They do not have much interest on firms and industries that are expected to be underperformed in the upcoming period. This is because the financial service industry is much more profitable when the markets go up than when they fall. However, this overvaluation would not last for a long time because profits will not outgrow GDP. Overvaluation may also result from irrational buying or weakening of a company’s financial strength, both of which inflates the security’s market price. However, overvaluation can be corrected by falling interest rates, rising earnings expectations, and of course, decreasing stock prices. In the same way, undervaluation can be corrected when interest yields increases, earnings expectations decreases, and stock prices rises (Yardeni, 2003).

The Chinese stock market has experienced tremendous growth and development over the past years. The recent Chinese stock market development has been recognised as one of the greatest achievement in China’s financial market since the Chinese economic reform in 1978. It is now the second largest stock market in Asia (after Japan). The increasing numbers of stock investors and the generally upward trend of the local stock indexes transform the Chinese stock market into one of the most actively traded stock market domestically (Wang and Chin, 2004). For example, the number of listed firms reached 1,463 in July 2007, an increase from only 10 firms in the early 1990s with a total market capitalization of more than RMB19919 billion with 110 million investor accounts (KPMG Survey, 2007).

The Chinese stock market is different from other stock markets, particularly in terms of investors’ composition and the extent of government regulations. China protects its economy and markets by market segregation and the “currency shield” acts as a barrier between China’s capital markets and global investors. The stock markets have three classes of shares - A

shares for domestic investors, B shares for foreign investors and H shares which are issued by mainland firms and have the capability of dual-listing on the Stock Exchange of Hong Kong and mainland China. The size, total market value and long term performance of the B share market lags behind that of the A share market. For example, the A share prices have typically been two to four times higher than B share prices (Fernald and Rogers, 2002). According to Li, Yan and Grec (2006), discounts on H shares relative to A shares are related to systemic risk premiums deviation of the local markets.

In spite of the credible development of the Chinese stock market, not much is known about China's stock price behaviour. Most of the existing empirical work on the Chinese stock market has emphasized either on modelling day-of-the-week effects (see Tsui and Yu, 1999; Chen et al., 2001) or on explaining the obvious puzzle of much higher prices in the A share than in the B-share segment of the market (see Chakravarty et al., 1998; Fernald and Rogers, 2002; Gordon and Li, 1999; Mei et al., 2005; Su, 2000; Zhang and Zhao, 2004).

Debates have been developing on the Chinese stock market valuation over the past years. Previous empirical works reveal the overvaluation of stock prices and describe some speculative characteristics of the Chinese stock market. Some argue that abnormal high Price/Earning ratios (P/E), low profits, and price deviations of the Chinese A shares indicate that Chinese A share markets have already been systematically overvalued (see Du, 2004; Gao, 2002; Fernald and Rogers, 2002).

For example, according to the 1994 data, the average P/E ratio of Chinese A share markets is twice the average of the P/E of 10 Asian new rising markets. The number exceeds the P/E of Hong Kong by 88% and Taiwan by 39%. In addition, some blue-chips stocks succeeded in lowering the average P/E ratio depleting their prices. This means the overall P/Es of Chinese A shares are very high according to international pricing structure. The serious overvaluation of the A share markets indicates that the Chinese stock markets experienced some "bubbles" but some industries and enterprises followed the international valuation standards to fend off the bubbles phenomena. Thus the Chinese stock markets tend to experience falling stock prices if it is truly overvalued (Du, 2004).

Others believe that the stock market valuation in China deviates significantly from underlying fundamentals with obvious speculative characteristics (see Mei et al., 2005; Girardin and Liu, 2003; Feng, 2003). There have also been large amount of arguments on the Chinese stock market “bubble” written in Chinese (see Guo, 2004; Zhang, 2004; He, 2007; Li, 2007). Discussions about the bullish Chinese stock markets has become more heated when the Shanghai and Shenzhen stock exchanges experienced extraordinary bull market since mid 2005 (KPMG Survey, 2007).

This study examines whether the Chinese stock markets been overvalued using the dividend discount model. We investigate how much have the economic and price-based factors, such as term structure, inflation and price momentum affected the stock market pricing errors.

The paper is organized as follows: section 2 provides the literature review on overvaluation and undervaluation of the stock market. Section 3 discusses the Chinese stock markets. Section presents methodology and data. Section 5 discusses the empirical results and findings and section 6 concludes the study.

2. Overvaluation or Undervaluation of the Stock Markets

The market value of a stock is determined by the ability of a firm to earn a return on its investments above the opportunity cost of capital. There is mounting evidence that certain stock-valuation methods can profitably differentiate among stocks (Chen and Dong, 2001). For example, Fama and French (1992) find value strategies are fundamentally riskier, that is, investors tend to bear some kind of higher fundamental risk in value stocks such as those with high book-to-market ratios, and the average higher returns compensate for taking this risk.

A valuation measure allows one to achieve better returns may be indicative of investor overconfidence and mispricing. When typical investors are overconfident, certain types of value strategies seemed to have beaten the market because these strategies take advantage of the suboptimal behaviour of them. This means contrarian investors bet against naive investors, who, for example, overreact to stocks that have performed very

poorly, oversell them, and then make these out-of favour “value” stocks to become underpriced (Lakonishok, et al., 1994).

Another source of better returns in a valuation method could be mispricing of individual stocks as well as the aggregate market (Dong and Hirshleifer, 2004). Fama and French (1993) explain the mispricing premium as the compensation for risk factors. De Bondt and Thaler (1985, 1987), and Lakonishok, et al., (1994) argue that investor overconfidence and market inefficiency enable valuation methods to effectively achieve superior returns.

Mispricing of stock has mean reverting characteristics. This means undervalued stocks are likely to become less undervalued as time goes by, and overvalued stocks are likely to become less overvalued (Dong and Hirshleifer, 2004). The stock market tends to undergo over- and undervaluation cycles. The mispricing cycle turns round approximately once every 1.5 years on average. The most undervalued group is the most overvalued group some years later and some years before. This systematic turnaround of stock values from hot to cold and then from cold to hot is link to the winner-loser reversal hypothesis (Chen and Dong, 2001). When the valuation ratios such as price earning ratio (P/E) are at their historical extreme relative to some fundamental indicators, such as dividends or earnings, it is safe to assume that prices will not deviate too far away from their original levels.

High security prices should reflect strong growth opportunities under efficient stock markets. When the firm’s new investment opportunities are overvalued by the stock market, the firm could make additional investment in an attempt to achieve a high price for newly issued equity. Thus companies regularly react to overvaluation by investing more. According to this argument, mis-valuation can occur by the raising the equity capital. Specifically, firms are motivated to issue equity to raise funds when the firm’s equity becomes more and more highly valued. In a similar way, a fund manager may obtain the high short-run stock price by investing heavily at the cost of long-term value so as to satisfy optimistic market expectations (Dong, et al., 2007).

Campbell and Shiller (2001) show that stock prices are probably overvalued based on the dividend-price and price-smoothed-earnings ratios.

According to the authors, the extreme valuation ratios outside their historical range over the late 1990s poses a challenge to the traditional opinion that equity prices resemble a sign of rational expectations and that they are substantially motivated by mean reversion. However, Campbell and Shiller do not agreed the traditional valuation levels and they argued that their findings showed a poor long-term stock market outlook.

