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PRICE-EARNINGS RATIO AND INFLUENCE FACTORS:
EVIDENCE FROM CHINA

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ABSTRACT

This paper studies relations between P/E ratios and influence factors. It employs data of average P/E ratios in Shanghai and Shenzhen stock markets, as well as the companies' P/E ratios from Hushen 300 Index on empirical research. It aims to reveal correlations between P/E ratios and influence factors, the impact of influence factors on P/E ratios and to build regression models for estimating and forecasting P/E ratios. The purpose of the study is to provide theoretical model foundations for estimating and forecasting of P/E ratios for investors when judging investment values according to P/E ratios and corresponding indices. It also gives an instruction for the IPO pricing.

The empirical researches are divided into two parts, one on the market average P/E ratios and the other on the companies' individual P/E ratios. Descriptive analysis, correlation analysis and regression process are used to examine the correlations. Finally regression models are derived to supply theoretical model reference for estimation and prediction on P/E ratios.

The empirical results demonstrate that macroeconomics indices have limited effect on market average P/E ratios for the market's weak reflection of national economy. Industrial and financial indices should be taken into account when estimating the companies' individual P/E ratios. Moreover, the research effect will be better with more factors employed.

KEYWORDS: Average P/E Ratio, Companies' P/E Ratio, Influence Factors.

1. INTRODUCTION

The Price-Earnings Ratio (P/E Ratio), which indicates the earnings multiple, is a measure of the price paid for a share relative to the income or profit earned by the firm per share. It was presented firstly in the famous text "Security Analysis" written by Benjamin Graham and David Dodd (1934). The P/E looks at the relationship between the stock price and the company's earnings. It shows how much investors are willing to pay per dollar of earnings. It has long been recognized as one of the most useful financial indicators for valuing both stock markets and individual stocks.

As a rapid growing Emerging Securities Market, the P/E Ratios of both the whole China's market and individual stocks are relatively higher than the developed markets. In the history, it was 10 to 20 before 1996; and then fluctuated between 30-50 from 1996-1999; after that it hovered around 60 from Mid 2000 to Mid 2001; it has been obviously volatilizable from then and especially in the year 2007, at the peaks of 70 with 300 for one individual in the October, the period of the growth spurts of the stock market. As for the relations between theoretical and practical P/E Ratio, it is discrepancy rates reduced first, expanded regressively later. Different industries and individual stocks were of different characters.

Since 2001, there has been a debate both within the financial academy and practice field, whether the P/E Ratios in China's market is too high to result in bubbles in the market.

In this debate, one kind of opinion is "The China's stock market P/E Ratio is overvalued with the average ratio of 60, there is not a country whose economy can support such a high P/E Ratio." (Zhang Wei, 2001). "In the developed countries, the average P/E Ratio maintains no more than 20. The growth of South Korea economy was more than 14%, with the P/E Ratio of 20 in the 1970's. Both Hongkong and Southeast countries P/E Ratios are no more than 20. Only Japan is an exception, its high P/E Ratio of 60 in the economics bubbles period lead to the disaster in 1990, and a decade later it hasn't been resuscitated." (Wu Jinglian, 2001).

Another representation of viewpoint thinks "There's no comparable P/E Ratio to other markets in China."(Hua Sheng, 2001). And "There's not a fixed rational P/E Ratio to measure the stock market, different markets and stages apply different standard." (Wang Kaiguo, 2002). "The current P/E Ratio is not overvalued; it is within the rational range for China's market."

Moreover, there are still other ideas: someone thinks that the P/E Ratios should be classified when measured，Special treatments and Particular Transfers stocks should be eliminated; Some others consider the relation between the supply and demand in the stock market, they figure out that in the developing market, demand exceeding supply rise up the stock prices and P/E Ratios, which can not be estimated by using the normal measurement.

1.1. The Research Problem and Purpose of Study

The research problem is to reveal relations between P/E ratios and influence factors, the impact of influence factors on P/E ratios and to build regression models for estimating and forecasting P/E ratios.

The purpose of this study can be listed as follows.

(1) From the research some influence factors of P/E ratios will stand out, especially the factors with the Chinese stock market characteristic. We will acquire the degree of impact on P/E ratios, and will estimate P/E ratios and investment value by distinguishing these factors.

(2) To give investors a reference when they using the P/E ratios index which financial indices should they pay attention on. More comprehensive information but not only P/E ratios own will be used when investors judge investment value according to P/E ratios.

(3) To supply a model reference and theoretical judgments foundation for P/E ratios' estimation and prediction by building regression models. The IPO can also be priced on more scientific and practical theoretical model foundation.

1.2. Research Hypothesis

We divide P/E ratios into two parts: the market average P/E and the companies' individual P/E ratios. The market average P/E ratio is found being correlated to macroeconomic indices in previous studies, and it could reflect the national economy to a certain extent. Thus, this paper selects six influence factors that may affect the market P/E ratios to examine relations between them and P/E ratios.

The hypotheses for average P/E ratio are:

H1: Five factors (the growth rate of GDP, growth rate of CPI, Shanghai Index, Shenzhen ZH Index and Securitization Proportion) correlate positively to average P/E ratio.

H2: Annual Interest Rate correlates negatively to average P/E ratio.

The individual companies' P/E ratios are supposed to be influenced by the industrial average P/E ratio and other financial and non-financial figures of the companies'. Total fifteen influence factors are included in the hypotheses for companies' P/E ratios:

H3: Ten factors (Industrial Average P/E Ratio, Return on Equity (ROE), Growth Rate of Earnings Per Share (EPS), Growth Rate of ROE, Dividend Payout Ratio, Growth Rate of Net Assets, Growth Rate of Main Business Income, Growth Rate of Main Business Profit, Price-Book (P/B) Ratio and IPO Price) correlate positively to companies' P/E ratios.

H4: Four factors (Beta, Liability-Asset (L/A) Ratio, Circulation Stock Proportion and Listing Date) correlate negatively to companies' P/E ratios.

Detailed specifications on hypothesis can be found in Chapter 3.

1.3. Previous Studies

1.3.1. Review of the International Research

Benjamin Graham & David Dodd (1934) presented in the "Securities Analysis" that the value of a stock is multiple of its current earnings; it depends on both macro (confidence on the stock) and micro factors (the property and history of the company). They considered that P/E ratios reflect the information on previous performance and the future growth of the companies. The average earnings must be accounted when valuing stock price, 16 times of the average earnings is the top price investors can afford.

A traditional view is that P/E ratio is a "profit capitalization multiplication" (Grahametal, 1962), namely the reciprocal of investor anticipated repayment rate, experiential studies (Beaver and Morse, 1978) found that P/E ratio reflects the "durative" and "temporary" profit structure in current surplus, and it is the profit

capitalization multiplication only if temporary profit is zero. Therefore P/E ratio reflects both the proportion of temporary profit to current surplus and the probability of earnings capitalization, namely changes of future earnings. Because that current durative profit can predict the future, then P/E ratio is an earning growth index. Some other studies (Basu, 1983) P/E ratio can predict the future stock investment yield; investing low P/E stocks can gain a higher earnings. Ou and Penman (1989) discussed the feasibility P/E ratio forecast the future investment yield and made an explaination. They found there is a negative relationship between P/E predicting and accounting information predicting earnings. Bernard, Thomas and Wahlen (1997) affirmed P/E effect, but they thought there exists high investment risk to win the market if portfolio stratagem is devised according to P/E effect. Fairfield (1994) researched on American data from 1970-1984, confirmed high P/E ratio foretelling high growth rate of future excess earnings, and indicated cointegration of P/E and P/B ratio has better predictive ability for future stock price.

Penman (1996) gave a detailed discussion about the theoretical essence of P/E ratio and the relation between current and future return on equity (ROE). The study concludes that P/E ratio is a united decision of current and future ROE; it has a negative relation between current ROE and positive relation between anticipative net assets.

In the research on the influencing factors of P/E ratios by using the S&P 500 Index data from 1968 to 1993, Loughlin (1996) found that the P/E ratio has a positive relation to the dividend payout ratio and expected growth of Earnings. White (2000) used longer term samples (1926-1997) to obtain the similar result. In the time series analysis on S&P 500 Index Data, many researchers proved there exists a negative relation between the P/E Ratio and risk-free rate of return (Loughlin, 1996, and White, 2000). Some one considered the positive relation between the Inflation rate and the P/E Ratio (Reilly, Griggs and Wong, 1983; Kane, Marcus and Noh, 1996; and White, 2000).

Jain and Rosett (2001) researched on the relationship between macro-economic variables and the E/P Ratio, the reciprocal of P/E Ratio. In their research model, besides the expected inflation ratio, the real interest rate, the expected real growth rate of GDP and curve slope of financial revenue, the consumers' sentiments were considered as well. The findings show that only the expected inflation ratio and expected real growth rate of GDP have obvious effect on explaining the samples from 1952 to 2000. They found the changes with time of P/E Ratio are not easy to be

explained by using a constant group of micro-economic variables, and the consumers' sentiments are not a remarkable index out of others.

Donna, Dudney etc. (2004) mainly focus on the impact of the consumer's confidence and taxation on the P/E ratio. The results confirm their expectation of the obvious effect. Moreover, they also proved the dividend payout ratio, asset-liability ratio, curve slope of financial revenues; short-term interest rate and expected growth rate are distinct variables. They used two methods to measure the growth rate: the historical and forecasting growth trend based on the Livingston Surbey forecasts, and obtained similar results.

1.3.2. Review of China's Research

Xu Ming etc. (2003) take the current ratio, securitization ratio and consumer price index (CPI) into the regression models, the findings indicate there have positive relationships between P/E Ratio and the three indices, the responding level are all above 90%.

Wu Minxiao (2003) figured that in order to keep the controlling position of the public ownership, the stateowned shares which occupied a majority proportion in the ownership structure of the listed firms, can not circulate in the market. On the effect of the relation between supply and demand, the small issuing scale lead to a high initial and exchange price, which finally result in a higher P/E ratio.

Zang Suyu (2004) described the structure characteristics of the P/E Ratio by observing the performance, size and industries of firms, concluded the market P/E Ratio is on the high side, the initial structure of P/E Ratios differ hugely, and all the performance, size, industrial and style characteristics represent a remarkable dualistic structure.

Xu Xiaofeng and Li Shouxi (2005) also get the conclusion that the P/E Ratio is positively relative with current ratio, negatively with working capital ratio, ROE, current share ratio and firm scale. P/E of listed firms going onto market after 2001 and acquiring standard opinions is lower than the others.

For the stocks P/E Ratios, Bai Na etc. (2002) worked out that the dividend payout ratio, the growth rate of EPS, the industrial average P/E Ratio have main explaining effection on the stocks P/E Ratios. It is consistent with the results of Chen Ying

(2003). However, the size of capital has limited explaining function. They used the empirical methods to show the significant differences of P/E Ratios between industries, the higher the industrial P/E Ratio, the higher the individual P/E Ratios are.

In addition, researches on the influencing variables are debt ratio (Li Shehuan etc., 1998), coefficient Beta (Zheng Junjun, 2000), turnover rate (Liu Xiuli etc., 2003) and so on, but few on growth indices and profitable indices such as ROE. This thesis will study on the relationships.

1.4. Structure of the Paper

There are six chapters in this paper. Chapter 1 introduces the problem and purpose of study, reviews previous studies both out and inside China's stock market. Chapter 2 supplies the theoretical foundation of this research. Chapter 3 introduces the hypothesis. Data and methodology will be expressed in Chapter 4. Empirical researches of average P/E ratios and companies' P/E ratios will both be in Chapter 5. Chapter 6 will make a conclusion of this paper and provide suggestions on further researches.

2. BASIC THEORIES ON STOCK PRICING AND P/E RATIO

In this section, basic stock pricing models are discussed to reveal the intrinsic value of stocks as well as the relationships between P/E ratio and its influence factors.

2.1. Gordon Growth Model

Gordon growth model is a variant of the discounted cash flow model, is a method for valuing intrinsic value of a stock or business. Many researches on P/E ratios are based on this constant dividend growth model. The derivation process is presented as follows.

When investors purchase a stock, they expect two kinds of cash flows: dividend during holding shares and expected stock price at the end of shareholding. As the expected share price is decided by future dividend, then we can use the unlimited discount to value the current price of stocks.

A normal model for the intrinsic value of a stock:

$$V = \frac{D_1}{(1+R)^1} + \frac{D_2}{(1+R)^2} + \cdots\cdots + \frac{D_n}{(1+R)^n} = \sum_{t=1}^{\infty} \frac{D_t}{(1+R)^t} (n \to \infty) \qquad (1)$$

In equation (1) where V: intrinsic value of the stock;

D_t: dividend for the tth year;

R: discount rate, namely required rate of return;

t: the year for dividend payment.

Assume the market is efficient, the share price should be equal to the intrinsic value of the stock, then equation (1) becomes:

$$P_0 = \frac{D_1}{(1+R)^1} + \frac{D_2}{(1+R)^2} + \cdots\cdots + \frac{D_n}{(1+R)^n} = \sum_{t=1}^{\infty} \frac{D_t}{(1+R)^t} (n \to \infty) \qquad (2)$$

Where P_0: purchase price of the stock;

D_t: dividend for the tth year;

R: discount rate, namely required rate of return;

t: the year for dividend payment.

Assume the dividend grows stably at the rate of g, we derive the constant dividend growth model.

That is Gordon constant dividend growth model:

$$
\begin{aligned}
P_0 &= \frac{D_1}{(1+R)^1} + \frac{D_2}{(1+R)^2} + \cdots \cdots + \frac{D_n}{(1+R)^n} \\
&= \frac{D_0(1+g)}{(1+R)^1} + \frac{D_0(1+g)^2}{(1+R)^2} + \cdots \cdots + \frac{D_0(1+g)^n}{(1+R)^n} (n \to \infty) \quad (3) \\
&= \sum_{t=1}^{\infty} \frac{D_0(1+g)^t}{(1+R)^t}
\end{aligned}
$$

When g is a constant, and R>g at the same time, then equation (3) can be modified as the following:

$$
P_0 = \frac{D_0(1+g)}{R-g} = \frac{D_1}{R-g} \quad (4)
$$

In equation (4) where:

P_0: purchase price of the stock;

D_0: dividend at the purchase time;

D_1: dividend for the 1st year;

R: discount rate, namely required rate of return;

g: the growth rate of dividend.

We suppose that the return on dividend b is fixed, then equation (4) divided by E_1 is:

$$
\frac{P_0}{E_1} = \frac{D_1 / E_1}{R - g} = \frac{b}{R - g} \quad (5)
$$

In equation (5) where:

P_0: purchase price of the stock;

D_1: dividend for the 1st year;

E_1: earnings per share (EPS) of the 1st year after purchase;

b: return on dividend;

R: discount rate, namely required rate of return;

g: the growth rate of dividend.

