Investor Sentiment and Corporate investment in Chinese stock markets

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Abstract: - The question about whether investor sentiment correlates with their corporate investment is often examined in the literature. Thus, based on behavioral finance theory, this paper aims to investigate whether investor sentiment in stock market has an impact on corporate investment in listed Chinese firms, where the mutual fund flows is taken as the proxy variable of investor sentiment for stocks. We utilize the database of China Stock Market as the origin of data sources and collect data of the mutual fund flows and corporate investment as the sample from the first quarter of 2007 to the fourth quarter of 2011. Then, we document a significant positive relationship between investor sentiment and corporate investment by using a proxy for investor sentiment. Further, the coefficient of investment-sentiment sensitivity is employed to divide portfolios. Consequently, the empirical evidence shows that investor sentiment sensitivities change differently across the level of firm investment. In terms of corporate investment, small firms show relatively higher sentiment sensitivity than large firms. Besides, the portfolios indicate that there is no significant relationship between other control variables and cross-sectional investor sentiment.

Key-words: - Investor sentiment, Corporate investment, Asset-pricing, Chinese firms

1 Introduction
Classical finance theory hypothesizes that investors are completely rational and they ignore the existence of noise traders playing a significant role in capital market. Economists state that a share price should reflect investors’ rational expectations about the share’s future cash flow. As a result, no relationship can be found between the share price and the amount of corporate investment when the firms’ fundamental value is given. Consistent with this theory, a number of papers find little additional explanatory power above the fundamental value of share price for investments at both the firm level and the aggregate level (Morck et al. 1990; Blanchard et al. 1993). However, behavioral finance theory has been increasingly developed since 1980s. Investors do not always make decisions based on rationality. When the probability of uncertain events occurs, they will depend on several typical heuristic biases, such as overconfidence, representativeness or availability. Since investors can’t handle unbiased information, they make a deviation of the market price. In particular, the stock price is found to be driven not only by fundamentals but also by non-fundamental elements such as the investor sentiment. In recent years, more and more scholars have begun to study the effects of investor sentiment on firm investment.

A core feature of the literature in behavioral finance theory is the existence of investor sentiment—a phenomenon that biases expectations of future firm performance. These literatures have well explored how firms vary their financing and investment decisions according to investor sentiment and its possible effect on market prices in developed markets (Hirshleifer.2001, Baker et al. 2007). Unfortunately, relevant studies in emerging capital markets are limited. As a consequence of poor investor protection, opaque accounting, high asymmetric information and unevenly structured investor biases in emerging capital markets, the investor sentiment is expected to be more pronounced in these underdeveloped markets than in well-functioning developed markets, especially in China.

In this paper, we investigate whether firms attempt to influence sentiment-driven expectations in the listed Chinese companies. We use the data from the Chinese stock market to empirically analyze the association between investor sentiment and investment. Our paper focuses on the investment of Chinese stock market because of several reasons. First, towing to the lack of short selling mechanism in China, there is no arbitrage under the assumption of efficient capital markets. Second, the Chinese
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Our paper proceeds as follows. First, we gather proxies for investor sentiment as time-series conditioning variables. More generally, many different measures of investor sentiment are used on stock trading behavior (Kumar and Lee 2004; Kaniel et al.2008), the closed-end fund discount (Delong et al.1988; Lee et al.1991), and the investor surveys (Otoo 1999; Solt and Statman 1988; Clarke and Statman 1998; Brown and Cliff 2005; Shiller 2000; Schmeling 2007; Zwergel and Klein 2006). There are no perfect proxies for investor sentiment. All these sentiment measures are subject to several methodological drawbacks and mainly for the entire market. However, there is a lack of investor sentiment methods based on individual stock. One of methods is to use mutual fund flows as a measure of individual investor sentiment for different stocks. The approach we establish in this paper is similar to Frazzini (2008). We want to devise a measure based on returns. We use mutual fund flows as a measure of individual investor sentiment for different stocks. Our measure of investor sentiment is based on the actions of the good candidates for sentiment-prone investors, who are individual investors. Concerning their trades, we infer the high sentiment and the low sentiment. Individual investors are good candidates for sentiment-prone investors because a lot of evidence indicates that they make suboptimal investment decisions. Some scholars present extensive evidence that individual investors are likely to, who suffer from biased-self attribution and tend to be overconfident, engage in wealth-destroying excessive trading (Odean 1998; Barber and Odean 2000, 2001, 2009; Grinblatt and Keloharju 2000; Goetzmann and Massa 2002). Second, we examine the role of sentiment in a variety of risk factor models to determine the cross-sectional impact of investor sentiment on firms with different levels of opacity. Our initial empirical analysis provides us an alternative approach to examine the relationship between firm characteristics and sentiment. We estimate sentiment sensitivities within our pooled time-series cross-section of stocks at first, and then we report firm characteristics across portfolios formed according to sentiment sensitivities. Third, we deal with the relationship between investor sentiment and firm investment based on the panel data context. In a panel framework, we find that the number of available observations greatly increases when examining the relationship of investment-sentiment, and more informative data can be obtained. All in all, we estimate panel fixed-effect regressions, where the sentiment effect relies on firm characteristics data in Chinese stock market.

Our paper contributes to the literature on investor sentiment and corporate investment in the following ways. First, this paper divides investor sentiment into the optimism and pessimism about a given asset, which supplies existing empirical research that lacks subdividing the sentiment component. We establish a theoretical model based on the relationship between investor sentiment and corporate financial behavior. Third, in order to cater to investor preferences, Chinese managers often raise short-term stock prices and do not consider companies’ long-term interest. These phenomena have become huge obstacles to developing a healthy capital market. Therefore, with regard to these problems of investment decision, managers cater to investors’ demand, which has not only become the prevailing research of corporate finance, but also needs solving by regulatory agencies of the listed Chinese companies as well as corporate reformers. It allows us to examine how corporate investment changes according to the fluctuating investor sentiment.

Our measurement of investor sentiment is based on the individual investor sentiment for different stocks. Our measure of investor sentiment is based on the actions of the good candidates for sentiment-prone investors, who are individual investors. Concerning their trades, we infer the high sentiment and the low sentiment. Individual investors are good candidates for sentiment-prone investors because a lot of evidence indicates that they make suboptimal
investors are optimistic about the prospects for a specific stock, the stock will sell at a premium, and vice versa. We shed lights on an important role played by investor sentiment in changing investment in Chinese capital market.