According to Reschreiter (2004) findings, extreme valuation ratios may due to fundamentals that are expected to grow in extraordinary rates and stock prices are expected to grow at normal rates. The author argues that the extreme valuation indicators do not imply that stock prices will fall to fundamental values; instead, such high ratios imply the expectation of fundamentals catching up with prices. The author concludes that stock prices are not exuberant because the predicted fundamental growth rates do not seem to be unrealistic compared to historical growth rates. The results imply that increases in dividends and earnings rather than falling stock prices will bring the high valuation ratios back to equilibrium levels. Since expected growth rates in dividends and earnings are rational and the expected fundamental growth rates inherent in the valuation ratios are at the historical level, stock investment is rational in spite of the high valuation ratios.

Lettau and Ludvigson (2005) argue the rational justification for the high valuation ratios may be high growth rates in fundamentals that explain the record high valuation ratios. The valuation ratios become high as prices are expected to grow less than fundamentals. The authors conclude that the high valuation ratios may be a sign of anticipation of above average future growth rates in the fundamentals and below the average future returns. But this does not mean that prices and fundamentals grow at expected rates above or below their long run averages that resulted in the high valuation ratios.

3. The Chinese Stock Markets

The stock valuation standard in China is quite indefinite in valuing and setting stock prices. For example, the Chinese A share is priced differently relative to the universe standard. Foreign investors considered Chinese firms to be unreasonably overvalued due to heavy government intervention and influence. Unlike some countries which need global funds to increase their market liquidity, China does not rely on international capital market to raise

its valuation level. Some institutional investors think that it is most suitable to adopt the American stock valuation measures because both countries are major economies in the world. Both China and America have industries covering extensive fields and the main businesses of listed firms are in their respective country and most stocks are traded in their domestic stock exchanges. However, China focuses on heavy manufacturing industry development such as steel and traditional chemical engineering which is known as high growth industries but is considered sunset-industries in America (Ping, 2004). Thus the China's stock market has neither its own stock valuation rules nor the exact referential experience from other stock markets.

Chinese investors have been pouring money into the stock market while lacking of a well-developed financial system and other viable alternatives to bank deposits. Prasad (2007) thinks that it is difficult to answer whether the stock market valuations in China are completely out of whack and disposed to a steep fall based on traditional metrics, for example, price-earnings ratios. Since about two-thirds of the shares are held by institutional investors (mostly state-owned) and are not actively traded, individual investors' aggregate stock market wealth amounts to at most 30 percent of GDP. Prasad (2007) believes that the market is in danger of sharp falls in prices in order to generate broader concerns about the domestic financial system with the massive run-up in stock prices within a very short period of time and the increasingly wide participation in the stock market by uninformed investors.

Although opinion varies significantly on the size of the overvaluation in China's stock markets, Gao (2002) study, which investigates the Chinese stock market from 1994 to 2001 shows little doubt that the low earnings posted by most companies resulted in high valuations. Girardin and Liu (2003) investigated the Shanghai stock market from April to December 1996 and found the market was characterized by strong speculative pressure. The Composite index amounted 120% at the end of 1996. The daily turnover in the Shanghai stock market was one and a half times the highest daily turnover in the Hong Kong stock market, which has increased threefold, reaching 19.6 billion Yuan. However, the Hong Kong stock market has a 20 times bigger capitalization than that of Shanghai stock market.

Fernald and Rogers (2002) examine the A and H share stock markets from 1993 to 1997. Their study shows that the generally high level of the Chinese A share prices are attributed to low expected returns as a result of limited alternative investments available in China. The authors conclude that the higher prices of the A shares over B shares are due to the different risk premium demanded by domestic and foreign investors even though they are legally identical with the same dividends and voting rights. They also found that firms in Shenzhen or Hong Kong H shares have higher P/E ratios for both domestic and foreign investors relative to Shanghai's A shares. However, the insignificant difference of H shares is not consistent with the proposition that H shares should have lower P/E ratios because they are listed in larger, better regulated and more transparent and liquid market, which shows high probability of A shares' overvaluation.

According to Li, et al. (2006) study, the price differentials in the Chinese cross-listed A and H shares are mainly due to the systemic risk premiums deviation of the local markets. The authors conclude that the H shares excess returns represent risk premiums from both the Hong Kong and Chinese markets. However, the A-share excess returns are only affected by the market risk premium from the Chinese markets. They proved that discounts on H shares relative to A shares are very much related to the contemporary discounts of H share local market index (HSI) relative to A share local market index (SHI).

According to Green (2003), the total values in China's official market capitalization is ambiguous because they include non-tradable legal person and state shares which occupy two-thirds of the total shares. Only one third of the shares that is known as individual person shares are publicly issued and can be freely traded by private individuals and institutional investors on the exchanges. The difficulty in computing the total market value of the Chinese listed firms is that the non-tradable shares do not have market prices. In addition, the state-owned shares and legal-person shares are traded on informal markets in China with a 70%-80% illiquidity discount on average (Bai, et al., 2004). Using the market price of tradeable shares to represent the price of those non-tradable shares, Bai, et al. (2004) discovered that the Chinese publicly listed firms are highly valued by shareholders on the whole during the year of 2000. Nevertheless, when non-tradable shares are

discounted, the authors obtained a more comparable result of Tobin's q ratio and the market/book ratio with those in other major stock markets.

Feng (2003) evaluates the efficiency of stock market valuation in terms of the underlying fundamentals based on the present-value model. The key findings of the study show that stock market valuation in China deviates significantly from underlying fundamentals. For example, earnings growth and stock market valuations are strongly negative related. More strikingly, valuation ratios in China behave in a manner against the efficient markets theory that is based on investor rationality. The P/E ratios are significantly and negatively associated with earnings growth, even during the 'exuberant' stock expansion years. The result suggests that the worse the firms perform, the higher their market values. This implies persistent investor deviations from the economic axioms of rationality and they support the systematic human irrational behaviour argument.

Mei, et al., (2005) show that the Chinese market showed extraordinary booms and busts, which is similar to the pattern of U.S. technology stocks in late 1990s. They hypothesized that Chinese investors would engage in serious speculative trading because they disagree about stock valuation due to their lack of experience. The upwardly biased stock prices reflect the valuations of the optimists who pay prices that go above their own valuation of future dividends since they expect a buyer who is willing to pay even more in the future. Heterogeneous beliefs are generated conveniently by overconfidence, which is thought to be a widely observed behavioural bias in psychological studies. Thus, the stock price exceeds its fundamental value in similar fashion.

Our study is different from previous studies in two ways. First, we use market index, rather than individual stocks to apply the market valuation model. We believe the index is more representative of the market. Using market index allows us to resolve the non-tradable and tradable share pricing problem. Second, we use both macroeconomic variables and individual stock price data to study how the underlying fundamentals affect the market mispricing.

4. Methodology and Data

4.1 Methodology

To estimate how a market is overvalued, we need to have a benchmark which gives a theoretical value of a market. We compare it to the actual price for equity market. The difference between the actual price levels for the index and the expected prices is calculated as pricing errors. Following this, we examine what economic factors cause the mispricing (pricing errors).

