The Role of the Stock Market in Influencing Firm Investment in China

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Abstract

This study investigates the impact of China's stock market on firm-level investment by using a panel data set constructed by the author of all Chinese listed firms for the period of 1992 to 1999 and by applying both fixed effects and generalized method of moments (GMM) techniques. The results show that stock market valuation has a highly significant and positive influence on listed firms' investment decisions, particularly during the stock market boom from 1996 to 1999. However, based on the present-value model, it is found that stock market valuation in China deviates significantly from underlying fundamentals. As a result, the recent stock market expansion in China is likely to produce an inefficient resource allocation and cause detrimental effects on the real economy.

Key words: firm-level investment; stock markets; financial development; Chinese economy.

JEL classification: E22; E44; G31; G32.

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I. Introduction

This study empirically investigates the relationship between stock market development and real investment in the case of China based on a panel data set constructed by the author of all publicly listed Chinese firms for the period of 1992 to 1999. This data set is modeled on and is comparable to the COMPUSTAT database in the US. To the author's knowledge, this is the only existing data set which provides complete financial and accounting information of all Chinese listed firms from the onset of the stock market to the end of 1999. This study contributes to the recent discussions[1] on the role of stock markets in economic growth by focusing on one specific country and by providing firm-level evidence on one particularly important link between the stock market and long-run growth, that is, how firm investment is affected by the stock market.

In the last decade, the Chinese stock market has been one of the fastest-growing equity exchanges in the world. More than a thousand firms have already been listed and as a whole they constitute a significant portion of the Chinese economy.[2] Meanwhile, stock prices have also appreciated considerably.[3] This study evaluates the economic impact of stock market expansion in China by exploring two important and related issues. First, do Chinese listed firms make investment decisions based on stock market valuations? If yes, then the second question is, are those stock market valuations efficient in terms of reflecting fundamentals? More specifically, to comprehend the first issue, this study computes Tobin's q as a measure of stock market valuation and then applies both fixed effects and generalized method of moments (GMM) techniques to estimate how firm-level investment is affected by stock market valuations while controlling for other potential determinants of investment. With regard to the efficiency of stock market valuations, this study uses the present-value model to examine how market signals respond to fundamental factors such as growth in earnings and dividend distribution.

The main findings are twofold. On the one hand, the stock market is found to have a highly independent and significantly positive influence on firms' investment decisions, particularly during the stock market expansion years from 1996 to 1999. In addition, the stock

[1] See, among others, Levine and Zervos (1996, 1998), Levine (2000), and Beck and Levine (2002) for a review of this line of research.

[2] By 2001, listed firms as a whole contributed to about 16% of GDP in China (calculated based on data from *China Listed Company Reports*, 2002). Note that unless otherwise stated, all figures in this paper are calculated by the author based on her own data set.

[3] From the beginning of 1996 to the middle of year 2001, China's stock market experienced an unprecedented bull market. The Composite Indexes for the two stock exchanges in China went up by 270% and 460% respectively (calculated based on data from http://www.securities.com).

market influence is more pronounced among those firms with a higher percentage of tradable shares and therefore are presumably more sensitive to market signals. On the other hand, evidence indicates that market valuations in China are not responsive to changes in underlying fundamentals in a manner consistent with what the efficient markets theory predicts. In fact, valuation ratios are higher for firms with inferior performance, especially during the period of stock market expansion from 1996 to 1999. These results suggest persistent investor deviations from the economic axioms of rationality and they support the notion of systematic human irrational behavior, as demonstrated by a number of influential psychological studies (Tversky and Kahneman, 1974; Kahneman and Riepe, 1998). Considering that capital allocation in China has increasingly relied on stock market valuation, these erroneous stock market signals may hinder the productivity of investment and produce an inefficient allocation of resources in China. The outcome of this study supports the view that some sensible regulations of the Chinese stock market are necessary in order to deter the detrimental effects that unregulated stock market expansion might have on the real economy.

The rest of the paper is organized as follows. The next section reviews the existing literature on the role of stock markets, banks, and overall financial development in promoting economic growth. Section 3 provides some background information on the stock market development in China and reviews some related research efforts. Section 4 then discusses the construction of the data set and describes summary statistics of some key variables. Section 5 specifies the econometric model, discusses the regression methodology, and presents estimation results. The last section concludes.

II. Stock Markets, Banks, Investment, and Economic Growth

For almost a century, economists have debated the relationship between overall financial development and long-run economic growth.[4] Given the rapid growth of equity markets, particularly the emerging markets, in the past two decades[5], recent studies have extended to assess the independent effects of stock markets in addition to banks on economic growth.[6] These

[4] Early literature includes Schumpeter (1911), Goldsmith (1969), McKinnon (1973) and Shaw (1973).
[5] Between 1982 and 1996, world stock market capitalization grew at an annual average of 15% form $2 trillion to over $15 trillion. Total capitalization among emerging markets accounted for 13% of world stock market capitalization in 1996 compared to only 4% back in 1982. (Arestis, Demetriades, and Luintel, 2001.)
[6] See, for instance, Levine and Zervos (1996, 1998), Levine (2000), and Beck and Levine (2002) for a review of recent development in this area.

debates are especially relevant to transitional economies such as China where the financial system is currently undergoing reforms.

There are diverging views on the explicit role for stock markets in economic growth. Proponents of stock markets emphasize that well-functioning stock markets could spur growth through a number of channels. Critics, on the other hand, argue that the benefits of stock markets are overly exaggerated. For instance, some studies show that large and liquid stock markets could facilitate pooling of savings and channel capital to investment projects (Greenwood and Smith, 1997). However, some other studies observe that compared to banks, equity markets are a trivial source of funds for corporate investment (Mayer, 1990; Corbett and Jenkinson, 1994). Stock market development could also increase liquidity and provide a vehicle for risk diversification. On the one hand, more liquidity and diversification reduce the risk and the cost of investing in those long-term projects with higher returns and therefore could result in efficient resource allocation by promoting more and better investment (Levine, 1991; Saint-Paul, 1992; Bencivenga, Smith, and Star, 1996). On the other hand, more liquidity and less risk could in fact cause less need for precautionary savings and thus reduce savings rates and hurt growth (Bencivenga and Smith, 1991; Bencivenga, Smith, and Star, 1995; Pagano, 1993).

In addition, some studies stress that stock markets could improve corporate governance by alleviating the principal-agent problem between the owners and managers (Diamond and Verrecchia, 1982; Jensen and Murphy, 1990). By contrast, other studies point out that stock market development could have negative effects by facilitating hostile counter-productive takeovers (Shleifer and Summers, 1988; Morck, Shleifer, and Vishny, 1990). Moreover, some argue that takeover threats could provoke managerial short-termism, discourage long-term investment, and therefore lead to inefficient allocation of resources (Singh and Weiss, 1998). Furthermore, some assert that stock markets, by providing profit incentives, are more effective than banks in information acquisition and dissemination and therefore could enhance quality of investment and thus stimulate growth (Cho, 1986; Holmstrom and Tirole, 1994). On the contrary, some others believe that banks are superior to stock markets in that they could monitor firms' investment and management at a lower cost. They contend that in reality, due to dispersed stock ownership, individual investors are relatively small and they neither have the ability nor the incentives to acquire the costly yet necessary information for achieving efficient resource allocation (Stiglitz, 1985; Bhide, 1993; Singh, 1993, 1997).

It is worth highlighting that the ability of stock markets to achieve efficient allocation of resources ultimately hinges on the relevance of market signals in reflecting underlying fundamentals. Many studies, though, caution that stock prices often deviate substantially from underlying fundamental values and thus might not provide correct and useful information necessary for achieving allocative efficiency. For instance, according to Tobin, share prices are largely not "fundamental-valuation efficient" because they are primarily determined by "speculations on the speculations of other speculators" (Tobin, 1984: 7). Others also underline the excessiveness of stock price volatility by pointing out that price movement cannot be simply justified by changes in fundamentals (Shiller, 1981, 1989, 2000; Shleifer, 2000). Moreover, the uncertainty caused by excessive stock market volatility could have detrimental effects on the productivity of investment (DeLong et al. 1989; Federer, 1993).

As for empirical evidence on the role of stock markets in economic growth, a number of recent studies adopt cross-country growth regression method to show that stock market development, even independent of bank development, is strongly linked to subsequent economic growth (Atje and Jovanovic, 1993; Levine and Zervos, 1996, 1998). However, the robustness of cross-country methodology is undermined by a number of econometric issues. First, results in general are very sensitive to model specification and choice of control variables. For instance, Harris (1997) uses current instead of lagged investment in estimating the same model by Atje and Jovanovic (1993) but on the contrary, no significant effect of stock market activities on growth is found, especially so for developing countries. Second, results might be largely driven by outliers. As demonstrated by Zhu, Ash, and Pollin (2002), Levine and Zervos' (1998) outcome that stock market development is significantly associated with economic growth is mainly due to outliers, i.e., the five Asian countries with both high growth as well as active stock markets. Third, it is problematic to assume homogeneity of both slope coefficients (Evans, 1995) and the convergence term (Lee, Pesaran, and Smith, 1996) across countries.[7] Besides these econometric concerns, one major drawback of the cross-country analysis is that it could only provide limited policy implications for individual countries since the average effect among countries does not reveal notable differences across countries. In fact, according to a number of

[7] In an attempt to alleviate some econometric shortcomings, more recent studies have resorted to panel method. For instance, Beck and Levine (2002) improve on Levine and Zervos (1996, 1998) by applying GMM technique for dynamic model to a panel data set of 40 countries over the time period of 1976 to 1998. Rousseau and Wachtel (2000) employed panel vector autoregressions for a set of 47 countries with annual data for 1980-95. Both studies conclude that stock markets and banks independently and positively affect growth.

time-series studies, the causal link between financial and economic development varies across countries and in addition, financial development affects the economy primarily through the banking system (Demetriades and Hussein, 1996; Arestis and Demetriades, 1997; Arestis, Demetriades and Luintel, 2001). These studies also find that in countries like Germany, stock market volatility has a significant and negative impact on growth. Another point worthy of note is that studies based on a cross-country framework in general have omitted China due to lack of data. Needless to say that given the increasing role of China in the world economy, understanding China is important in its own right.