Therefrom we derive the P/E ratio theoretical computation model, from which appear factors deciding P/E directly, namely return on dividend, required rate of return and the growth rate of dividend. The P/E ratio is related positively to the return on dividend and required rate of return, and negatively to the growth rate of dividend.

Realistically speaking, most investors relate high P/E ratios to corporations with fast growth of future profits. However, the risk closely linked the speedy growth is also very important. They can counterbalance each other. For instance, when other elements are equal, the higher the risk of a stock, the lower is its P/E ratio, but high growth rate can counterbalance the high risk, thus lead to a high P/E ratio. P/E ratio reflects the rational investors' expectation on the companies' growth potential and risk in the future. The growth rate of dividend (*g*) and required rate of return (R) in the equation also response growth opportunity and risk factors.

Financial indices such as Dividend Payout Ratio, Liability-Assets (L/A) Ratio and indices that reflecting growth and profitability are employed in this paper as direct influence factors that have impact on companies' P/E ratios.

Derived from equation (5), the dividend payout ratio has a direct positive effect on P/E ratio. When there is a high dividend payout ratio, the returns and stock value investors expected will also rise, which lead to a high P/E ratio. Conversely, the P/E ratio will be correspondingly lower.

Earnings per share (EPS) is another direct factor, while its impact on P/E ratio is negative. It reflects the relation between capital size and profit level of the company. When the profit level is the same, the larger the capital size, the lower the EPS will be, then the higher the P/E ratio will be. When the liability-assets ratio is high, which represents that the proportion of the equity capital is lower than debt capital, then the EPS will be high and finally the P/E ratio will led to be low. Therefore, the companies' L/A ratio also negatively correlate to P/E ratio.

Some other financial indices including growth rate of EPS, ROE, growth rate of ROE, growth rate of net assets, growth rate of main business income and growth rate of main business profit should theoretically positively correlate to P/E ratios, because if the companies' growth and profitability are both great, then investors' expectation will be high, and then the stock prices and P/E ratios will be correspondingly high. Conversely, they will be low.

We make further assumption of factors in the above equations, to research into the derivation on P/E ratios.

In the Gordon growth model, the growth of dividend is calculated based on the return on retained earnings reinvestment, r, therefore:

g = r (1-b) = retention ratio* return on retained earnings.

As a result:

$$\frac{P_0}{E_1} = \frac{b}{R - g} = \frac{b}{R - r(1 - b)} \quad (6)$$

Especially, when the expected return on retained earnings equal to the required rate of return (i.e. $r = R$) or when the retained earnings is zero (i.e. $b=1$),

There is:

$$\frac{P_0}{E_1} = \frac{1}{R} \quad (7)$$

Obviously, in equation (7) the theoretical value of P/E ratio is the reciprocal of the required rate of return. According to the Capital Asset Pricing Model (CAPM), the average yields of the stock market should be equal to risk-free yield plus total risk premium. When there not exists any risk, then the required rate of return will equal to the market interest rate. Thus, the P/E ratio here turns into the reciprocal of the market interest rate.

As an important influence factor, the annual interest rate affect on both market average and companies' individual P/E ratios. On the side of market average P/E ratio,

when interest rate declines, funds will move to security markets, funds supply volume increasing will lead to the rise of share prices, and then rise in P/E ratios. In contrast, when interest rate rises, revulsion of capitals will reflow into banks, funds supply will be critical, share prices decline as well as P/E ratios. On the other side on the companies' P/E ratio, the raise on interest rate will be albatross of companies, all other conditions remain, earnings will reduce, then equity will lessen, large deviation between operation performance and expected returns appears, can not support a high level of P/E ratio, so stock prices will decline. As a result, both market average and companies' individual P/E ratios will be influenced by the annual interest rate.

It is also suitable to estimate the market average P/E ratio, and only when all the above assumptions are satisfied, that the practical P/E ratio amount to the theoretical value. However, different from the securities market, the interest rate is relatively rigid, especially to the strict control of interest rate countries; the interest rate adjustment is not so frequent, so that it is not synchronous with macroeconomic fundamentals. Reversely, the stock market reflects the macroeconomic fundamentals; high expectation of investors can raise up the stock prices, sequent the growth of the aggregate value of the whole market. Other market behaviors can also lead to changes of average P/E ratios. Therefore, it is impossible that the average P/E ratio is identical with the theoretical one. Variance exits inevitably, the key is to measure a rational range for this variance.

For the market average P/E ratio, P should be the aggregate value of listed stocks, and E is the total level of capital gains. To the maturity market, the reasonable average P/E ratio should be the reciprocal of the average yields of the market; usually the bank annual interest is used to represent the average yields of the market.

The return on retained earnings is an expected value in theory, while it is always hard to forecast, so the return on equity (ROE) is used to estimate the value.

Then equation (6) can be evolved as follows:

$$\frac{P_0}{E_1} = \frac{b}{R-g} = \frac{b}{R-r(1-b)} = \frac{b}{R-ROE(1-b)} \quad (8)$$

From equation (8) we can know, ROE is one of the influence factors to P/E ratio, which measures the value companies created for shareholders. It is positively correlated to the P/E ratio.

2.2. Net Present Value of Growth Opportunity Model

The estimation of P/E ratio can be studied from the angle of the growth opportunity. We firstly divide the stock price into two parts: one part without a growth opportunity, the other one with the opportunity.

Suppose that a company's dividend is constant, all the earnings are paid to investors ($b = 1$), so:

$$E_1 = E_2 = E_3 = \cdots\cdots = E_n = D_1 = D_2 = D_3 = \cdots\cdots = D_n (n \rightarrow \infty)$$

Then:

$$P_0 = \frac{E_1}{R} \quad \text{the same as equation (7)}$$

However, no retained earnings is inconsistent with practical, there usually have some growth opportunities. They are added into the following equation:

$$P_0 = \frac{E_1}{R} + NPVGO \qquad (9)$$

If the return on reinvestment equals to the required rate of return ($r = R$), NOVGO is zero, which is the assumption in equation (6). When $r > R$, NPVGO is positive, there creates new values. While when $r < R$, NPVGO is negative, neither new values come out, nor will the stock price be lower than there's no growth opportunities.

Divided equation (9) by E_1:

$$\frac{P_0}{E_1} = \frac{1}{R} + \frac{NPVGO}{E_1} \qquad (10)$$

Equation (10) is another theoretical model of P/E ratio. It is positively related to the net present value of growth opportunity. It is a reflection of the companies' prospects, which has the same views with the theoretical derivation. NPVGO is a reflection of

the company's prospects; the more growth opportunities, the higher is the P/E ratio of its shares, conversely it will be low.

Two other influence factors are unscrambled. One is the discount rate R, it is negatively related to the P/E ratio, while generally the discount rate is positively connected to the share risk, so the P/E ratio is negatively related to the share risk. We usually use β to measure the stock risk.

The required rate of return of stocks is determined by beta coefficient in Capital Asset Pricing (CAPM) Model. As shown in formula (5), the required rate of return (represented by beta coefficient) derived from Gordon growth model, is one of direct determinants of P/E ratios. It is a risk factor and correlated P/E ratio negatively.

The other factor is that the choice of accounting methods will influence earnings per share (EPS), and finally influence the P/E ratio. For example, there are First-In First-Out (FIFO) and Last-In First-Out (LIFO) methods for inventory measurement to choose from. Under the circumstances of inflation, FIFO will understate the inventory cost, but earnings will be more than LIFO which with more cost. As last, the P/E ratio will be different using different accounting methods.

Both Gordon Growth Model and Net Present Value of Growth Opportunity Model are used to assess share prices; they are proved to get the same prices in different ways. Two different expressions of P/E ratio are derived from these two models, influence factors are also deduced.

Factors showed by Gordon Growth Model are: discount rate (using risk element β to replace), return on dividend, growth rate of earnings per share, interest and return on equity (ROE) etc.

Net Present Value of Growth Opportunity Model (NPVGO) indicated factors as: discount rate, net present value of growth opportunity (NPVGO, can be represented by industrial factors, growth rate of financial indices), choice on accounting methods and financial indices derived from these.

3. HYPOTHESIS

Based on previous studies and literature, this paper selected six factors affecting the average P/E ratios, and fifteen factors affecting the companies' P/E ratios, specific factors and hypothesis are as follows.

3.1. Hypothesis on Relationship between Average P/E Ratio and Influence Factors

Generally speaking, stock markets are barometers of national economy, they are positively related. Inevitably, the reaction sometimes is advanced, while sometimes lagged, it is impossible peaks or low points appear at the same time points. The overseas experience has fully borne this out. Many suchlike discussions are also taken in China. As the China's security markets are still in the initial period, they can not reflect the operational state of national economy to a certain extent; while the market is driving to maturity after several years of rapid progress, it will function better and better gradually.

This paper is to examine whether P/E Ratio is consistent with some macroeconomic factors. Tight correlation is observed from earlier studies, according to which and practical situations, discussion and hypothesis about the average P/E Ratio and its influence factors will be propounded in the following.

3.1.1. Macroeconomic Indices

(1) GDP Growth Rate

When a country in rapid development period of economy, prospective returns of listed companies will be high, share prices which reflect immanent value and development potential of stocks will be high, so that P/E ratios will high; however, when the national economy in downturn, investors look on the gloomy side of stocks, share prices fall, P/E ratios will also be lower than normal. So we suppose that P/E ratio is positively related to the growth rate of GDP.

(2) Annual Interest Rate of Deposit

Influence from interest rate on share prices embodies in two aspects. Firstly, changes in interest rate can affect directly movements of funds in security markets. Generally, when interest rate declines, funds will move to security markets, funds supply volume increasing induces rise in share prices, and then rise in P/E ratios; conversely, when interest rate rises, revulsion of capitals will reflow into banks, funds supply will be critical, share prices decline as well as P/E ratios. Therefore, negative connection between interest rate and average P/E ratios.

In addition, changes of interest rate have direct impact on earnings of companies. Raise of interest rate will be albatross of companies, all other conditions remain, earnings will reduce, then equity will lessen, large deviation between operation performance and expected returns appears, can not support a high level of P/E ratio, so stock prices will decline; on the other side, when interest rate reduces, share prices raise with high level of P/E ratios. As a result, individual stock P/E ratios will move inversely to the direction of changes of interest rate.

(3) Growth Rate of CPI (Consumer Price Index)

It is well known that stocks and real estates have inflation-proof in value in the inflation period. So, investor purchase capitals such as stocks to reduce loss from devaluation, P/E ratios will be high in inflation period; while when it is deflation, situations are completely the opposite. They are obviously positively related. Thus, when making investment decision by using P/E ratio, changes of inflation rate (usually replaced by growth rate of CPI) must be considered to evade devaluation risk.

(4) Stock Market Index

Under the condition that profit invariable and share capital changing little, P/E ratios at a great certain are changing in the same direction of stock market index. Shanghai Stock Market Index and Shenzhen ZH Index are gathered in this study, to inspect and verify relationship between changes of P/E ratios and stock market index at an empirical angle.

(5) Securitization Proportion

This ratio compares a country or region's stock market capitalization to the GDP in that country or region. It's a measure of development of a country or region's stock market.

In developed countries, enterprises with a certain size will appear on the stock market, the ratio aggregate value occupies GDP (GDP Securitization proportion) is about 130%, in America it is even as high as 150%. Only a very small part of companies are listed in China's stock market, the ratio aggregate value accounted for a small percentage of GDP, it was mostly below 50% except the highest 53.79% in the year 2000. While it increased sharply from 44% to 132.65% in the boom of security market in 2007.

For the number of investment accounts, by the end of 2007, Shanghai and Shenzhen stock markets accounts are totally over 138 millions. Assume that three persons on one account, the number of people involved in securities investment is far below 25% of China's total population. In developed countries, this ratio is usually above 60%. The ratio is 85% in United States that people directly or indirectly invest in the stock market. Changes in the stock markets have considerable impact on the consumer's confidence, thus affecting economic operation.

Low GDP Securitization proportion, low proportion of investment people on the total population are the main reason that China's development of securities markets and macroeconomic can not be linked tightly. After 15 years of development of the China's security markets, what relationship between Securitization proportion and P/E Ratio is what we will test in the following parts.

3.1.2. Summary of Assumptions on Average P/E Ratios

This paper selected six factors affecting the average P/E ratios, according to above discussions, assumptions on average P/E ratios are as follows:

Table 1. Summary of Assumptions on Average P/E Ratios

Influence factors	GDP	Annual IR	CPI	Shanghai Index	Shenzhen ZH Index	Securitization proportion
Correlate to P/E Ratio	Pos.	Neg.	Pos.	Pos.	Pos.	Pos.

3.2. Hypothesis on Relation between Companies' P/E Ratios and Influence Factors

We selected 15 variables which may influence companies' P/E ratios. In this section, we will give a simple expression on relations between these factors and P/E ratios, and give hypothesis on them.

3.2.1. Financial Indices

(1) Dividend Payout Ratio

The dividend payout ratio is derived from formula (5) of Gordon growth model as one of the direct determinant factors to P/E ratios. When the dividend payout ratio is high, the expected returns investors gained will be correspondingly high, which will further lead investors make a high measure of stock values, the companies' P/E ratios will then rise. Conversely, the P/E ratios will decline. Therefore, it is supposed that there is a positive correlation between dividend payout ratios and companies' P/E ratios.

(2) Liability-Asset (L/A) Ratio

Earnings per share (EPS) is one of the indices directly influencing P/E ratios. This index reflects the relation between capital size and profit level of listing companies. In the same level of corporate profits circumstances, the larger the capital size, the fewer will EPS be, the higher will the P/E ratios be; conversely the lower will the P/E ratios be. Debt capital and equity capital are accounting for inverse proportions with each other. When the liability-asset ratio is high, the proportion the equity capital accounting for will be lower, which lead the EPS being high and finally the P/E ratios be low. Therefore, the companies' L/A ratios negatively correlate P/E ratios. The higher the L/A ratios, the lower will P/E ratios be.

(3) Indices that Reflecting Growth and Profitability

As stock investment core are the companies' growth and profitability, so we selected six variables that directly or indirectly reflecting growth and profitability and influencing P/E ratios as well. They are growth rate of EPS, ROE, growth rate of ROE, growth rate of net assets, growth rate of main business income and growth rate of main business profit.

These financial indices, should theoretically positively correlate to P/E ratios, because if the companies' growth and profitability are both great, then investors' expectation will be high, and then the stock prices and P/E ratios will be correspondingly high. Conversely, they will be low.

Among the indices, the return on equity (ROE), another direct determinant of P/E ratios, is the most representative index that reflecting the corporate performance the best. It measures the value companies created for shareholders.