To formally investigate the probability of the over-valuation of China's A share market, the Dividend Discount Model which is based on the standard relationship in financial economics is adopted in our study as follows:

$$P_0 = P'_T / (1+r_t)^T \quad (1)$$

$T = t+7$

where

$P_0 =$ the expected intrinsic value or price that one would expect to pay for the asset in a given day t

$P'_T =$ the terminal price in day T which is dividend adjusted

$r_t =$ the constant discount rate or the rate of return required by investors at time t

$T =$ t plus 7 since P'_T is discounted on a 7 days basis.

Following the CAPM model, the discount rate is defined as follows:

$$r_t = r_{ft} + \beta(MRP_t) \quad (2)$$

where $r_{ft} =$ the one-year deposit rate at time t

β is assumed to be 1.0 because the stock market index not individual stock that is valued here

$MRP_t =$ the approximate market risk premium at time t computed as the market return less the yield on the long-term Chinese government bond.

Thus a pricing error can be obtained by calculating prices from equations (1) and (2) to the actual price at each time t :

$$UP_t = (P_0 - P_t) / P_t \quad (3)$$

where UP_t = the unexpected portion of the price in period t
 P_t = the actual price
 P_0 = the expected valuation based on the terminal index price

UP represents the proportional variation between the expected value of shares using dividends discounted at the estimated cost of equity and r_{ft} shows the degree of mis-valuation of the cost of equity. UP should be zero if the market is efficient and correctly valued. If the actual price, P_t is larger than the expected price, P_0 , UP should be negative and vice versa (Foerster and Sapp, 2006).

The Dividend Discount Model assumes certain assumptions to estimate equity value, and it is necessary to investigate the quality of the estimate for the crucial input-discount rate.

To determine how well the method performs at predicting the discount rate, the observed prices are used to back out the implied discount rate.

$$r_{it} = (P'_{T+1} / P'_T) - 1 \quad (4)$$

where r_{it} = the implied discount rate at time t
 P'_{T+1} = the terminal price in day $T+1$ which is dividend adjusted
 P'_T = the terminal price in day T which is dividend adjusted

The estimated discount rate at each period, r_t , which is calculated by equation (2), and is compared with the implied discount rate, r_{it} obtained by the historical data. The unexpected part of the current discount rate is defined as follows:

$$UR_t = (r_t - r_{it}) / r_{it} \quad (5)$$

Where UR_t = the unexpected part of the current discount rate
 r_t = the constant discount rate or the rate of return required by investors at time t
 r_{it} = the implied discount rate at time t

4.1.2 Determinants of Mispricing

This section discusses how the pricing errors are impacted by changing economic conditions. Our study uses the following model:

$$UP_t = a + \sum b_j * F_{jt} + e_t \quad (6)$$

where UP_t = the unexpected portion of the price in period t
 F_{jt} = the value of economic factor j in period t
 b_j = the sensitivity of the pricing errors to factor j
 a = the intercept term
 e_t = the error term

Three key economic and price-related factors are included in our study: term structure, inflation and price momentum.

The term structure (TERM) is defined as the yield on long-term government bonds less the yield on short-term government bonds. This variable measures how the economy is developing over time and to capture the business cycle effects. The slope of the yield curve is commonly viewed as a leading economic indicator. If the yield curve is upward-sloping or the term structure is positive, economic expansion is generally taking place. On the contrary, an inverted yield curve or negative term structure always indicates that the business climate is deteriorating. This is because of the indication of a future recession by the associated tightening of monetary policy which increases short-term rates (Lin, 2004). The economy condition is expected to improve as the term structure increases especially when the slope of the yield curve goes from being negative to positive. When the economy is improving, investors would more optimistically anticipate for future dividend payments by firms as a result would not require as large a return on their equity (Foerster and Sapp, 2006). For this reason the actual stock price is expected to increase as the term structure increases, which improves the economic condition. Thus a negative relationship between term structure and the pricing errors (the difference between the expected price and actual price) is expected.

The inflation measure used in our study is measured using differences in the yearly consumer price index (CPI) adjusted on daily basis. The stocks are viewed as a way of compensating for or providing a long-term hedge

against inflation. Furthermore, stock price changes are regularly observed to have a negative relationship with the changes in inflation in the short-run. The measure offers a means to investigate the changes in investors' expectations regarding inflation. In many times, inflation is rising when the economy goes into a recession. Thus, the changes in inflation (DCPI) measured by the differences CPI adjusted on daily basis are negatively related to the economic conditions. In addition, the pricing errors would be positively related to the rate of inflation. That is, when inflation is decreasing, the actual stock price is expected to increase more than the expected stock price. With the improving economic conditions, there would be more optimistic expectation about the future decreasing actual cost of equity for the market and increasing dividends (Foerster and Sapp, 2006).

Price momentum (MOM) factor is measured by the cumulative changes in equity prices over the past 30 days. Momentum is supposed to be a leading indicator, which means that there would be a decrease in the cost of equity or an increase in the expected level of future dividends as the actual stock prices rises. Thus the economic condition improves with increasing MOM. As a result momentum is positively related to the economic conditions and the pricing errors are supposed to have a negative relationship with momentum (Foerster and Sapp, 2006).

Our study also examines how changes in the economic factors are related to the changes in the actual price and consequently on the unexplained portion of the actual prices or the pricing error. The unexplained portion (UP) of the actual prices or the pricing error should be zero in an efficient market. The relationship between the unexplained pricing error and the economic factors are assumed to depend on the information of these economic measures with regard to the required return on equity and future dividend growth (Foerster and Sapp, 2006). Given a period of continuous over- and under-valuation in the stock market is anticipated in this study, we assumed that there are periods when investors are under-estimating (over-estimating) the required return on equity or systematically over-estimating (or under-estimating) the future dividend growth rate. This will lead to a negative unexplained pricing error, UP, because the actual price, P , would be greater than the expected price, $E[P]$. The unexplained pricing error, UP, would be positive when the contrary is the case (Foerster and Sapp, 2006).

The possible relationships between the economic factors and the implied and the estimated costs of equity, UR, are also investigated in our study:

$$UR_t = a + \sum b_j * F_{jt} + e_t \quad (7)$$

Where UR_t is the unexpected part of the current discount rate, and F_{jt} is the value of economic factor j in period t .

The implied cost of equity is supposed to be greater than the estimated cost of equity when the economic factors show an improvement in future economic performance. The forward looking implied cost of equity will capture the investors' perception that future conditions are improving and thus equity prices should be improving in the future (Foerster and Sapp, 2006). Thus UR is expected to have a negative relationship with the TERM and MOM and have a positive relationship with the lagging indicator, DCPI.

4.2 Data

Data for this study is obtained from the China Stock Market & Accounting Research Database (CSMAR), compiled according to the format of *CRSP* and *Compustat* by Hong Kong Polytech University and GTA Information Technology Company Limited in Shenzhen.

The data time period is from July 2002 to June 2005. It consists of daily index prices including dividends of Shanghai composite index 180 and Shenzhen composite index 100 (from CSMAR). To estimate the term structure, the difference between the bond yields with low risk but different times to maturity is considered. The long term government ten years bond issued in 2002 listing on both Shanghai and Shenzhen markets are used (from CSMAR). In the literature doing Chinese market, the one-year fixed term deposit rate, rather than short-term bond yield, is used to represent the short-term risk-free rate. This is because the Chinese central bank started to issue short-term bonds from late 2003. In this paper, we use one-year term deposit rate as short-term rate from 2002 to 2003 and the one-year bond yield as short-term rate from 2003 to 2005. The one year deposit rates are obtained from the historical data of National Development bank of China. A one year bond issued at 2004 and 2005 are obtained from CSMAR. The CPI is obtained from China Statistics Yearbook.