Given the limitations of cross-country studies, country-specific case studies and studies focusing on specific channels through which stock markets might affect the economy can provide valuable insights into the precise role of stock markets for growth in individual countries with idiosyncratic institutional settings. In terms of the specific link between stock markets and investment activities, both country-level and firm-level empirical studies generally draw on the q theory of investment.[8] The q theory of investment provides a framework where net investment depends on the q ratio – the ratio of market valuation to replacement value of capital assets. Results from country-level studies are mixed. For instance, Robert Barro (1990) reports that in the case of US, stock market variables, measured by the q ratio as well as stock returns, can largely explain the subsequent aggregate investment even after controlling for fundamentals. On the contrary, Morck, Shleifer, and Vishny (1990) suggest that in the US, the stock market, on an aggregate level, is not much of a predictor of future investment. Meanwhile, a study by Galeotti and Schiantarelli (1994), based on quarterly aggregate data from the non-financial corporate sector in the US, finds that investment decisions are significantly affected by stock price fluctuations, regardless whether the variation is due to fads or due to changes in fundamentals. On the other hand, firm-level studies typically show that there is a very limited effect of the stock market on investment (Abel and Blanchard, 1986; Morck, Shleifer, and Vishny, 1990; Blanchard, Rhee, and Summers, 1993).

[8] One exception is a recent cross-country study by Ndikumana (2001) on the role of financial development on domestic investment using a panel data set of 99 countries for the time period of 1965 to 1997. It finds that the overall financial development, but not the stock markets or banks *per se*, significantly and positively affects investment.

Against this background, this current study extends the existing research by conducting a country case study of China and by examining the impact of the stock market development on firm-level investment in China. The next section offers a brief description of the stock market development in China and it also reviews some related research efforts in understanding the stock market behavior in China.

III. Stock Market Development in China and Current Research Efforts

China officially launched economic reforms in 1978. However, it is since the 1990s that the government has adopted extensive market-based reform policies. To restructure the state-owned sector has long been a thorny problem for the government. The emergence and subsequent development of the stock market in China is largely related to the state-owned enterprises (SOEs) reform. SOEs account for over 90% of all Chinese listed firms. During the 1990s, the government has fully embraced the stock market and has increasingly relied on the stock market as the key mechanism for the SOE reform and for more efficient allocation of investment funds.

With its growing importance in the SOE reform, the stock market has developed remarkably in terms of the number of firms listed, total market capitalization, and total trading volume (Table 1).[9] Today, the number of listed firms exceeds 1,200. Only the largest and best-performing SOEs are qualified for listing. By the end of 2001, more than half of the 520 largest and most strategic SOEs in China have already been listed. As a result, listed firms as a whole constitute an increasingly significant portion of the Chinese economy. The total sales of listed firms combined accounted for about 16% of GDP by the year 2001. In terms of total market capitalization, China ranks as the second largest in Asia, only behind Japan (*Economist*, 6/1/2000, 2/6/2003). Total market capitalization as the ratio of GDP increased from 4% in 1992 to over 50% at the end of 2000 (Table 1). Trading has been extremely active on the Chinese stock market. The annual turnover ratios averaged more than 400%, which is more than five times higher than that on the US market. Volatility has also reached unparalleled levels. Nonetheless, the stock market has become an increasingly important financing source for listed firms. For instance, in the year 2000, the total amount of funds raised on the stock market accounted for 5% of total fixed investment and 12% of the total increase in bank loans. In fact,

[9] Calculated based on information from *China Statistical Yearbook* (various years).

the stock market has become the most important source of financing for Chinese listed firms. One recent study (Xiao, 2003) finds that listed firms in China rely mostly on equity financing, less on internal funds, and least on bank loans.

Despite the increasingly important role of the stock market in the Chinese economy, there have not been any systematic studies on the economic consequences of stock market development in China, particularly on the effects on firm investment. Empirical efforts have been devoted to understanding many other aspects of the Chinese stock market. Some studies provide detailed accounts of stock exchange at its early stage of development and related speculative trading activities (Li and Wong, 1997; Hertz, 1998). Numerous other studies analyze the risk and return structure in the Chinese stock market based on the capital asset pricing model (CAPM) as well as the arbitrage pricing theory (APT) (Wong, Leung and Wong, 1997; Song, Liu & Romilly, 1998; Su & Fleisher; 1998). Those studies, however, provide conflicting results as whether or not the Chinese stock market is informational-efficient. Some try to dissect the difference between the A shares and B shares markets (Chakravarty, Sarkar, and Wu, 1998; Fernald and Rogers, 2000). Both Xu and Wang (1997) and Chen and Lin (2000) study the impact of ownership structure on listed companies' performance over a very short time period using OLS. Both find that there is a significant and positive relationship between the proportion of institutional shares and firm performance while the tradable A shares have no significant effect on firm profitability. In addition, firm performance is negatively related to state ownership. The policy implication therefore is to limit state shares and foster large institutional shareholders as the key to improving SOEs' efficiency and profitability. In a different spirit, Wang (2000) examines the macroeconomic impact of the stock market by applying the Levine and Zervos' (1998) method. However, this implementation is problematic due to the brevity of the sample period (1993 -1999). In any case, no significant correlation between stock market development and growth indicators is found. There has also been a burgeoning amount of information on the stock market written in Chinese. Though often a bit anecdotal in nature, many of they provide fascinating and revealing descriptions of some speculative characteristics of the Chinese stock market (Li, 2000; Yang, 2001; Li, 2001; Wu, 2002).

IV. Data Construction and Summary Statistics

In order to fully assess the impact of the stock market on firm investment, this study addresses two important but related issues. First, is stock market valuation important for firm investment decisions? Second, if in fact the stock market has a significant influence on investment, then are stock market valuations efficient in terms of reflecting underlying economic fundamentals? This study empirically investigates these two issues based on a panel data set constructed by the author. This data set is comparable to the U.S. COMPUSTAT database and covers all Chinese listed firms for the time period of 1992 to 1999. The complete data set provides annual financial and accounting information on a total of 480 companies listed on the Shanghai Stock Exchange and 459 companies listed on the Shenzhen Stock Exchange by the end of 1999. A more detailed description of the key variables collected and used in subsequent econometric testing is provided in Appendix A.

1. Determinants of Investment Equation

Excluding all missing values for some regression variables, there are a total of 2,682 observations for 824 firms for the period of 1993 to 1999. Descriptive statistics of regression variables are presented in Table 2. Standard deviations are calculated for the original variables as well as for the between group (BG), within group (WG), and first-differenced (FD) transformations. As seen in Table 2, there is significant variation for all variables. For most variables, the FD variation is larger than the WG variation and the BG variation is even smaller. Table 2 also lists descriptive statistics for three other variables, namely, the percentage of individual-owned tradable shares, the percentage of state-owned non-tradable shares, and the percentage of remaining shares. In terms of share distribution, there is considerable difference between groups but very small variation within groups.

2. Efficiency of Stock Market Valuation

Excluding all missing values for regression variables, there are a total of 3,603 observations on 835 listed firms with each observed for an average of four years (ranging from one to eight years). Since it is theoretically problematic to explain the negative valuation ratios using the present value model, 274 observations with negative values for the dependent variable are excluded from the sample. This leaves us with 3,329 observations on 835 listed firms over the time period of 1992 to 1999 for the regression analyses. Descriptive statistics of regression variables are shown in Table 3 and Table 4. As seen in Table 3, there is significant variation for all regression variables. For almost all variables (except the amount of tradable shares), the within group variation is considerably larger than the between group variation. While the price-to-earnings ratios (P/E) typically are very high, a significant fraction of listed firms experienced deteriorated performance and profitability. Even though the regression sample consists of only those firms that have positive annual net profit, over 50% of all observations on growth in earnings per share ($EPSG$) are negative with a median value of -13% (Table 3). As a matter of fact, since 1994, every year more than half of the firms saw their earnings per share shrink rather than grow (Table 4). Moreover, about a third of growth in earnings (EG) and growth in sales revenue ($SaleGrow$) are negative as well (Table 3). Nonetheless, each year (except for year 1995), more than half of the firms managed to expand their total earnings (Table 4). In addition, since a relatively small percentage of firms distributed cash dividends, a large proportion of all observations on dividend payout ratios (Div) are zeros (Table 3). For instance, in 1999, there were only 287 out of 835 firms paid cash dividends (Table 4). Notice that all annual averages of Div 's are relatively small except for the year of 1995 (Table 4). However, this is mainly due to the fact that most firms' earnings (the denominator in dividend payout ratio) dropped sharply in 1995.

V. Econometric Analysis: Specifications and Results

1. On Determinants of Investment

This section consists of four parts. The first part provides a description of the theoretical background and motivations for subsequent econometric specifications. Next, estimation methodology is discussed. Part 3 then presents regression outcomes. Part 4 summarizes the regression results.

(1) Empirical Model

The empirical estimations draw on the Tobin's q theory of investment to analyze how firms' investment behavior responds to stock market valuation. The q model explicitly links, within an optimization framework, the investment rate to marginal q (i.e. the shadow price of capital) as follows[10]:

$$\left(\frac{I}{K}\right)_t = f\left(b, q_t, p_t^I / p_t\right) \tag{1}$$

where b is the adjustment cost, q_t is marginal q, p_t is the price of firm's output, and p_t^I is the price of investment goods. Under a number of assumptions (Hayashi, 1982, 1985), the unobservable marginal q could be proxied by the measurable average Q (i.e. market valuation to replacement cost of capital) so that the investment equation becomes a linear function of average Q for estimation.[11]

$$\left(\frac{I}{K}\right)_t = c + \left(1/b\right)Q_t + e_t \tag{2}$$

As a result, the q theory directly relates investment to stock market valuation of the firm given that the average Q truly captures all information about future profitability of investment. However, the average Q is not a perfect measure of future investment opportunities. Due to imperfections in financial markets, firms' liquidity position and financial leverage become important in that given investment opportunities, they could face different financing constraints and different costs of capital. In addition, because of the measurement error in the calculation of Q, liquidity and sales may also contain information on marginal value of capital, and therefore reflect investment opportunities.

Numerous empirical studies have demonstrated the significance of internal finance and the accelerator effect on investment even within the setting of a q model specification (Fazzari, Hubbard, and Peterson, 1988; Hoshi, Kashyap, and Scharfstein, 1991; Blundell et al., 1992; and Gilchrist and Himmelberg, 1995). To take into account the liquidity effect, cash flow, as measured by the after-tax net profit[12], is added to the estimation equation (Equation (2)). Notice

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[10] See Summers (1981) and Blundell et al. (1992) for the derivation of the q investment equation. Essentially, it is based on the first-order condition for investment from the adjustment cost function.

