The Real Value of China's Stock Market*

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Abstract

What capital allocation role can China's stock market play? Counter to perception, stock prices in China have become as informative about future profits as they are in the US. This rise in stock price informativeness has coincided with an increase in investment efficiency among privately-owned firms, suggesting the market is aggregating information and providing useful signals to managers. However, price informativeness and investment efficiency for SOEs fell below that of privately-owned firms after the post-crisis stimulus, perhaps reflecting unpredictable subsidies and state-directed investment policy. Finally, evidence from realized returns suggests Chinese firms face a higher cost of equity capital than US firms.

JEL Codes: E44, F30, G12, G14, G15, O16, O53, P21, P34.

Keywords: capital allocation, price informativeness, market integration, global investing.

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1 Introduction

Over the last ten years, China's GDP tripled for the third decade in a row. China has become the world's largest investor, with $5.9 trillion of investment in 2018 compared to $4.3 trillion in the US and $1.2 trillion in Japan. It has also become the world's greatest contributor to global growth, making the efficiency of its investment a matter of global importance. This explosive, investment-driven economic growth has been fueled by a financial system dominated by its state-owned banking sector, as these banks represent the key instrument of centrally planned investment policy. Thus, while China has been successful in rapidly building up infrastructure, its banking sector has swollen to $35 trillion in assets. Concerns about the inefficiency of investment have mounted along with the proliferation of the resulting non-performing loans.

China's domestic stock market, the market for A shares, has grown exponentially since 1990, but remains dwarfed by its banking sector.[1] In particular, as a capital allocation channel, China's stock market has been a side experiment, derided as a casino, dominated by retail investors, and subject to frequent regulatory interventions and significant restrictions on the tradability of shares.[2] Researchers and journalists emphasize the low correlation between China's stock market and its GDP.[3] Repeated market interventions, trading halts, and IPO suspensions reflect low confidence in the market by regulators as well. Deng and Wei (2018) report that regulators have "tightened standards on IPOs" reducing corporate financing by stock sales to only "5% of total new financing, compared with bank loans that made up 73% in 2017." Despite programs to accommodate foreign investment in A shares, foreign investors still hold only 3% of the market. However, with over 3,700 firms now listed and over $8 trillion in market capitalization as of December 2019, China's stock market is becoming a focus of attention by international investors and regulators.

A long literature in financial economics links good legal and market institutions to stock price informativeness about future profits, and further to the efficiency of capital allocation and corporate investment. This paper sheds new light on the potential of China's stock market as a capital allocation channel by analyzing the functioning of this market in terms of the informativeness of prices, the efficiency of investment, and the cost of equity capital.

[1] Equity listings of firms incorporated in mainland China are of three types. A shares, which are the focus of this paper, are listed on the Shanghai and Shenzhen Stock Exchanges and tradable in RMB. B shares are listed on the Shanghai and Shenzhen Stock Exchanges and are tradable in USD and HKD, respectively, by foreign investors. B-share issuance has died out since the introduction of the Qualified Foreign Institutional Investor (QFII) program in 2002. H shares are listed on the Stock Exchange of Hong Kong and traded in HKD.

[2] The "casino theory" of China's stock market was first proposed by a well-known Chinese economist Wu Jinglian in 2001. More recently, The Economist (2015) dubbed China's stock market "a crazy casino."

[3] See, for example, Allen, Qian, Shan, and Zhu (2017) or the Wall Street Journal MoneyBeat (2015).

Using data over the period 1995-2016, we begin with a comprehensive study of price informativeness in China using the methodology of Bai, Philippon, and Savov (2016). Based on the predicted variation from cross-sectional regressions of future firm profits on past prices, we find that although stock prices were indeed uninformative in the early years when the market earned its reputation as a casino, stock prices have become as informative about future profits in China as they are in the US since 2004. China's stock market no longer deserves its reputation as a casino. This improvement in price informativeness coincided with a wave of stock market reforms in China, most notably the Split-Share Structure Reform of 2005, which plausibly broadened the investor base.

It is well known that in China, privately-owned and state-owned enterprises (SOEs) differ in both funding sources and investment policy, in ways that might make SOE profits less predictable. Therefore, we estimate informativeness as a function of the fraction of state ownership and also perform subsample analyses for privately-owned and state-owned enterprises. We find that after the financial crisis, price informativeness about future profits among SOEs fell significantly below that of private firms. We attribute this to the government's massive and unpredictable economic stimulus program that channeled financing to SOEs.