This paper is organized as follows. A literature overview is given in Section 2. Supposing the stock market is inefficient, Section 3 discusses why corporate investment, equity mispricing and investor sentiment might be related to each other and how this relationship might manifest itself. Section 4 presents the data and explains the quantitative effect of high (low) investor sentiment on corporate investment. Section 5 testifies how the cross-sectional firm investment varies with sentiment-prone stocks. We also investigate their robustness to investor sentiment models using share turnover rate rather than mutual fund flows. On the whole, our findings are robust to these models. Finally, in section 7, conclusions and discussions are stated. Section 8 illustrates limitations and managerial implications.

2 Literature review

This paper investigates how investor sentiment affects firm investment in Chinese A-share market. Broadly defined as market-wide “optimism” (or “pessimism”) not justified by existing fundamentals, investor sentiment is a central theme in behavioral finance. Our paper extends these two lines of inquiry by documenting a number of key empirical linkages between investor sentiment and corporate investment. Our main tests are motivated by the hypothesis that corporate investment might not be fully efficient. Early works by members of the “Austrian School of Economics” (Mises 1924; Hayek 1929) argued that overinvestment occurs during boom periods of inflated growth expectations and easy access to capital. Concerning seriously the hypothesis that corporate investment may sometimes be inefficient, we examine this implication. We test for a contemporaneous correlation between investor sentiment and investment. Specifically, we conjecture that corporate investment is positively associated with investor sentiment.

In standard finance theory, corporate managers undertake new investment when their expected net present values are positive. Therefore, the level of investments should vary positively with market-wide measures of current profitability and expected growth. They are also largely confirmed by prior studies that examine the drives of firm investment (Morck et al. 1990). Morck et al (1990) empirically address a broader question of how the stock market affects investment. With the investor sentiment rising, the stock price also goes up. Because stock price contains investor sentiment and managers need to acquire related information from it, it is difficult to separate investor sentiment from its fundamental value. If managers share the same sentiment towards the prospects of their firms as investors do, investment would be in sentiment. Making investment decisions, managers rely on the stock market as a source of information, thus causing them to infer high expected cash flow or low discount rates. Both would prompt much more investment.

A straightforward explanation for these findings is that aggregated corporate investments are affected by some aspect of market-wide investor sentiment. This association may occur through several channels, and involve suboptimal behavior on the part of the managers. For example, investor sentiments are associated with easier access to capital. Rational managers will increase their investments during several periods of positive sentiment. It is often referred to as the “market timing” or “catering” view (Stein 1996; Baker and Wurgler 2003; Polk and Sapienza 2009), which provides empirical support for external financing costs, which could limit investments for firms where financing constraints are binding (McLean and Zhao 2013). Stein (1996) proposes a market timing theory, which supposes that a firm is equity-dependent when the investor sentiment runs higher and the stock is overvalued. The cash holdings and debt capacity are so low that it depends on external equity financing for its capital investment. Managers seeking to maximize shareholder value will expand investment scale. On the contrary, when the investor sentiment is low, it will lead to insufficient investment. The resulting effect is a positive relation between non-fundamental component of its stock price (such as investor sentiment) and the level of new investment. Following Stein’s work, a few empirical papers investigate the relationship between the investor sentiment and corporate investment (Goyal and Yamada 2001; Gilchrist et al. 2005; Baker and Wurgler 2006; Dong et al, 2007).

Delong et al (1990) provide a useful framework to investigate the effect of investor sentiment on corporate investment. They argue that prices revert to their fundamental values in the long term. This process may not be smooth and may take a long time. Their model makes predictions about the relationship between sentiment and price volatility at the level of individual securities. In this paper, we contribute to the theoretical literature in terms of developing a model that investigates the relationship between investor sentiment and corporate investment. Baker, Stein and Wurgler (2003) use a simple model of
corporate investment to determine whether investment is sensitive to non-fundamental movements in stock prices. They conclude that stock prices have a stronger impact on the investment of equity-dependent firms that need external equity to finance their marginal investments. In particular, firms that rank in the top quintile of the equity dependence have investment that is almost three times as sensitive to stock prices as those that rank in the bottom quintile. The firms in need of external finance may forego more investment if their securities are undervalued, and for this reason, both investment and external finance will increase in sentiment.

Liu and Zhang (2004) exclude the relationship between investment opportunities and the net financial level, using liquidity as an indicator of investor sentiment. Their empirical study shows that firm investment is significantly negative related to the investor sentiment. Liu and Chen (2006) analyze the effects of Chinese corporate stock valuation on the investing activities by means of market timing theory. They find that stock valuations have significantly positive effects on long-term investment, and such effects become stronger with investor sentiment increasing. Ye and Zhu (2008) find that investor sentiment has a strong influence on the investment of the listed Chinese companies.

Shleifer and Vishny (2003) argue that overvalued stocks that contain high sentiment lead to more investment in the form of mergers, because overvalued firms can make acquisitions with stock. Firms with overvalued equity might be able to make acquisitions. Polk and Sapienza (2009) propose that the sensitivity of investment to misevaluation would be higher when managers have a stronger focus on short-run stock prices, because a short term perspective makes overvalued projects more attractive. Due to the asymmetric information, if firms are overvalued, managers may try to boost short-run share prices by catering to investor sentiment. When shareholder perspectives become shorter and assets become more difficult to value, managers should cater more to sentiment. Grundy and Li (2010) predict that the corporate investment level increases with investor’s optimism and that the relationship between investment level and executive compensation depends on investor sentiment and other parameters. The empirical test shows that optimism is significantly and positively related to the level of investment. Dong, Hirshleifer and Teoh (2007) explain that misevaluation affects corporate investment by comparing tangible with intangible investments and that mispricing affects investment through both direct catering and equity issuance. The sensitivity of capital expenditures to misevaluation is strongest among financially constrained firms. The equity channel reinforces direct catering.