[11] The assumptions imposed are: product and factor markets are perfectly competitive; perfect capital markets; production and adjustment cost functions are linear homogeneous. Of course, these are theoretically necessary nonetheless unrealistic conditions for Equation (2) to hold. Therefore, in empirical testing, the average Q alone often does not explain investment well. Also note that Q_t in fact should be the tax-adjusted average Q.

[12] An alternative measure of cash flow, the after-tax-and-dividend net profit, is also used. Since the estimation results are stable across alternative specifications, only those based on the after-tax net profit are reported.

that the dependent variable is net investment; therefore the cash flow variables do not include depreciation allowances. Since given investment opportunities, the availability of internal finance constrains the investment decisions, cash flow is expected to have a positive relation with investment. To incorporate the accelerator effect, sales revenue is included in the estimation. Although in theory, the change rather than the level in output or sales is more appropriate to account for the accelerator effect, empirical testing often shows the opposite, suggesting that firms might adjust toward a target capital-output ratio (Fazzari, Hubbard, and Peterson, 1988).[13]

Moreover, financial leverage could also have an impact on investment decisions. First, interest payments from debt obligations directly reduce the cash flow available for investing. Further, in the event of future profits falling short of expectations, more debt service commitment due to high leverage ratio magnifies the threat of insolvency. Investment thus becomes riskier and therefore more restricted (Ndikumana, 1999). Second, the cost of financing for investment might increase with a premium required on loans for firms perceived riskier with higher leverage ratios (Harris, Schiantarelli and Siregar, 1994). Following these arguments, the debt to equity leverage ratio is included in the Equation (2) and is expected to have a negative effect on investment.[14] In addition, the model also considers the effect of the current ratio, i.e. current assets as the percentage of short-term debt, on investment decisions.[15] The current ratio measures the liquidity of a firm's financial position since it shows a firm's ability to pay off its current liabilities by liquidating its current assets.

To incorporate firm heterogeneity, individual firm effects are included. Time dummies are also added in order to filter out the impact of changes in macroeconomic conditions (Hsiao, 1986). The model then makes two further adjustments. First, to handle the problem of heteroscedasticity, all level variables are normalized by the beginning-of-the-year net capital stock. Second, since investment decisions made in time period t are based on the cash flow and

[13] Nonetheless, both the change in sales and the growth rate in sales in place of the levels in sales are tested. Since the results are not substantially different, they are not reported here.
[14] A different measure of leverage (interest coverage ratio) is also tested in substitution of debt-equity ratio but is found to have no significant effect on investment.
[15] The quick ratio is also studied in place of the current ratio. Both variables measure how fast the amount of assets can readily been converted into cash.

other information available at the beginning of the year, all explanatory variables used are lagged one-period. Notice this also alleviates the problem of endogeneity.[16]

Building on the static model, the dynamic adjustment of investment decisions is also explored. Since it takes time to allocate resources and adjust investment decisions, it is essential to allow for slow adjustment. To take account of the adjustment process, a lagged one-period dependent variable is added as an explanatory variable. It is theorized that as firms adjust their investment spending towards the optimal level of capital, current period investment should correspond negatively with that of the previous year.

To summarize, Equation (3) forms the basis of the empirical estimations.

$$?I/K?_{it} \; ? \; ?_1 Q_{it?1} \; ? \; ?_2 (CF/K)_{it?1} \; ? \; ?_3 (Sales/K)_{it?1} \; ? \; ?_4 (DE)_{it?1} \; ? \; ?_5 (CurRatio)_{it?1} \; ? \; ? ?I/K?_{it?1} \; ? \; ?_i \; ? \; ?_t \; ? \; ?_{it} \qquad (3)$$

where the dependent variable is the net (net of depreciation) fixed investment (I) normalized by the beginning-of-the-year total net (net of depreciation) capital stock (K), Q is the beginning-of-the-period Tobin's q (i.e. last year's average Q) measured as the ratio of market value of equity plus book value of debt to book value of total assets[17], CF denotes cash flow, $Sales$ stands for sales revenue, DE is the debt-to-equity ratio, $CurRatio$ refers to the current ratio, $?_i$ represents firm specific effects, $?_t$ indicates the time effect, and $?_{it}$ is the disturbance term and is assumed to be $i.i.d.N(0,?_?^2)$.

Using Equation (3), the study estimates the overall effect of stock market valuation, that is, Tobin's q, on investment decisions, while controlling for other potential determinants of investment. Moreover, it hypothesizes that if market valuation is a significant determinant of investment, firms with a higher percentage of tradable shares should be more responsive to market signals. Therefore the study investigates the difference in investment based on the sample split by tradable shares. Furthermore, it focuses on investment behavior during the sub period of

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[16] Note that for instance, current period Q is endogenous because it includes the investment made during the current year in the denominator, and therefore the coefficient of the contemporaneous Q would be biased toward zero.

[17] Due to lack of data, a more sophisticated measure of Q can not be computed. However, for instance, Hermes and Lensink (1998) for a study of Chile also calculated Q as the ratio of market value of equity plus book value of debt to book value of total assets.

stock market expansion years from 1996 to 1999 when the market valuations reached unprecedented levels.

(2) Econometric Methods

The econometric analyses begin with a static model (that is, without the lagged dependent variable as a regressor). The static model is estimated by the pooled OLS, the between (groups) effects, and the fixed effects (i.e. the within groups effects) estimators. The results of between effects estimates are reported because they could reflect the long-run effects of a corresponding dynamic model if assuming stationary variables and strict exogeneity of the explanatory variables (Pirotte, 1999).

If the individual effect ($?_i$) were assumed to be equal across all firms, then the pooled OLS estimates would be consistent and efficient.[18] However, since the individual effects ($?_i$) capture the unobserved specific firm characteristics, which could be correlated with explanatory variables, omitting them will lead to biased estimates. Allowing for different $?_i$'s is important as it controls for unobserved heterogeneity of firms.[19] Since my data set includes *all* listed companies therefore it is reasonable to assume fixed effects (Greene, 2000; Kennedy, 1998). In addition, both the Breusch-Pagan test and the Hausman test (for fixed effects)[20] statistics confirm that the appropriate model should be the fixed effects model.

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[18] An F-test was conducted to determine whether all u_i's are equal. In this case, the test statistics indicate that the null hypothesis that u_i's are the same across firms should be rejected. In other words, the fixed effects model is a preferred method.

[19]Based on assumptions of the nature of $?_i$'s, two types of models, fixed effects and random effects, are generally used in the panel data setting. If $?_i$ takes the form of a dummy variable specific to the i th firm but time invariant (i.e. $?_i$'s are assumed to be fixed), then the model is called the fixed effects model. On the other hand, the random effects model considers the firm-specific $?_i$ as a random error term, drawn from an unknown population. In the context of panel data when typically the cross section N is large and the time period T is small, fixed effects and random effects approaches are used (the consistency of the estimates depends on $N ? ?$). When N is small and T is large, a number of alternative models are utilized based on more general assumptions such as heteroscedastic cross-sectional errors, contemporaneous errors between sections, and autocorrelated errors within sections (the consistency of the estimates depends on $T ? ?$) (Kennedy, 1998, p. 231 and Greene, 2000, Ch. 15). Notice that these more complex models all fare poorly in testing due to the difficulty of estimating the error variance-covariance matrix (Kennedy, 1998, quoting Beck and Katz (1995)).

[20] The B-P test is an LM test statistic for random effects. Rejection of the null hypothesis suggests that there are individual effects and the classical pooled regression model with a single constant term is inappropriate. The Hausman test for fixed effects is to test whether the individual effects (i.e. the random error) are correlated with

Further complications arise once the lagged dependent variable is included as a regressor. Since the lagged dependent variable is correlated with the error term $?_{it}$ (i.e. it is endogenous) even if that $?_{it}$ is not itself autocorrelated, the OLS, fixed and random effects estimators all become biased and inconsistent unless $T ? ?$, which certainly is not the case in typical panel data where the number of cross sectional units are large but the length of time periods is short. To cope with this problem, I use both an instrumental variable approach developed by Anderson and Hsiao (1981) and a GMM estimator proposed by Arellano and Bond (1991).

According to Anderson and Hsiao (1981), to estimate a dynamic panel model, we could first remove the firm heterogeneity term $?_i$ by taking first differences. Then, either the differences $?y_{it?2}$ (i.e. $y_{it?2} ? y_{it?3}$) or the lagged levels $y_{it?2}$ could be used as instruments for $(y_{it?1} ? y_{it?2})$ to obtain consistent estimates, because both are highly correlated with $(y_{it?1} ? y_{it?2})$ but not correlated with the error term $(?_{it} ? ?_{it?1})$. However, Arellano (1989) recommended using levels $y_{it?2}$ instead of the differences $?y_{it?2}$, as instruments because they have no singularities and much smaller variances. Therefore I use the lagged two-period dependent variable as an instrument in the Anderson-Hsiao first-differenced instrumental estimator (hereafter AH_FD_IV).

The difference GMM estimator by Arellano and Bond (1991) (hereafter AB_DIF_GMM) is a generalization of AH_FD_IV method. It extends Anderson and Hsiao's idea by noting that many more instruments should be utilized to improve the efficiency of the estimates. For instance, in the first differenced model, further lags of the level y $(y_{i,s*}, y_{i,s*?1}, y_{i,s*?2}, ..., y_{i,t?2}, s^* ? 0,1,...,t ? 2)$ are all uncorrelated with the disturbance term $(?_{it} ? ?_{it?1})$. Omitting this information would lead to loss of efficiency. Therefore all these further lags of the dependent variable are valid instruments and should be used in testing.[21]

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other regressors. Rejection of the null hypothesis suggests fixed effects are more appropriate given no misspecification.

[21] Note that Kiviet (1995) proposed a small sample correction based on the fixed effects estimator to reduce the biases a *difference* GMM estimator (Arellano and Bond, 1991) might produce. However, this correction method can not be implemented for unbalanced panels (Adam, 1998). In addition, a *system* GMM estimator (Blundell and Bond, 1998) which combines the regression in differences (Arellano and Bond, 1991) with additional moment conditions for equations in levels (Arellano and Bover, 1995) could alleviate the small sample property of a difference GMM estimator. A DPD package (runs on either GAUSS or OX) is required in order to do a *system* GMM estimation.