3.2.2. Non-Financial Indices

(1) Circulation Stock Proportion

Generally, the earnings yield of stocks is in reverse proportion with the company size. The larger the capital size, more difficult for dealers to manipulate stock markets. So the P/E ratios will be low when the circulation stock proportion is high.

Because of the historical reasons in China's stock markets, there are a large amount of non-circulation stocks. Widespread low circulation stock proportions are one of main reasons for the overall high P/E ratios. Pilot reform is ongoing to expand circulation stock proportion, which will play certain role on the overall P/E ratios return reasonable level.

(2) Beta (Risk Factor)

Shown in formula (5) derived from Gordon growth model, the required rate of return (represented by beta coefficient) is one of direct determinants of P/E ratios. It is a risk factor. The required rate of return of stocks is determined by beta coefficient in Capital Asset Pricing (CAPM) Model. The larger is beta, the larger will be the risk,

then the expected return on stock will be high, the P/E will be low. Negative correlation is between beta and P/E ratios.

(3) Initial Public Offerings (IPO) Price

When stocks are in circulation in the market, the stock prices generally fluctuate on the foundation of IPO price. It the IPO price is high, the P/E ratios will often stay at a high level displaying certain dependence. So, positive correlation is supposed to exist between IPO price and P/E ratios.

(4) Industry Factors and Industrial Average P/E Ratios

In mature securities markets, for listing companies in different industries, the market structures, profit abilities, interrelatedness with macro economic cycle, as well as the life cycle and stage of different industries are also very different; so the business performance and the stock investment risk return also have the remarkable difference. Therefore, in the practical security analysis, taking the industry factors into account is a necessary step.

Specifically, the situations of industries the companies listing in, and the industrial average P/E ratios will directly affect the individual companies' P/E ratios. As the different profitablities, different development level, the expectation on development prospects and profitabilities of individual stocks are inevitably different. High average P/E ratios in high-growth industries are certainly leading to high individual P/E ratios. While the P/E ratios in poor-growth traditional industries will be correspondingly lower. This indicates a positive correlation between industrial average P/E ratio and individual companies' P/E ratios.

(5) Price-Book (P/B) Ratio and Annual Yield

The relation between P/B and P/E ratios is essentially the relation between earnings per share and equity per share. So obviously, if the equity per share is high, the earnings per share will also be high, they are positively related.

Annual yield of stocks are derived from the difference subtracting closing price at beginning of year from that at the end of the end of year divided by the closing price at beginning of year. On the relation between annual yield and P/E ratios, there is no

theoretical or empirical proof to support, so no hypothesis will be made here. We will study the relation on the following empirical analysis.

(6) Listing Date

In China's Stock market, the sooner the date of listing, the higher will the P/E ratios be; as the time goes, P/E ratios will descend down gradually. In addition, P/E ratios have certain dependence on the IPO P/E ratios. Stocks issued early with high IPO P/E ratios will lead to relative higher P/E ratios in circulation. Negative correlation is assumed between listing date and companies' P/E ratios.

3.2.3. Summary of Assumptions on Companies' P/E Ratios

This part selected 15 factors influencing the companies' P/E ratios, according to above discussions; assumptions on correlations are listed as follows.

Table 2. Summary of Assumptions on Companies' P/E Ratios

Influence factors	AIPE	ROE	GR of EPS	GR of ROE	DPR
Correlate to P/E Ratio	Pos.	Pos.	Pos.	Pos.	Pos.
Influence factors	BETA	GR of NA	GR of MBI	GR of MBP	L/A
Correlate to P/E Ratio	Neg.	Pos.	Pos.	Pos.	Neg.
Influence factors	Annual Yield	P/B	CSP	IPO PRICE	LISTING DATE
Correlate to P/E Ratio	None	Pos.	Neg.	Pos.	Neg.

4. DATA AND METHODOLOGY

4.1. Data Selection

In this paper, the average price-earnings ratio data are collected from the Shanghai and Shenzhen stock markets in the period from 1992-2007. Companies' P/E ratio data are selected from Hushen 300 Index in the period from 2005-2007. As the sample data of the average P/E ratio is relatively simple, this chapter will focus on the detailed instructions on the data samples selection of companies' P/E ratios.

4.1.1. Hushen 300 Index

The Hushen 300 Index is the first unified index after China's securities markets establishment about 15 years. It is now one of the most important figures reflecting the whole fluctuation of China's Shanghai and Shenzhen stock exchanges, which include both large and medium-sized companies. About one fifth of the total stocks listed on the two markets are chosen as samples of the Hushen 300 Index, accounting for 60 percent of the market value in China's stock market. The Base Day of the Index is 31st December, 2004 with the Base Value 1000. It was prepared by Shanghai Stock Exchange and Shenzhen Stock Exchange, released officially on 8th April, 2005. Index abbreviation is: Hushen 300 Index; Index code is: 000300 in Shanghai stock market and 399300 in Shenzhen stock market.

By 28th December, 2007, the aggregate market value of index samples is 25.07 trillion RMB Yuan, accounting for 77.25% of aggregate market value of Shanghai and Shenzhen A-Shares stock markets; circulation capital is 5.91 trillion RMB Yuan, which accounting for 65.31% of aggregate circulation capital values of Shanghai and Shenzhen A-Shares stock markets. The index samples cover all 13 industries, except for medicine and information technology industries, the proportion of index samples aggregate market value and circulation capital value are both over 50%, of which energy, finance, estate and public utility industries are more than 80%. Overall, the distribution of Hushen 300 Index samples among industries is balanced; the deviation is only 2.03%.

Affected by multiple factors such as the appreciation expectation of RMB, excess liquidity, rapid growth of macroeconomic and profits of listed companies, China's security markets continued good performance in 2007, index closing and turnover created new high repeatedly, the performance exceeded market expectations.

The Hushen 300 Index was open quotation on January 4, 2007 on 2073.25 points, lowered to 2030.76 points, and touched 5891.72 points peak, finally closed on 5338.27 points, rised over that of the end of 2006 by 161.55%. In the corresponding period, earnings of Shanghai 180 Index, Shenzhen 100R Index, Shanghai Index and Shenzhen Component Index increased separately 151.55%, 179.05%, 96.66% and 166.29%

It can be found that the developing trend of Hushen 300 Index is consistent with other main security indices; it has widespread market representation to show changes in the whole security market. Correlation coefficients shown in the following figure and table indicate the trend of Hushen 300 Index is highly relevant to other main indices.

Fig. 1. Tracks of Hushen 300 Index and Other Main Indices
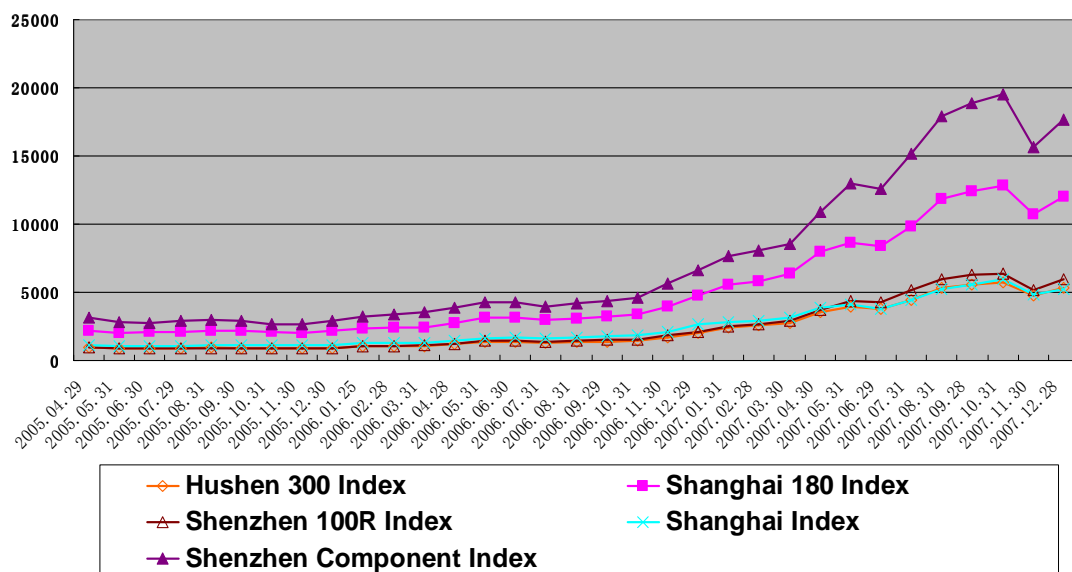
As can be seen from Fig. 1., Hushen 300 Index developed synchronously with other main indices; it is almost overlapped by Shanghai Index and Shenzhen 100R Index.

Table 3. Simple Correlations and Significance Text between Hushen 300 Index and Other Main Indices

Pearson Correlation	Shanghai 180 Index	Shenzhen 100R Index	Shanghai Index	Shenzhen Component Index
Hushen 300 Index	0.999815***	0.999242***	0.997005***	0.998906***

***. Correlation is significant at the 0.001 level (2-tailed).

The highest correlation is between Hushen 300 Index and Shanghai 180 Index revealed in Table 3., with the coefficient being 99.9815%; that with Shenzhen 100R Index, Shanghai Index and Shenzhen Component Index are separately 99.9242%, 99.7005% and 99.8906% (significant at the 0.001 level, 2-tailed). It is quite high in everyone which can also proves that Hushen 300 Index samples can represent the entire A-Shares market. For the above reasons, this paper selected Hushen 300 Index as the study sample.

4.1.2. Time Period and Scope of Data Samples

The time period and scope of factors that influencing average and companies' P/E ratios are listed as following:

Table 4. List of Time Period and Scope of Data Samples

Study Object	Time Period	Time Unit	Collection Sample
Average P/E Ratios	1992-2007	Annual	Shanghai and Shenzhen Stock Markets
Companies' P/E Ratios	2005-2007	Annual	Hushen 300 Index Shares

4.1.3. Principles of Data Samples Selection

In this paper, the sample period of average P/E Ratios is from 1992, the year China's stock market opening, to the end of 2007 with the greatest boom; and that of companies' P/E Ratios is from 2005, the beginning of Hushen 300 Index issued, to the end of 2007. The P/E Ratios data samples come from website of Shanghai and Shenzhen Stock Exchanges and Hushen 300 Index data come from website of China Securities Index Co. Ltd. Samples of companies' P/E ratios were selected in accordance with the following principles:

(1) Seeing that the P/E ratio is a positive indicator, no sense exists when it is negative, we eliminated shares with negative P/E ratios (namely negative EPS);

(2) In view of the objectives in this paper are long-term investment values, when P/E ratios are abnormally high or exceed a certain value, sane investors would not choose such stocks to make investment. There is no sense to bring such numerical values into data samples, or else they will impact the research results. Based on this, listed companies with P/E ratios higher than 100 will be picked out of samples. A lot of companies were eliminated for this reason because of the crazy boom which is also the greatest boom historically in the year 2007.

(3) According to the same reasons of (2), meager profit shares with EPS lower than 0.01 which could lead to abnormal values of P/E, were also eliminated to optimize the sample further.

(4) Because the data samples were selected from the beginning of 2005, companies listed after 31 December, 2004 were eliminated to avoid the impact of new shares as well as ensure the integrity of the data.

(5) In order to compare the changes P/E ratios and the influence factors in three years, data in three years were integrated to process. Finally 167 companies were chosen as data samples, which means that same 167 companies are listed on the same samples each year. Among them 58 companies are listing on Shenzhen Stock Exchange, the other 109 ones are listing on Shanghai Stock Exchange, which can represent both markets well.

4.1.4. Industry classification of Data Samples and Industrial P/E Ratios

Industrial P/E ratio is a very important factor that may affect the companies' P/E ratio. Therefore the choice of a scientific industry classification standard is very necessary, for this will certainly impact on the reliability of research results.

To reflect the structure of the securities market and satisfy the demand for investment management, China Securities Index Co. Ltd. divided listed companies into 10 first-level industries and 25 second-level industries. Businesses operating income in formal notice of listed companies is regarded as the classification criteria. If it is hard to classify according to the main business revenue alone, profits will also be taken into account. Principles for industry classification of listed companies are as following:

(1) If the proportion main business revenue on total revenue is more than 50%, then the company should be classified into the industry the main business corresponding to;

(2) If the company does not have a primary income accounting for total revenue more than 50%, but a business revenue and profits are the highest in all business and accounting for both the company's total revenue and total profits more than 30%, then the company should be classified into corresponding industry;

(3) If the company does not have a business income and profits accounting for more than 30% of the total ones, then there will be a group of experts making further study and analysis on the industry attribution.

Table 5. lists the industrial distribution of 167 sample stocks and industrial P/E Ratios from the year 2005 to 2007.

Table 5. Industry Classification of Sample Companies And Industrial P/E Ratios

Code	Industry	Amount	2005 P/E	2006 P/E	2007 P/E
00	Energy	10	13.41	16.63	53.74
01	Material	49	15.01	26.77	50.43
02	Industry	37	20	30.21	55.94
03	Optional Consumption	23	21.19	39.38	65.08
04	Main Consumption	7	23.05	41.22	66.79
05	Medicine	4	22.87	33.04	70.2
06	Finance	15	20.97	42.1	75.32
07	IT	5	23.62	37.05	57.36
08	Telecom	2	25.39	33.34	73.13
09	Utility	15	15.44	24.31	49.63
Annual Average P/E Ratios			20.1	32.41	61.76

4.2. Methodology

Based on the sample data processing, this paper adopts methodology of correlation analysis and regression analysis.

4.2.1. Methodology for Average P/E Ratios and Influence Factors

In the study on average P/E ratio and relation with the influence factors, in order to avoid repetition, we use data from Shanghai stock market to represent the aggregate market; before that, nonparametric tests (Mann-Whitrney U Test and Wilcoxon Test) were carried out to examine whether average P/E ratios from Shanghai and Shenzhen stock markets distributing similarly. There is also a graphic analysis and correlation analysis to test the significant correlation and discrepancy between two markets. To the average P/E ratios, graphic and correlation analysis were conducted between P/E and its influence factors, finally regression analysis gave an empirical method to test the significant factors.

4.2.2. Methodology for Companies' P/E Ratios and Influence Factors

There three parts on researches on companies' P/E ratios and influence factors.

(1) Descriptive Statistics

First part is descriptive statistics. We analysis on discrete features and distributions to get recognize a general situation of sample data. Then stocks will be divided into 10 industrial intervals. This will statistics amount and proportion in each interval to analysis distribution and structure of P/E ratios in the whole stock market. Thirdly, Pearson correlation analysis on companies' P/E ratios in three years; Fridman test statistic and Kendall's coefficient of concordance test statistics will test whether P/E ratios distribute identically in three years; finally Goodness-of-fit Kolmogorov-Smirnov test will be performed to inspect whether each group of samples obey the normal distribution and the uniform distribution.