Then we examine the link between stock prices and future firm investment, which under the model of Bai et al. (2016) should parallel the link between prices and profit, if managers are learning from prices. The model assumes managers are value maximizers, which is a more appropriate assumption for privately-owned firms in China than for SOEs. Accordingly, we find a highly significant time-series correlation between the price-profit link and the price-investment link for private firms. The correlation is significant but weaker for SOEs. These results constitute evidence that stock prices not only contain information about future profits, but also that this information is incremental to managers' private information. In other words, in the language of Bond, Edmans, and Goldstein (2012), stock prices in China exhibit not only Forecasting Price Efficiency, but also Revelatory Price Efficiency.

Next, we study the efficiency of capital allocation in China using the predicted variation from cross-sectional regressions of future firm profits on past investment. Again, under the model of Bai et al. (2016), this should parallel price informativeness about future profits if managers are value maximizers and are learning from prices. We find a significant time-series correlation between price informativeness and investment efficiency for private firms but not for SOEs. Taken together these results suggest that China's stock market has real value for the economy, which is not fully realized by SOEs.

For value-maximizing managers, investment decision making depends not only on information about future profits, but also on cost of capital. Therefore, to shed further light on

the role of the stock market in capital allocation, we analyze the cost of equity capital faced by Chinese firms, and compare it to that of firms in the US. We hypothesize that from the perspectives of both domestic Chinese CNY investors, who hold almost all of China's stock market, and foreign USD investors, China's cost of capital is greater than that in the US, because of the high volatility and lack of diversification opportunities that must be borne by domestic investors, and the repatriation risk and other frictions that must be borne by foreign investors.

Using realized average excess market returns as estimates of required returns, we find that the annualized equity premium in China is almost 5% higher than that in the US. However, we acknowledge that the estimate of this differential may reflect unexpectedly good realized stock market performance in China over this period. Such unexpected outperformance would be a plausible result of the same liberalizations that may have led to the increase in price informativeness that we document. We also find that in terms of its USD monthly returns, China's stock market portfolio delivered an alpha with respect to US and global factors of almost 1% per month. Again, this estimate is based on realized returns, which may not equal expected returns. To the extent that these estimates reflect differences in expected returns, they suggest an elevated cost of capital for Chinese firms. Thus, efforts to increase diversification opportunities for domestic investors and increase the flow of foreign investment into the stock market could lower China's cost of equity capital and fuel corporate investment and economic growth.

The paper proceeds as follows. Section 2 analyzes stock price informativeness and corporate investment efficiency. Section 3 briefly examines the cost of capital in China. Section 4 concludes.

2 Stock price informativeness and allocational efficiency

A long literature in economics, finance, and accounting going back to Hayek (1945) and Fama (1970) links good legal and market institutions to stock price informativeness about future profits, and further to the efficiency of capital allocation and corporate investment. Elements of this nexus include the benefits of effective listing, disclosure, and auditing policy (Amihud and Mendelson, 1988; Diamond and Verrecchia, 1991; Healy and Palepu, 2001; Hail and Leuz, 2009), aggregation of diffuse information across individuals, incentives to generate information, and its inference from prices (Grossman and Stiglitz, 1980; Glosten and Milgrom, 1985; Kyle, 1985), and managerial use of price signals in resource allocation and investment decisions (Wurgler, 2000; Baker, Stein, and Wurgler, 2003; Durnev, Morck, and Yeung, 2004; Chari and Henry, 2004; Chen, Goldstein, and Jiang, 2007; Bakke and

Whited, 2010).

Bond et al. (2012) provide a detailed review, in which they distinguish two forms of price efficiency: Forecasting Price Efficiency (FPE), the traditional notion in which prices forecast firm value, and Revelatory Price Efficiency (RPE), the extent to which prices reveal information that is incremental to managers' private information and useful for improving real efficiency. Bond et al. (2012) also highlight two channels through which price informativeness has real effects: an incentive-contracting channel through which it affects managers' incentives to act efficiently, and a learning channel through which it affects managers' ability to act efficiently. Holmstrom and Tirole (1993) show that when prices are more efficient, the optimal compensation contract weights stock price performance more heavily, a feedback effect that can amplify the real impact of price informativeness.