(3) Estimation Results

i. The Static Panel Model

Table 5 and Table 6 show the results for the static model based on the OLS, the between effects (BG), and the fixed effects (FE) models. Since the pooled OLS is an average of all data over time and the BG model is a regression of group means across time, both estimates could be broadly interpreted as cross-sectional variations in firms' investment behavior. Meanwhile, the FE model estimates the deviations from the group means across time. Results based on all three estimators are largely consistent and the signs of the coefficients are all as expected. Investment spending responds positively and significantly to the stock market valuations, Tobin's q. More specifically, a one-unit increase in q leads to at least a 0.04 unit subsequent increase in investment. In addition, the coefficients of both cash flow and the current ratio are positive and highly significant in all regressions. However, there is no significant accelerator effect. Finally, the debt-to-equity ratio does not seem to be a constraint in the investment decision-making process. The effect of outliers on the estimation outcomes has also been checked, and the results are robust to the exclusion of outliers.[22] In terms of the magnitude of the coefficients, the elasticity of coefficients at the mean is calculated and listed in the last column of Table 4 for comparison.[23] The q elasticity of investment equals 0.45, which means that a 10% increase in the q ratio at the mean will result in a 4.5% growth in investment. Compared to the other variables, q clearly has the largest impact on investment.

ii. The Dynamic Panel Model

To account for adjustment effect, the model next includes the lagged dependent variable as a predictor. Because of the endogeneity of the lagged dependent variable, both the OLS and the fixed effects estimates are biased and inconsistent. The OLS estimate of the coefficient of the lagged dependent variable is upwardly biased because the omitted firm effects $?_i$'s are positively

[22] Following the Stata reference manual (StataCorp., 2001), the studentized residuals (Belsley, Kuh, and Welsch, 1980), Cook's Distance (Cook, 1977), DFITS (Welsch and Kuh, 1977), and Welsch Distance (Welsch, 1982) are used to identify outliers, leverage points, and influential observations. Only very few data points are singled out as a result. Excluding those observations does not alter the estimation results.

[23] Since the regression specification is in a linear instead of log-linear form, the strengths of the coefficients cannot be directly compared. Note that the original data are not log-transformed because doing so will leave out 798 observations for the dependent variable which have negative values. Excluding such a large number of observations will certainly introduce a sizable bias. The elasticity of an explanatory variable is calculated as (the coefficient of the explanatory variable) * (mean of the explanatory variable) / mean of the dependent variable.

correlated with the lagged dependent variable. In contrast, since the error term and the lagged dependent variable after the within transformation are negatively related, the FE estimate of the coefficient of the lagged dependent variable is biased downward. As a result the OLS and the FE estimators provide an upper and lower bound on the true parameter of the lagged dependent variable. Therefore, the OLS and the FE regression results are reported for reference in the first two columns of Table 7.[24]

Since both the OLS and the FE estimates are biased and inconsistent in the dynamic panel data framework, the study resorts to an AH_FD_IV estimator as well as an AB_DIF_GMM estimator. The lagged two period dependent variable $y_{it?2}$ is used as the instrument for the AH_FD_IV estimator. For the AB_DIF_GMM estimator, the study uses all available lagged (up to the lagged two-period) levels of the dependent variable (namely, $y_{i,92}, y_{i,93},...y_{i,t?2}$) as instruments. Columns 3 and 4 of Table 7 report the results based on these two estimators. The AH_FD_IV and the AB_DIF_GMM estimates are broadly consistent. The market valuation, Tobin's q, has a positive and significant impact on investment. The current ratio is also an important determinant of investment. On the other hand, while cash flow positively and significantly affects investment according to the AB_DIF_GMM estimator, it is not a significant factor by the AH_FD_IV estimator. Neither the sales nor the debt-to-equity ratio is statistically significant. In both estimation methods, the sign on the coefficient of the lagged dependent variable is negative; however, there does not appear to be any statistically significant adjustment effect.

In addition, Arellano and Bond (1991) suggested using results from the one-step robust estimator for inference on the coefficients but the two-step Sargan test statistic for overall model specification. Therefore the coefficients and t statistics from the robust one-step estimation are reported. The two-step Sargan test indicates no substantial misspecification. As expected, there is significant negative first order autocorrelation (judging by the m_1 test statistics) but no significant second order autocorrelation (based on the m_2 test statistics). This means we could accept that the instruments used are valid.

[24] However, a word of caution is needed in that this reference on the true parameter is limited by that fact that we have to rely on a much smaller number of observations for both the AH_FD_IV and the AB_DIF_GMM estimations.

iii. Sample Split According to the Percentage of Tradable Shares

Since both the AH_FD_IV and the AB_DIF_GMM estimation results suggest that there is no significant adjustment effect[25], the lagged dependent variable is not included as a regressor in further estimations. The fixed effects model is the preferred estimation method. All results reported henceforth (unless otherwise noted) are estimated with both fixed firm and year effects.

The full sample is split into two sub groups according to the percentage of their tradable shares. The average percentage of tradable shares since listing is used because overall there is very small variation of this percentage within groups (see Table 2). First, the study divides firms into two equally numbered groups based on the median value of tradable shares (30%). The first two columns of Table 8 present estimation results of these two divisions of firms. The market valuation is a more important determinant of investment for those firms with above-median percentage of tradable shares (the q elasticity of investment is 0.71) as compared with firms with less percentage of tradable shares (the q elasticity of investment is 0.49).[26] In fact, investment of firms with more than 30% tradable shares responds significantly only to the stock market valuations but not to any other fundamental factors. On the other hand, net profit is a highly significant determinant of investment for firms with less than 30% tradable shares. The distinction in the effect of market valuation on investment is even more remarkable when firms are divided into two groups based on the 50% tradable shares cutoff line (Columns (3) and (4), Table 8). The q elasticity of investment is much larger (1.77) for firms with higher than 50% tradable shares than that of those with less tradable shares (0.58).[27] Again, investment of those firms with fewer tradable shares is subject to changes in net profit while investment of firms with 50% or more tradable shares does not correspond to net profit. In summary, the higher percentage of tradable shares is directly associated with greater firm responsiveness to stock market signals in making investment decisions. This finding buttresses the main result based on

[25] Note that this is consistent with the Durbin-Watson test statistics from both the OLS and the fixed effects, which indicate that the static model is not seriously misspecified without allowing for the adjustment effect.

[26] Since our model is a linear (not a log-linear) function, in order to compare the significance of q on investment between these two groups, the q elasticity of investment (scale invariant) should be used. The q elasticity of investment is calculated as coefficient of q * mean of q / mean of the dependent variable, investment. Therefore for firms with 30% or more tradable shares, the q elasticity of investment = 0.07*2.74/0.27 = 0.71; for firms with less than 30% tradable shares, the q elasticity of investment = 0.04*2.94/0.24 = 0.49.

[27] These numbers are calculated in the same way as explained in the previous footnote. For firms with 50% or more tradable shares, the q elasticity of investment = 0.24*2.43/0.33 = 1.77; for firms with less than 50% tradable shares, the q elasticity of investment = 0.05*2.88/0.25 = 0.58.

the full sample that the stock market is a significant determinant of firm investment, as it is even more so for firms with more tradable shares and thus are more subject to market valuations.

iv. Investment Spending During the Stock Market Expansion Years[28]

From the beginning of 1996 to the middle of 2001, stock prices in China had appreciated significantly and correspondingly market valuation ratios had reached record high levels. Given that this market surge may be substantially driven by speculative elements, additional estimations look at firm investment behavior during those "exuberant" years when market values were exceptionally high. Because all explanatory variables including the market valuation ratios are lagged one-period, the investment equation is tested for the time period of 1997 to 1999. Table 9 reports the regression results based on the full sample and the overall finding is that investment is significantly and positively affected by the q ratio. In addition, the current ratio also has a significant effect on investment. All other variables are not statistically significant. Notice that although not statistically significant, the sign of the coefficient on cash flow is actually negative.

(4) Summary of Regression Results

To summarize, the main findings are as follows. First, stock market valuation ratio as measured by Tobin's q is a highly significant determinant of investment. It is particularly so for firms with higher percentage of tradable shares. Overall, investment is less responsive to availability of funds. Debt-to-equity ratio does not appear to have much effect on investment. Since almost all Chinese listed firms enjoy preferential treatment in terms of access to capital and loans, this might explain why debt-to-equity ratio does not matter and limitation on cash flow need not deter investment substantially. However, the current ratio, which measures the liquidity of assets, is highly significantly related to investment. In addition, there is no consistent accelerator effect on investment. In terms of the adjustment effect, results suggest that firms

[28] There are a number of other reasons for focusing on the time period after 1995. First, although there was also a stock market boom in 1992, there were very few companies listed back then and in addition, we only have observations for 5 firms for 1992. Second, accounting and financial information for listed firms might not be reliable in the very early stage of the stock market development. Third, it was on July 1st, 1993 that the new accounting rules which are comparable to international standards (GAAP – the generally accepted accounting principles) took effect in China. Fourth, the years 1994 and 1995 are somewhat unusual as the government adopted austerity programs in an attempt to fight skyrocketing inflation. The stock market during this period was relatively "dull".

adjust investment decisions fast and the current investment decision has no significant bearing on future investment.