(2) Correlation Analysis

On correlation analysis of companies' P/E ratios and influence factors, both Pearson and Partial correlation analysis will be used to find out the affect degree of factors correlative on companies' P/E ratios.

(3) Regression Analysis

Before the regression process, Eigenvalue and Variance Proportions are adopted to examine whether there is the colllinearity problem between variables. Then regression models are built to process multi regression analysis. The general model is shown below.

$$P/E = \alpha_0 + \alpha_1 x_1 + \alpha_2 x_2 + \alpha_3 x_3 + \alpha_4 x_4 + ... + \alpha_i x_i + \xi \quad (11)$$

In the model (11):

P/E: Companies' P/E Ratios;

x_i: Influence factors, $i = 1, 2, 3……$;

α_i: Estimate coefficients of regression, $i = 1, 2, 3……$;

ξ: Estimate residual.

At last, regression models will be examined the credibility by estimating the date in former year and predicting data in the coming year.

Data studied on in this paper are searched from the database of Bank of World, National Bureau of Statistics of China, Renmin University of China, China Securities Index Co., LTD, Shanghai Stock Exchange and Shenzhen Stock Exchange.

Excel processing tools and statistics software SPSS are used in data processing and statistics analysis.

5. EMPIRICAL RESEARCHES

5.1. Empirical Research on Stock Market Average P/E Ratio

In this section, the factors influencing the stock market average P/E Ratio will be verified.

5.1.1. Discrepancy Research on Stock Markets Average P/E Ratios

There are two stock markets in China, namely Shanghai Stock Market and Shenzhen Stock Market. Before research on factors, the Descriptive Statistics, Correlation tests and nonparametric tests (Mann-Whitrney U Test and Wilcoxon Test) will be done firstly to verify whether the two markets have significant correlation or distribute similarly, that is the discrepancy research.

Following are the histogram, line chart made by Excel to and test statistics of distributions and correlation analysis of two stock markets average P/E Ratios made by SPSS, to show there's no discrepancy between this two markets average P/E Ratios.

Fig. 2. Comparation of Two Stock Market Average P/E Ratios (Histogram)
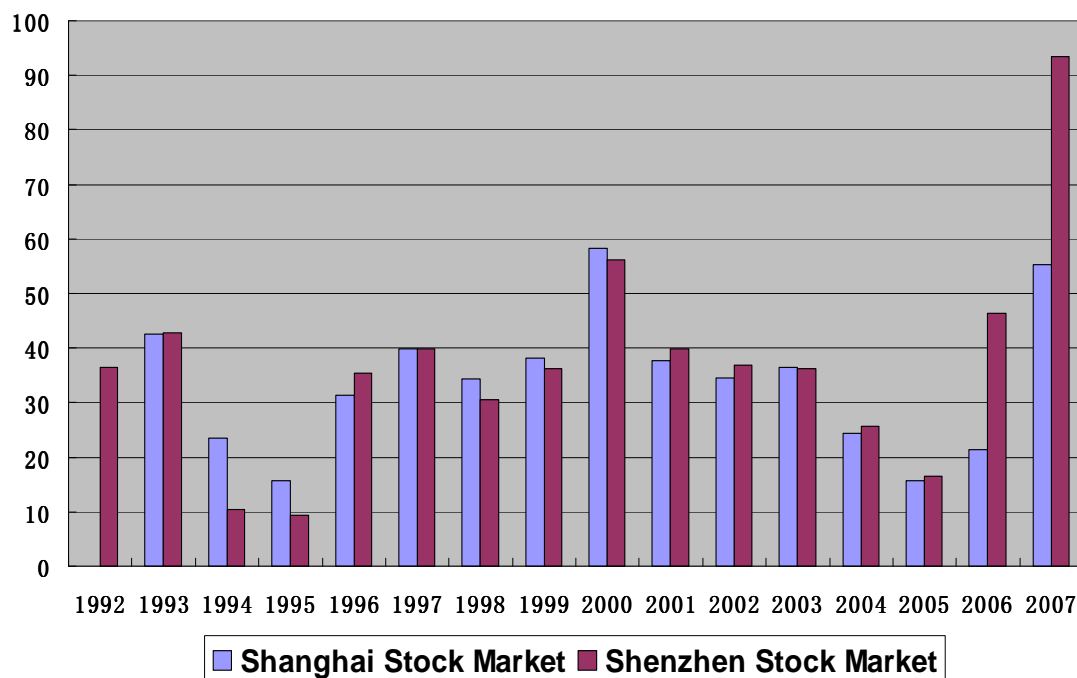
Fig. 3. Comparation of Two Stock Market Average P/E Ratios (Line Chart)
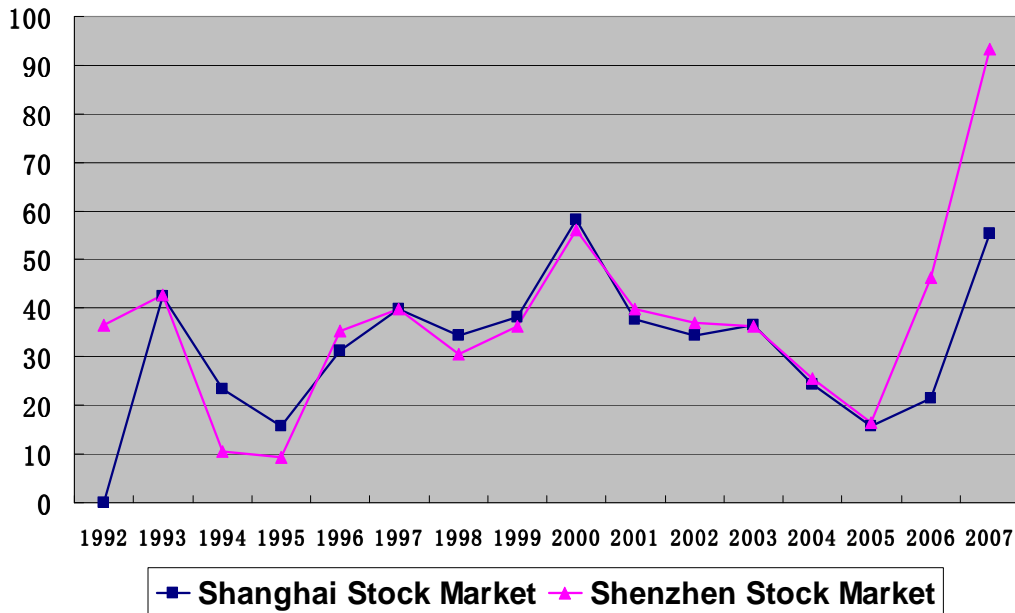
Two charts hereinbefore show the changes of two markets average P/E ratios in different angles. Fig. 3. describes the tracks of the changes; it is obvious that the trends of two stock markets average P/E ratios almost synchronize most of time. They reached the first peak in year 2000, and declined slowly after that till 2005, since then there is a gap between them, but the trend is still similar. This indicates that there's no discrepancy between the changes of the two stock market average P/E ratios.

Table 6. Test Statistics of Distributions of Two Markets Average P/E Ratios

Mann-Whitney U	109.500
Wilcoxon W	229.500
Z	-.415
Asymp. Sig. (2-tailed)	.678
Exact Sig. [2*(1-tailed Sig.)]	.682

Table 6. includes the results of Mann-Whitney U Test (109.5), Wilcoxon W (229.5) and Z (-0.415), as well as that ones of Asymptotic Significant (2-tailed) and Exact Significant [2*(1-tailed Sig.)]. Distinctly both P (0.678 and 0.682) are greater than 0.05, which means that no discrepancy between distributions of two average P/E Ratios is an acceptable hypothesis.

Table 7. Correlations of Two Markets Average P/E Ratios

Pearson Correlation	ShangHai APE	ShenZhen APE
ShangHai APE		0.808***
ShenZhen APE	0.808***	

***. Correlation is significant at the 0.001 level (2-tailed).

The correlation analysis in Table 7. educes the coefficient of correlation is 0.808; it stands the significance test at the 0.001 level (2-tailed).

In summary, not only the two distributions are similar, but coefficient of correlation passed the significance test. In other words, either average P/E Ratio can represent the one that of the whole China's stock market. Hence we use only data from Shanghai stock market to study on; the results can also reflect characteristic of that ones from Shenzhen stock market.

5.1.2. Descriptive Statistics on Average P/E Ratios and Influence Factors

First of all, we use Excel to make figure descriptions of tracks of average P/E ratio and its macro influence factors, and obtain a directviewing conception of their correlation.

Fig. 4. Tracks of Average P/E Ratios and Growth Rate of GDP
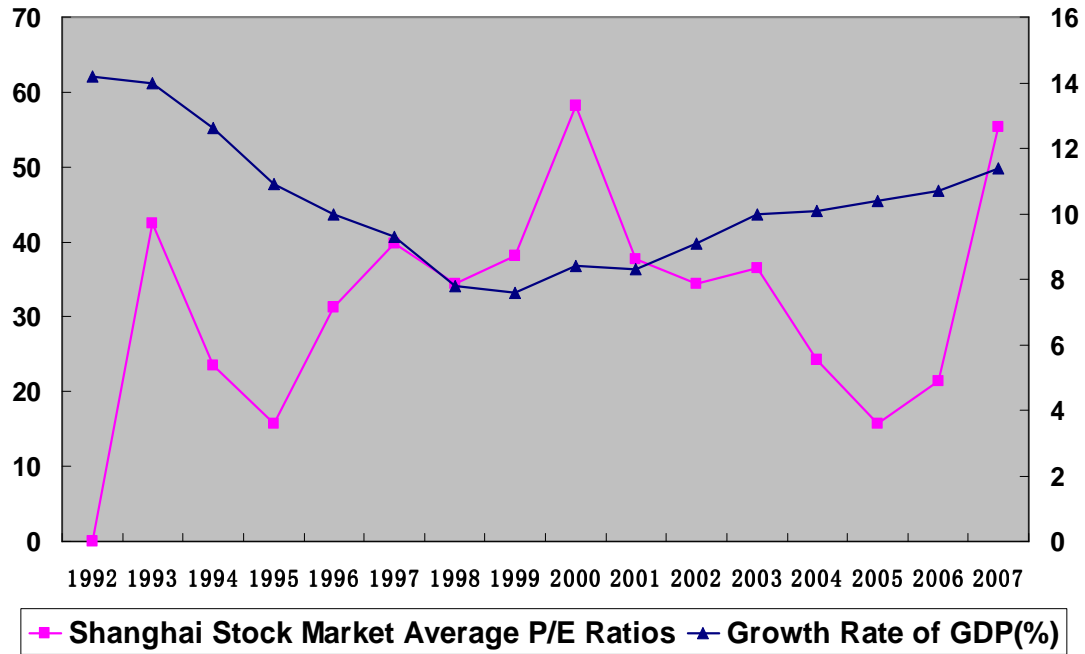
The correlation between average P/E ratio and growth rate of GDP is not obvious in Figure 4.

Fig. 5. Tracks of Shanghai Stock Market Average P/E Ratios

And Annual Deposit Interest Rate
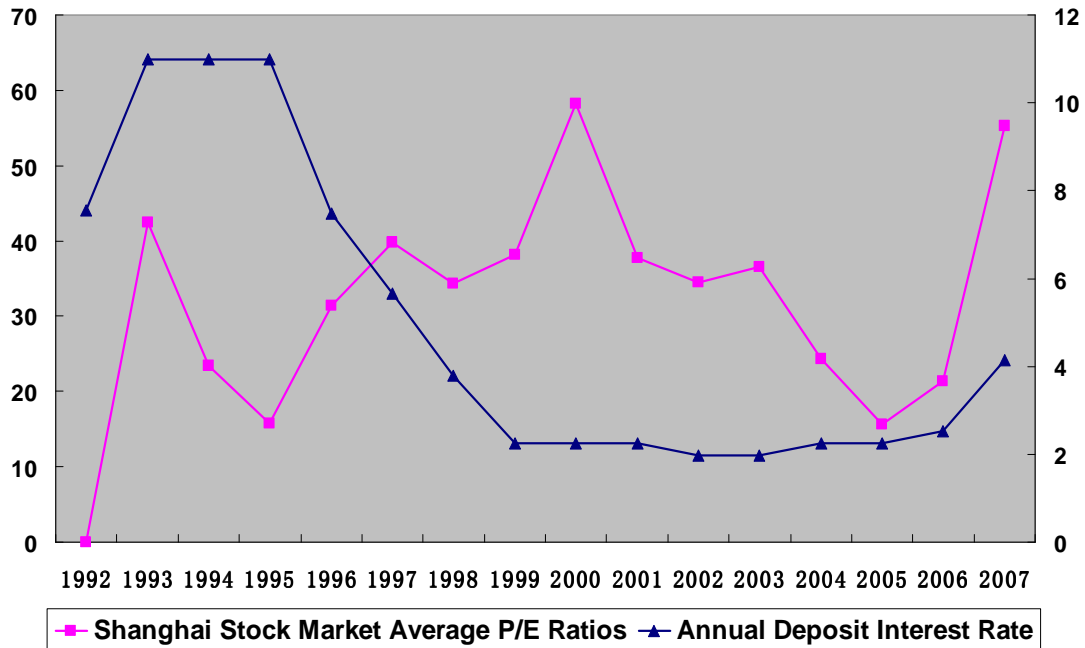
Neither there exists a clear relation between average P/E ratio and annual deposit interest rate according to the Figure 5.

Fig. 6. Tracks of Average P/E Ratios of Shanghai Stock Market

And Annual Growth Rate of CPI
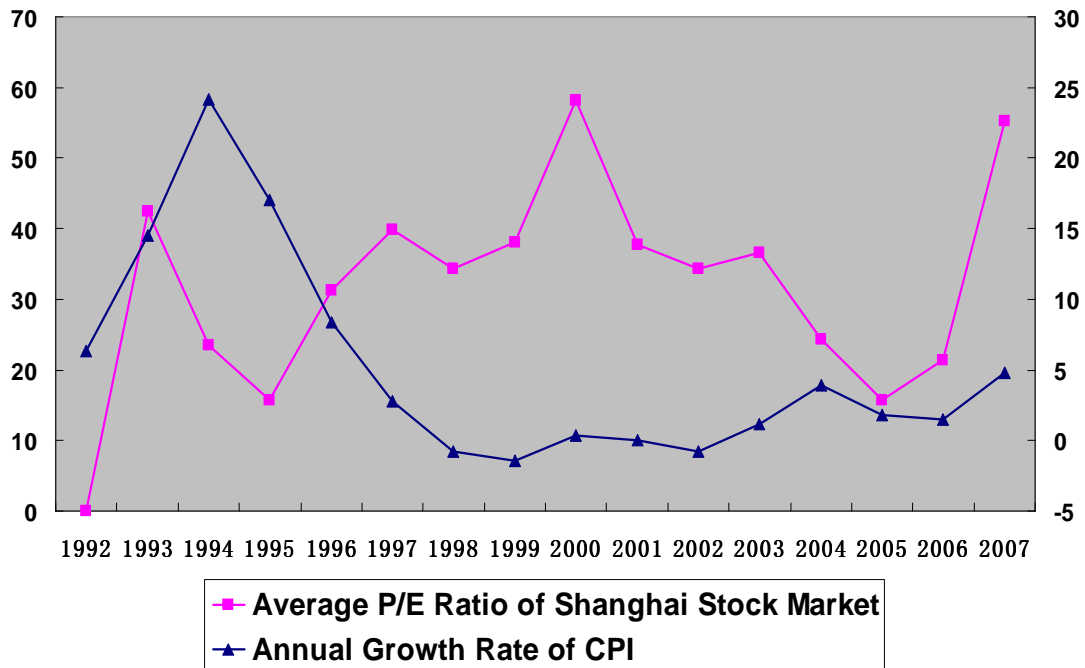
Positive correlation between average P/E ratio and annual growth rate of CPI is observed in Figure 6.