A growing body literature argues the relationship between investor sentiment and the cross-section of stock returns with an examination of the characteristics of stocks. The behavioral approach suggests that waves of irrational sentiment, times of optimistic or pessimistic expectations, can insistently affect prices. The precise form in which sentiment will affect returns is not clear ex ante. If noise traders are sensitive to sentiment changes, then sentiment changes should drive returns. The significant relationship of sentiment for returns has been explored in a number of papers. Lee et al (1991) conclude that small stock returns are positively (and significantly) related to sentiment, relative to portfolios of large stocks, although the relation has weakened over time. In contrast, Elton et al (1998) find smaller stocks display a positive sensitivity to investor sentiment, showing the strongest returns concurrent with periods in which closed end fund discounts narrow. Brown and Cliff (2005) also consider the impact of sentiment on cross-sectional size and book to market portfolios with incongruent findings. They regress long-term perspective returns on economics explanatory variables as well as lagged sentiment, and provide evidence that large stocks show greater exposure to investor sentiment, relative to small stocks. Baker and Wurgler (2006) also study the cross-sectional impact of investor sentiment. They find when proxies for sentiment are low, subsequent returns are relatively high for small stocks, young stocks, high volatility stocks, unprofitable stocks, and non-dividend-paying stocks. When sentiment is high, such categories of stock earn relatively low subsequent returns. Fink et al (2010) affirm that young firms explain most of the spike in volatility, rather than firm size, profitability, or asset tangibility. The above studies suggest that investor sentiment has significant effects on the cross-section of stock prices.

In summary, the literature tells us that investor sentiment has a significant impact on corporate investment. However, there is a lack of theoretical model that investor sentiment affects investment behavior as well as cross-sectional investment and investor sentiment based on individual stocks in the listed Chinese companies. In our empirical analysis we do two things. Firstly, we examine the causality relationship between corporate investment and investor sentiment. Secondly, we examine whether sentiment sensitivities increase directly with multiple measures of opacity in the cross-section.
3 The model
3.1 The model setting
We give three assumptions before the model setting. First, Let us assume that (1) the stock market is inefficient, in the sense that high (low) investor sentiment may cause equity mispricing, which is the stock price may deviate from its fundamental values. In order to simplify the model, we suppose there are two periods. At time 0, the degree of mispricing is $\delta$; at time 1, the stock price returns to its intrinsic value, so $\delta = 0$. (2) We suppose managers are rational. On one hand, when facing inefficient stock market, they can accurately determine the fundamental value and identify mispricing that is caused by investor sentiment. On the other hand, managers’ interests are consistent with that of the existing shareholders, there is no principal-agent problem. (3) The listed companies have no debt financing, assuming all are equity-financing firms. The stocks that decide to issue or buy back account for $e$ of the market value of a firm’s shares. The average issuing cost of equity financing firms is $c$. (4) Consider a firm that uses capital, $K$ at time 0. $K$ is continuous and homogenous with marker price $C$. The market return of a firm at time 0 is $f(K)$, which is a concave function increasing monotonically, satisfying $f'(K) < 0, f''(K) < 0$. The discounted rate is $r$ and we exclude taxes, financial distress costs and agency costs.

3.2 Model construction
Following Stein (1996), in this model we show how stock price deviates from fundamental value, which has a direct effect on the investment policy of a firm. According to previous hypothesis, the net value of a firm’s investment is equal to $\frac{f(K)}{1+r} - KC$. The mispricing function caused by managers catering investor sentiment is denoted by $\delta(\cdot)$. The independent variables of stock mispricing may be technology investments, cash dividends and other earnings management. The specific content depends upon the irrational investor preferences. The optimal model of investment decision is:

$$\max \lambda \left[ \frac{f(K)}{1+r} - KC + e(\delta(\cdot) - c) \right] + (1 - \lambda)\delta(\cdot)$$ (3-1)

Where, $\lambda$ is the perspective of company manager, $0 \leq \lambda \leq 1$; when managers pursue long-term shareholder interests, they would max

$$\frac{f(K)}{1+r} - KC + e(\delta(\cdot) - c) \text{; with } \lambda \text{ increasing, managers become more and more short-term oriented and emphasize more on short-term stock price, namely } \delta(\cdot). \text{ Based on the perspective, managers make investment and financing decisions.}

According to the equation (3-1), we solve the first derivative: $K, e$ and make them separately equal to 0. Hence, rational managers when facing ineffective market can make optimal investment decision. The formulation is as follows,

$$f_k(K) = 1 - \frac{1 - \lambda}{\lambda} \delta(\cdot)$$ (3-2)

$$f_k(K) = 1 + \frac{1 - \lambda}{\lambda} \delta(\cdot)$$ (3-3)

In equation (3-2), it reflects the relationship between investment behavior and mispricing. If the market is effective, then $\delta(\cdot) = 0$. Under rational conditions, managers make optimal investment $f_k(K) = 1$; if investor is overoptimistic, then $\delta(\cdot) > 0$, and managers decide to expand investment to cater to investor sentiment and issue equity by using overvalued price, thus $\left(1 + \frac{1 - \lambda}{\lambda}\right)\delta(\cdot) > 0$ and $\frac{f_k(K)}{1+r} < 1$. Similarly, $\delta(\cdot) > 0$, when investor sentiment is high ($\delta(\cdot)$ is larger, $f_k(K)$ is smaller), the quantity of investment is larger; if investor sentiment is low, then $\delta(\cdot) < 0$, managers decrease investment in order to avoid shares fall further, which can be caused by pessimistic sentiment. And repurchase shares that are undervalued. Thus, $\left(1 + \frac{1 - \lambda}{\lambda}\right)\delta(\cdot) < 0$ and $\frac{f_k(K)}{1+r} > 0$, because when $f''(K) < 0$, investment is below its fundamental value that is subject to optimal investment under maximizing object. The more pessimistic investor becomes, the less quantity of investment becomes. Therefore, we give the following hypothesis.

**Hypothesis 1** The relationship between investor optimistic sentiment and the level of investment is significantly positive. When investor sentiment is optimistic, the stocks are overvalued, and firms would issue shares as much as possible and make the same optimal investment decisions as they would in the efficient market.

**Hypothesis 2** The effect of pessimistic sentiment on investment is significantly positive. When
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in investor sentiment is pessimistic, the equities are undervalued, and firms would issue parts of shares or even abandon them. The optimal level is lower than that in the efficient market.