The data series of this study include the daily data on the Shanghai 180 Composite Index (July 2002–June 2005) and Shenzhen 100 Composite index (January 2003–June 2005). The Shanghai 180 A-Share Stock Price Index is a market-value weighted index that tracks the daily performance of 180 A-Shares listed on the Shanghai Stock Exchange. The Shanghai 180 index was formed on July 1, 2002 designed to provide a benchmark for Shanghai A shares stock market performance. Similarly, the Shenzhen 100 A-Share Stock Price Index is a market value -weighted index that tracks the daily performance of 100 A-Shares listed on the Shenzhen Stock Exchange. The Shenzhen 100 index was formed on January 2, 2003 designed to provide a benchmark for Shenzhen A shares stock market performance. This study uses the Shanghai 180 composite index and Shenzhen 100 composite index data because they are the most commonly used benchmark portfolio of Chinese stock market that provide information on the daily price level of the index including the corresponding dividend payments. The Shanghai A-share and the Shenzhen A-share stock price indexes are excluded from our study because they are capitalization-weighted indexes including all A-shares listed on Shanghai and Shenzhen Stock Exchanges. These two composite indexes have relatively high P/E ratios because they include stocks of firms with inferior performance but high prices. However, the Shanghai 180 composite index and Shenzhen 100 composite index is much easier to understand and evaluate the Chinese stock market movements.

5. Empirical Results

5.2 Descriptive Statistics

Figure 1 shows the performance of the expected prices obtained from the DDM (dividend discount model). The DDM seems to perform reasonably well in estimating the real prices over the sample. The deviations between the actual and expected prices appear in same pattern in the Shanghai and Shenzhen stock markets. The expected prices appear to be over-valuing stocks during the sample period as the pricing errors appear to be more distributed across the under-valuation over the sample. The differences between the actual and expected prices are the largest when there are large changes in the Chinese economy (for example, during 2004).

Figure 1. Actual Price of Shanghai 180 Composite Index and the Expected Price Calculated by the Dividend Discount Model

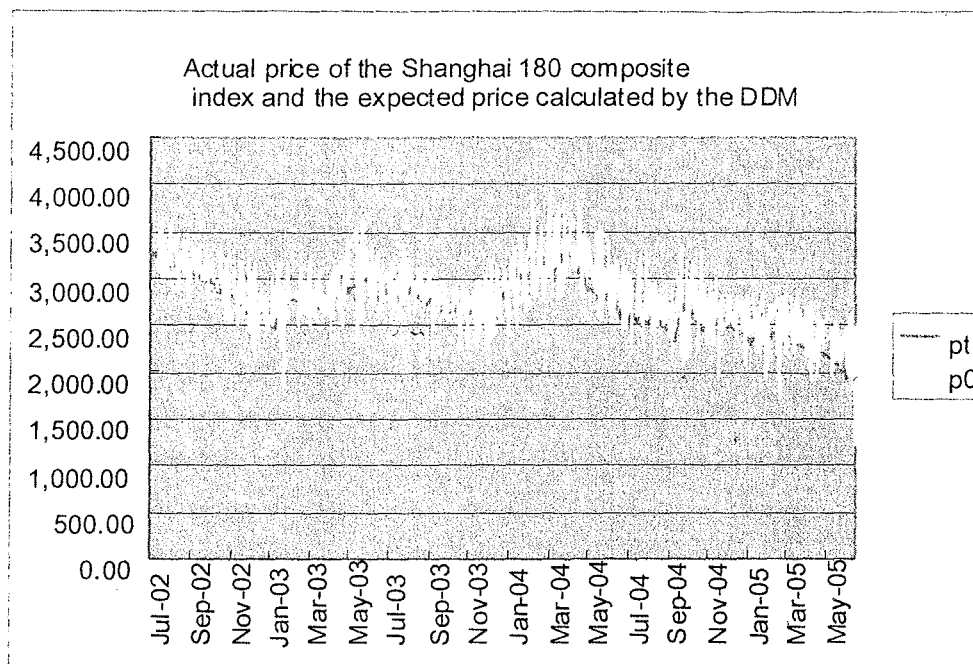
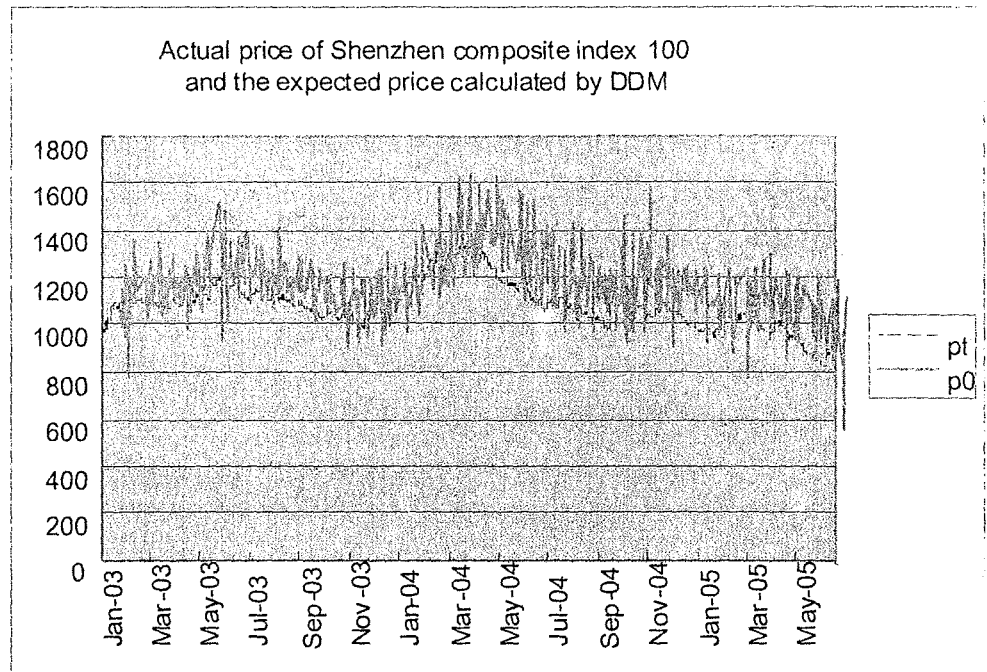


Figure 2. Actual Price of Shenzhen 100 Composite Index and the Expected Price Calculated by the Dividend Discount Model



Notes: P_t is the actual price and P_0 is the expected intrinsic value or price based on DDM.

The economic factors over the sample period are shown in Figures 2 to 4. Looking at the long-term and short-term government bond rates in Figures 2a and 2b respectively, the long-term rates are more stable than the short-term rates over the entire sample. For the same bond but listed in different stock market, the long term and short term bond performed in similar pattern but with quite different values in the Shanghai and Shenzhen stock markets. In Figure 2a, our result shows that the long term rates fluctuate narrowly until early 2004. The long term rates increased rapidly from April 2004 and peaked in May. In October 2004 and March 2005, the central bank of China increased the deposit rate and reserve ratio. The short term rate did not exceed the long term rate in the Shanghai stock market. However, the short term bond rates fluctuated wildly from January to May 2005. In Figure 2b, our result shows in the Shenzhen stock market, the short term

interest rates experienced dramatic swings, with the very low negative value and much higher rates than the long-term bond during the period.