Bai et al. (2016) develop a model in which stock price informativeness promotes efficient allocation of corporate investment and economic growth. They define price informativeness as the extent to which market valuations differentiate firms that will have high profits from those that will not. Empirically, they measure price informativeness in a given year t as the predicted variation of profit from prices, $b_t \times \sigma_t(\log(M/A))$, in the following cross-sectional regression of profit k years ahead on current equity market value and current profit, normalized by asset book value,

$$\frac{E_{i,t+k}}{A_{i,t}} = a_t + b_t \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ , \tag{1}$$

where the $1_{i,t}^s$ are sector indicators to control for industry effects. This predicted variation is a measure of FPE, the amount of information about future cash flows contained in prices. It is increasing in two quantities, the cross-sectional standard deviation of the earnings forecast variable $\log(M/A)$, and the earnings responsiveness coefficient b_t. Intuitively, the greater the dispersion in $\log(M/A)$ across firms and the more sensitive earnings are to this variable, the greater the forecasting power of $\log(M/A)$.

Other authors have developed different measures of price informativeness. Morck, Yeung, and Yu (2000) inspired a strand of literature that uses the R^2 from a market model, and other measures of stock price synchronicity, as inverse measures of the degree of stock-specific information in prices. As these authors acknowledge, this measure is problematic for cross-country comparisons when market-level volatility differs across countries, making a stock's idiosyncratic variance a more robust measure than R^2. In addition, as originally emphasized by Roll (1988), even this idiosyncratic variance is generated by both news and noise, and thus, as Hou, Peng, and Xiong (2013) demonstrate, it is also problematic as a measure of price informativeness. We therefore prefer the more direct measure of price informativeness

proposed by Bai et al. (2016), which is the most relevant for the role of stock prices in capital allocation. Farboodi, Matray, and Veldkamp (2017) also adopt the Bai-Phillipon-Savov measure to study the effect of increased data availability and processing power on price informativeness, and Kacperczyk, Sundaresan, and Wang (2018) use it to study the impact of foreign investors on market efficiency.

Next, under the assumption that managers choose investment to maximize value, the model of Bai et al. (2016) predicts that as prices become more informative, they should predict investment more strongly.[4] In this way, price informativeness about profit matters for real managerial decisions. Bai et al. (2016) measure the predictive power of prices for investment as the predicted variation of investment from prices $b_t \times \sigma_t(\log(M/A))$ in annual cross-sectional regressions of the form

$$\frac{I_{i,t+k}}{A_{i,t}} = a_t + b_t \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t(\frac{I_{i,t}}{A_{i,t}}) + e_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ . \tag{2}$$

Finally, under the same assumption that managers choose investment to maximize profit, the model of Bai et al. (2016) predicts that if managers are learning from prices, i.e., if the equilibrium displays RPE, then as prices become more informative about future profit, the efficiency of capital allocation should increase. To study the efficiency of capital allocation, Bai et al. (2016) measure the extent to which firms with greater investment go on to have higher earnings. Specifically, they look at the predicted variation of profit from investment, $b_t \times \sigma_t(I/A)$, in annual cross-sectional regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_t + b_t \frac{I_{i,t}}{A_{i,t}} + c_t \frac{E_{i,t}}{A_{i,t}} + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ . \tag{3}$$

Here, current investment is a proxy for the manager's earnings forecast and the intuition is that if prices are refining managers' information about future earnings, their forecasts about future earnings should display greater cross-sectional dispersion.

We take the model of Bai et al. (2016) to the data on earnings, equity market value, investment, and asset book value from the China Stock Market and Accounting Research database (CSMAR) from 1995 to 2016. For the earnings variable $E_{i,t}$, we use the net profit reported for firm i earned over calendar year t. For equity market capitalization $M_{i,t}$, we multiply firm i's A-share price at the end of year t by the total number of shares outstanding, including tradable A, B, and H shares and nontradable shares. We use capital expenditure as our measure of investment I.

[4]Edmans, Jayaraman, and Schneemeier (2017) also study investment-price sensitivity and its reaction to the enforcement of insider trading laws, which increases revelatory price efficiency. They find that enforcement increases investment-price sensitivity, even when controlling for total price informativeness.