2. Efficiency of Stock Market Valuation

The present-value model (Gordon, 1962) is commonly used to analyze stock valuations. According to the present-value model, the price of a stock should be equivalent to the present discounted value of all future expected payments it generates. It can be further shown that based on the present-value model, the price-to-earnings ratios are determined by expected future growth in earnings per share ($EPSG$) and dividends per share (Div), and the required rate of returns on the particular stock (i.e. the degree of risk associated with the stock) (Equation (4)).[29]

$$(P/E)_{it} \ ? \ ? \ \ ? \ ?_1 EPSG \ ? \ ?_2 Div \ ? \ ?(RiskFactors) \ ? \ ?_{it} \qquad (4)$$

A number of variables including the volatility in share price movement ($V?$), the relative intensity of stock trading (the trading coefficient, $TCoef$), financial leverage (as measured by the debt-to-equity ratio, DE), and the size of the firm ($Size$) (measured by both the total assets ($TotalAssets$) as well as the total amount of tradable shares ($AShares$)) are used to proxy for the riskiness of a stock.[30] In addition, sales growth ($SaleGrow$) is included to account for the possibility that efficient markets might price fast-growing companies higher. Moreover, firm dummies are added in an attempt to capture firm specific characteristics that might systematically influence its valuation.[31] Lastly, since market preferences might change over different time periods, time effects are also taken into account. To summarize, Equation (5)

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[29] Based on the present-value model, the following equation could be derived: $P_t \ ? \ \frac{D_t(1 ? g)}{(R ? g)}$ where P_t = price of a stock; D_t = dividend payout; g = growth in earnings per share; and R = required rate of return. Further, since $D_t \ ? \ E_t(1 ? b)$ where b = retention ratio, it follows that $\frac{P_t}{E_t} \ ? \ \frac{(1 ? b)(1 ? g)}{(R ? g)}$. This is the basis for Equation (4).

[30] See Appendix for detailed descriptions of all variables used.

[31] For instance, in the early 1960s, the tobacco stocks were consistently underpriced compared to their theoretical price. It could be because the theoretical price did not account for the risk that tobacco companies are under the threat of government intervention (Elton and Gruber, 1995: 466).

forms the basis of the econometric analyses of the determinants of stock-market valuations in China.

$$
?P/E?_{it} \; ? \; ?_1 EPSG_{it} \; ? \; ?_2 Div_{it} \; ? \; ?_3 V?_{it} \; ? \; ?_4 TCoef \; ? \; ?_5 DE_{it} \; ? \; ?_6 SaleGrow
$$

$$
? \; ?_7 Size \; ? \; ?_i \; ? \; ?_t \; ? \; ?_{it} \qquad (5)
$$

While controlling for other potential explanatory variables, the model focuses on the effect of fundamental factors such as growth in earnings per share and dividend payout on the valuation ratios. If the market valuation is rational, then the higher the earnings growth is, the greater the P/E ratios should be. In other words, higher valuation ratios should be associated with better future earnings prospects. Dividend distribution is expected to have a positive impact on the P/E ratios as well. Paying out dividends not only would directly benefit shareholders but could also signal a high-quality firm with solid liquidity position and optimistic future earnings potential. Consequently, the valuation ratios should rise as shareholders respond positively to more dividend payout. On the other hand, the value of a share should be inversely related to the degree of risk involved in holding the stock.

Firm-level analysis begins with tests for firm specific effects as well as time effects. Judging by the F test statistics, the study cannot reject that there are neither individual firm effects nor time effects. Therefore, the study estimates Equation (5) using pooled OLS. Table 10 presents the regression results. The last column of Table 10 shows the coefficient estimates of Equation (5) and Columns (1) through (6) are estimation results based on variations of Equation (5). Since the overall goodness of fit as measured by the R^2 is low, Table 10 also reports the F statistic on the test of the coefficients on all explanatory variables are jointly zero. The F statistics indicate that the model specifications are significant. The main result is that both $EPSG$[32] and Div, the two measures of economic fundamentals, are in fact significantly correlated with the dependent variable, P/E ratio. As expected, Div is found to have a positive effect on the P/E ratio and one unit increase of dividend payout ratio would yield 17 units

[32] Note that growth in total earnings (EG) was substituted for $EPSG$ (growth in earnings per share) in testing and the results remained essentially the same. Higher P/E's are also statistically significantly associated with lower EG .

increase in the P/E ratio. However, what's peculiar is that $EPSG$ is *negatively* related to P/E. More specifically, if earnings per share grow by one unit, the P/E ratio could go down, on average, by almost a unit. Alternatively, higher P/E ratios correspond to *falling* earnings per share. Moreover, both the relative trading coefficient ($TCoef$) and the amount of tradable shares ($AShares$) significantly affect the P/E ratio. Those relatively less traded stocks tend to have higher P/E's and firms with smaller tradable shares also have higher P/E's. The rest of the parameters in the model are not statistically significant. However, it is interesting to note that the sign of growth in sales revenue ($SaleGrow$) is negative, which indicates that the market actually values fast-growing firms less favorably. The positive parameter of the debt-to-equity ratio (DE) is also unanticipated. It means that in fact firms which are more financially leveraged have higher P/E ratios. Finally, the signs of both volatility of share price movement ($V?$) and total value of assets ($TotalAssets$) are as expected. Large firms and firms with relatively more stable share prices are considered less risky and therefore are valued higher.

Because there are some extreme values and considerable variation for all regression variables as well as for the dependent variable (see Table 3), it is particularly important in this case to check the effect of influential observations on the estimation results. Four different methods are applied to identify outliers. Table 11 reports regression results excluding outliers. As evident from Table 11, the key finding that there exists a strong negative association between earnings growth and the stock-market valuations is robust to the exclusion of outliers. On the other hand, all other parameter estimates are more or less sensitive to the effect of outliers. In particular, although the dividend payout ratio is still statistically significant, in two of the five specifications, it is negatively correlated with the price-to-earnings ratio.

Next the study focuses on the determinants of the P/E ratio during stock market expansion years of 1996 to 1999. The average P/E's were excessively high during this time period (see Table 4). It is especially relevant to investigate the stock price efficiency during this period. The first column of Table 12 presents the regression outcome on the full sample of firms for the entire time period from 1996 to 1999. This regression result shows that during the stock market boom, firms with inferior performance (slower earnings growth) are priced higher while the dividend payout ratio has no statistically significant effect on the stock valuation. In addition, both $TCoef$ and $AShares$ appear to have negative and significant coefficients. Overall, the extremely low R^2 indicates that the explanatory variables, including the fundamentals, cannot reasonably explain the variability in valuation ratios during the stock market expansion.

Furthermore, this study explores valuation ratios for subsamples of firms with different fundamental characteristics during the stock expansion years. Firms are divided into groups according to the two fundamentals – growth in earnings per share ($EPSG$) and the dividend payout (Div).[33] Columns (2) through (7) of Table 12 report regression results based on these subgroups of firms. In addition, Table 13 presents a summary with interpretations of all regression results from Table 12.

To begin with, there are only 45 firms with consistently good performance over the entire time period from 1996 to 1999. Earnings per share for these firms continued to grow each year during this four-year time period. Even for these relatively high-quality firms, the valuation ratios are strongly and negatively correlated with earnings growth (Column (2), Table 12). Meanwhile, their valuation ratios are not significantly affected by their dividend payouts. However, in this case, the market does seem to value fast-expanding firms with larger sales growth more favorably. At the other end of the performance spectrum, there are 267 firms whose performance continued to fall each year over the entire period. For these relatively inferior firms, as it turned out, the worse they perform, the higher their valuation ratios (Column (3), Table 12)! In fact, there exists a very strongly significant and negative association between their $EPSGs$ and $P/E\,s$. The coefficient on $EPSG$ is -233.0 and is statistically significant at more than the 99% confidence level. Dividend payout, on the other hand, is also significantly and negatively related to the P/E ratios! Overall, for those 267 firms with diminishing performance, more distribution of cash dividends in fact lowers their market valuations. In addition, out of those 267 firms, 109 firms never paid out any cash dividends while a total of 61 firms consistently paid out cash dividends during the entire time period. For these 109 firms who saw their earnings per share continuously dwindle and who never even distributed any cash dividends, the worse their performance is, the higher their market valuations (Column (7), Table 12). For the other 61 firms that experienced constantly shrinking earnings per share but still managed to always pay out cash

[33] See notes at the end of Table 7 for more detail. Essentially, firms are divided into eight groups according to (1) $EPSG > 0$; (2) $EPSG < 0$; (3) $Div > 0$; (4) $Div = 0$; (5) $EPSG < 0$ and $Div = 0$; (6) $EPSG < 0$ and $Div > 0$; (7) $EPSG > 0$ and $Div = 0$; and (8) $EPSG > 0$ and $Div > 0$. Regression results based on sub groups of firms (1) through (6) are reported correspondingly in Columns (2) through (7) of Table 7. There are insufficient observations in groups (7) and (8) to obtain meaningful regression results.

dividends, the dividend distribution actually does not have a significant effect on their valuation ratios. However, the worse they perform, the higher their market values (Column (6), Table 12). Finally, regardless of their performance, altogether there are 132 firms consistently paying out cash dividends annually and in contrast, 240 firms never paying out cash dividends for the entire four-year period. The P/E ratios of those 132 dividend-paying firms are significantly and negatively associated with their earnings growth. However, at least in this case, their dividend payout is positively linked to their market valuations (Column (4), Table 12). For those 240 non-dividend-paying firms, the worse they perform, the higher their market valuations (Column (5), Table 12).

To summarize, the regression analysis of the valuation efficiency in China generates the following results. First, although the model specifications are significant (based on the F values), the extremely low R-squared values for most of the regressions suggest that overall, stock market valuation in China does not correspond to underlying fundamentals and other potential determinants as would be predicted by an efficient markets theory. In addition, there is also no indication of "mean-reversion" for valuation ratios.

More strikingly, valuation ratios in China behave in a manner contrary to the efficient markets theory based on standard notions of investor rationality. The price-to-earnings ratios are found to be *significantly and negatively* correlated with earnings growth, even during the 'exuberant' stock expansion years. This implies that the worse firms perform, the higher their market values! On balance, dividend payout does not have as much of a significant effect on the price-to-earnings ratios, particularly during the market expansion years. Market valuation in China overall seems to reflect a high level of systemic investor idiosyncrasy. The exact reason for such pervasive investor sentiment in China is still open to question. However, models of stock market behavior which take into account both the Keynesian notions of speculative motives and psychological factors, as indicated by behavioral approach to financial markets, might provide a promising avenue to understanding the behavior of Chinese investors (Kahneman and Tversky, 1973; Tversky and Kahneman, 1974; Stich, 1990; Kahneman and Riepe, 1998; Barberis and Thaler, 2002; Shleifer, 2000; Shiller, 2003).

Finally, although their effects are somewhat sensitive to specifications, the degree of active trading and the amount of tradable shares are by and large negatively related to the price-to-earnings ratios. It appears that relatively more frequently traded stocks are perceived to be more volatile and therefore are valued lower. On the other hand, firms with smaller tradable shares generally have more potential for equity expansion in the future and therefore should be valued higher by the market.