Figure 2(a). Long-Term and Short-Term Government Bond Yields, 2002-2005 (Shanghai Stock Market)

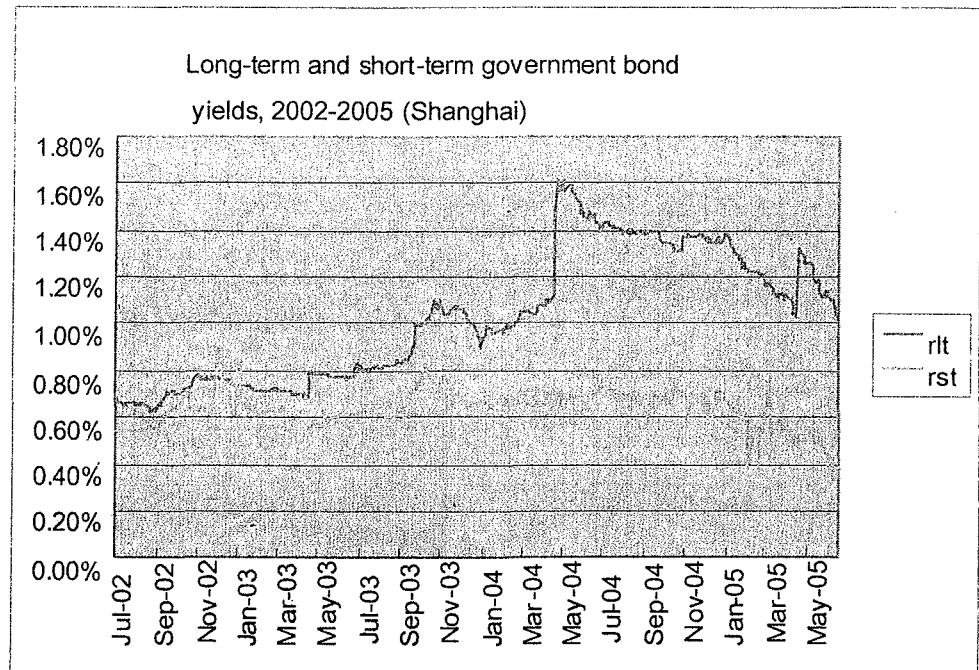
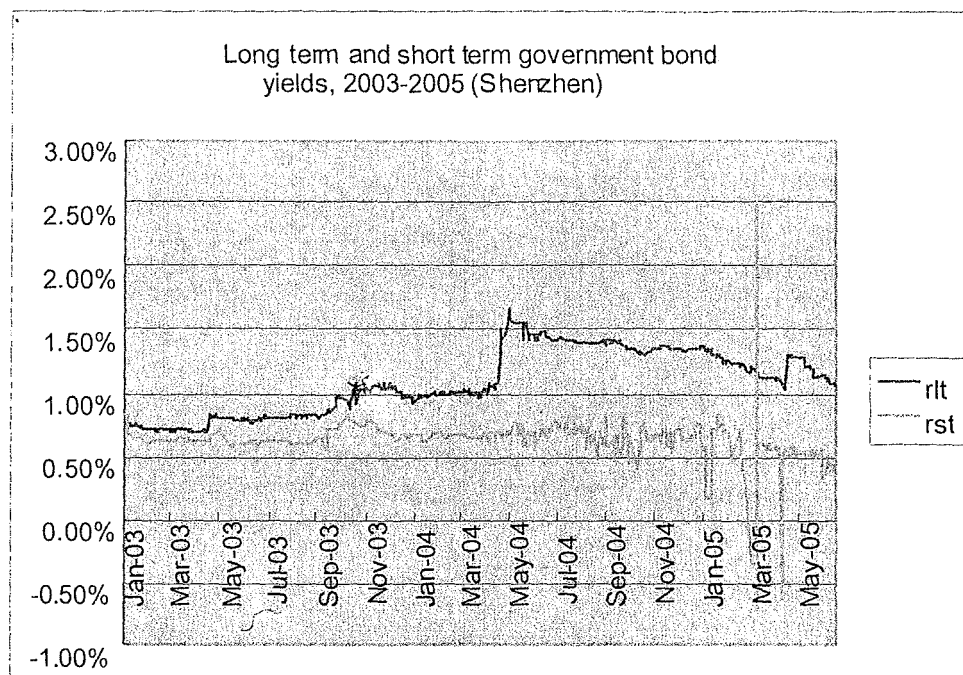


Figure 2(b). Long-Term and Short-Term Government Bond Yields, 2003-2005 (Shenzhen Stock Market)



In general, the long and short-term interest rates followed similar patterns but the differences in yield widens after April 2004. In Figures 3a and 3b, the term structure is measured by the difference between the yields on the long and short term bonds. Our result shows how the spread between them has changed over this time period. In Figure 3a, the term structure started to decrease since July 2002 with its value very close to zero until October. The term structure rapidly trended up from April 2004. In Figure 3b, during January to May 2005, the term structure started to decrease when big inversion displayed on Shenzhen stock market.

Figure 3(a). Term Structure Measure, 2002-2005 (Shanghai Stock Market)

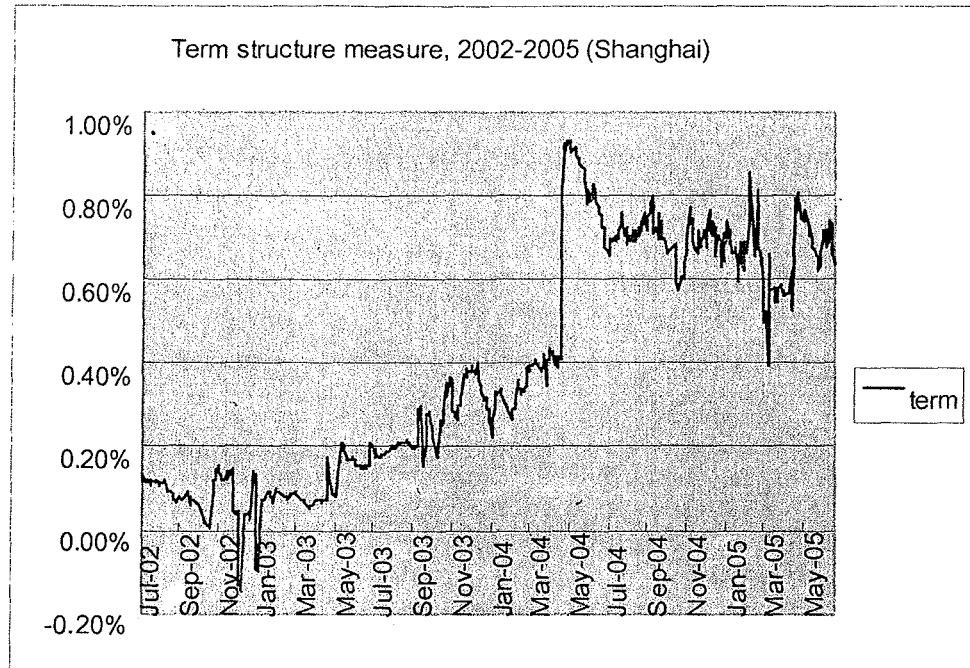
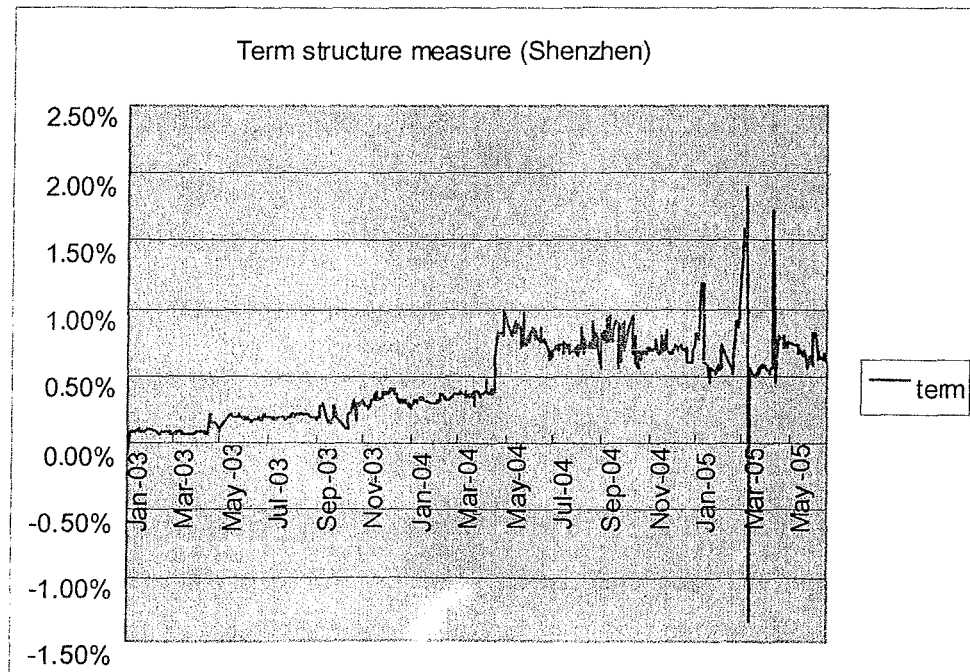