4 Data and variables

The original transaction data comprises the records of all A-share stocks traded on the Shanghai and Shenzhen Stock Exchanges from the data released by the Shenzhen Flush information Co., Ltd. As a financial service company, it collects and sorts various financial data from the Chinese financial markets. Many large security companies, fund management companies and investment institutions use Flush Information Products. We consider all firms listed on the Shenzhen and Shanghai Stock Exchange in China from 2007 to 2011 with financial data available from Flush Financial terminal Database, such as Equity fund code, NAV, fund returns and net fund’s actual percent of value of the total mutual fund and the percent of the stocks held by mutual funds and company financial data. In order to ensure continuous and effective data, insufficient funds and stock should be deleted during the trading day. The raw sample period is from 2007 to 2011, consisting of 60 months. All variables have been winsorized at the 1st and 99th percentiles. This approach mitigates the impact of extreme observations by assigning the cut-off value to values beyond the cut-off point.

4.1 Independent variables—investor sentiment

The challenging part of our analysis is to find a proxy for investor sentiment. With regard to constructing investor sentiment indicators, most studies look at the entire stock market, and relatively a few base on individual stocks. Generally, there are two ways. One is in the opinion of Kaniel et al (2004). They construct sentiment indicators using individual trading account. The other is in the opinion of Frazzind et al (2008). They calculate mutual fund flows to build sentiment indicators. Overall, individual trading account is the direct source of investor sentiment, since the account data is confidential and we can’t easily get all the data. This paper use mutual fund flows as a measure of individual investor sentiment for different stocks. Since we do not observe flows directly, we infer flows from fund return and net assets (Njt). Let Njt be the total net asset of a fund j at time t and let Rjt be its return between semi-annual t − 1 and semi-annual t. Following the standard practice in the literature (Frazzind and Lamont 2008; Chi and Zhuang 2012), we compute flows for fund j in semi-annual t, Fjt, as the actual flow of fund j using

\[ F_{jt} = N_{jt} - (1 + R_{jt}) \times N_{jt-1} \]  \hspace{1cm} (4-1)

Counterfactual flows are computed under the assumption that each fund receives a pro rata share of the total flows to the mutual fund sector between t − k and s. In order to compute the flow at data s, we start by looking at the total net asset value of the fund at date t − k, then, for every date s we track the evolution of the fund’s counterfactual \( \hat{F}_{jt} \) using:

\[ \hat{F}_{jt} = \frac{N_{jt-k}}{N_{jt-k}} F_{jt} \]  \hspace{1cm} (4-2)

\[ \hat{N}_{jt} = (1 + R_{jt}) \hat{N}_{jt-1} + \hat{F}_{jt}, t - k \leq s \leq t \]  \hspace{1cm} (4-3)

Where \( \hat{F}_{jt} \) is counterfactual flow and \( F_{jt} \) is the actual aggregate flow for the entire mutual fund sector, while \( \hat{N}_{jt-k} \) is the actual aggregate \( N_{jt} \) at date \( t - k \).

Let \( x_{jt} \) be the total net assets of fund \( j \) at date \( t \) as a percentage of total assets of the mutual fund sector \( x_{jt} = \frac{N_{jt}}{N_{jt-k}} \); the counterfactual under proportional flows is \( \hat{x}_{jt} = \frac{\hat{N}_{jt}}{\hat{N}_{jt-k}} \).

For each stock, we calculate our central variable, Flow, as the percent of the shares outstanding with mutual fund ownership attributable to flows. The flow of security \( i \) is given by

\[ S_i = \frac{\sum_j x_{jt} w_{ji} \hat{N}_{jt}}{M_i} - \frac{\sum_j \hat{x}_{jt} w_{ji} \hat{N}_{jt}}{M_i} \]  \hspace{1cm} (4-4)

Where, \( w_{ji} \) is the actual percentage of the shares outstanding held by the mutual fund sector, \( M_i \) is the market capitalization of firm \( i \) at date \( t \).

4.2 Data processing

i. Identify time cycle and select semi-annual data from 2007-2011.

ii. Screen equity funds of each period which holds heavily loaded with stocks that are not repeated. In each period, each fund holds different heavily stocks and note i. Define research object as \( i \) and recalculate fund data (j) holding the shares (i).

iii. According to formula (4-1), we compute \( F_{jt} \) and counterfactual flows.
4.3 Empirical methodology

Empirically, we test the cross-sectional implication of the above hypothesis by regressing models. We first examine our empirical models of investment-sentiment sensitivity using multiple regression method. To further study the relationship between investment and sentiment, we classify investor sentiment into two groups: optimistic and pessimistic. And note \( \Delta \text{Sent}_{it} = S_i - S_{i-1} \) (sentiment is optimistic if \( \Delta \text{Sent}_{it} > 0 \)); similarly, sentiment is pessimistic if \( \Delta \text{Sent}_{it} < 0 \). Following the above classification, we set up our baseline empirical model of investment-sentiment as follows:

\[
I_{it} = \alpha_i + \alpha(\Delta \text{Sent}_{it})^2 D_t + \alpha_2(\Delta \text{Sent}_{it})^3(1 - D_t)
\]

\( + \sum_m \gamma_m \times \text{Control}_m + \epsilon_{it}, \) \hspace{1cm} (4-5)

Where \( i \), \( t \) are sectional unit and biannual separately, \( D_t \) is dummy variable. If \( \Delta \text{Sent}_{it} > 0 \), then \( D_t = 1 \); If \( \Delta \text{Sent}_{it} < 0 \), then \( D_t = 0 \). Investment is defined as the ratio of fixed assets cost, construction materials and construction in progress to total assets. We expect that the optimistic sentiment-investment sensitivity, captured by the coefficient \( \alpha \), will generally increase the degree of sentiment. Conversely, the pessimistic sentiment-investment sensitivity, captured by the coefficient \( \alpha_2 \), will decrease.