VI. Conclusion

This study empirically investigates the role of the Chinese stock market in influencing firm-level investment. It focuses on two related aspects of the stock market. First, using a Tobin's q theory of investment, it considers the relevance of stock market valuations to investment decisions. Second, in a present-value framework, it evaluates the efficiency of stock market valuation in terms of reflecting underlying fundamentals. The econometric evidence strongly indicates that in China firm managers respond significantly and positively to stock market valuations while making investment decisions. Meanwhile, the results also show that valuation ratios in China do not correspond to changes in underlying fundamentals. To the contrary, stock market valuations adjust in a manner inconsistent with what the efficient-market theory predicts. This suggests that stock market activities might produce distorted valuation signals. Given the significance of the stock market on investment, real investment made based on those erratic signals are likely to produce an inefficient resource allocation and cause harmful effects on the real economy.

The results of this study are informative concerning policy implications. First, in order to make best use of the stock market, some sensible regulatory measures are needed to prevent the negative effects of the Chinese stock market. Second, managerial myopia and unwarranted dependence on the stock market might be discouraged so that firm managers could make more prudent investment decisions.

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Appendix A. List of Tables

Table 1. Main Indicators of the Chinese Stock Market (1992 – 2001).

Year	Nominal GDP	No. of Listed Firms	Total Market Capitalization		Market Capitalization of Tradable Shares		Total Trading Volume (Turnover)		Turnover Ratio (%)
			Volume[a]	% of GDP	Volume[a]	% of GDP	Volume[a]	% of GDP	
1992	26638	53	1048	3.9	-	-	681	2.6	-
1993	34634	183	3531	10.2	862	2.5	3667	10.6	425
1994	46760	291	3691	7.9	969	2.1	8128	17.4	839
1995	58478	323	3474	5.9	938	1.6	4036	6.9	430
1996	67885	530	9842	14.5	2867	4.2	21332	31.4	744
1997	74463	745	17529	23.5	5204	7.0	30722	41.3	590
1998	78345	851	19506	24.9	5746	7.3	23544	30.1	410
1999	82068	949	26471	32.3	8214	10.0	31320	38.2	381
2000	89404	1088	48091	53.8	16088	18.0	60827	68.0	378
2001	95933	1160	43522	45.4	14463	15.1	38305	40.0	265

(RMB Yuan[b]: 100 Million)

Notes:
a. These numbers include both A shares and B shares. Note that in China, there are mainly three types of domestically-owned shares – state shares, institutional shares, and individual shares (called A shares), each constituting about one-third of the total outstanding shares. However, only the A shares are tradable while the other two are noncirculating shares. Foreign nationals may access China's stock market via B shares, which are traded separately from A shares. However, the number of B-share issuing firms is very small and the size of the B market is very limited. Total market capitalization of B shares is less than 5% of the A shares.
b. According to the official exchange rate, one US dollar is equivalent to about 8.3 Chinese RMB Yuan.

Source: Calculated based on information from *China Statistical Yearbook* (various years) and China Securities Regulatory Commission (CSRC) Web site (http://www.csrc.gov.cn).

Table 2. Determinants of Investment: Descriptive Statistics of Regression Variables. Total observations: 2,682. Number of firms: 824. Time period: 1993 – 1999.

Variables	Mean	Median	Min	Max	SD	SD (BG)	SD (WG)	FD[a]
$(I/K)_{it}$	0.25	0.10	-0.98	15.2	1.44	0.80	1.22	2.18
Q_{it-1}	2.84	2.53	0.51	25.26	1.42	1.29	0.82	1.32
$(CF_1/K)_{it-1}$ [b]	0.60	0.23	-12.6	258.8	5.39	3.10	4.17	4.85
$(CF_2/K)_{it-1}$ [c]	0.32	0.13	-14.2	68.1	1.83	1.06	1.42	2.30
$(CurRatio)_{it-1}$	2.02	1.50	0.08	85.7	2.57	1.80	1.88	3.90
$(QicRatio)_{it-1}$	1.54	1.08	0.05	83.0	2.40	1.65	1.78	3.66
$(Sales/K)_{it-1}$	3.96	1.95	0.02	159.9	8.21	7.03	4.88	11.5
$\Delta(Sales/K)_{it-1}$ [d]	0.62	0.11	-50.0	137.2	5.06	2.37	4.46	10.4
$SaleGrow_{it-1}$ [d]	0.27	0.08	-0.94	53.0	1.37	0.75	1.14	2.57
DE_{it-1}	1.23	0.78	-24.7	185.3	5.34	2.09	4.70	6.26
$APercent$	0.32	0.30	0.015	1.0	0.16	0.13	0.04	-
$StatePercent$	0.30	0.29	0	0.89	0.26	0.25	0.08	-
$OtherPercent$	0.37	0.39	0	0.97	0.27	0.26	0.09	-

Notes:

a. Based on fewer observations available.

b. CF_1 is the after-tax net profit; while CF_2 is the after-tax-and-dividend net profit.

c. There are 2,679 observations for $(CF_2/K)_{it-1}$.

d. There are 2,674 observations available for each of these two variables.

Table 3. Efficiency of Stock Valuation: Summary Descriptive Statistics of Regression Variables. Total observations: 3,329. Number of firms: 835. Time period: 1992 – 1999.

Variable	Mean	Median	Minimum	Maximum	< Zero[a]	SD	SD (BG)	SD (WG)
P/E	115.6	39.6	0.74	28025.2	-	634.2	249.8	566.0
EG	0.74	0.10	-80.3	453.4	1,254	10.4	3.0	9.6
EPSG	0.46	-0.13	-60.0	453.4	2,096	9.7	2.8	9.0
Div	0.39	0	0	41.8	1,748[a]	1.3	0.64	1.1
V?	0.18	0.16	0	0.75	-	0.10	0.06	0.09
TCoef	2.5	1.09	0	322.7	-	9.8	6.2	8.1
DE	1.0	0.74	-106.4	87.6	1[b]	2.8	1.5	2.3
SaleGrow	0.38	0.10	-0.95	206.3	1,070	4.0	2.4	3.3
TotalAssets	$1.4*10^9$	$7.9*10^8$	$6.2*10^7$	$1.0*10^{11}$	-	$2.9*10^9$	$4.0*10^9$	$7.6*10^8$
AShares	$6.9*10^7$	$4.9*10^7$	$4.5*10^6$	$1.1*10^9$	-	$7.7*10^7$	$6.7*10^7$	$3.5*10^7$

Notes:
a. This refers to the total number of observations which have a value of zero.
b. Due to negative equity.

Table 4: Efficiency of Stock Valuation: Descriptive Statistics of Key Regression Variables By Year. Total Observations: 3,329. Number of Firms: 835. Time Period: 1992 – 1999.

Year	Number of Firms	P/E [a]	EG [a]	$EG < 0$	$EPSG$ [a]	$EPSG < 0$	Div [a]	$Div = 0$
1992	5	98.4 (104.1)	3.2 (3.4)	0	0.78 (1.19)	2	0.22 (0.02)	1
1993	104	45.4 (37.0)	1.2 (0.97)	10	0.28 (0.32)	36	0.11 (0)	67
1994	247	36.7 (24.0)	0.47 (0.21)	70	0.37 (-0.09)	145	0.49 (0.44)	82
1995	276	88.7 (29.4)	-0.14 (-0.16)	164	-0.27 (-0.29)	207	0.97 (0.62)	51
1996	481	141.8 (35.0)	0.37 (0.18)	132	0.11 (-0.04)	255	0.38 (0)	275
1997	659	105.5 (39.0)	1.61 (0.18)	188	1.24 (-0.14)	441	0.44 (0.32)	262
1998	722	124.4 (42.9)	0.75 (0.03)	325	0.41 (-0.17)	493	0.28 (0)	462
1999	835	142.0 (48.3)	0.56 (0.06)	365	0.39 (-0.14)	517	0.18 (0)	548

Notes:
a. All are annual averages of all observations (number of observations are as in the second column) and the median values are in the parentheses.

Table 5: Determinants of Investment: Estimation Results of Equation (3) for the Static Model on the Full Sample. OLS and Between Effects models. Time Period: 1993 – 1999. Total Observations: 2,682. Number of Firms: 824.

Dependent Variable = $(I/K)_{it}$	OLS			Between Effects		
	(1)	(2)	(3)	(1)	(2)	(3)
Q_{it-1}	0.07 (4.62)*	0.06 (4.70)*	0.06 (4.23)*	0.08 (3.81)*	0.08 (3.63)*	0.07 (3.10)*
$(CF1/K)_{it-1}$		0.05 (10.9)*	0.05 (9.44)*		0.05 (18.6)*	0.04 (18.5)*
$(CurRatio)_{it-1}$			0.02 (3.75)*			0.02 (1.95)**
$(Sales/K)_{it-1}$			0.002 (0.79)			0.002 (0.87)
DE_{it-1}			-0.001 (-1.01)			-0.0002 (-0.06)
Total observations	2,682	2,682	2,682	2,682	2,682	2,682
Number of firms	824	824	824	824	824	824
R^2	0.04	0.25	0.25	0.06	0.17	0.17

Notes:
1. T-statistics calculated based on heteroscedastic consistent standard errors are shown in parentheses.
2. * Denotes significant at 1% level. ** Significant at 5% level. *** Significant at 10% level.
3. Year dummies are included in the OLS regressions. The coefficients on year dummies are not reported.
4. The Durbin-Watson test statistics for the OLS estimates indicate that autocorrelation is not a problem for this relatively short panel.
5. The variance inflation factors (VIF) suggest that there is no significant multicollinearity among regressors.

Table 6: Estimates of Equation (3): Fixed Effects Model. Time Period: 1993 – 1999. Total Observations: 2,682. Number of Firms: 824.