Figure 3(b). Term Structure Measure, 2003-2005 (Shenzhen Stock Market)



For the yearly CPI in Figure 4a fluctuates widely. The inflation reaches its peak at 23% in year 1995, and then it declines. Deflation occurred in 2002 and then returned back to normal until 2004. This provided some evidence that increasing in inflation paved the way for the economic downturns, especially since 2004 when inflation has but kept decreasing from 2005.

Figure 4a. Consumer Price Index (1990-2007)

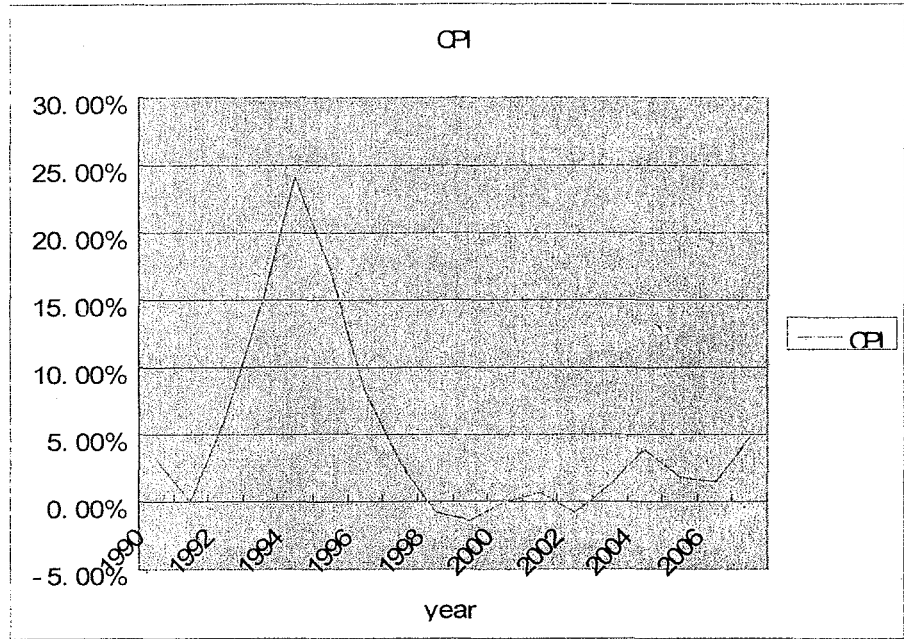
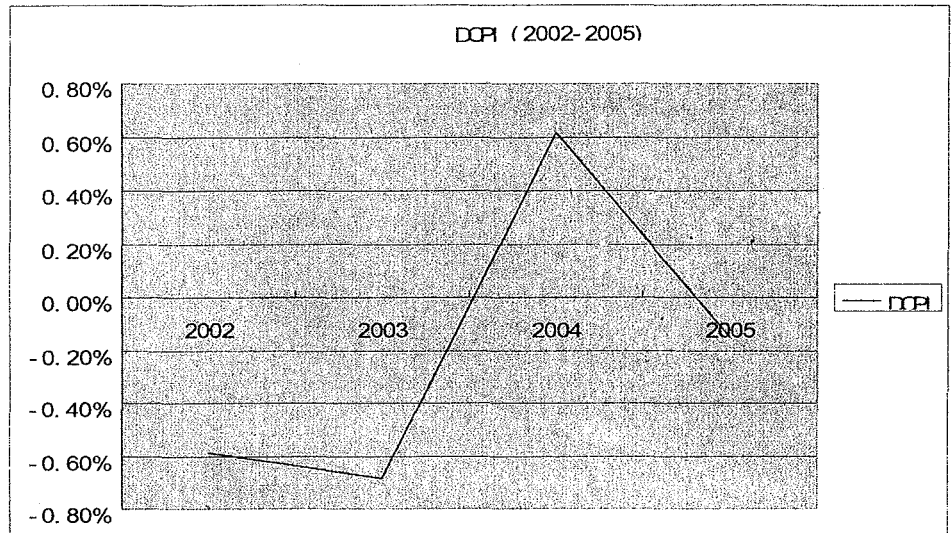


Figure 4b. Change in Consumer Price Index (2002-2005)



To further see how investors' valuation of equities has changed over time, Figures 5a and 5b show the one month price momentum factor. This clearly demonstrates how equity prices rise and fall during the sample period.