Fig. 7. Tracks of Average P/E Ratios and Index of Shanghai Market
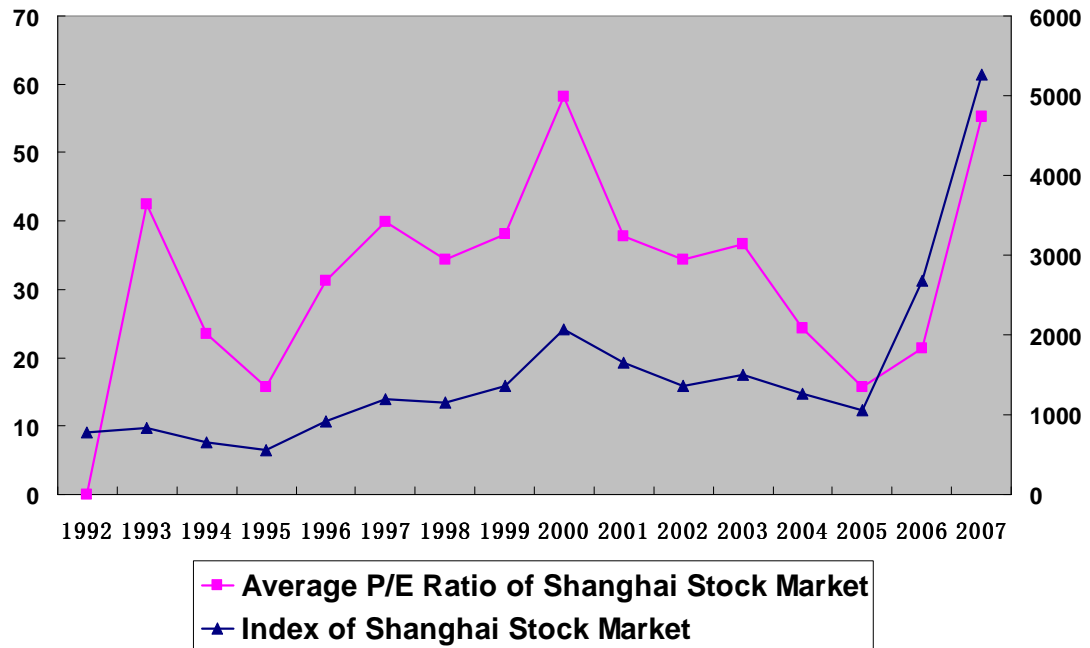
In Fig. 7., it is clear that the relation between average P/E ratio and Index of Shanghai market is positive.

Fig. 8. Tracks of Average P/E Ratios and Index of Shenzhen ZH
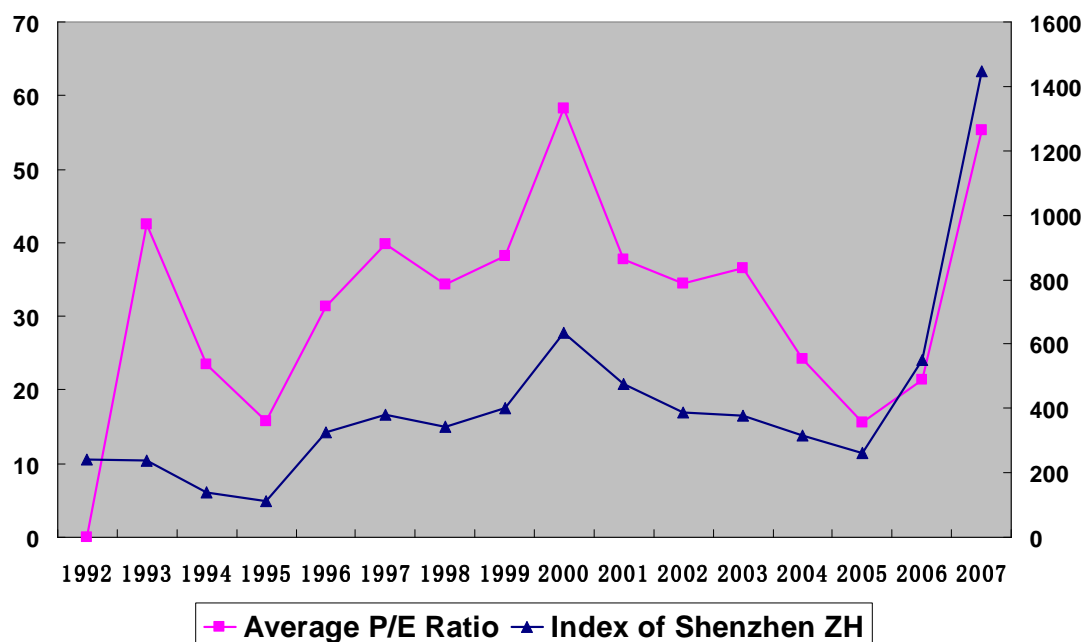
The average P/E ratio is related to Index of Shenzhen ZH more apparently and positively showed in Fig. 8.

Fig. 9. Tracks of Average P/E Ratios and Securitisation Proportion
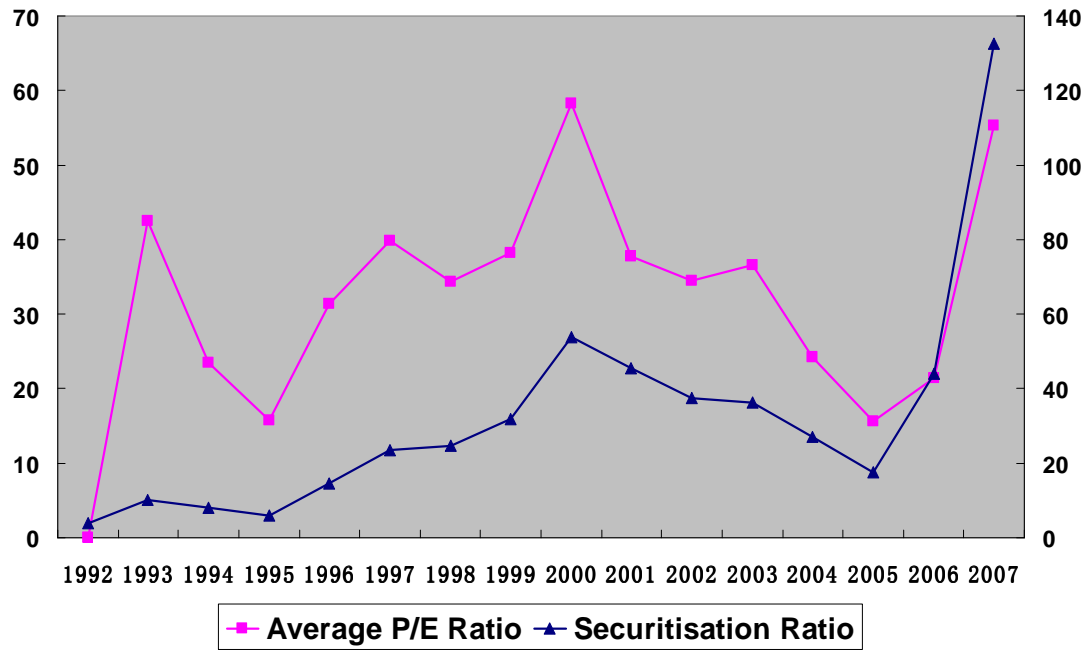
According to Fig. 9., the average P/E ratio is positively related to securitization proportion.

5.1.3. Correlation Analysis on Average P/E Ratios and Influence Factors

Picture interpretation was given by using Excel to give a graphic relation between average P/E ratio and influence factors in last section. We will calculate the correlation coefficients and take obvious tests by using SPSS, to give an empirical research on the relation between average P/E ratio and its influence factors. As a matter of the foreign experience, the reciprocal of P/E is more correlative to other macro variables; their correlation research is also dealt in the following studies.

Table 8. Simple Correlations and Significance between Average P/E Ratio and Its Influence Factors

Pearson Correlation	GDP	IR	CPI	SH	SZ	SP
APE	-0.184	-0.210	-0.316	0.537[*]	0.656[**]	0.631[*]
RAPE	0.238	0.226	0.343	-0.386	-0.502	-0.481

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 8. appears the simple correlations and significance tests between average P/E ratio and its influence factors. As shown in the table, strong correlations exist between average P/E ratios, reciprocals and Shanghai Index, Shenzhen ZH Index. The highest correlation coefficient is 0.656; it passed the significance test at the 0.01 level (2-tailed). This indicates that the P/E ratio and the stock market index enjoy a tight linkage, showing strong positive correlations.

In addition, the correlation coefficient between Securitization proportion and average P/E ratio also passed the hypothesis testing. As the table shows that the correlation coefficient is 0.631, they are positive related and adopted the significant test at the 0.05 level (2-tailed).

On the correlation between CPI and average P/E ratio, the correlation coefficient is showed -0.316, in contrast with the theoretical assumptions. The correlation coefficient between CPI and the reciprocal of average P/E ratio is 0.343. This can be verified that comparing the P/E ratio itself, its reciprocal has stronger relevance with the relevant variables especial ratio variables. It is also indicated that many foreign

studies using reciprocal of average P/E ratios as dependent variables in the regression analysis.

This can also be illustrated from the correlation test of reciprocal of average P/E ratio and annual interest rate of deposit and the growth rate of GDP. This shows that conclusions reached from China's stock market data are homologous with foreign results. The regression results will be better with the reciprocal of P/E ratio as a variable in the regression analysis.

Based on the above discussion of the results of correlation analysis, the comparison of theoretical assumptions and actual results on average P/E ratio and its influence factors are shown in the table below:

Table 9. Comparison of Theoretical Assumptions and Actual Results on Average P/E Ratio and Influence Factors

Influence factors	GDP	Annual IR	CPI	Shanghai Index	Shenzhen ZH Index	Securitization Proportion
Theoretical Assumptions	Pos.	Neg.	Pos.	Pos.	Pos.	Pos.
Practical Results	Neg.	Neg.	Neg.	Pos.	Pos.	Pos.

5.1.4. Regression Analysis on Average P/E Ratios and Influence Factors

In order to understand further on the specific relation between average P/E ratio and its influence factors, in this paper, we do a simple regression analysis on the average P/E ratio, GDP growth rate, securitization proportion, growth rate of CPI and interest rates to reflect the specific relationships between them. Results are shown as bellows (T-statistics are in parentheses):

Table 10. Coefficients of Regression Analysis

	α_0	α_1	α_2	α_3	α_4	Adjusted R Square	F
(Constant)	47.161						
	(2.375)						
GDP		-1.318				-0.040	0.457
		(-0.676)					
(Constant)	37.477						
	(6.625)						
IR			-0.742			-0.030	0.598
			(-0.773)				
(Constant)	36.666						
	(9.320)						
CPI				-0.526		0.031	1.442
				(-1.201)			
(Constant)	25.105						
	(6.290)						
SP					0.258	0.352	8.593**
					(2.931)**		

a. Dependent Variable: APE

b. ** is significant at the 0.01 level (2-tailed).

c. $P/E = \alpha_0 + \alpha_1 GDP + \alpha_2 IR + \alpha_3 CPI + \alpha_4 SP + \xi$

In Table 10., the highest F value is Securitization proportion being 8.593, and only it passed the significant test at the 0.01 level, other factors didn't pass the significance test. Other factors are not correlated with average P/E Ratios as significant as the former hypothesis.

5.1.5. Conclusion of Empirical Researches on Average P/E Ratios and Influence
   Factors

Securitization proportion correlates positively to average P/E ratios the most significantly. This suggests that when the overall size of stock markets increased or the speed of investment was faster than the growth tempo of GDP, the stock price premium will lead to an increasing of P/E ratios. This was proven in the historical greatest boom in China's stock markets in 2007.

Generally, China's stock markets are still in an initial and developing period, the system is not perfect and can not reflect the performance of the national economy well. The effect of macroeconomic indicators on market average P/E ratios is limited, while the Securitization proportion has some explanatory ability at least in the present stage.

5.2. Empirical Research on Companies' P/E Ratios

This section will give a research on whole situation of companies' P/E ratios from 2005-2007, including overall description, structure and comparison analysis. By analyzing on figures, we obtained an initial understanding on horizontal distribution and vertical changes of companies' P/E ratios.

5.2.1. Descriptive Statistics on Companies' P/E Ratios

In Table 11., discrete features and distribution features give an overall description of sample data.

Table 11. Descriptive Statistics of Companies' P/E Ratios

Year	Range	Minimum	Maximum	Mean		Std. Deviation	Variance	Skewness		Kurtosis	
					Std.				Std.		Std.
	Statistic	Statistic	Statistic	Statistic	Error	Statistic	Statistic	Statistic	Error	Statistic	Error
2005	62.00	.00	62.00	18.3502	.78870	10.19230	103.883	1.081	.188	1.661	.374
2006	91.85	7.88	99.73	30.9602	1.48263	19.15976	367.096	1.269	.188	1.442	.374
2007	79.35	20.41	99.76	57.6689	1.57828	20.39590	415.993	.151	.188	-.919	.374
Valid N (listwise)	167										

Shown in the table, most data indicate that there is a trend of increasing P/E ratios year by year. The historical greatest boom in 2007 is reflected on a sharp development of P/E ratios, which is also proved that there is a positive relationship between changes of market index and P/E ratios.

5.2.1.1. Structure Analysis on Companies' P/E Ratios

We divided P/E ratios into 10 intervals; each length is 10, for the edge data, for instance: 10 will be accounted into interval 0-10, numbers greater than 10 but less than 11 will be classified into interval 10-20; others are by parity of reasoning. We will acquire an initial acknowledge of the whole structure of companies' P/E ratios

from statistics of amount of companies and proportion they accounting for in each interval. Details are seen in table 12.