Another empirical model is employed to examine the overall sentiment as general optimism or pessimism towards firm investment. The impact of investor sentiment may vary in the cross-section. Our initial empirical analysis provides an alternative approach to examine the relationship between firm characteristics and its sentiment. We first estimate sentiment sensitivities within our pooled time-series cross-section of stocks. And then we report firm characteristics across portfolios according to sentiment sensitivities. After controlling other systematic risk sources, our interest is how the characteristics of firms correlate with various sentiment sensitivities. This approach mitigates the spurious impact of correlations between sentiment measures and risk sources, which may be prevalent in the extant literature. If the general firm characteristics of high sentiment (or low sentiment) sensitivity portfolios correspond to opaque (or translucent) characteristics, then it is confirmatory that these portfolios capture sentiment effects.

We estimate sentiment sensitivities at the firm level. Lee et al (1991) employ a two-factor model, where market portfolio and the change in the closed-end fund discount, are used to estimate sentiment sensitivities changes across a declining size of firms in their study. We adopt a similar approach, but change the variable of ‘return’ into ‘investment’. Our regression model may be formulated as:

\[
I_{it} = \beta_i + \beta_{it, sent} \Delta \text{Sent}_{it} + \epsilon_{it}, \hspace{1cm} (4-6)
\]

For \( i = 1, 2, 3, ..., N \) ; \( t = 1, 2, 3, ..., T \) ; and \( N \) is the number of available cross-sectional observations and \( T \) is the number of time series; \( \Delta \text{Sent}_{it} \) represents the change of individual investor sentiment. Based on parameter estimates of \( \beta_{i, sent} \), we assign stocks to 10 portfolios of sentiment-sensitivity. In the initial analysis, we estimate Eq. (4-6) of each unique firm, and assign stocks based on the full-sample \( \beta_{i, sent} \) parameter estimate. For some stocks, investor sentiment has a negligible impact on their investment. Further, throughout our sample, some stocks may exhibit that investments vary inversely with investor sentiment. However, our interest is to identify those sentiment-prone stocks because most stocks are positively related to investor sentiment. We assign any stock \( i \) for which the parameter estimate of \( \beta_{i, sent} \), which is less than zero, to the five portfolios \( port1, port2, ..., port5 \). We then equally divide the remaining firms into the five remaining sentiment sensitivity portfolios, ensuring that all stocks with a positive \( \beta_{i, sent} \) estimate are classified into portfolios \( port6, port7, ..., port10 \), where each portfolio has equal number of stocks, and sentiment betas increase across portfolios. For each firm, we calculate the average time series for each firm characteristic variable, and then pool these averages across sentiment sensitivity portfolios to report the resultant averages in Table 4.

5 Empirical results and analysis

5.1 Descriptive statistics

Table 1 shows the descriptive statistics of our sample. From Table 1, we can observe that the A-share stocks of Shanghai and Shenzhen Stock Exchanges show the following characteristics. First, companies present excessive investment. Average investment level is 0.1078, which is higher than median (0.0473). One possible reason is that company managers are self-motivated. Another reason is that governments encourage enterprises to invest more. Second, the standard deviation of investment is 0.2531, drawing near to 2.5 times of the mean of investment. Even though enterprises use total assets to standardize the investment level, there are still some differences.
between the scales of investment of listed companies. Third, from the view of control variables, average firm size is 22.3061 and standard deviation is 1.4455, which suggests small differences of firm size. Fourth, mean value of leverage is 0.4863, which is much higher than optimal leverage ratio (0.2). Fifth, sentiment changes for firms investment are uneven, ranging from -7.9% to 9.9%, and average sentiment range is 0.0011. We use a dummy variable $D_t$, which has the value 1 if the sentiment change is above zero: $\Delta \text{Sent}_{i,t} > 0$. And it is displayed that optimistic sentiment change has a mean of 0.0002625, while the mean of pessimistic sentiment is 0.0001864.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean</th>
<th>Median</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{t,1}$</td>
<td>0.1078</td>
<td>0.04734</td>
<td>0.25307</td>
</tr>
<tr>
<td>$\Delta \text{Sent}_{i,t}$</td>
<td>0.0011</td>
<td>0.00328</td>
<td>0.02116</td>
</tr>
<tr>
<td>$(\Delta \text{Sent}_{i,t})^2 D_t$</td>
<td>0.0003</td>
<td>1.07e-07</td>
<td>0.00121</td>
</tr>
<tr>
<td>$(\Delta \text{Sent}_{i,t})^2 (1-D_t)$</td>
<td>0.0002</td>
<td>0.00080</td>
<td></td>
</tr>
<tr>
<td>$Q_{i,t-1}$</td>
<td>1.8527</td>
<td>1.4845</td>
<td>1.2962</td>
</tr>
<tr>
<td>$\text{Lev}_{i,t-1}$</td>
<td>0.4863</td>
<td>0.4952</td>
<td>0.2076</td>
</tr>
<tr>
<td>$\text{Cash}_{i,t-1}$</td>
<td>0.032</td>
<td>0.0085</td>
<td>0.2255</td>
</tr>
<tr>
<td>$\text{Cashflow}_{i,t-1}$</td>
<td>0.04002</td>
<td>0.0354</td>
<td>0.09233</td>
</tr>
<tr>
<td>$\text{Size}_{i,t-1}$</td>
<td>22.3061</td>
<td>22.3145</td>
<td>1.4455</td>
</tr>
</tbody>
</table>