Figure 5a. One Month Price Momentum Factor, 2002-2005 (Shanghai Stock Market)

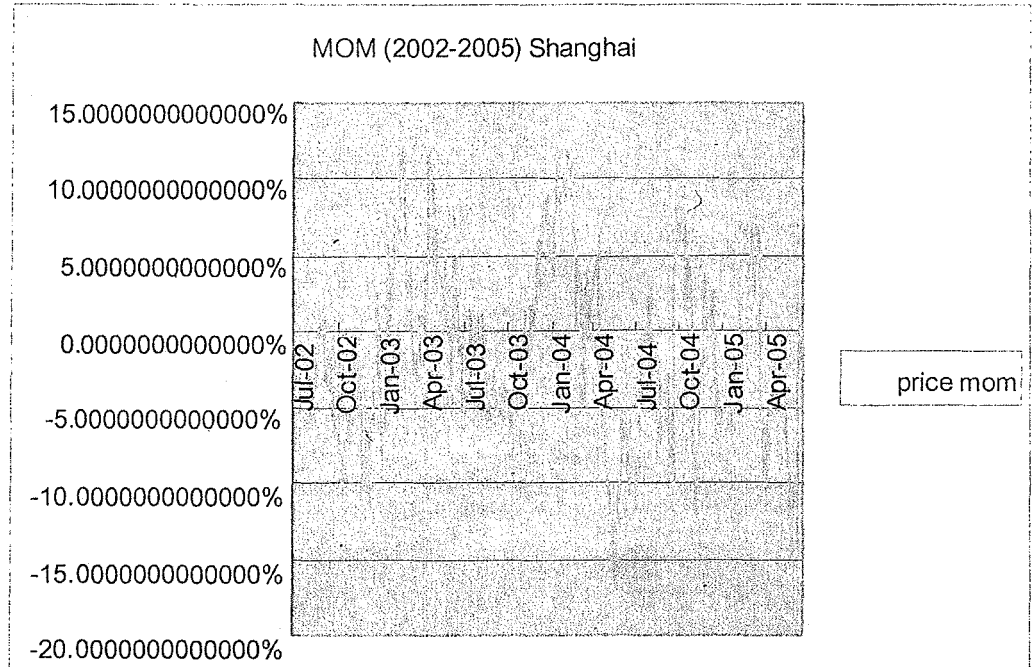
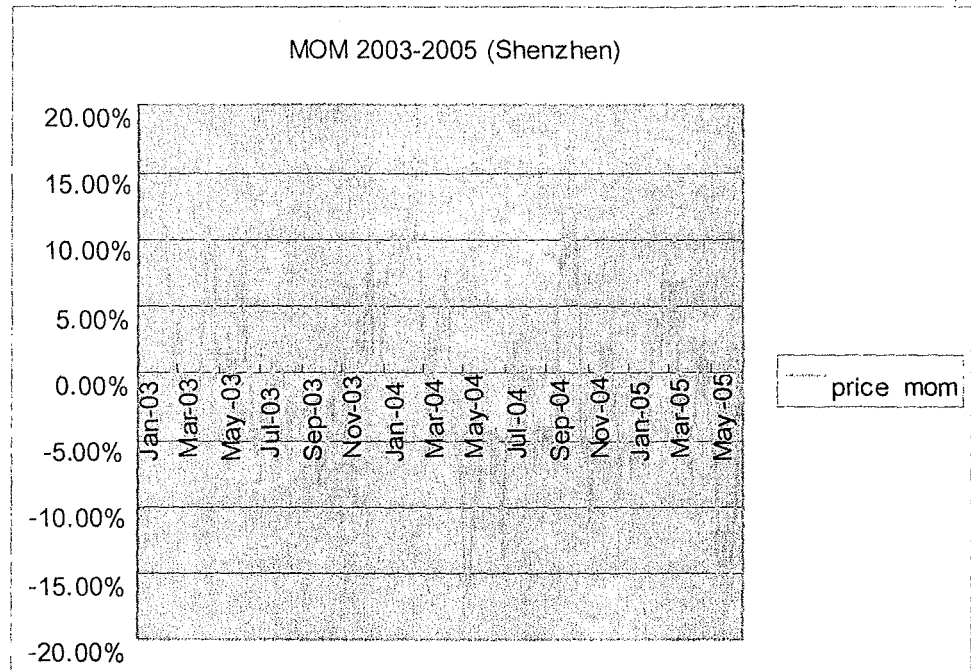


Figure 5b. One Month Price Momentum Factor, 2003-2005 (Shenzhen Stock Market)



5.2 Discussions

This section examines the valuation techniques using expected future dividends to explain the actual value of the Shanghai 180 and Shenzhen 100 Composite Indexes. Since dividends play an important role in stock valuation, it is assumed that investors use the expected dividends and adopt the CAPM in calculating the discounts rates to determine the current value of stocks.

Table 1 shows the estimated results using equation (6). The regression results show the relationships between the pricing errors and the economic and price based factors. The intercept term represents the average pricing error over the corresponding sample period (Foerster and Sapp, 2006). Consistent with the results shown in Figures 1a and 1b, the estimated intercept shows there is an average under-pricing of 0.9% of the Shanghai stock market and 1% of the Shenzhen stock market over the entire sample period. But the results are not statistically significant.

Table 1. Pricing Errors Regression

	Intercept	TERM	DCPI	MOM	Adj R-sq	F	N
Panel A: Shanghai Stock Market, 2002-2005							
Coefficients	0.009	5.336	0.56	-0.298	0.082	21.686	694
t-statistic	(0.943)	(2.687)	(0.611)	(-4.735)			
Panel B: Shenzhen Stock Market, 2003-2005							
Coefficients	0.01	5.078	0.473	-0.362	0.091	20.122	572
t-statistic	(1.116)	(3.046)	(0.565)	(-5.253)			

Notes: The regressions are based on the dependent variable pricing errors presented in equation (7): $UP_{t} = a + b_j * F_{jt} + et$ where "Upt" is defined as $(P_t - P_0) / P_t$, P_t is the actual price of the index and P_0 is the expected valuation based on the terminal index price (the cost of equity used to discount the dividends and terminal price is estimated using a rolling CAPM), F_{jt} is the value of economic factor j in period t, b_j is the sensitivity of the pricing errors to factor j, a is the intercept term and et is the error term. The TERM, DCPI and MOM factors are described in Table 1. T-statistics are presented in parentheses. Adj R-sq is the adjusted R-square. F is the F statistic. N is the number of observations.

The regression results in Table 1 show that the Shanghai and Shenzhen stock markets during 2002-2005 deviate from their intrinsic value for a very small distance. This is supported by the t value statistics for the intercept term revealing that the model does not provide strong evidence of market under-valuation. In other words, the Chinese stock markets are quite near to efficient when they were bear market from 2002 to mid 2005. This result

supports the existing literatures about overvaluation of the Chinese stock markets in the 1990s from a different viewpoint.

Contrary to the expected sign, there is a positive relationship between the term structure of interest rates and the pricing errors (see Table 1). This might be explained by the investors' expectation of riskier economy though the positive term structure normally indicates better economic conditions. This finding is consistent with the investors who view the government's actions as an attempt to revive the economy by reducing short-term interest rates. The relationship between the pricing errors and price-based factor, price momentum, is much more significant compared to the two economic factors in the overall period. This result reveals that the Chinese stock market is quite momentum driven. The pricing errors are not quite affected by rate of inflation. The probable explanation is that we use the yearly CPI data and adjust the CPI on daily basis. The year-over-year changes in consumer prices with a 365 days moving average, and DCPI does fluctuate during a year. Overall the results from the estimated models for the pricing errors provide evidence of positive and negative relationships between the economic factors and the pricing errors. It suggests that the value of these economic factors in the standard asset pricing model is possibly related to their ability to forecast how investors are valuing assets. This is evidenced by matching the actual prices that investors are willing to pay for the expected prices based on fundamental valuation (Foerster and Sapp, 2006).

Next, we study the relationship between the estimated and implied costs of equity. Summary statistics for each of the values as well as the difference between them are presented in Table 2. The estimated and implied costs of equity are very similar and are just below 8% per year over the whole sample in spite of the variability and lower values of the estimated cost of equity over time (mean of $r_{it} * 250$ trading days). The low standard deviation of the cost of equity indicates their stability over the entire sample period.

