

Five Factors to Measure P/E Ratio in China

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Abstract

One of the most popular indicators of a stock valuation, Price-to-earnings ratio is designed to provide investors with information about stock price relative to the earnings. Theoretically, P/E ratio should keep stock values in equilibrium, however, researchers found that P/E ratio is negatively correlated with future earnings and future stock returns. Previous studies connect this misevaluation issue with forecasting errors. Using fixed effects panel regression and the sample of Chinese A-shares, this study analyzes the major determinants of P/E ratio. The results reveal that investor sentiments rather than growth rate are the major factor for stocks valuation in China.

Keywords: P/E ratio; Earnings Growth; Stock valuation; Investor sentiments; Industry analysis.

JEL Codes: G11; G12; G14; G17; G32; G35

I. Introduction

Over the past decades, price-to-earnings ratio (P/E) has become one of the main indicators used by investors during the process of stock valuation. At the first glance, P/E simply conveys information about a price which investors are willing to pay for every 1 dollar of earnings generated by a firm, but investors and researchers consider that P/E includes information about other factors such as earnings growth prospects, a proportion of debt, management efficiency, risks, and investor sentiments. These factors are diverse from firm to firm as well as from industry to industry. Some industries are growing faster than others and accordingly valued higher as well as the firms comprising those industries. However, there are some issues with a stock valuation depending on a forecasted growth factor. Some investors assume that high stock valuation can be justified and eventually be adjusted by the future earnings. As a result, so-called “glamor” stocks become so highly valued that they start distancing from the firms’ fundamentals (Lakonishok *et al.*, 1994). This phenomenon was observable during the stock market bubbles in 2000’s when the firms with low or no earnings at all were highly priced and their P/E were reaching irrational levels. Another concern with the P/E is pointed out by researchers (Basu, 1977; Nicholson, 1960; etc.) who found that stocks with high P/E dramatically underperform in a long-run, while low P/E stocks generate higher future earnings. Considering these issues, it can be assumed that P/E reflects not only fundamental factors but also a sentimental component.

Unlike many other studies about future returns and P/E relationship which was already extensively researched, this study joins the investigations which try to find an answer for stocks misevaluation by examining the factors determining P/E. This investigation employs variables that reflect major factors which theoretically may influence stock valuation including fundamental, technical, and behavioral factors. The major novelty of this research is the addition of investor sentiments to the model which may help to understand the negative correlation between P/E and future returns.

This investigation conducts a research based on a sample of Chinese stock market due to several reasons. A globalization process and modern technologies which support trading in distance made all major markets such as US, Japan, and EU to have similar characteristics and they already were extensively studied by many researchers. Chinese stock market on the other hand, has become one of the major stock markets in the world and also possesses a

unique set of features which is distinctive for the country with a transitional economy of large scale. Chinese market should not be ignored due to the fact that this market is slowly integrating with the rest of the world and the consequences of this merger are still ambiguous.

II. Literature Review

The relationship of P/E and stock returns are long discovered and well examined (i.e. Anderson and Brooks, 2006; Basu, 1977; Dreman, 1977; Lakonishok *et al.*, 1994; Nicholson, 1960). These researchers based their works during different periods and locations but constantly get the same results – firms with low P/E provide higher stock returns in a long-run, while the opposite is true for high P/E stocks. This phenomenon was thoroughly examined by several researchers who tried to elucidate this outcome by the potential factors which may distort the linear relationship of P/E and future returns. The first group of researchers used the beta extracted from the CAPM model as a risk factor to explain higher returns of low P/E stocks or so-called “value” stocks (i.e. Anderson and Brooks, 2006; Fuller *et al.*, 1993; Lakonishok *et al.*, 1994). They all did not find enough evidence to prove that long-term investor, who holds a portfolio of low P/E stocks gains higher returns because the portfolio was exposed to a higher level of risk. Fuller *et al.* (1993) went further and added industry classificatory and 14 other potentially influencing factors but they also failed to justify the outperformance of “value” stocks.