Table 12. Distributions of Companies' P/E Ratios in Each Interval

Intervals	2005		2006		2007	
	Amount	Proportion	Amount	Proportion	Amount	Proportion
0-10	34	20.36%	5	2.99%	0	0.00%
10-20	73	43.72%	56	33.53%	0	0.00%
20-30	39	23.35%	33	19.76%	17	10.18%
30-40	14	8.38%	29	17.36%	22	13.17%
40-50	6	3.59%	20	11.98%	24	14.38%
50-60	0	0.00%	10	5.99%	32	19.16%
60-70	1	0.60%	5	2.99%	22	13.17%
70-80	0	0.00%	3	1.80%	23	13.77%
80-90	0	0.00%	4	2.40%	15	8.98%
90-100	0	0.00%	2	1.20%	12	7.19%
0-100	167	100%	167	100%	167	100%

As can be seen in table 12., the highest proportion in year 2005 and 2006 are both in the interval 10-20; there respectively 73 and 56 companies, accounting for 43.72% in 2005 and 33.53% in 2006. When in 2007, 32 companies are standing in interval 50-60, accounting for 19.16%, which is the greatest proportion. This confirmed the growth trend of P/E ratios from another side.

Most companies' P/E ratios are no more than 30 in 2005, accounting for more than 85%; and no one is greater than 70. P/E ratios concentrated at a low level. When in 2006, the biggest amount was still in the interval 10-20, but the proportion decreased to 33.53%. More P/E ratios evenly distributed in a higher level from 10-50, which accounting for more than 80%. While when it came to 2007, no P/E ratios are lower than 20 in our sample data. The most amount interval is 50-60, totally 32 companies accounted for 19.16% of the whole sample. Balanced distribution located in an even higher level, 12 companies in the highest interval 90-100 are much more than that amount in year 2006 and 2007.

As a result, P/E ratios distributed more and more evenly and increased year by year can be observed in table 12.

5.2.1.2. Correlation Analysis and Distribution Tests on Companies' P/E Ratios

Followings are simple correlation analysis (Pearson Correlation) and distribution tests (Fridman Test Statistics and Kendall's W Test Statistics). Then goodness-of-fit Kolmogorov-Smirnov Test will be performed to inspect whether each group of samples obey the normal distribution and the uniform distribution.

Table 13. Correlations Analysis of P/E Ratios from 2005-2007

Pearson Correlation	2006	2007
2005	0.588**	0.292**
2006	1	0.441**

**. Correlation is significant at the 0.01 level (2-tailed).

Table 13. showed that all the correlation coefficients are significant at the 0.01 level (2-tailed), while close years' correlation is relatively higher. For instance, correlation coefficient between 2005 and 2006 is 0.588; between 2006 and 2007 is 0.441. Lower correlation is between longer time span, as the coefficient between 2005 and 2007 is 0.292. This shows that companies' P/E ratios will change in a certain range; it also indicates that discrepancy between different companies P/E ratios is stable for significant correlations in each year.

Table 14. Distribution Tests on Companies' P/E Ratios

Friedman Test Statistics	
Chi-Square	250.287
df	2
Asymp. Sig.	0.000

Kendall's Coefficient of Concordance Test Statistics	
Kendall's W	0.749
Chi-Square	250.287
df	2
Asymp. Sig.	0.000

Results in table 14. are data to test whether P/E ratios distribute identically. Both Asymp. Sig. of Fridman and Kendall's W Test Statistics are 0.000, lower than 0.01, namely significant at 0.01 level; which also means the null hypothesis H_0 was rejected, the alternative hypothesis was accepted. That is the distributions of P/E ratios in these three years are different.

Table 15. Distribution Tests of P/E Ratios in Each Year

	Goodness-of-fit Kolmogorov-Smirnov Test			
	Normal Distribution Test		Uniform Distribution Test	
2005	Kolmogorov-Smirnov Z	1.319	Kolmogorov-Smirnov Z	5.068
	Asymp. Sig. (2-tailed)	0.062	Asymp. Sig. (2-tailed)	0.000
2006	Kolmogorov-Smirnov Z	1.707	Kolmogorov-Smirnov Z	5.328
	Asymp. Sig. (2-tailed)	0.006	Asymp. Sig. (2-tailed)	0.000
2007	Kolmogorov-Smirnov Z	0.866	Kolmogorov-Smirnov Z	1.272
	Asymp. Sig. (2-tailed)	0.442	Asymp. Sig. (2-tailed)	0.079

Table 15. employs Goodness-of-fit Kolmogorov-Smirnov Test to verify whether P/E ratios in each year obey the normal or uniform distribution. As results, the Asymp. Sig. in year 2006 is 0.006, lower than 0.01. However, it is 0.062 and 0.442 separately in year 2005 and 2007; changes are unstable and range is wide. For the uniform distribution tests, both figures are significant at 0.01 level in year 2005 and 2006, but that of year 2007 is 0.079. No proof can indicate P/E ratios from each year obey identical distributions and no regular patterns in distributions.

5.2.2. Correlation Analysis on Companies' P/E Ratios and Influence Factors

In this part, we will first make simple correlation (Pearson) analysis on P/E ratios and selected variables, then partial correlation analysis to eliminate affects from correlation between variables, which can finally affirm the influence factors, degrees and directions to P/E ratios. At last, regression model will be established to give a further analysis.

5.2.2.1. Simple Correlation Analysis and Significant Tests on Companies' P/E Ratios and Influence Factors

First of all, the Pearson correlation analysis and significant tests on companies' P/E ratios and 15 influence factors are listed as following in Table 16. to give an initial understanding on them.

Table 16. Correlations Analysis And Significant Tests of Companies' P/E Ratios And Influence Factors

Pearson Correlation				
	IPE	ROE (%)	GR of EPS (%)	GR of ROE (%)	DPR (%)
2005 Com. P/E Ratios	0.649**	-0.598**	-0.256**	-0.299**	0.213**
2006 Com. P/E Ratios	0.497**	-0.668**	-0.326**	-0.302**	0.133
2007 Com. P/E Ratios	0.562**	-0.754**	-0.410**	-0.311	0.149

**. Correlation is significant at the 0.01 level (2-tailed).

Pearson Correlation				
	BETA	GR of NA (%)	GR of MBI (%)	GR of MBP (%)	L/ A (%)
2005 Com. P/E Ratios	0.097	-0.356**	-0.314**	-0.224**	-0.007
2006 Com. P/E Ratios	0.228**	-0.177**	-0.409**	-0.257**	-0.042
2007 Com. P/E Ratios	0.411**	-0.245	-0.367**	-0.278	-0.037

**. Correlation is significant at the 0.01 level (2-tailed).

Pearson Correlation				
	Annual Yield (%)	P/B	CSP (%)	IPO PRICE	LISTING DATE
2005 Com. P/E Ratios	0.013	-0.012	0.291**	0.197**	-0.241**
2006 Com. P/E Ratios	-0.254**	-0.055	0.198**	0.255**	-0.279**
2007 Com. P/E Ratios	0.017	0.168**	0.011	0.287**	-0.299**

**. Correlation is significant at the 0.01 level (2-tailed).

As shown in Table 16., there are 6 variables passed the significant test at the 0.01 level (2-tailed), and kept an obvious consistency on correlation with companies' P/E ratios in three years. They are average industrial P/E ratios, ROE, growth rate of EPS, growth rate of main business income, IPO price and listing date. Seven factors closely correlated only in some certain years, such as growth rate of ROE, dividend payout ratio, beta, growth rate of net assets, annual yield, P/B ratios and circulation stock proportion, among them the directions of correlation coefficient of annual yield and P/B ratios have changed in three years. The correlation directions of ROE, growth rate of EPS, growth rate of ROE, beta, growth rate of net assets, growth rate of main business income, growth rate of main business profits and circulation stock proportion are opposite with hypothesis; others are the same.

On the correlation coefficients, the highest are average industrial P/E ratios and ROE; others are all lower than 0.450. Then these two variables are the most significant factors correlating to companies' P/E ratios among the 15 variables.

5.2.2.2. Partial Correlation Analysis on Companies' P/E Ratios and Influence Factors

When calculating Pearson correlation coefficients, interaction between variables are not considered, then we can not simply affirm the correlation between companies' P/E ratios and influence factors just according to results of Pearson correlation analysis. This needs to remove the collinearity influence between the variables, and then calculate correlations between companies' P/E ratios and each variable again. In order to give a further definite correlation between P/E ratios and influence factors, Partial correlation analysis is as follows.

Table 17. Partial Correlations Analysis And Significant Tests of Companies' P/E Ratios And Influence Factors

Partial Correlation				
	IPE	ROE (%)	GR of EPS (%)	GR of ROE (%)	DPR (%)
2005 Com. P/E Ratios	0.412**	-0.459**	0.053	-0.164	0.036
2006 Com. P/E Ratios	0.362**	-0.645**	0.002	-0.037	0.023
2007 Com. P/E Ratios	0.423**	-0.682**	0.297**	-0.316**	0.076

**. Correlation is significant at the 0.01 level (2-tailed).

Partial Correlation				
	BETA	GR of NA (%)	GR of MBI (%)	GR of MBP (%)	L/A (%)
2005 Com. P/E Ratios	0.127	-0.244**	-0.086	0.224**	-0.107
2006 Com. P/E Ratios	0.243**	-0.287**	-0.100	0.064	-0.100
2007 Com. P/E Ratios	0.332**	-0.475**	-0.021	0.078	-0.125**

**. Correlation is significant at the 0.01 level (2-tailed).

Partial Correlation				
	Annual Yield (%)	P/B	CSP (%)	IPO PRICE	LISTING DATE
2005 Com. P/E Ratios	0.022	0.286**	-0.004	0.013	-0.010
2006 Com. P/E Ratios	0.002	0.413**	-0.060	0.054	-0.056
2007 Com. P/E Ratios	0.051	0.618**	-0.251**	0.213**	-0.099

**. Correlation is significant at the 0.01 level (2-tailed).

Some changes can be seen in Table 17. is that variables passed the significant test at the 0.01 level (2-tailed) are industrial P/E ratios, ROE, growth rate of net assets and P/B ratios. Good consistency is showed in each year's significant test. Growth rate of EPS, growth rate of ROE, beta, liability-asset ratio, circulation stock proportion and IPO price are significantly correlated to P/E ratios only in some certain years. Some directions of correlation coefficients are also changed. Some variables such as dividend payout ratio, growth rate of main business income, annual yield and listing date did not pass any significant test, correlation between P/E ratios and them are not obvious.

5.2.2.3. Conclusions of Correlation Analysis on Companies' P/E Ratios and Influence Factors

After Pearson and Partial correlation analysis, we will make a conclusion here about the results.

(1) Positive correlation is found between average industrial P/E ratios and companies' P/E ratios, which is consistent with the theoretical assumptions. The correlation coefficients are relatively higher than other factors, and the significance probabilities passed the significant test at the 0.01 level (2-tailed). This indicates that close correlation is between average industrial P/E ratios and companies' individual P/E ratios; the higher the industrial P/E ratio, the higher will be the individual company's P/E ratios within this industry. Conversely, individual P/E ratios will be low within an industry with a lower average P/E ratio.

(2) Significant negative correlation is proven between Return On Equity (ROE) and companies' P/E ratios. The significant probability 0.000 passed the significant tests at 0.01 level (2-tailed) each year; it means the correlation is completely believable.

This is just contrary to positive relationship in formula (8) derived from Gordon Growth Model in Chapter 2. According to the analysis results however, it shows relatively higher correlation with P/E ratios comparing with other variables in each year. A reasonable explanation for diametrically opposite conclusions on relation between ROE and P/E ratios may be that China's stock markets are still in an initial and undeveloped period, so undervaluing on high ROE companies while

overvaluing on lower ROE companies are ineluctability, at least in the present stage. The higher the ROE, the lower are the P/E ratios; conversely, the higher are the P/E ratios.

(3) Negative correlation exists between growth rate of net assets and companies' P/E ratios. The significant probability 0.000 passed the significant tests at 0.01 level (2-tailed) in each year; good stability of correlation can be seen in each different year. While the analysis results are contrary to the theoretical assumptions.

(4) A high degree of positive correlation is between Price-Book (P/B) ratios and P/E ratios. The highest correlation coefficient is 0.618; the reliability is also 100% in each year. It indicates that the higher the P/B ratios, the higher will be the P/E ratios; conversely, the lower leads to the lower. It reflects practically the relation between earnings per share and net assets per share.

The commonality of three variables of ROE, growth rate of net assets and P/B ratio is the net assets. They all perform strong correlation between P/E ratios. It reflects the closer relation between P/E ratio and net assets element, including the net assets profitability, the net assets growth and the evaluating price of net assets. Therefore, these factors should be taken into account on the value judgments by using P/E ratios.

(5) There are three direct determining factors to P/E ratios in the selected data samples: dividend payout ratio, growth rate of EPS and beta. In the partial correlation analysis, except that growth rate of EPS obviously correlated to P/E ratios in 2007, neither correlation coefficient is significant between growth rate of EPS, dividend payout ratio and P/E ratios. Both correlations are positive, which matches to the theoretical assumptions.

In addition, the factor beta passed the significant test at 0.01 level (2-tailed) in both 2006 and 2007; while the positive correlation is contrary to the theoretical assumptions, which deviated the due negative relation between P/E ratios and risks.

(6) Five variables including the growth rate of ROE, growth rate of main business profit, liability-asset ratio, circulation stocks proportion and IPO price are significant correlated to P/E ratios only in one year. Negative correlation between growth rate of ROE and P/E ratios is contrary to the theoretical assumption.

(7) No distinct correlations between the growth rate of main business income, annual yield, listing date and P/E ratios can be found in the analysis conclusions.

According to the above discussions on analysis results, the comparison between theoretical assumptions and practical results are listed as follows.

Table 18. Comparison of Theoretical Assumptions and Actual Results on Companies' P/E Ratios and Influence Factors

Influence factors			GR of	GR of	
	IPE	ROE	EPS	ROE	DPR
Theoretical Assumptions	Pos.	Pos.	Pos.	Pos.	Pos.
Practical Results	Pos.	Neg.	Pos.	Neg.	Pos.
Influence factors				GR of	
	BETA	GR of NA	GR of MBI	MBP	L/A
Theoretical Assumptions	Neg.	Pos.	Pos.	Pos.	Neg.
Practical Results	Pos.	Neg.	Neg.	Pos.	Neg.
Influence factors	Annual				
	Yield	P/B	CSP	IPO Price	Listing Date
Theoretical Assumptions	None	Pos.	Neg.	Pos.	Neg.
Practical Results	Pos.	Pos.	Neg.	Pos.	Neg.