Table 2. Summary Statistics for Cost of Equity

Variable	Mean	Std Dev	Mm	Max
Panel A: Shanghai Stock Market, 2002-2005				
Urt	-0.5159805	15.67961175	-401.09842	38.57076
rit	-0.000328	0.0119976	-0.03697	0.06348
rt	-0.004125	0.012765	-0.04242	0.07538
Panel B: Shenzhen Stock Market, 2003-2005				
Urt	-0.444918	9.4849447	-176.221	45.45362
rit	0.0000328	0.0133049	-0.04297	0.07555
rt	-0.004272	0.0140174	-0.0496	0.07836

Notes: The variable include r_t , the estimated cost of equity(or discount rate) using the CAPM: $r_t = r_{ft} + \hat{\alpha}(MRPt)$ where r_{ft} is the yield on a long-term Chinese government bond yield at time t , $\hat{\alpha}$ is assumed to be 1.0, and $MRPt$ is the estimated market risk premium at time t calculated as the Chinese market return(the Shanghai 180 composite index and Shenzhen 100 composite index) less the yield on a long-term Chinese government bond yield. r_{it} , the implied cost of equity, is calculated based on the historic index price using equation (5): $r_{it} = (P^*T + 1/P^*T) - 1$. And the unexpected part of the current discount rate at time t : $UR_t = (r_t - r_{it}) / r_{it}$. The summary statistics include the mean, standard deviation, minimum and maximum daily values, July 2002-June 2005 for Shanghai and January 2003-June 2005 for Shenzhen

Table 3 presents the regression results of the level of the difference between the estimated and implied cost of equity (UR) and the economic factors using equation (7). The overall regression results demonstrate the average under-estimation of the cost of equity by means of the moving average for the market premium in the CAPM compared to the implied cost of equity obtained by historical index prices. That is, the cost of equity is overvalued in the Shanghai stock market by 6.5% and 16.3% in the Shenzhen stock market.

Table 3. Cost of Equity Deviations Regression

	Intercept	TERM	DCPI	MOM	Adj R-sq	F	N
Panel A: Shanghai Stock Market, 2002-2005							
Coefficients	-0.065	-280.619	146.249	-21.322	0.003	3.07	693
t-statistic	(-0.061)	(-0.845)	(1.141)	(-1.956)			
Panel B: Shenzhen Stock Market, 2003-2005							
Coefficients	-0.163	-40.949	11.949	-10.727	-0.001	0.905	571
t-statistic	(-0.178)	(-0.237)	(0.138)	(1.505)			

Notes: The regressions are based on the dependent variable pricing errors presented in equation (8): $UR_t = \hat{a} + \sum_j b_j F_{jt} + e_t$ where "UR_t" is defined as $(r_t - r_{it}) / r_{it}$, r_t is the estimated cost of equity (or discount rate) using the CAPM: $r_t = r_{ft} + \hat{a}(MRP_t)$ where r_{ft} is the yield on a long-term Chinese government bond yield at time t , \hat{a} is assumed to be 1.0, and MRP_t is the estimated market risk premium at time t calculated as the Chinese market return (the Shanghai 180 composite index and Shenzhen 100 composite index) less the yield on a long-term Chinese government bond yield. r_{it} , the implied cost of equity, is calculated based on the historic index price using equation (5): $r_{it} = (P^*T + 1/P^*T) - 1$. F_{jt} is the value of economic factor j in period t , b_j is the sensitivity of the pricing errors to factor j , \hat{a} is the intercept term and e_t is the error term. The TERM, DCPI and MOM factors are described in Table 1. T-statistics are presented in parentheses. Adj R-sq is the adjusted R-square.

Given that the estimated cost of equity is obtained from a moving average of past prices, the changes in investor sentiment are more rapidly integrated into the implied cost of equity than the estimated cost of equity.

The data in Table 3 shows the relationship between the deviations of cost of equities and price momentum is much more significant compared to the other two factors in the overall period.

However, the result shows negative relationship between the cost of equity deviation and term structure. This contradicts our expectation. Our results show that the implied price increases more than the estimated price as the term structure increase and investors would require a higher compensation for taking risk when short-term rate increases (Foerster and Sapp, 2006). Positive term structure is identified as a signal of improving economic condition. The possible explanation is that increasing the long-term rates to stimulate the economy leads to a necessary increase in the cost of equity offered to investors. This explanation is in consistent with the findings shown in Figure 3. There is constant positive cost of equity since June 2005. This means the estimated cost of equity is higher than the implied cost of equity at that time. From the middle of 2005 the Chinese stock markets started to boom. This might be an indication of the investors starting to under-estimate the actual cost of equity or having unrealistically high expectations regarding the equity premium.

6. Conclusions

By examining the actual prices and dividend payments for the Shanghai 180 composite index (July 2002-June 2005) and Shenzhen 100 composite index (January 2003-June 2005), the dividend-based valuation method proved to perform relatively well in explaining the actual prices for the two composite index. We find that the stocks were undervalued during 2002-2005, on average, by approximately 0.9% and 1% for Shanghai and Shenzhen, respectively. The result is not significantly different from zero, which concludes an average zero pricing error occurs in both markets. So the Chinese stock market was close to the real value during 2002-2005 when the bear market lost quite a lot of its value. Our results support Ahmed, Li, and Rosser (2006) and Green (2003) findings about the overvaluation of the Chinese stock markets in the 1990s. Therefore, this study provides a pursuant proof of the general public's enthusiasm and over-optimism of the security markets in China.

When evaluating the level of pricing errors (differences between the actual price levels for the index and the expected prices), our results show

that changes in the economic and price-related factors have different effect on these differences. Our results show that the inflation has very little influence on the deviation between the intrinsic value and real stock prices. This maybe caused by the year-over-year changes in consumer prices on daily basis, DCPI, doesn't fluctuate during a year as we use the yearly CPI data. However, the price-based factor, price momentum, has much larger effect on the "pricing errors" compared to that of the economic factors, inflation and term structure. Similarly, the economic and price-based factors are also used to explain the differences between estimated costs of equity obtained by CAPM and implied costs of equity obtained by historical equity price. The relationship between the deviation and the estimated cost of equity (based on CAPM) and the implied cost of equity (based on the actual index prices) provides similar results.

Chinese stock markets are much more momentum driven. This conclusion is consistent with the view that there is no apparent correlation between stock market price fluctuations and the general economic situation in China and the Chinese investors depend heavily on anecdotal information for significant momentum profits (see He, 2007; Drew et al., 2003; Girardin and Liu, 2003).

Some limitations are inherent in this study. The first is the time period examined. In our study, we choose the sample period for Shanghai A share market from July 2002 to June 2005, when the Shanghai 180 composite index begins. The Shenzhen 100 composite index starts from January 2003 to June 2005. In this regard, we cannot directly prove that the Chinese stock market was over-valued for the 1990s. During 2002 to 2005 when the Chinese A share market lost its value and the average P/E ratio fell to the historical lowest, our results showed both the Shanghai and Shenzhen A share markets were very close to their real value in this time period. Our study data did not investigate the data for the 1990s' Chinese stock markets. This might make our findings and conclusions less robust than if we could directly prove the Chinese stock markets are over-valued.

In the study, we investigate three major economic and price-based factors, the term structure, inflation, and price momentum. However, there are many other important economic factors, such as default premium and earnings/price ratio that could make our results more detailed and findings and conclusions more conclusive.

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