Previous studies, which attempted to find the main determinants of P/E, identified two major factors: earnings growth and risk. Allen and Cho (1999) found that P/E is better explained by forecasted growth rate than the risk factor. Kane *et al.* (1996) found that only volatility of Standard & Poor’s 500 index can explain its P/E. While these studies used major markets (US, EU) data, it is assumed that due to preferential differences of Chinese investors, valuation process in China is not identical to the previously researched markets. Another factor which was not well examined is a behavioral aspect. Brown and Cliff (2004) argue that investors’ optimism or pessimism can be a reason for biased expectations and as a result, stock misvaluation. Cutler *et al.* (1991) noticed that in October 1987 Dow Jones Industrial Average lost approximately 22.5% without any major news announcements or other rational factors which could affect the economy.

III. Methodology

In an attempt to explain investors’ stock valuation criteria, the study employs several variables representing major factors which might be considered by the investors. As previous studies suggested first to be included are the risk and growth factors. *Beta* and Debt ratio (*Lev*) are the most popular proxies for systematic and non-systematic risks. The growth factor is represented by the earnings-per-share (EPS) growth rate (*EPSG*). Most of other variables are on some level related to the risk or growth factors. Management efficiency is represented by the return-on-equity ratio (*ROE*) and it is expected to be a significant indicator for the stock valuations. Firms size (*Size*) on the market with limited freedom of action not only indicates firm’s stability but also demonstrates many other elements which are difficult to measure such as an access to international markets, connections with the government, etc. Dividend payout ratio (*Payout*) should reveal if investors prefer short-term cash inflow in form of dividends or long-term stock price appreciation due to the growth funded by retained earnings. As a result of commonality in China to distribute cash dividends only once a year, payout ratio reoccurs in 3 quarters following to the distribution quarter or until a next dividend distribution. Stock turnover ratio (*Turn*) represents liquidity of the stock which as suggested by Baker and Stein (2004) considers investor sentiments and will add a behavioral aspect to the model. According to Baker and Stein (2004), unreasonable levels of stock

turnover ratio should indicate a presence of investor sentiments. To account for the impact of the major foreign markets (US, EU, and Singapore), a binary variable *CL* will identify firms which are cross-listed on those markets. Another binary variable (*Gov*) divides firms with government control and private companies. Stock returns (*R*) were added to the analysis of means but they are excluded from the regression model due to a probability of endogeneity problem addition into the model. Over or undervaluation of stocks may have long lasting effect. In order to avoid the autocorrelation problems, the lagged term of *P/E* has been added.

P/E was calculated using trailing twelve months earnings divided by an adjusted closing price on the last day of a quarter multiplied by a number of average outstanding shares. Unlike other studies which invert *P/E* to *E/P* in order to avoid division by 0, this study keeps the original form because there is no observation with 0 earnings in the sample. Daily recalculated 1-year *Beta* based on CAPM, *Lev*, *ROE*, and *Turn* are used in initial forms as they were extracted from the database. EPS growth rate (*EPSG*) is a result of a division of a quarterly EPS divided by a lagged term. *Size* is calculated by taking a natural logarithm of total assets. Stock returns (*R*) are calculated by dividing a difference between current and lagged stock price by a lagged stock price. To deal with the outlier issue, all non-binary variables were winsorized at 1st and 99th percentiles.

Quarterly data was obtained in Taiwan Economic Journal (TEJ) database and all A-shares (excluding financial industry) on both Shanghai (SSE) and Shenzhen (SZSE) stock exchanges were covered. Stock prices and total assets are denominated in local currency - Renminbi (RMB). Despite the data period inquiry from 1990 until 2016, the balanced sample starts from 2002 because prior to 2002, Chinese firms were required to publish financial statements only semi-annually.

This investigation employs a panel data regression model with fixed effects. The model proposed by the study is as follows:

$$PE_{i,t} = \alpha_i + \beta_2 Beta_{i,t} + \beta_3 Lev_{i,t} + \beta_4 EPSG_{i,t} + \beta_5 ROE_{i,t} + \beta_6 Size_{i,t} + \beta_7 Payout_{i,t} + \beta_8 Turn_{i,t} + \beta_9 PE_{i,t-1} + \varepsilon_{i,t} \quad (1)$$

where $PE_{i,t}$ stands for the price-to-earnings ratio for a firm i at time t ;

α_i is an unobserved time-invariant individual effect;

$\beta_2 \sim \beta_9$ are the slopes for the explanatory variables;

$\varepsilon_{i,t}$ is a residual.