Dependent Variable = $(I/K)_{it}$	Fixed Effects			
	(1)	(2)	(3)	Elasticity of Coefficients
Q_{it-1}	0.04 (1.68)***	0.05 (2.77)*	0.04 (2.69)*	0.45
$(CF_1/K)_{it-1}$		0.06 (11.8)*	0.06 (11.1)*	0.14
$(CurRatio)_{it-1}$			0.02 (3.28)*	0.16
$(Sales/K)_{it-1}$			0.001 (0.29)	0.02
DE_{it-1}			-0.0004 (-0.34)	-0.002
Total observations	2,682	2,682	2,682	
Number of firms	824	824	824	
R^2	0.05	0.27	0.28	

Notes:
1. T-statistics calculated based on heteroscedastic consistent standard errors are shown in parentheses.
2. * Denotes significant at 1% level. ** Significant at 5% level. *** Significant at 10% level.
3. Year dummies are included in all regressions. The coefficients on year dummies are not reported.
4. The variance inflation factors (VIF) suggest there is no significant multicollinearity among regressors.
5. Given that the regression model is a linear (not log-linear) function, the strengths of the coefficients cannot be directly compared. Note that the original data are not log-transformed because doing so will leave out 798 observations for the dependent variable which have negative values. Excluding such a large number of observations will certainly introduce a sizable bias. The elasticity of coefficients at the mean (scale invariant) is calculated in order to compare the strengths of the coefficients. The elasticity of the explanatory variable is equal to (the estimated coefficient of the explanatory variable) * (mean of the explanatory variable) / mean of the dependent variable. As a result, the q elasticity of investment = 0.04*2.84/0.25 = 0.45; the cash-flow elasticity of investment = 0.06*0.60/0.25 = 0.14; the current-ratio elasticity of investment = 0.02*2.02/0.25 = 0.16; the sales elasticity of investment = 0.001*3.96/0.25 = 0.02; and the debt-to-equity elasticity of investment = (-0.0004)*1.23/0.25 = -0.002.

Table 7: Does Investment Adjust Quickly or Slowly? Regression Results for the Dynamic Model on the Full Sample.

Dependent Variable = $\left(I/K\right)_{it}$	OLS	Fixed Effects	AH_FD_IV Estimator	AB_DIF_GMM Estimator
Q_{it-1}	0.06 (4.28)*	0.04 (2.38)**	0.06 (3.93)*	0.05 (2.10)**
$\left(CF_1/K\right)_{it-1}$	0.05 (10.9)*	0.06 (14.2)*	-0.03 (-1.48)	0.06 (9.64)*
$\left(CurRatio\right)_{it-1}$	0.02 (3.71)*	0.02 (3.13)*	0.04 (3.37)*	0.02 (2.25)**
$\left(Sales/K\right)_{it-1}$	0.004 (1.47)	0.01 (2.01)**	0.01 (1.49)	-0.01 (-1.00)
DE_{it-1}	-0.001 (-1.19)	-0.0002 (-0.15)	-0.002 (-0.97)	-0.002 (-1.19)
$\left(I/K\right)_{it-1}$	-0.03 (-2.65)*	-0.08 (-3.43)*	-0.02 (-0.36)	-0.02 (-0.56)
Total observation	2,682	2,682	1,458	1,834
Number of firms	824	824	706	706
Time Period	1993 –1999	1993 –1999	1994 –1999	1994 –1999
R^2	0.26	0.30	0.03	-
m_1	-	-	-	$p = 0.00$
m_2	-	-	-	$p = 0.12$
Sargan	-	-	-	$p = 0.38$

Notes:
1. T-statistics calculated based on heteroscedastic consistent standard errors are shown in parentheses.
* Denotes significant at 1% level. ** Significant at 5% level. *** Significant at 10% level.
2. Year dummies are included in all regressions. The coefficients on year dummies are not reported.
3. m_1 and m_2 are the test statistics for autocorrelation in the first differenced residuals of first order and second order. Sargan test is the test statistic of over identifying restrictions (based on the two-step estimator).

1.

Table 8: Do Market Signals Really Matter? Another Test. Estimates of Equation (3) for a Sub-sample of Firms Based on Their Tradable Shares. Fixed Effects Model. Time Period: 1993 – 1999.

	(1)	(2)	(3)[a]	(4)
Dependent Variable = $(I/K)_{it}$	Average A shares Percentage		Average A shares Percentage	
	>30%	$\leq$ 30%	>50%	$\leq$ 50%
Q_{it-1}	0.07 (2.38)**	0.04 (2.03)**	0.24 (2.55)*	0.05 (2.86)*
q elasticity of investment	*0.71*	*0.49*	*1.77*	*0.58*
$(CF_1/K)_{it-1}$	0.03 (0.72)	0.06 (12.53)*	0.03 (0.54)	0.06 (11.9)*
$(CurRatio)_{it-1}$	0.008 (0.62)	0.02 (3.50)*	0.003 (0.60)	0.02 (3.57)*
$(Sales/K)_{it-1}$	0.007 (1.18)	-0.005 (-0.88)	0.03 (1.69)***	0.001 (0.33)
DE_{it-1}	-0.002 (-0.19)	-0.0002 (-0.17)	-0.03 (-1.81)***	-0.001 (-0.82)
Total observation	1,384	1,298	253	2,429
Number of firms	412	412	57	767
R^2	0.10	0.41	0.19	0.32

Notes:

a. Since the F-statistic rejects that there are firm effects in this case, the result based on pooled OLS is reported instead.

1. All T-statistics shown in parentheses are calculated based on heteroscedastic consistent standard errors.
2. * Denotes significant at 1% level. ** Significant at 5% level. *** Significant at 10% level.
3. Year dummies are included in all regressions. The coefficients on year dummies are not reported.
4. For firms with 30% or more tradable shares, the q elasticity of investment = 0.07*2.74/0.27 = 0.71; for firms with less than 30% tradable shares, the q elasticity of investment = 0.04*2.94/0.24 = 0.49. For firms with 50% or more tradable shares, the q elasticity of investment = 0.24*2.43/0.33 = 1.77; for firms with less than 50% tradable shares, the q elasticity of investment = 0.05*2.88/0.25 = 0.58.

Table 9: Do Stock Market Signals Still Matter During 'Exuberant' Expansions? Estimates of Equation (3) During the Stock Market Expansion Years, 1996 – 1999.

Dependent Variable = $(I/K)_{it}$	Fixed Effects (1996 – 1999)		
	(1)	(2)	(3)
Q_{it-1}	0.06 (2.65)*	0.06 (2.65)*	0.06 (2.65)*
$(CF_1/K)_{it-1}$		0.0002 (0.01)	-0.03 (-0.48)
$(CurRatio)_{it-1}$			0.05 (3.11)*
$(Sales/K)_{it-1}$			0.008 (1.40)
DE_{it-1}			-0.001 (-0.52)
Total observations	2,030	2,030	2,030
Number of firms	824	824	824
R^2	0.05	0.05	0.06

Table 10: Determinants of P/E Ratios: Estimates of Equation (6). Pooled OLS. Time Period: 1992 –1999.

Dependent Variables = $?P/E?_{it}$	(1)	(2)	(3)	(4)	(5)	(6)	(7)
EPSG [a]	-0.97 (-1.67)***	-0.98 (-1.67)***	-0.98 (-1.67)***	-0.99 (-1.68)***	-	-1.02 (-1.67)***	-0.98 (-1.65)***
Div	17.0 (2.37)**	16.8 (2.33)**	16.8 (2.33)**	16.9 (2.35)**	17.2 (2.42)**	-	17.1 (2.38)**
TCoef		-1.02 (-3.12)*	-1.02 (-3.03)*	-1.08 (-3.03)*	-1.18 (-2.73)*	-1.22 (-2.80)*	-1.18 (-2.73)*
V?					-51.2 (-0.50)	-38.7 (-0.38)	-47.4 (-0.47)
DE					0.79 (0.63)	0.78 (0.63)	0.80 (0.64)
SaleGrow			-0.11 (-0.06)		-0.16 (-0.09)	-0.22 (-0.12)	-0.13 (-0.07)
TotalAssets					$8.4*10^{-8}$ (1.43)	$8.4*10^{-8}$ (1.43)	$8.4*10^{-8}$ (1.43)
AShares [b]				-0.001 (-1.35)	-0.003 (-2.00)**	-0.003 (-1.99)**	-0.003 (-2.01)**
Total Observations	3,329	3,329	3,329	3,329	3,329	3,329	3,329
Number of firms	835	835	835	835	835	835	835
F-Statistic	4.76*	7.19*	5.39*	5.24*	3.71*	2.87*	3.53*
R^2	0.002	0.001	0.003	0.002	0.003	0.002	0.003

Notes:
a. Growth in earnings (*EG*) has been substituted for growth in earnings per share (*EPSG*) and the results remain essentially the same. b. *AShares* are measured in 10 thousands.
1. T-statistics are in parentheses. 2. All standard errors are corrected for heteroscedasticity. 3. * denotes significant at 1% level. ** Significant at 5% level. *** Significant at 10% level. 4. I also check for multicollinearity among regressors but there is no indication of high degree of multicollinearity (based on very low value of variance inflation factor). 5. The Durbin-Watson statistic for model (7) is 1.99, which indicates that the model without the lagged dependent variable is not severely misspecified. In any case, using further lagged price-to-earnings ratios as instruments, the two-stage least squares regression shows that the current-period P/E ratios are not statistically significantly and negatively correlated with their previous levels.

Table 11. Do Outliers Determine the Results? No, the Results Do Not Depend Upon Influential Observations.

	(1)[a]	(2)[b]	(3)[c]	(4)[d]	(5)[e]
Dependent Variables = $?P/E?_{it}$	Excluding Outliers with Extreme Residuals	Excluding Leverage Points	Excluding Influential Points	Excluding Hadi Outliers	Median Regression
EPSG	-0.43 (-1.63)***	-19.1 (-3.48)*	-1.28 (-2.87)*	-26.2 (-15.94)*	-0.10 (-2.50)*
Div	25.1 (4.83)*	-57.8 (-2.89)*	8.41 (2.02)**	-10.6 (-8.03)*	10.7 (34.0)*
TCoef	-0.52 (-3.42)*	-4.89 (-3.74)*	0.97 (-5.04)*	-1.50 (-3.85)*	-0.001 (-0.04)
V?	-34.6 (-1.38)	-10.9 (-0.10)	-80.0 (-3.47)*	-6.50 (-1.26)	4.9 (1.20)
DE	1.76 (2.13)**	-0.84 (-0.06)	2.14 (2.25)**	4.35 (4.62)*	1.25 (9.98)*
SaleGrow	-0.83 (-1.71)***	15.2 (0.33)	-3.54 (-2.19)**	-1.68 (-1.32)	-0.07 (-1.59)
TotalAssets	$1.1*10^{-9}$ (1.01)	$3.4*10^{-8}$ (1.81)***	$2.8*10^{-9}$ (1.70)***	$-4.4*10^{-9}$ (-5.57)*	$-4.2*10^{-10}$ (-2.30)*
AShares	-0.001 (-1.29)	-0.008 (-2.39)**	-0.001 (-2.85)*	-0.0003 (-2.10)**	-0.0003 (-3.89)*
Total Observations	3,305	3,210	3,303	2,634	3,329
Number of firms	812	720	805	433	835
F-Statistic	6.11*	5.38*	6.45*	42.82*	-
R^2	0.04	0.009	0.01	0.21	0.007

Notes:
a. Excluding those observations with their studentized residuals exceeding +3 or -3.
b. Based on the diagonal elements of hat matrix (Belsley, Kuh, and Welsch, 1980)
c. Based on Cook's Distance (Cook, 1977).
d. The significance level for Hadi multiple outlier cutoff is 5%.
e. Note that the pseudo R^2 in this case is not directly comparable to other R^2 and t - statistics are based on bootstrapped standards errors.