One of the most distinctive aspects of China's corporate sector is its spectrum of governance models ranging from fully privately-owned firms, which might be presumed to maximize profit, to predominantly state-owned enterprises (SOEs), which purportedly pursue additional or alternative objectives, such as maximizing employment, GDP, or strategic value to the government. See, for example, Lin, Cai, and Li (1998), who blame state-imposed policy burdens for SOE underperformance, Kato and Long (2006), who find that state ownership weakens the pay-performance link for top managers, and Chen, Jiang, Ljungqvist, Lu, and Zhou (2015), who document inefficient capital allocation in state-controlled business groups and find that managerial promotion depends not on profitability but on avoiding layoffs. In addition, Harrison, Meyer, Wang, Zhao, and Zhao (2019) find that compared to fully privately-owned firms, privatized SOEs continue to benefit from low-interest loans and government subsidies. Harrison et al. (2019) also find that differences between private firms and SOEs become more pronounced with China's massive post-financial-crisis economic stimulus package. As documented by Chen, He, and Liu (2017), starting in 2009, four trillion yuan was funneled through the state-owned banks, often to other state-owned firms, to stimulate investment.

It is therefore natural to ask whether stock price informativeness and investment efficiency vary with the fraction of a firm's equity that is state-owned, especially after the crisis. State ownership could affect price informativeness about future profit in Equation (1) in a number of ways. State support of state-owned firms, either direct or in the form of access to cheap capital through state-owned banks, could be unpredictable and thus lead to unpredictable profits. Alternatively, state support might serve to smooth out profit fluctuations associated with broader economic fluctuations. In addition, the theoretical foundation for the connection between the price informativeness measure in Equation (1) and the investment policy modeled empirically in Equations (2) and (3) assumes investment is chosen to maximize profit. However, this link may be weaker for SOEs, since they are given incentives to choose investment to pursue other objectives as well.

For these reasons, we hypothesize that stock price informativeness and investment efficiency are lower for firms with greater state ownership, especially after 2008. To test these hypotheses, we collect equity ownership data from the Wind database and estimate versions of Equations (1)-(3) that are extended to allow the price informativeness and investment efficiency coefficients to vary with the fraction of the firm's equity that is state-owned. We also divide the sample firms into two subsamples, those with more and those with less than 40% of equity owned by the state, and conduct a separate analysis for each.

As in Bai et al. (2016), we deflate all nominal quantities by the GDP deflator. We winsorize all variables at the first and ninety-ninth percentiles. To control for industry effects,

we construct a version of the 1-digit SIC classification from CSMAR's industrial code B. We also eliminate financial firms from the sample, although this makes little difference to the results. A few papers in the accounting literature document low quality of auditing and reported earnings in China (DeFond, Wong, and Li, 1999; Chen and Yuan, 2004; Wang, Wong, and Xia, 2008). Such errors should bias our results against finding price informativeness.

2.1 Stock price informativeness about future profit

We begin by estimating regression Equation (1) for Chinese firms for each year t from 1995 to $2016-k$ and comparing the results to those for US firms.[5] We initially consider forecasting periods $k = 1, 2, 3, 4$, and 5 years. As Bai et al. (2016) find in the US, the predicted variation $b_t \times \sigma_t(\log(M/A))$ in Equation (1) tends to increase with the length of the forecasting period k. Figure 1 plots the time-series average predicted variation for each $k = 1, 2, 3, 4$, and 5 years for China and the US. The figure shows that for both China and the US, the average predicted variation tends to increase in k. This may be because more distant earnings realizations are better proxies for the earnings stream capitalized in market value, particularly in China where growth rates are high. For the year-by-year analysis, we focus on the horizons $k = 3$ and $k = 5$. Figure 1 shows that the time-series average price informativeness over the whole sample period is higher in the US than in China. However, the year-by-year analysis we conduct next shows that price informativeness about future profit in China is not significantly lower than that in the US after 2003.

Table 1 presents predicted variations and their t-statistics for China and the US for $k = 3$ and $k = 5$.[6] In almost all years, these are significantly positive, although there is considerable variation over time. China reaches a low in price informativeness around the year 2000, which is when a prominent Chinese economist coined "the casino theory" of the stock market. However, stock price informativeness in China begins to increase after the reforms associated with its accession to the World Trade Organization in 2001. In 2005, the CSRC introduced the Split-Share Structure Reform to unlock nontradable shares gradually and this may have increased price informativeness by broadening the investor base. In any case, from 2004 on, China's stock price informativeness tends to approach or even exceed that of the US.