IV. Empirical Results

Table I presents descriptive statistics of used variables and their cross-correlation coefficients. Means of the full sample provide information of general characteristics of Chinese stock market. Approximately, every average quarter firms generated a profit of 6% (ROE) of their equity while having a debt of 24% (Lev) of their total assets. Investors were ready to pay 33.6 RMB for every 1 RMB EPS generated annually. Considering quarterly growth rate at 27% (EPSG), it can be roughly estimated that investments in the stocks could be doubled in less than 3 years (assuming reinvestment of dividends). The stocks provided with annual cash dividend at 22.6% of earnings and a quarterly stock return of 5%. Only 2% of firm/years belong to cross-listed companies and 36% of firm/years are controlled by the government. Regarding the correlation matrix, it is noticeable that the variables associated with a firm performance (ROE and EPSG) are negatively correlated with the lagged valuation variable (PE_{t-1}). This finding confirms the previous findings suggesting that undervalued stocks outperform highly valued stocks in the future (Basu, 1977; Nicholson, 1960; etc.). The

highest correlation (0.41) is between stock returns and turnover ratio which may imply that stocks returns are primarily based on investor sentiments.

Table I. Descriptive statistics

| | P/E | Beta | Lev | EPSG | ROE | Size | Payout | Turn | CL | Gov | R |
|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Mean | 33.56 | 1.111 | 0.239 | 1.273 | 0.057 | 14.50 | 0.226 | 37.39 | 0.022 | 0.361 | 0.053 |
| Median | 17.08 | 1.120 | 0.226 | 1.250 | 0.040 | 14.39 | 0.100 | 26.60 | 0.000 | 0.000 | 0.004 |
| Max | 199.5 | 4.116 | 0.721 | 9.000 | 0.484 | 18.41 | 2.505 | 172.1 | 1.000 | 1.000 | 1.045 |
| Min | -43.47 | -2.024 | 0.000 | -5.000 | -0.429 | 11.56 | 0.000 | 2.466 | 0.000 | 0.000 | -0.438 |
| S.D. | 54.36 | 0.327 | 0.177 | 1.640 | 0.109 | 1.237 | 0.343 | 33.68 | 0.147 | 0.480 | 0.272 |
| OBS. | 110,403 | 109,651 | 125,629 | 133,315 | 136,467 | 133,970 | 142,426 | 114,737 | 170,880 | 142,426 | 101,401 |

Correlation matrix

| | Beta | Lev | EPSG | ROE | Size | Payout | Turn | R | P/E _{t-1} |
|--------------------|--------|--------|--------|--------|--------|--------|------|--------|--------------------|
| Beta | 1.00 | | | | | | | | |
| Lev | (0.03) | 1.00 | | | | | | | |
| EPSG | 0.02 | (0.02) | 1.00 | | | | | | |
| ROE | (0.06) | (0.15) | 0.10 | 1.00 | | | | | |
| Size | 0.05 | 0.28 | 0.02 | 0.11 | 1.00 | | | | |
| Payout | 0.02 | (0.15) | 0.02 | 0.07 | 0.03 | 1.00 | | | |
| Turn | 0.13 | 0.04 | (0.05) | (0.11) | (0.15) | (0.07) | 1.00 | | |
| R | (0.03) | (0.01) | (0.05) | 0.03 | (0.02) | (0.00) | 0.41 | 1.00 | |
| P/E _{t-1} | 0.08 | (0.05) | (0.05) | (0.06) | (0.08) | 0.05 | 0.12 | (0.04) | 1.0 |

V.1 Firms with Foreign and Government Ownership

Foreign ownership in China is limited and except for a few qualified institutional investors, foreigners are not allowed to trade A-shares directly. However, this fact does not concern part of shares of cross-listed on the stock exchanges abroad. Cross-listed firms in search of an access to a capital pass through cross-listing procedures and have to comply with the target market rules. Cross-listing on developed markets with strict information disclosure requirements not only forces firms to improve their transparency but also under a pressure from foreign investors they are demanded to advance a corporate governance quality (Sami and Zhou, 2004). The main impact of a cross-listing to a valuation of firms is suggested by Lang *et al.* (2003) who argued that as a result of a higher media and analysts coverage accounting quality and forecast accuracy of cross-listed firms significantly rise. In addition, a valuation of cross-listed firms is higher than that of domestic firms (Doidge *et al.*, 2004; Fernandes and Ferreira, 2008).