**Table 1: Descriptive statistics of variables**

### 5.2 Univariate analysis

To better understand the factors that drive real investment, Table 2 presents a series of explanatory variables, including investor sentiment and various other control variables nominated by prior literature. It shows that both optimistic sentiment and sentiment change are negatively related to pessimistic sentiment and positively related to Tobin $Q$. For one hand, sentiment is positively correlated with Tobin $Q$ and cash, suggesting that sentiment is important to the market value of total assets. Table 2 also provides that firm size is inversely related to the amount of cash a firm holds, consistent with the Trade-off Theory. For another, Empirical studies provide evidence for a negative relationship between leverage and cash, suggesting that debts are acting as a substitute for cash holdings. The leverage ratio is negatively correlated with sentiment change and Tobin $Q$. Consistent with the Trade-off theory, firms with greater degree of cash flow hold greater amounts of cash to decrease the expected cost of liquidity constraints.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Min</th>
<th>Max</th>
<th>Var</th>
</tr>
</thead>
<tbody>
<tr>
<td>$I_{t,1}$</td>
<td>-0.2914</td>
<td>1.8692</td>
<td>0.0640</td>
</tr>
<tr>
<td>$\Delta \text{Sent}_{i,t}$</td>
<td>-0.0796</td>
<td>0.0990</td>
<td>0.0004</td>
</tr>
<tr>
<td>$(\Delta \text{Sent}_{i,t})^2 D_t$</td>
<td>0</td>
<td>0.0098</td>
<td>1.46e-06</td>
</tr>
<tr>
<td>$(\Delta \text{Sent}_{i,t})^2 (1-D_t)$</td>
<td>0</td>
<td>0.0063</td>
<td>6.47e-07</td>
</tr>
<tr>
<td>$Q_{i,t-1}$</td>
<td>0.0683</td>
<td>7.9483</td>
<td>1.6801</td>
</tr>
<tr>
<td>$\text{Lev}_{i,t-1}$</td>
<td>0.0460</td>
<td>0.9450</td>
<td>0.0431</td>
</tr>
<tr>
<td>$\text{Cash}_{i,t-1}$</td>
<td>-0.2095</td>
<td>1.5145</td>
<td>0.0509</td>
</tr>
<tr>
<td>$\text{Cashflow}_{i,t-1}$</td>
<td>-0.2316</td>
<td>0.3612</td>
<td>0.0085</td>
</tr>
<tr>
<td>$\text{Size}_{i,t-1}$</td>
<td>19.8975</td>
<td>27.8091</td>
<td>0.0509</td>
</tr>
</tbody>
</table>

**Table 2: Correlation matrix for variables**

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\Delta \text{Sent}_{i,t}$</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$(\Delta \text{Sent}_{i,t})^2 D_t$</td>
<td>0.7036</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>$(\Delta \text{Sent}_{i,t})^2 (1-D_t)$</td>
<td>-0.6208</td>
<td>-0.0504</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>$Q_{i,t-1}$</td>
<td>0.0188</td>
<td>0.0297</td>
<td>0.0137</td>
<td>1</td>
</tr>
<tr>
<td>$\text{Lev}_{i,t-1}$</td>
<td>-0.0109</td>
<td>-0.0024</td>
<td>-0.0091</td>
<td>-0.2632</td>
</tr>
<tr>
<td>$\text{Size}_{i,t-1}$</td>
<td>-0.0180</td>
<td>-0.0610</td>
<td>-0.0597</td>
<td>-0.4248</td>
</tr>
<tr>
<td>$\text{Cash}_{i,t-1}$</td>
<td>0.0050</td>
<td>0.0453</td>
<td>0.0411</td>
<td>-0.0873</td>
</tr>
<tr>
<td>$\text{Cashflow}_{i,t-1}$</td>
<td>-0.0036</td>
<td>0.0307</td>
<td>0.0313</td>
<td>0.1272</td>
</tr>
</tbody>
</table>

**Notes:** The final sample is collected from 1265 listed companies in China from 2007 to 2011. Investment is defined as the ration of fixed assets cost, construction materials and construction in progress to total assets. Tobin $Q$ represents the market value of total assets/replacement cost, which equals (stock market capitalization + non-tradable shares representing the amount of the net assets + long-term debt+/ short-term liabilities)/total assets. Sentiment is defined as the actual percent of the stock owned by mutual funds minus the counterfactual percent. Cash flow is the ratio of earnings from operating activities to lagged total assets. Leverage equals total debt divided by total assets. Cash holding is the ratio of Cash and cash equivalents to lagged total assets. Firm size equals natural logarithm of total assets.

### 5.3 Multivariate analysis

#### 5.3.1 Time-series regression analysis between firm investment and investor sentiment

We first carry out Huasman test for panel data which supports the fixed effects model, then another test the LME was conducted, and we find out that
individual random effect model is not efficient, so the results support the individual fixed effects model. The regression results are reported in Table 3, Column 1, namely, Regression result (1).

Table 3 reports the connections among firm investment, investor sentiment and other control variables. As can be seen from Table 3, the overall Goodness of Fit is not very significant (R squared 0.0781), but much better than similar studies. There may be much more factors that exert impact on enterprises’ investment behaviors. While the control variables do not cover all possible factors, each variable regression is significant, which suggests that the model explains the impact of investor sentiment on corporate investment more scientifically as a whole.

In the case of significance at 1%, Line 2 in Column 1 shows that there is a significant positive relation between investor optimistic sentiment and corporate investment. When investor sentiment is optimistic, the stocks are overvalued, firms would issue shares as much as possible and make investment decisions as optimal as efficient market. Therefore, H1 is justified. Similarly, a significant positive relationship is documented between corporate investment and pessimistic sentiment. However, when investor sentiment is pessimistic, the stocks are undervalued, firms would issue parts of shares or abandon them. The optimal level of investment is lower than the effective market. Consequently, the empirical result also supports H2. Further, judging from the regression coefficients, the declining investor sentiment in stock market will exert greater impact on the rising sentiment. Investor sentiment declining in the stock market, it has a greater impact on the rising sentiment. In conclusion, the above analyses suggest an imbalance of fluctuations of investor sentiment which affect corporate investment. It also reflects the alternate sentiment changes of investors in China stock market during the financial crisis (2008-2009).