In the columns labeled p-val in Table 1, we formally test the null hypothesis that stock price informativeness in China is equal to that in the US in each year for which we have the

[5] Many thanks to Alexi Savov for providing us with the US results. The US results shown here are slightly different from those reported in Bai et al. (2016) because of small methodological differences, such as the use of net income instead of EBIT, which is more comparable across the two countries.

[6] All cross-sectional t-statistics reported in this section are White-heteroscedasticity-consistent. We also calculated standard errors clustered by industry, with qualitatively similar results.

US data, 1995 to 2014$-k$. These columns report the probability level in percent at which the null hypothesis that the coefficients in the US and China are equal can be rejected in favor of the alternative hypothesis that the US coefficient is greater. For example, a p-value of 50% corresponds to a year in which the US and China price informativeness coefficients are equal, and p-values greater than 50% are in years in which the China coefficient is greater than the US coefficient. Counter to conventional wisdom, stock prices in China have become as informative about future profits as they are in the US. From 2004 onwards, 10 out of 14 of the p-values exceed the conservative threshold level of 10%, and there are two cases in which the p-value exceeds 90%, i.e., observations for which the null hypothesis of equality can be rejected in favor of the alternative that price informativeness in China is greater than in the US at the 10% level.

Figure 2 illustrates these results by plotting the time series of these Equation (1)-predicted variations for China and the US along with the boundary of the rejection region for the one-sided 10% test of the null hypothesis that price informativeness in China and the US are equal. In particular, the dotted line shows the highest China price informativeness level for which the hypothesis that price informativeness in China is as high as in the US can be rejected at the 10% level in a one-sided test. Stock price informativeness in China easily clears this conservatively high hurdle in most cases from 2004 onwards.

2.1.1 Robustness checks

There are two potentially related concerns about the results reported in Table 1 and Figure 2. The first is about composition effects over time. In the US market, Bai et al. (2016) report significant time-variation in price informativeness associated with a composition effect, which is why the majority of their analysis focuses only on firms in the S&P500 that do not exhibit this composition effect. As they document in Appendix C, in the full cross-section of listed firms, there is a dramatic increase in the cross-sectional dispersion in earnings, as measured by the cross-sectional standard deviation of E/A, and in the cross-sectional dispersion in valuations, as measured by the cross-sectional standard deviation of $\log(\frac{M}{A})$ (see Table C1 and Figure C1 in their paper). This increase in cross-sectional dispersion apparently causes a decrease in price informativeness over time. A natural question is whether composition effects underlie the time-variation in price informativeness that we document, especially given that the number of firms in our sample increases dramatically over our sample period, from 312 in 1995 to 2,904 in 2016.

To address this question, Figure 3 plots the time series of the cross-sectional dispersion of earnings and valuations for our China sample. The top plot shows the cross-sectional median and the 10th and 90th percentiles of earnings, E/A. The bottom plot shows the

same cross-sectional statistics for valuations, $\log(\frac{M}{A})$. There is some evidence of an increase in the cross-sectional dispersion of earnings, particularly in the lower tail of the distribution, in the early to mid 2000s. This time period also coincides with lower price informativeness, as shown in Figure 2, and a period when there were significant concerns about the quality of accounting reports, to be discussed in the next section. However, the period of significantly positive and relatively stable price informativeness that begins in 2003 coincides with a similarly stable period of earnings dispersion. In other words, there is no evidence that the more than doubling in the number of firms in our sample from 2003 onwards has any meaningful effect on either the dispersion of earnings or price informativeness. While there is dramatic variation in the level of valuations in China, which is hardly surprising given the volatility of prices at the market level and the stability of asset values, there is little evidence of large changes in the cross-sectional dispersion. In general, the median, and the 10th and 90th percentiles move together over time, with a slight indication of an increase in dispersion in the latter part of the sample. To summarize, there is no evidence that the post-2003 price informativeness measures are significantly influenced by a composition effect.