Another binary variable **Gov** is related to the government-controlled firms which still exist in China and may follow interests not aligned with the interests of private shareholders. Government as the shareholder is usually represented by specified government agencies. These agencies are not allowed to sell the shares and the only cash inflow they may get is from cash dividends. Lam *et al.* (2012) tested ‘tunneling effect’ on Chinese firms and found out that the firms with the state ownership tend to pay higher than usual cash dividends. This has a great influence on the firms’ growth as the reinvestment funds are being drained periodically. Assuming this obstruction to the firms’ best interests, it is expected that investors adjust their valuations depending on this factor.

Table II. Subsamples divided by cross-listing and government control

| | Obs. | P/E | Beta | Lev | EPSG | ROE | Size | Payout | Turn | R |
|------------------|--------|--------|-------|--------|--------|--------|--------|--------|--------|-------|
| Non-cross-listed | 167111 | 33.854 | 1.112 | 0.238 | 1.273 | 0.056 | 14.477 | 0.224 | 37.653 | 0.054 |
| Cross-listed | 3769 | 24.143 | 1.088 | 0.285 | 1.273 | 0.063 | 15.483 | 0.288 | 29.256 | 0.045 |
| Dif. | | 9.711 | 0.024 | -0.047 | 0.000 | -0.007 | -1.006 | -0.064 | 8.397 | 0.009 |
| P-value* | | 0.000 | 0.000 | 0.000 | 0.997 | 0.000 | 0.000 | 0.000 | 0.000 | 0.072 |
| Private | 91011 | 35.145 | 1.118 | 0.223 | 1.272 | 0.060 | 14.275 | 0.224 | 38.363 | 0.058 |
| State-owned | 51415 | 30.943 | 1.099 | 0.268 | 1.274 | 0.051 | 14.897 | 0.228 | 35.821 | 0.046 |
| Dif. | | 4.202 | 0.019 | -0.045 | -0.002 | 0.008 | -0.621 | -0.003 | 2.542 | 0.011 |
| P-value* | | 0.000 | 0.000 | 0.000 | 0.866 | 0.000 | 0.000 | 0.077 | 0.000 | 0.000 |

*Based on the result of t-test for means equality

Comparing cross-listed firms to non-cross-listed firms in Table II, it can be seen that cross-listing does not improve earnings growth rate while having significant differences in the other factors. Cross-listed firms are less valued, provide fewer stock returns, have higher ROE ratio, are bigger in size, have less turnover ratio, and distribute more dividends. Explanation of lower valuation while having stronger fundamental indicators lies in the fact that cross-listing in countries with a better informational environment and access to arbitrage opportunities provide resistance to investor sentiments. Consequently, their valuation is closer to their fundamental factors. The fact that the cross-listed firms are less valued than their domestic analogues despite the significant dominance in fundamental factors may raise the question about the justification of cross-listing in general.

The analysis of state-owned and private firms reveal several similarities and differences. First of all, the firms with government ownership are indeed distribute more cash dividends than private firms, however, the state-ownership is found to have no significant impact on the growth factor as it was suggested by Lam *et al.* (2012). Despite having similar growth rate and lower beta, state control symbolizes lower valuation and lower stock returns. Lower ROE of state-owned firms might be a result of larger firms' sizes in comparison to private firms. After exclusion of all logical explanations which might explain low stock valuation of state-owned firms, the results leave only one factor – a stock turnover ratio.

The analysis came to the conclusion that either the model is missing an important explanatory variable or the state-owned firms in China are undervalued based on the investors' pessimism towards government's approach to managing the firms.

a. Industry Analysis

According to a conventional wisdom, to avoid a comparison of substantially different firms, P/E ratio should be compared only within the same industry. The basic logic behind this opinion is a difference between industries. Some industries (e.g. IT industry) are developing relevantly faster and generate higher returns than more conservative industries (e.g. Agriculture or Utility) which are less prominent and consequently less attractive to a majority of investors. Theoretically, investors should value stocks depending on their calculation based on fundamental indicators, but in practice, some investors may mistakenly overvalue or undervalue some industries following their sentiments and beliefs.