5.2.3. Multiple Linear Regression Analysis on Companies' P/E Ratios and Influence Factors

In order to reveal the influence of factors on P/E ratios, we will build two linear regression models to provide reference for the forecast and value of P/E ratios. Data samples influencing P/E ratios significantly are selected into regression models according to the results of correlation analysis. We choose data from the year 2006 so that it can test the validity of models by comparing with the data from 2005 and 2007.

5.2.3.1 Collinearity Diagnostics

Before the regression process, it must be examined that whether there exists the collinearity problem between the independent variables. Here we adopt stepwise method in regression analysis, and use Eigenvalue and Variance Proportions to examine the Colllinearity. The collinearity diagnostics are listed as follows.

Table 19. Collinearity Diagnostics[a]

Dim.	Eigenvalue	Condition Index	Variance Proportions							
			(Constant)	IPE	ROE	GR of EPS	BETA	GR of NA	P/B	CSP
1	6.65	1.00	0.04%	0.13%	0.23%	0.27%	0.07%	0.45%	0.16%	0.39%
2	0.60	3.33	0.05%	0.51%	0.42%	1.24%	0.04%	42.70%	0.55%	4.69%
3	0.30	4.67	0.21%	0.00%	12.28%	1.87%	0.57%	19.53%	0.43%	29.34%
4	0.19	5.87	0.52%	4.65%	11.67%	28.59%	3.78%	1.88%	0.47%	0.21%
5	0.13	7.17	0.10%	5.78%	16.84%	35.12%	0.07%	1.87%	0.05%	64.60%
6	0.07	9.72	1.83%	5.05%	6.91%	7.31%	3.59%	25.52%	73.80%	0.13%
7	0.04	12.25	0.23%	61.66%	34.45%	10.58%	22.22%	7.99%	17.84%	0.42%
8	0.01	23.06	97.03%	22.22%	17.20%	15.01%	69.66%	0.05%	6.70%	0.23%

a. Dependent Variable: P/E Ratio

As shown above, the minimum eigenvalue is 0.01, whose corresponding maximum condition index is 23.06. According to the standard, if the condition index is higher than 15, then there is possible to have the collinearity problem. If the index is more than 30, then there will be a serious collinearity problem. However, we should take a further check on Variance Proportions. For the large condition index, if there are two proportion values more than 50%, it will judge the collinearity between variables. In table 19., the condition index in dimension 8 is 23.06, in corresponding variance proportions there is only one of factor beta being 69.66% higher than 50%. As a result, there is no collinearity between variables, not to mention serious collinearity. Therefore, regression analysis will be directly processing.

5.2.3.2. Model Construction

(1) Model on Average P/E Ratio

We bring the seven influence factors: industrial average P/E ratios, ROE, growth rate of ROE, beta, growth rate of net assets, P/B ratios and circulation stock proportions into regression model, as shown below:

$$P/E = \alpha_0 + \alpha_1 IPE + \alpha_2 ROE + \alpha_3 GE + \alpha_4 \beta + \alpha_5 GNA + \alpha_6 PB + \alpha_7 CSP + \xi \quad (12)$$

In model (12): P/E: Companies' P/E Ratios;

IPE: Industrial Average P/E Ratios;

ROE: Rate on Return;

GE: Growth Rate of EPS (Earnings per Share);

β: Beta, risk index;

GNA: Growth Rate of Net Assets;

PB: Price- Book (P/B) Ratios;

CSP: Circulation Stock Proportion;

α_0 : Estimate Constant;

α_i: Estimate Regression Coefficients, i = 1, 2, 3, 4, 5, 6, 7;

ξ : Estimate Residual Error.

(2) Model on Companies' P/E Ratio

As the industrial average P/E ratio and ROE are the factors that significant correlate to companies' P/E ratios no matter in what analysis method or which year, so model (13) employs these two variables as follows.

$$P/E = b_0 + b_1 IPE + b_2 ROE + \mu \quad (13)$$

In model (13): P/E: Companies' individual P/E Ratios;

IPE: Industrial Average P/E Ratios;

ROE: Rate on Return;

b_0 : Estimate Constant;

b_1: Estimate Regression Coefficients, $i = 1, 2, 3, 4, 5, 6, 7$;

μ : Estimate Residual Error.

5.2.3.3. Conclusion on Regression Results

The regression results on model (12) are listed as follows.

Table 20. Regression Results of Model (12)

Model Summary	R	R Square	Adjusted R Square	Durbin-Watson
	0.820	0.673	0.662	2.102

ANOVA		F	Sig.
		63.098	0.000

Regression Coefficients and Significant Tests	Variables	B
	(Constant)	17.87 (3.434)***
	IPE	0.45 (4.067)***
	ROE	-2.28 (-14.140)***
	GR of EPS	5.41 (7.579)***
	BETA	13.29 (3.651)***
	GR of NA	-0.18 (-4.963)***
	P/B	-0.11 (-1.881)*
	CSP	0.23 (2.564)**

***. Correlation is significant at the 0.01 level (2-tailed).

**. Correlation is significant at the 0.05 level (2-tailed).

*. Correlation is significant at the 0.1 level (2-tailed).

The value of Durbin-Watson in table 20. is 2.102, very close to 2; which explained that no serious autocorrelation problem between the residuals. The significant probability of F statistics is 0.000, which indicates that the overall effect of regression is remarkable. The Adjusted R Square is 0.662, showing that to the overall changes of companies' P/E ratios, the proportion that the seven selected variables can explain is 66.20%. The degree of fitting with the practice is quite high. Other 33.8% proportion of P/E ratios changes need to be expounded by impact of some other factors.

In the regression coefficients and significant tests, the lowest T statistics is -1.881, passing the significant test at 0.1 level. Except that circulation stock proportion passed the test at 0.05 level, others are all passing at 0.01 level. This means that all the coefficients of variables and constant are significant different from 0.

According to the discussions above, the multi regression equation (14) of factors influencing on P/E ratios is expressed as follow.

$$P/E = 17.87 + 0.45 \text{ IPE} - 2.28 \text{ ROE} + 13.29 \text{ GE} + 5.41 \ \beta$$
$$- 0.181 \text{ GNA} - 0.11 \text{ PB} + 0.23 \text{ CSP} \qquad\qquad (14)$$

The constant is 17.87 in the equation, coefficient of IPE is 0.45, indicating that when the industrial average P/E ratio change one unit, the corresponding companies' P/E ratios will change 0.45 unit. The coefficient of ROE is -2.28, which means that when the companies' ROE changes one unit, then their P/E ratios will change inversely 2.28 units. To other factors, the directions of regression coefficients are as same as the results of correlation analysis.

The regression results on model (13) are listed as follows.

Table 21. Regression Results of Model (13)

Model Summary	R	R Square	Adjusted R Square	Durbin-Watson
	0.725	0.525	0.521	2.068
ANOVA			F	Sig.
			121.758	0.000
Regression Coefficients and Significant Tests	Variables		B	
	(Constant)		32.36 (8.142)***	
	IPE		0.73 (6.033)***	
	ROE		-1.75 (-11.372)***	

***. Correlation is significant at the 0.01 level (2-tailed).

**. Correlation is significant at the 0.05 level (2-tailed).

*. Correlation is significant at the 0.1 level (2-tailed).

In table 21., the value of Durbin-Watson is 2.068, also very close to 2; that indicates that no serious autocorrelation problem between the residuals. The significant probability of F statistics is 0.000, so that the overall effect of regression is obvious. The adjusted R square is 0.521, showing that the proportion that industrial average P/E ratio and ROE can explain the overall changes of companies' P/E ratios is 52.10%. Thus it is clear that the degree of fitting with the practice is still quite high when there are only two variables.

In the regression coefficients and significant tests, the T statistics of constant Increases obviously, from 3.434 to 8.142. That figure of industrial average P/E ratios increased but the one of ROE declined, while they all passed the significant test at 0.01 level. This shows that all the coefficients of variables and constant are significant different from 0.

According to the coefficients in the above table, the multi regression equation (15) of factors influencing on P/E ratios is expressed as follow.

$$P/E = 32.36 + 0.73 \ IPE - 1.75 \ ROE \qquad (\ 15\ )$$

As seen in the equation, the constant is 32.36, the coefficient of IPE is positive 0.73, indicating that when the industrial average P/E ratio change one unit, the corresponding companies' P/E ratios will change 0.73 unit on the same direction. The coefficient of ROE is -1.75, which means that when the companies' ROE changes one percent, then their P/E ratios will change inversely 1.75 units.

The adjusted R square in model (12) is 0.662, which is only 0.141 higher than that 0.521 in model (13). This indicates that the explanation ability of other factors is limited. The proportion the industrial average P/E ratios and ROE can expound is over 50%. The impact of these two factors companies' P/E ratios is quite significant.

5.2.3.4. Validity Test of the Model

On the validity of two regression models, we use the data of 2005 and 2007 to test the explanation ability and the predict effect of the models. We use the models to estimate P/E ratios in 2005 and 2007, then make a comparison between the results and the real P/E ratios. The deviation statistics are here below in table 22.

Table 22. Deviation Statistics between Estimate and Practical P/E Ratios

		Deviation (%)	0%-2%	2%-6%	6%-10%	10%+
Model (12)	2005	Amount	107	85	14	17
		Proportion	48%	38%	6%	8%
	2007	Amount	50	85	46	42
		Proportion	22%	38%	21%	19%
Model (13)	2005	Amount	64	112	27	20
		Proportion	29%	50%	12%	9%
	2007	Amount	52	88	46	37
		Proportion	23%	39%	21%	17%

A conclusion can be easily recognize in the above table is that neither predict effects are better than estimate of former year's data. For instance, in model (12) only 17 companies have the deviations larger than 10%, that accounting for 8% of the total.

However, the amount increased sharply to 42 which standing for 19% in predict of data in 2007. Same results are shown in model (13) but not so significant. A reasonable explanation is the greatest boom in 2007; abnormally swell of market index and stock prices increase the difficulty of predict. In fact, more than 80% companies have deviations lower than 10%, thus the overall credibility of estimate and forecast of regression models is still relatively high.

In addition, on the forecast on data in 2007, the deviation distribute averagely in both models. Differences are in the results of 2005, especially in intervals 0%-2% and 2%-6%. The effect of model (12) is a little better than model (13), but not much. This can be explained that more variables are taken into account in model (12). As a result, more factors will give better effect on researches.

6. RESEARCH CONCLUSION AND LIMITATION

This paper studies empirical researches on correlations between P/E ratios and influence factors, conclusions are derived from the study.

6.1. Research Conclusions on Average P/E Ratios and Influence Factors

6.1.1. Summary of Empirical Research on Average P/E Ratios and Influence Factors

(1) First of all, it is found that there is no difference between the market average P/E ratios from Shanghai and Shenzhen stock markets in the statistical point of view. Average P/E ratios from these two markets tend to be more and more consistent.

(2) In the selected variables, three of six factors significantly correlate to P/E ratios. Among them, the effect degree and explanation ability of securitization proportion to P/E ratios are the highest.

6.1.2. Conclusion on Research Results

(1) Securitization proportion correlates positively to average P/E ratios the most significantly. This suggests that when the overall size of stock markets increased or the speed of investment was faster than the growth tempo of GDP, the stock price premium will lead to an increasing of P/E ratios. This was proven in the historical greatest boom in China's stock markets in 2007.

Moreover, securitization proportion is still quite low in China. Only a very small part of companies are listed in China's stock market, the ratio aggregate value accounted for a small percentage of GDP, it was mostly below 50% except the highest 132.65% in the boom of security market in 2007. This indicates that financing structure is unreasonable, investment accounts for a small proportion on residents' income. This may be caused by single financial instruments and imperfect risk circumvention mechanism. Therefore, China's securities market needs further deepening the development in this respect.

(2) CPI and GDP correlate to average P/E ratios negatively, opposite the theoretical analysis. They are not reflecting changes of P/E ratios correctly.

(3) Interest rate is a direct influence factor of P/E ratios theoretically. But it is not so important of its impact according to our analysis results. The macroeconomic

indicators have limited effect on stock market's average P/E ratio. This may because of the short operating period of China's stock market, no longer than 20 years totally from 1992.

(4) Generally, China's stock markets are still in an initial and developing period, the system is not perfect and can not reflect the performance of the national economy well. The effect of macroeconomic indicators on market average P/E ratios is limited, while the Securitization Ratio has some explanatory ability at least in the present stage.

6.2. Research Conclusion on Companies' P/E Ratios and Influence Factors

6.2.1. Summary of Empirical Research on Companies' P/E Ratios and Influence Factors

(1) By using sorts of methods to test, it is found that distributions of P/E ratios in each year are different. And no proof can indicate P/E ratios from each year obey identical distributions and no regular patterns in distributions.

(2) Industrial average P/E ratios and ROE are most significant factors that influencing companies' P/E ratios. The proportion they can explain the overall changes of companies' P/E ratios is 52.10%. Industrial average P/E ratios correlate to companies' P/E ratios positively, that correlation between ROE and companies' P/E ratios is negative.

(3) Negative correlation is found between growth rate of net assets and companies' P/E ratios, which is contrary to the hypothesis. The significant probability 0.000 passed the significant tests at 0.01 level (2-tailed) in each year, which shows good stability of correlation in each different year.

(4) A high degree of positive correlation is between Price-Book (P/B) ratios and P/E ratios. The highest correlation coefficient is 0.618; the reliability is also 100% in each year. It indicates that the higher the P/B ratios, the higher will be the P/E ratios; conversely, the lower leads to the lower. It reflects practically the relation between earnings per share and net assets per share.

(5) Three direct determining factors dividend payout ratio, growth rate of EPS and beta are not correlating to P/E ratios significantly, except that growth rate of EPS

obviously correlated to P/E ratios in 2007.Correlation coefficients of growth rate of EPS and dividend payout ratio are positive, which matches to the theoretical assumptions. But the positive correlation coefficient of beta is contrary to the dued negative relation between P/E ratios and risk.

(6) Five variables including the growth rate of ROE, growth rate of main business profit, liability-asset ratio, circulation stocks proportion and IPO price are significant correlated to P/E ratios only in one year. Negative correlation between growth rate of ROE and P/E ratios is contrary to the theoretical assumption.

(7) No distinct correlations between the growth rate of main business income, annual yield, listing date and P/E ratios can be found in the analysis conclusions.

6.2.2. Conclusion on Research Results

(1) Generally, if the corporation business performs well, investors will pay a good expectation and confidence on it, which will lead to increase of stock price and in turn of raise of P/E ratio. Therefore, when profitable indices rise, the P/E ratios must be growing. However, negative correlation between profitable indices and P/E ratios are derived from empirical analysis in this paper. The diametrically opposite conclusions may be due to that China's stock markets are still in an initial and undeveloped period, so undervaluing on high ROE companies while overvaluing on lower ROE companies are ineluctability, at least in the present stage. The phenomenon of high quality stocks being underestimated is quite serious.