Table 12: Determinants of P/E Ratios: Stock Market Expansion Years, 1996 – 1999.

	(1)[a]	(2)[b]	(3)	(4)[b]	(5)	(6)[b]	(7)
Dependent Variables = $\left(P/E\right)_{it}$	Whole Sample (1996-1999)	*EPSG* > 0	*EPSG* < 0	*Div* > 0	*Div* = 0	*EPSG* < 0 & *Div* > 0	*EPSG* < 0 & *Div* = 0
EPSG	-1.04 (-1.71)***	-6.40 (-2.40)**	-233.0 (-3.26)*	-17.3 (-2.99)*	-4.40 (-2.52)**	-31.9 (-1.80)***	-187.6 (-2.20)**
Div	12.9 (1.54)	10.0 (0.82)	-39.9 (-1.86)***	42.7 (2.41)**	-	15.1 (1.22)	-
TCoef	-1.22 (-2.49)*	0.10 (1.17)	-1.25 (-2.34)**	-0.84 (-3.34)*	-0.86 (-1.78)***	-0.62 (-2.73)*	-2.66 (-2.47)*
V?	18.6 (0.14)	-15.4 (-0.46)	-1.69 (0.02)	-23.5 (-1.06)	426.9 (1.73)***	-0.53 (-0.02)	180.7 (0.86)
DE	0.74 (0.61)	-5.95 (-0.70)	-0.91 (-0.68)	-7.38 (-1.02)	0.70 (0.99)	-30.5 (-1.11)	-1.72 (-1.16)
SaleGrow	0.20 (0.09)	7.24 (6.64)*	-0.58 (-0.20)	-0.82 (-0.83)	1.29 (0.46)	17.5 (1.05)	-0.33 (-0.12)
TotalAssets	$9.1*10^{-9}$ (1.41)	$6.8*10^{-9}$ (0.67)	$3.6*10^{-9}$ (0.88)	$-1.9*10^{-9}$ (-0.46)	$2.1*10^{-8}$ (1.33)	$5.5*10^{-9}$ (0.28)	$1.4*10^{-10}$ (0.02)
AShares	-0.004 (-2.18)**	-0.001 (-0.43)	-0.003 (-1.46)	0.002 (2.08)**	-0.01 (-2.32)**	0.001 (-0.51)	-0.01 (-1.14)
Total Observations	2,697	73	570	311	557	98	189
No. of Firms	835	45	267	132	240	61	109
F-Statistic	3.01*	21.69*	3.09*	89.6*	2.55*	4.80*	2.42**
R^2	0.002	0.90	0.05	0.81	0.01	0.57	0.03

Notes: All regression results are heteroscedasticity-consistent.
a. The influence of outliers has been checked as well. The result is robust to the exclusion of outliers.
b. There are firm effects among these firms so I report results based on LSDV (OLS with firm dummies).
Column (2) refers to firms with consistently good performance (*EPSG* > 0 every year for the whole period).
Column (3): Firms with diminishing performance (*EPSG* < 0 every year for the whole period).
Column (4): Firms always paid dividends (*Div* > 0 every year for the whole period).
Column (5): Firms never paid dividends (*Div* = 0 every year for the whole period).
Column (6): Firms with declining performance but always paid dividends (*EPSG* < 0 but *Div* > 0 every year for the whole period).
Column (7): Firms with declining performance and also never paid dividends (both *EPSG* < 0 and *Div* = 0 every year for the whole period).
For the other two possible scenarios, there are insufficient observations (only 12 firms (18 observations) with *EPSG* > 0 and *Div* > 0 every year for the whole period and only 25 firms (35 observations) with *EPSG* > 0 and *Div* = 0 every year for the whole period) to obtain meaningful regression results.

Table 13: Fundamentals Alone Do Not Determine Market Values! Interpreting Equation (5) and Table (12).

Composition of Valuations During Exuberant Expansion

	Firms with Consistently Good Performance (*EPSG* > 0 for the whole period)	Firms with Declining Performance (*EPSG* < 0 for the whole period)	Total Obs & No. of Firms	Implication
Firms Paid Dividends Every Year (*Div* > 0 for the whole period)	12 firms with 18 obs.[a]	Stock market valuations deviate significantly from fundamentals. Dividend payouts do not matter. The worse firms perform, the higher their valuation ratios. (61 firms with 98 obs.) (Column (6))	132 firms with 311 obs.	Dividend payouts influence P/E ratios, but the worse firms perform, the higher their valuation ratios. Stock market valuations deviate from fundamentals. (Column (4))
Firms Never Paid Dividends (*Div* = 0 for the whole period)	25 firms with 35 obs.[a]	Stock market valuations deviate significantly from fundamentals. The worse firms perform, the higher their valuation ratios. (109 firms with 189 obs.) (Column (7))	240 firms with 557 obs.	Stock market valuations deviate significantly from fundamentals. The worse firms perform, the higher their valuation ratios. (Column (5))
Total Obs & No. of Firms	45 firms with 73 obs.	267 firms with 570 obs.	Conclusion Stock market valuations deviate significantly from fundamentals. Dividend payouts do not matter. The worse firms perform the higher their valuation ratios. (835 firms with 2,697 obs.) (Column (1))	
Implication	Stock market valuations deviate significantly from fundamentals. Dividend payouts do not matter. The worse firms perform, the higher their valuation ratios. (Column (2))	Stock market valuations deviate significantly from fundamentals. The worse firms perform, the higher their valuation ratios. Dividend payouts actually have negative impacts on valuation ratios. (Column (3))		

Notes:

a. Insufficient observations to obtain meaningful regression results.

Appendix A. Data Source and List of Variables.

I. Data Source

Aggregate data on the Chinese stock market are collected from the following sources: the websites of China Securities Regulatory Commission, the Shanghai Stock Exchange, and the Shenzhen Stock Exchange; and various issues of *Annual Reports of Listed Companies*, *Shanghai Securities Yearbook*, *Shenzhen Securities Yearbook*. The individual company accounting and financial data come from *China Listed Company Reports* (1995, 1997, 1999, 2000, 2001, 2002), the CNInfo website (a subsidiary of the Shenzhen Stock Exchange), and the websites of the Homeway and Guosen securities companies.

II. Description of Variables

All variables are end-of-the-year figures (unless otherwise specified).

1. Ownership structure is measured by tradable A shares, state shares, and other shares as percentage of total outstanding shares.
2. Accounting identities: total debt = short-term debt + long-term debt; and total assets = total debt + total equity + minority interest.
3. Debt-equity ratio = total debt / total equity
4. Net fixed investment (net of depreciation) is calculated as the difference between this year's total net fixed assets (net of depreciation) and that of last year's.
5. Two measures of liquidity are the current ratio and the quick ratio (i.e. the acid test ratio). Current ratio = current assets /short-term debt. It measures the firm's ability to pay off its current liabilities by liquidating its current assets. Quick ratio = (current assets – inventories) / short-term debt = (cash + cash equivalents + receivables) / short-term debt
6. Annual average share price (average of closing prices over total annual trading days) P_i for stock i (i = 1, 2, 3, … N_t; N_t = total number of listed companies for year t).
7. Price-to-earnings ratio (P/E) = average share price / (after-tax net profit / total number of shares)
8. Volatility of annual price movement for stock i ($V?_i$) is measured as

$$V?_i \; ? \; \frac{\sqrt{\overset{d_i}{\underset{j?1}{?}} (P_{ij} \; ? \; P_i)^2 \Big/ n_i}}{P_i}$$

where

i = 1, 2, 3, … N_t;

N_t = total number of listed companies for year t;

P_i ? annual average share price for stock $i = \overset{d_i}{\underset{j?1}{?}} P_{ij} \Big/ d_i$;

P_{ij} ? closing price of trading day j for stock i (j = 1, 2, 3, …, d_i);

d_i ? total annual trading days for stock i.

9. Trading coefficient for company i ($TCoeff_i$) is measured as $= \dfrac{\dfrac{TTV_i / d_i}{TotalAshares_i}}{\dfrac{TTV/D}{TotalAshares}}$

   where

   i = 1, 2, 3, … N_t;

   N_t = total number of listed companies for year t;

   TTV_i = total annual trading volume for stock i;

   TTV = total annual trading volume for all listed stocks;

   D = total annual trading days.

10. Due to data limitation, Tobin's Q is calculated as the sum of market value of equity and book market of total debt as a ratio of book value of total assets. That is, $Q_i ? \dfrac{P_i ? TotalNumberofShares_i ? BookValueofDebt_i}{BookValueofAssets_i}$ (i = 1, 2, 3, … N_t).
11. Interest coverage ratio = EBIT (earning before interest payments and taxes)/interest payments. Because interest payments are not listed as a separate entry in the income statement, they are estimated by "financial expenses."
12. Short-term bank loans and long-term bank loans.
13. Total sales revenue, before tax profit, and after-tax net profit.
14. Internal funds = after-tax net profit – dividends (+ annual depreciation).
15. Actual amount of funds raised from the stock market.
16. Two measures of firm profitability/performance: return on assets (ROA) and return on equity (ROE). ROA is defined as earnings before interest and taxes (EBIT) divided by total assets. Because interest payments are not listed as a separate entry in the income statement, they are estimated by "financial expenses." ROE = after-tax net profits / equity.