Table III. Cross-industry analysis

| | P/E | R | EPSG | Turn | Size | Payout |
|-----------------------------------|--------|-------|-------|--------|--------|--------|
| Agriculture, forestry & fishery | 37.643 | 0.048 | 1.195 | 45.810 | 14.160 | 0.234 |
| Mining | 32.348 | 0.044 | 1.215 | 34.362 | 14.925 | 0.212 |
| Manufacturing | 34.308 | 0.056 | 1.276 | 37.738 | 14.458 | 0.243 |
| Elec, heat, gas & water | 25.461 | 0.040 | 1.288 | 33.618 | 14.946 | 0.242 |
| Construction | 27.031 | 0.054 | 1.254 | 38.929 | 14.702 | 0.164 |
| Wholesale & retail | 36.188 | 0.047 | 1.237 | 36.914 | 14.558 | 0.203 |
| Transportation, warehouse & post | 23.436 | 0.041 | 1.286 | 30.259 | 15.171 | 0.275 |
| Information technology & software | 41.767 | 0.073 | 1.382 | 41.684 | 13.975 | 0.224 |
| Real estate | 28.025 | 0.050 | 1.287 | 35.389 | 14.740 | 0.153 |
| Leasing and business | 36.997 | 0.057 | 1.223 | 37.828 | 14.401 | 0.188 |
| Other | 38.035 | 0.047 | 1.227 | 40.160 | 14.016 | 0.166 |
| Whole sample | 33.564 | 0.053 | 1.273 | 37.399 | 14.500 | 0.226 |

Analysis of the results in Table III reveals that the most valued industry in China is Information Technology & Software (IT industry), which is reasoned by being the first ranked in the column of stock returns and earnings growth. The industry is also characterized by above average stock turnover ratio. The firms of IT industry distribute their earnings at the same proportion as the whole market average. Another extreme description of the IT industry is the size factor. The firms are smaller in terms of total assets than any other industry.

The least valued industry is the Transportation, Warehouse & Post with its below market average return stocks and the lowest stock turnover ratio. Interestingly, the growth rate is above average while the firms of the industry are bigger and payout more than the averages of the other industries. It may be assumed that the industry is undervalued. The low stock turnover ratio which is inconsistent with the growth rate may indicate serious affection by investor sentiments. Opposite to this, Agriculture, Forestry & Fishery industry has the highest stock turnover ratio but the lowest earnings growth rate, therefore, the industry is valued above the market average and may be considered as overvalued.

Excluding the Construction industry, all other industries have higher (lower) than market average P/E ratio if the stock turnover ratio is also above (below) market average. Observing the pattern of the stock valuation in Table 3, it can be concluded that turnover ratio is playing a major role in the stock valuation process.

b. Determinants of the Price-to-Earnings Ratio

The final step in this study comprises of regression models which attempt to detect substantial determinants of P/E. According to the results of the full sample in the second column of Table IV, all variables except for the Beta have an impact on the valuation of the stocks. The biggest coefficient belongs to the ROE while the smallest belongs to the Turn. The stock turnover ratio which represents investor sentiments is a small but still a significant factor. The only result which cannot be explained and indicates an irrational valuation is the negative and significant coefficient of the EPSG coefficient. This may imply that the firms distribute too much cash as the dividends and as a result, ROE ratio is high in spite of negative EPSG. It can be assumed that investors in China have short-term interests and they prefer short-term cash inflow in form of cash dividends rather than long-term stock price appreciation.

The next two columns of Table IV display how the variables interact with the P/E ratio of cross-listed and non-cross-listed firms. The results reveal two major differences for those firms. The first, valuation of cross-listed firms has the significant and positive reaction to their earnings growth. The second difference is in the insignificance of ROE, which may imply that foreign investors do not rely on ROE in process of valuation Chinese firms. In general, this comparison signifies that coverage by foreign analysts has the significant impact on the stocks evaluation.