Table 3 The impact of investment on sentiment and control variables: OLS model

<table>
<thead>
<tr>
<th>Variables</th>
<th>Regression result (1)</th>
<th>Regression result (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>c</td>
<td>-0.33598***</td>
<td>0.4139757***</td>
</tr>
<tr>
<td></td>
<td>(-1.57)</td>
<td>(2.01)</td>
</tr>
<tr>
<td>(ΔSent.)² D</td>
<td>1.7766***</td>
<td>0.0052404***</td>
</tr>
<tr>
<td></td>
<td>(8.18)</td>
<td>(2.99)</td>
</tr>
<tr>
<td>(ΔSent.)²(1-D)</td>
<td>-2.261***</td>
<td>-0.0045773***</td>
</tr>
<tr>
<td></td>
<td>(-8.81)</td>
<td>(-4.75)</td>
</tr>
<tr>
<td>Q_h,t−1</td>
<td>-0.011***</td>
<td>-0.0148031***</td>
</tr>
<tr>
<td></td>
<td>(-2.73)</td>
<td>(-3.70)</td>
</tr>
<tr>
<td>Size_i,t−1</td>
<td>0.0189**</td>
<td>0.0144**</td>
</tr>
<tr>
<td></td>
<td>(1.93)</td>
<td>(1.53)</td>
</tr>
<tr>
<td>Lev_i,t−1</td>
<td>-0.377</td>
<td>-0.0011</td>
</tr>
<tr>
<td></td>
<td>(-0.81)</td>
<td>(-0.02)</td>
</tr>
<tr>
<td>Cashflow_i,t−1</td>
<td>0.613***</td>
<td>0.6156***</td>
</tr>
<tr>
<td></td>
<td>(14.72)</td>
<td>(14.66)</td>
</tr>
<tr>
<td>Cash_i,t−1</td>
<td>0.221***</td>
<td>0.2372***</td>
</tr>
<tr>
<td></td>
<td>(12.31)</td>
<td>(12.99)</td>
</tr>
<tr>
<td>R-sq</td>
<td>0.0781</td>
<td>0.0482</td>
</tr>
<tr>
<td>F value</td>
<td>99.13</td>
<td>76.28</td>
</tr>
<tr>
<td>F significance</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

Notes: Robust t-statistics are reported in parentheses. *, ** and *** denote significance at 10%, 5%, 1% level respectively. The individual fixed effects model result is in Table 3, Column 1; the robustness of results is in Table 3, Column 2 (see Robustness check).

In addition, there is a significant negative relationship between firm market value and investment indicated from control variables. First, the sensitivity of investment $Q$ is $-0.011$, which shows that investors are not optimistic about future investment opportunities. In consistent with some researches about Tobin $Q$ conducted by domestic scholars, there is an obvious “anti-Tobin” phenomenon in Chinese stock market, whether it is short-term response or long-term co-integration, which indicates a considerable degree of irrationality ingredients of Chinese investment. Second, a significant negative relationship is documented between leverage ratio and investment, displaying the greater bankruptcy risk and the lower firm investment. Third, company scale is positive at the 5% significant difference level, indicating that the larger firms are, the more scale advantages they have and the more confidence managers show. Consistent with previous researches, a significant positive correlation between cash flow sensitivity and corporate investment is showed, which suggests that the availability of internal funds can affect investment decisions. Intuitively, investment of overvalued firms should be less dependent on internal cash flow because they can rely more on the cheaper external funds. Therefore, overvalued firms should exhibit lower investment-cash flow sensitivity. Conversely, external funds are more expensive for undervalued
firms, thus, their investment would be more dependent on internal cash flow which will lead to higher investment-cash flow sensitivity. Fourth, corporate investment is also found to be in positive correlation with the cash-holding, because the more cash firms hold, the more investment they adapt to. This estimate is in line with the economic significance.

5.3.2 Cross sectional regressions
In this section, we employ the approaches of Lee et al (1991) to explore the cross-sectional relationship between corporate investment and investor sentiment. Previous researches show that with higher investor sentiment index, lower tangible assets, higher debt-asset ratio and non-dividend-paying stocks, managers appear to have a high degree of investor sentiment. The estimation results are presented in Table 4.

Table 4 Investment-sentiment sensitivity and firm characteristic

<table>
<thead>
<tr>
<th>Investment sentiment sensitivity</th>
<th>Size</th>
<th>Lev</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>Port1</td>
<td>22.5543</td>
<td>0.506899</td>
<td>1.738147</td>
</tr>
<tr>
<td>Port2</td>
<td>22.49118</td>
<td>0.493640</td>
<td>1.884147</td>
</tr>
<tr>
<td>Port3</td>
<td>22.40815</td>
<td>0.479360</td>
<td>1.903896</td>
</tr>
<tr>
<td>Port4</td>
<td>22.3631</td>
<td>0.469152</td>
<td>1.985503</td>
</tr>
<tr>
<td>Port5</td>
<td>22.3005</td>
<td>0.453252</td>
<td>1.955536</td>
</tr>
<tr>
<td>Port6</td>
<td>22.19272</td>
<td>0.470032</td>
<td>1.876122</td>
</tr>
<tr>
<td>Port7</td>
<td>22.10755</td>
<td>0.504157</td>
<td>1.795871</td>
</tr>
<tr>
<td>Port8</td>
<td>22.20393</td>
<td>0.504367</td>
<td>1.782547</td>
</tr>
<tr>
<td>Port9</td>
<td>22.39388</td>
<td>0.506798</td>
<td>1.74182</td>
</tr>
</tbody>
</table>

In table 4, the results strongly support that firms with high investor sentiment-sensitivity tend to be relatively opaque. Primarily, across all portfolios, differences are highly significant between the 1th and the 10th portfolio. From the 1th to the 8th portfolio, the value of firm size gradually decreases, ranging from 22.5543 to 22.0829. With sensitivity coefficient increasing, firm size gradually reduces. Moreover, compared to large companies, investment level of small companies is more closely related to sentiment. However, the value increase at the 9th and 10th portfolio, which is abnormal, and this may be unique features of sentiment changes in Chinese emerging stock market. It may due to a big difference of stock system, market microstructure and investment philosophy between domestic and foreign mature market. What is more, the portfolio coefficients of investment first increase and then decline from the 6th sentiment sensitivity portfolios. The last five portfolios show a converse changing tendency between Tobin Q and sentiment sensitivity, but the leverage ratio shows the same regular pattern as the Tobin Q. Finally, the first six sentiment sensitivity portfolios suggest the percentage of cash-flow from 3.61% to 5.67%. Firms in the last four sentiment sensitivity portfolio the cash-flow is about 4%, with an exception of the highest sentiment sensitivity portfolio (2.9%). Thus, cash holdings of firms appear to have no significant cross-sectional effect on its characteristic sentiment sensitivity portfolio.