(2) The commonality net assets of three variables of ROE, growth rate of net assets and P/B ratio is seen in the research. They all perform strong correlation to P/E ratios. It reflects the close correlations between P/E ratio and net assets element, including the net assets profitability, the net assets growth and the evaluating price of net assets. Therefore, these factors should be taken into account when judging P/E ratios.

(3) Industrial P/E ratio is positively correlating to companies' individual P/E ratios with the correlation coefficients relatively higher than other factors. The industrial average P/E ratio will affect each individual company's P/E ratios within this industry. As a result, investors should consider the industrial average level when estimating the P/E ratio of individual stocks.

6.2.3. Conclusion on Regression Models

Model (12) employs 7 variables; except for industrial average P/E ratio and risk coefficient beta, most of others are financial indices of companies. The proportion these factors can explain is 66.2%; which shows that the impact of financial indices on P/E ratios is limited. Investors do not attach importance to companies' business performance or financial indicators, but more concern about non-financial information such as hearsay, popular shares, and reorganization theme and so on. The unscientific investment philosophy ignores the business performance of companies, which is the essential factor to determine stock prices.

On the validity of two regression models, we use the data of 2005 and 2007 to test the explanation ability and the predict effect of the models. We use the models to estimate P/E ratios in 2005 and 2007, then make a comparison between the results and the real P/E ratios. More than 80% companies have deviations lower than 10%, thus the overall credibility of estimate and forecast of regression models is quite high. Moreover, the more factors employed the better will results be.

6.3. Research Limitation

This paper employs 6 influence factors of average P/E ratio, and 15 of companies' P/E ratio. While there are still some indices are impossible to quantify, such as the investors' confidence, popular degree of companies, management level of companies' staff and the disclosure procedure of companies' information and so on.

This paper only studies on data samples that can be obtained. The sample range is limited from 0 to 100, no further researches on P/E ratios that above 100.

More topics are found to be worth studying on during the research of this thesis. For instance, what level should P/E ratios located in China's stock markets; what is the root cause of P/E ratios difference between different industries, and so on.

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APPENDIX

Data Samples Selected in This Paper

Shen Zhen Stock Market (58 Companies)

Stock Code	Company Name
000001	SHENZHEN DEVELOPMENT BANK CO., LTD.
000002	CHINA VANKE CO., LTD.
000012	CSG HOLDING CO., LTD.
000021	SHENZHEN Great Wall KAIFA TECHNOLOGY CO., LTD.
000024	CHINA MERCHANTS PROPERTY DEVELOPMENT CO., LTD.
000027	SHENZHEN ENERGY INVESTMENT CO., LTD.
000039	CHINA INTERNATIONAL MARINE CONTAINERS (GROUP) CO., LTD.
000059	LIAONI HUAJIN TONGDA CHEMICALS CO., LTD.
000060	SHENZHEN ZHONGJIN LINGNAN NONFEMET CO., LTD.
000063	ZTE CORPORATION
000088	SHENZHEN YAN TIAN PORT HOLDINGS CO., LTD.
000089	SHENZHEN AIRPORT CO., LTD.
000157	CHANGSHA ZOOMLION HEAVY INDUSTRY SCIENCE AND TECHNOLOGY DEVELOPMENT CO., LTD.
000400	XJ ELECTRIC CO., LTD.
000401	TANGSHAN JIDONG CEMENT CO., LTD.
000402	FINANCIAL STREET HOLDING CO., LTD.
000410	SHENYANG MACHINE TOOL CO., LTD.
000422	HUBEI YIHUA CHEMICAL INDUSTRY CO., LTD.
000488	SHANDONG CHENMING PAPER HOLDINGS CO., LTD.
000527	GUANGDONG MIDEA ELECTRIC APPLIANCES CO., LTD.
000528	GUANGXI LIUGONG MACHINERY CO., LTD.
000538	YUNNAN BAIYAO GROUP CO., LTD.
000539	GUANGDONG ELECTRIC POWER DEVELOPMENT CO., LTD.
000541	FOSHAN ELECTRICAL AND LIGHTING CO., LTD.
000550	JIANGLING MOTORS CO., LTD.
000559	WANXIANG QIANCHAO CO., LTD.
000625	CHONGQING CHANGAN AUTOMOBILE COMPANY LIMITED
000629	PANZHIHUA NEW STEEL & VANADIUM CO., LTD.

000630	ANHUI TONGDU COPPER STOCK CO., LTD.
000651	GREE ELECTRIC APPLIANCES,INC.OF ZHUHAI CO., LTD.
000680	SHANTUI CONSTRUCTION MACHINERY CO., LTD.
000708	DAYE SPECIAL STEEL CO., LTD.
000709	TANGSHAN IRON AND STEEL CO., LTD.
000717	SGIS SONGSHAN CO., LTD.
000729	BEIJING YANJING BREWERY CO., LTD.
000758	CHINA NONFERROUS METAL INDUSTRY'S FOREIGN ENGINEERING AND CONSTRUCTION CO., LTD.
000767	SHANXI ZHANGZE ELECTRIC POWER CO., LTD.
000778	XINXING DUCTILE IRON PIPES CO., LTD.
000786	BEIJING NEW BUILDING MATERIALS PUBLIC CO., LTD.
000792	QINGHAI SALT LAKE POTASH CO., LTD.
000800	FAW CAR CO., LTD.
000807	YUNNAN ALUMINIUM CO., LTD.
000822	SHANDONG HAIHUA CO., LTD.
000825	SHANXI TAIGANG STAINLESS STEEL CO., LTD.
000828	DONGGUAN DEVELOPMENT (HOLDINGS) CO., LTD.
000839	CITIC GUOAN INFORMATION INDUSTRY CO., LTD.
000876	SICHUAN NEW HOPE AGRIBUSINESS CO., LTD.
000878	YUNNAN COPPER INDUSTRY CO., LTD.
000898	ANGANG STEEL COMPANY LIMITED
000900	XIANDAI INVESTMENT CO., LTD.
000912	SICHUAN LUTIANHUA CO., LTD.
000932	HUNAN VALIN STEEL TUBE & WIRE CO., LTD.
000933	HENAN SHEN HUO COAL INDUSTRY AND ELECTRICITY POWER CO., LTD.
000937	HEBEI JINNIU ENERGY RESOURCES CO. , LTD.
000959	BEIJING SHOUGANG CO., LTD.
000969	ADVANCED TECHNOLOGY & MATERIALS CO., LTD.
000970	BEIJING ZHONG KE SAN HUAN HIGH-TECH CO., LTD.
000983	SHANXI XISHAN COAL AND ELECTRICITY POWER CO., LTD.

Shanghai Stock Market (109 Companies)

Stock Code	Company Name
600000	SHANGHAI PUDONG DEVELOPMENT BANK CO., LTD.
600001	HANDAN IRON & STEEL CO., LTD.
600004	GUANGZHOU BAIYUN INTERNATIONAL AIRPORT CO., LTD.
600005	WUHAN IRON AND STEEL COMPANY LIMITED
600006	DONGFENG AUTOMOBILE CO., LTD.
600007	CHINA WORLD TRADE CENTER CO., LTD.
600009	SHANGHAI INTERNATIONAL AIRPORT CO., LTD.
600010	INNER MONGOLIAN BAOTOU STEEL UNION CO., LTD.
600011	HUANENG POWER INTERNATIONAL CO., LTD.
600012	ANHUI EXPRESSWAY CO., LTD.
600015	HUA XIA BANK CO., LTD.
600016	CHINA MINSHENG BANKING CORP., LTD.
600018	SHANGHAI INTERNATIONAL PORT (GROUP) CO., LTD.
600019	BAOSHAN IRON & STEEL CO., LTD.
600020	HENAN ZHONGYUAN EXPRESSWAY CO., LTD.
600021	SHANGHAI ELECTRIC POWER CO., LTD.
600022	JINAN IRON AND STEEL CO., LTD.
600026	CHINA SHIPPING DEVELOPMENT CO., LTD.
600027	HUADIAN POWER INTERNATIONAL CORPORATION LIMITED
600028	CHINA PETROLEUM & CHEMICAL CO., LTD.
600033	FUJIAN EXPRESSWAY DEVELOMENT CO., LTD.
600035	HUBEI CHUTIAN EXPRESSWAY CO., LTD.
600036	CHINA MERCHANTS BANK CO., LTD.
600037	BEIJING GEHUA CATV NETWORK CO., LTD.
600050	CHINA UNITED TELECOMMUNICATIONS CO., LTD.
600058	MINMETAL SDEVELOPMENT CO., LTD.
600066	ZHENGZHOU YUTONG BUS CO., LTD.
600085	BEIJING TONGRENTANG CO., LTD.
600096	YUNNAN YUNTIANHUA CO., LTD.
600098	GUANGZHOU DEVELOPMENT INDUSTRY (HOLDINGS) CO., LTD.
600102	LAIWU STEEL CO., LTD.
600117	XINING SPECIAL STEEL CO., LTD.
600123	SHANXI LANHUA SCI-TECH VENTURE CO., LTD.

600125	CHINA RAILWAY TIELONG CONTAINER LOGISTICS CO., LTD.
600132	CHONGQING BREWERY CO. , LTD.
600143	GUANGZHOU KINGFA SCI.&TEC. CO., LTD.
600151	SHANGHAI AEROSPACE AUTOMOBILE ELECTROMECHANICAL CO., LTD.
600153	XIAMEN C&D INC
600170	SHANGHAI CONSTRUCTION CO. , LTD.
600177	YOUNGOR GROUP CO., LTD.
600183	GUANGDONG SHENGYI SCI.TECH CO., LTD.
600188	YANZHOU COAL MINING CO., LTD.
600190	JINZHOU PORT CO., LTD.
600196	SHANGHAI FOSUN PHARMACEUTICAL (GROUP) CO., LTD.
600236	GUANGXI GUIGUAN ELECTRIC POWER CO., LTD.
600256	XINJIANG GUANGHUI INDUSTRY CO., LTD.
600269	JIANGXI GANYUE EXPRESSWAY CO., LTD.
600270	SINOTRANS AIR TRANSPORTATION DEVELOPMENT CO., LTD.
600271	AEROSPACE INFORMATION CO., LTD.
600282	NANJING IRON & STEEL CO., LTD.
600307	GANSU JIU STEEL GROUP HONGXING IRON & STEEL CO, LTD.
600308	SHANDONG HUATAI PAPER CO., LTD.
600309	YANTAI WANHUA POLYURETHANE CO., LTD.
600320	SHANGHAI ZHENHUA PORT MACHINERY CO., LTD.
600331	SICHUAN HONGDA CHEMICAL INDUSTRY CO., LTD.
600348	SHANXI GUOYANG NEW ENERGY CO., LTD.
600350	SHANDONG INFRASTRUCTURE CO., LTD.
600357	CHENGDE XINXIN VANADIUM AND TITANIUM CO., LTD.
600362	JIANGXI COPPER CO., LTD.
600383	GEMDALE CORPORATION
600415	ZHEJIANG CHINA COMMODITIES CITY GROUP CO., LTD.
600418	ANHUI JIANGHUAI AUTOMOBILE CO., LTD.
600428	COSCO SHIPPING CO., LTD.
600456	BAOJI TITANIUM INDUSTRY CO., LTD.
600497	YUNAN CHIHONG ZINC&GERMANIUM CO., LTD.
600500	SINOCHEM INTERNATIONAL CORPORATION
600508	SHANGHAI DATUN ENERGY RESOURCES CO., LTD.
600535	TIANJIN TASLY PHARMACEUTICAL CO., LTD.

600549	XIAMEN TUNGSTEN CO., LTD.
600569	ANYANG IRON& STEEL INC.
600583	OFFSHORE OIL ENGINEERING CO., LTD.
600585	ANHUI CONCH CEMENT CO., LTD.
600596	ZHE JIANG XINAN CHEMICAL INDUSTRIAL GROUP CO., LTD.
600597	BRIGHT DAIRY & FOOD CO., LTD.
600598	HEILONGJIANG AGRICULTURE CO., LTD.
600601	FOUNDER TECHNOLOGY GROUP CO., LTD.
600616	SHANGHAI FIRST PROVISIONS STORE CO., LTD.
600628	SHANGHAI NEW WORLD CO., LTD.
600631	SHANGHAI BAILIAN GROUP CO., LTD.
600639	SHANGHAI JINQIAO EXPORT PROCESSING ZONE DEVELOPMENT CO., LTD.
600642	SHENERGY CO., LTD.
600649	SHANGHAI MUNICIPAL RAW WATER CO., LTD.
600660	FUYAO GROUP GLASS INDUSTRIES CO., LTD.
600662	SHANGHAI QIANGSHENG HOLDING CO., LTD.
600663	SHANGHAI LUJIAZUI FINANCE & TRADE ZONE DEVELOPMENT CO., LTD.
600675	CHINA ENTERPRISE CO., LTD.
600690	QINGDAO HAIER CO., LTD.
600694	DASHANG GROUP CO., LTD.
600717	TIANJIN PORT CO., LTD.
600741	SHANGHAI BASHI INDUSTRIAL (GROUP) CO., LTD.
600754	SHANGHAI JINJIANG INTERNATIONAL HOTELS DEVELOPMENTCO., LTD.
600761	ANHUI HELI CO., LTD.
600780	TOP ENERGY COMPANY LTD. SHANXI
600795	GD POWER DEVELOPMENT CO., LTD.
600797	INSIGMA TECHNOLOGY CO., LTD.
600808	MAANSHAN IRON & STEEL CO., LTD.
600820	SHANGHAI TUNNEL ENGINEERING CO., LTD.
600832	SHANGHAI ORIENTAL PEARL CO., LTD.
600835	SHANGHAI MECHANICAL ＆ELECTRICAL INDUSTRY CO., LTD.
600839	SICHUAN CHANGHONG ELECTRIC CO., LTD.
600863	INNER MONGOLIA MENGDIAN HUANENG THERMAL POWER CO., LTD.

600879	LONG MARCH LAUNCH VEHICLE TECHNOLOGY CO., LTD.
600886	SDIC HUAJING POWER HOLDINGS CO., LTD.
600887	INNER MONGOLIA YILI INDUSTRIAL GROUP CO., LTD.
600895	SHANGHAI ZHANGJIANG HI-TECH PARK DEVELOPMENT CO., LTD.
600900	CHINA YANGTZE POWER CO., LTD.
600961	HUNAN ZHUYE TORCH METALS CO., LTD.
600997	KAILUAN CLEAN COAL CO., LTD.