The last two columns of Table IV match government controlled and private firms. The main difference is the Beta, which becomes significant and negative for the state-controlled firms. According to the Table II, the state-controlled firms have smaller Beta than the private firms. The negative correlation of systematic risk proxy and the firm value was expected, but the fact that this correlation is significant only for the state-owned firms may imply that investors have stricter requirements for the shares valuation of the government-controlled firms than for the shares of private firms.

Table IV. Determinants of P/E in China

| Variables | Full sample | | CL=1 | | CL=0 | | GOV=1 | | GOV=0 | |
|----------------------|-------------|-------|--------|-------|--------|-------|--------|-------|--------|-------|
| C | -66.01 | 0.000 | -95.37 | 0.000 | -65.43 | 0.000 | -49.03 | 0.000 | -77.22 | 0.000 |
| Beta | 0.206 | 0.735 | 0.038 | 0.991 | 0.203 | 0.736 | -1.797 | 0.080 | 1.021 | 0.160 |
| Lev | -11.38 | 0.000 | -16.77 | 0.024 | -11.35 | 0.000 | -12.76 | 0.000 | -10.30 | 0.000 |
| EPSG | -0.752 | 0.000 | 0.835 | 0.068 | -0.792 | 0.000 | -0.396 | 0.006 | -0.979 | 0.000 |
| ROE | 21.40 | 0.000 | 10.05 | 0.283 | 21.56 | 0.000 | 23.56 | 0.000 | 19.56 | 0.000 |
| Size | 5.306 | 0.000 | 6.717 | 0.000 | 5.284 | 0.000 | 4.214 | 0.000 | 6.098 | 0.000 |
| Payout | 7.314 | 0.000 | 10.56 | 0.000 | 7.256 | 0.000 | 8.569 | 0.000 | 6.556 | 0.000 |
| Turn | 0.139 | 0.000 | 0.146 | 0.000 | 0.138 | 0.000 | 0.127 | 0.000 | 0.143 | 0.000 |
| P/E _(t-1) | 0.514 | 0.000 | 0.381 | 0.000 | 0.516 | 0.000 | 0.486 | 0.000 | 0.529 | 0.000 |
| Obs. | 87229 | | 2280 | | 84949 | | 31761 | | 55468 | |
| Adj. R ² | 0.413 | | 0.342 | | 0.414 | | 0.387 | | 0.428 | |

V. Conclusion

This study analyzes the factors which influence the valuation of the stocks. Chinese stock market is substantially different from the other major markets due to a significant control of the government and limitation of trading and arbitrage. This has become a reason for the Chinese investors to have different valuation preferences and approaches. The results reveal several major differences between theory and practice, for instance, the growth rate of earnings has a negative correlation with the P/E ratio. This fact leads to the conclusion that investors on the market with limitations have short-term interests and they value firms which are targeted at the growth factor lower. In order to examine if this phenomenon is different from industry to industry, this study investigates valuation of stocks among the major industries. The outcomes reveal that not a growth factor but a stock liquidity is the major factor determining the P/E. This pattern reverses when a firm is cross-listed on the foreign markets. Coverage by a foreign market attracts investors who considerably modify the valuation of the stocks and appreciate the growth factor. The valuation becomes challenging to the cross-listed firms because despite having higher profitability rate (ROE), lower systematic risk (Beta), and higher dividend payout ratio, cross-listed firms are valued less than the firms which are listed only on the Chinese market. It is assumed that the explanation of the low valuation could be due to the low stock turnover ratio which serves to indicate investor sentiments. Cross-listed firms are exposed to the markets with significantly broader arbitrage opportunities that according to Baker and Wurgler (2006) is the primary cause of stock misvaluation. Finally, the analysis of the state-owned firms reveals that these firms are

valued lower than private firms. Similar affection by the investor sentiments has been demonstrated by the firms with the government control. Lam *et al.* (2012) proposed that firms with significant government ownership distribute a higher proportion of earnings through dividends than private firms which may impede a potential growth of their future earnings. Comparison of state-owned and private firms has shown that the former indeed possess higher payout ratio but this does not affect the earnings growth rate. The analysis concluded that the P/E which represents the stock valuation of the state-owned firms, as well as all other firms is primarily dependent on the investor sentiments.

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