6 Robustness check
In order to verify the robustness of results, we examine the robust relationship between investor sentiment and corporate investment. The most important thing for robustness test is the selection of variables. Discretionary accruals are often used to proxy stock mispricing. While others, such as Baker and Stein (2004) holds that an index reflecting market liquidity can better represent investor sentiment. According to Chinese stock market situation, in the presence of short-sales constraints, high liquidity is a symptom of the fact that the
market is dominated by irrational investors, and hence is overvalued. Since short-selling of stocks is prohibited by law in China, investors will enter the stock market to improve market liquidity throughout the stock boom of the capital market.

In this section, we propose to use a new variable, the stock turnover rate, to test our hypothesis and examine the robustness of the results. We take ‘stock turnover rate’ as a proxy for investor sentiment in the Chinese stock market. The ‘turnover rate’ refers to the number of shares traded as a fraction of the number of shares, regarded as a proxy for liquidity. The higher the stock turnover rate is, the higher frequency of investors trading for speculative purposes. It reflects the optimistic investor sentiment. And vice versa, the lower the stock turnover rate, the more pessimistic investor sentiment appears. Hence, taking the turnover rate as a proxy for sentiment, we can repeat the analysis of the relative role of stock characteristics employing the multilevel regression method.

The regression results are reported in Table 3, Column 2. We use the stock turnover rate as a proxy of the investor sentiment. In Column 2, the data of investor sentiment is the stock turnover data, in order to compare the robustness check with Column 1, we also use the variable . In fact, the results obtained in Column 2 are the same as those obtained as in Table 3, Column 1. The evidence suggests that liquidity plays a very significant role in explaining the impact of investor sentiment on corporate investment. A market with unusual liquidity is one in which pricing is dominated by irrational investors, who tend to under-react to the information embodied in either order flow or equity issues. Thus high liquidity is a sign that the sentiment of these irrational investors is positive.

7 Conclusion and Discussions

Research on behavioral finance suggests that sentiment affects trading decisions. Investors’ future expectations can cause a deviation of a firm’s share price from its fundamental value, in other words, overvalued or undervalued stocks will be generated and thus affect pricing models. Irrational emotion, such as the noise trader’s overconfidence or loss aversion, may lead to long-term deviation of stock prices. In this paper, using investment information gleaned from corporate financing statements, we examine the complex relationship between investor sentiment and corporate investment decisions. The empirical tests support our hypothesis. A number of findings are consistent with the view that corporate investment is affected by waves of sentiment, optimism or pessimism.

Firstly, there is a positive association between investor sentiment and corporate investment. The higher corporate investment shows, the more optimistic investor sentiment is. Specifically, evidence shows that corporate investment becomes much more during periods of positive investor sentiment in China. As a group, corporate managers make more investment in operating assets when investor sentiment is much more optimistic. In short, managerial investment decisions appear to be influenced by the same waves of optimism (or pessimism), just as reflected in investor sentiment measures. Prior studies have provided significant evidence that corporate managers may cater to the sentiment of noise traders. Secondly, it is found that investor sentiment can be inferred from mutual fund flows, or measured by market liquidity. Lastly, we also study the impact of investor sentiment on the cross-section of corporate investment and find out that the most serious sentiment-prone stocks tend to be volatile and small. That is, compared to large companies, investment of small firms is much easier affected by sentiment.

However, in our paper, there are several aspects that should be further taken into consideration regarding the results. Primarily, the time period of the drawn sample was characterized by a financial crisis and may be too short to conclude a general change in market fluctuations. Secondly, it is not a necessary condition in our study that individual managers should be wildly irrational. This is opposite to the assumption (2). As noted in Hassan and Mertens (2011), a small but common error of individual managerial forecasts may result in quiet substantial resource misallocation at the aggregate, even if the individual forecasts are “nearly rational”. It is also possible that managers are not overtly biased, but their investment decisions appear biased collectively. The reason is that they are influenced by market participants who can vote their sentiment through stock prices (Morck et al 1990).

Besides, our results have important implications for further research. On the one hand, we categorize portfolios into groups according to opaque (translucent) characteristics. And the results exhibit high (or low) exposure to investor investment. Further research could assess the sensitivity of investor sentiment to firm investment estimates obtained by other methods. On the other hand, since this risk appears to be non-diversifiable, future research may seek to incorporate investor sentiment as a priced risk factor. In addition, investor sentiment may display interesting patterns when it suffers from
potentially sudden changes. Currently, we examine the information feedback and delay mechanisms describing how sentiment patterns influence investment. It is found that many firm characteristics we have taken into consideration are related to asset-pricing anomalies. Our results, which show systematic relations between investor sentiment and firm characteristics, require additional research on asset mispricing.

8 Managerial implications

The sentiment indicators of stock market can help us in discovering the formation of “irrational bubble”, making macro decision as well as improving trading mechanisms. For one hand, as an emerging market, relevant laws and institutions are not perfect in Chinese stock market. The speculative trading behavior is one of its significant characteristics in China, which theoretically determines that stock market is more readily influenced by irrational investor’s psychology and behavior. In this paper, we establish a standard model of investment decision making which is affected by investor sentiment. Based on individual stocks, we use publicly traded securities data to construct sentiment indicators. Then, we discuss the impact of investor sentiment and sentiment volatility on corporate investment. This approach not only avoids the difficulties of conventional quantization, but also provides a new perspective for related issues.

For another, the securities market is not perfect in China. Many individual investors are desperately lack in rational investment philosophy and outstanding emotion administration, which are suitable for behavioral finance theory. According to the results in our paper, the following proposals can be made to improve corporate performance. First, Policy makers should improve laws and regulations of listed companies in China, which will help enterprises to invest benignly, because the domination of individual investors in Chinese stock market may lead to investor irrationality and emotional trading. Thus policy makers should set a limit on short-term profit of individual investors. Second, corporate managers should improve its governance structure and set up a more reasonable assessment system, rather than simply evaluate their capabilities by stock price, firm size and other indicators. Third, investor sentiment affects company’s stock price, and then influences firm investment. Therefore, while trading in stock market, investor should give more consideration to the fundamental value of companies as well as future development of the whole industry. In short, policy makers and firms’ managers and investor should both attach more importance to the impact of psychological factors on the stock market. Meanwhile, we should go deep into the research of investor irrationality behavior. Only in this way will the prosperity of Chinese stock market be promoted.

References


[44] Su-Sheng Wang, F. Zhao, Dong-Feng Wang. The effect of stock market mispricing on