The second concern is that institutional features specific to China's stock market are somehow influencing our results and obscuring the interpretation of the measure of price informativeness. We conduct a number of robustness checks to allay these concerns. One special feature of China's stock markets is that the listing process is tightly controlled by the CSRC, with stringent listing requirements, and there is often a long waiting list of firms that want to go public. The CSRC has also closed the IPO market at various points in the past, often for long periods of time (Cong, Howell, and Zhang (2017)). One result of this limitation on going public is that the value of a public listing itself may be substantial. This listing value could be a significant fraction of the market value of the smallest companies because these companies are potentially the targets of reverse mergers in which private companies merge with these listed firms in order to achieve publicly listed status without having to go through the IPO process (Lee, Qu, and Shen (2017)). If so, this value associated with the potential to be used as a shell in a reverse merger could increase the valuation ratio we use in our price informativeness regression, making these values less predictive of future earnings.

In their examination of the size and value effects in China, Liu, Stambaugh, and Yuan (2018) suggest excluding the smallest 30% of firms by market capitalization from the analysis because 83% of reverse mergers in their sample come from these three deciles, and we follow this suggestion. More than half of reverse mergers come from the bottom decile alone, so we also conduct an analysis with only the smallest 10% of stocks excluded. For brevity, we do not tabulate the coefficients for these robustness checks, but we note that eliminating the smallest 10% or 30% of stocks has almost no effect on the average coefficient in Equation (1)

and the year-by-year effects are also economically very small. This invariance to excluding small stocks may be surprising, but there are a number of mitigating factors. There are only 133 reverse mergers in the 10-year sample period, 2007-2016, used in Liu et al. (2018), an average of barely more than 11 per year. Perhaps shell value is not that important economically. However, one might speculate that the prices of small firms, in general, would be less informative. Our results suggest that this is not the case in China, but this result needs to be considered in light of the fact that the tight regulation of IPOs has the effect of truncating the left tail of the size distribution of Chinese firms. Regardless, the absence of a small-firm effect in price informativeness lends additional support to the argument that composition effects, especially those associated with the opening of the Shenzhen SME and ChiNext boards, are not driving our results.[7]

Another distinctive feature of China's stock market is the existence of so-called "special treatment" firms. In general, these are firms that are in danger of delisting due to periods of negative earnings, although delistings for this reason are extremely rare, in part due to the shell value of a public listing discussed above. There are several different categories of special treatment, but in addition to poor performance, these firms all have in common the fact that their daily price moves are restricted to a maximum of 5% in each direction instead of the standard price move limit of 10%. For various reasons, it is possible that these special treatment firms are unusual and have differential price informativeness. We exclude all special treatment firms and run the same price informativeness regression. As with our size screens, special treatment firms do not appear to be having an economically significant effect on our overall results. Given the robustness of the baseline full sample results, we continue to use the full sample of nonfinancial firms in the rest of our analysis.

2.1.2 Historical context

Figure 4 plots the time series of stock price informativeness in China as measured by the predicted variation of profit from prices for $k = 3$ in the context of the regulatory reforms and stock market news events taking place in China over the sample period. The early years were a time of construction and transition to a centralized modern market. In 1996, Dow Jones began to publish the China, Shanghai 30, and Shenzhen indices, which attracted a significant following by equity analysts. In addition, the exchanges unified limit-order books and greatly reduced trading commissions, which increased liquidity. Chordia, Roll, and Subrahmanyam (2008) show theoretically that increasing liquidity improves market

[7]The SME and ChiNext Boards were opened in Shenzhen in 2004 and 2009, with more relaxed listing standards than the Shenzhen and Shanghai Main Boards, to accommodate small and medium enterprises, and even smaller entrepreneurial firms.

efficiency and informativeness, which suggests that these developments contributed to the rise of informativeness in China's stock market over this period. The adoption of a price change limit of 10% and a one-day minimum holding period in 1996 may also have deterred stock price manipulation, as suggested by Kim and Park (2010). In 1997, the CSRC became the official regulator of China's stock market.

The years from 1998 to 2002 were a low point in price informativeness. By many accounts, this was a period of rampant speculation, accounting fraud, and stock price manipulation. In 1998, prices of firms in special treatment for financial distress began to soar and the CSRC reported widespread market manipulation. However, the turn of the century ushered in a wave of significant reforms. At the end of 2001, the CSRC enforced new and stricter delisting regulations to protect retail investor interests. In 2002, the CSRC ratified the QFII program, enabling qualified foreign institutional investors to invest in A shares directly. In 2004, the CSRC established the National Nine Rules to protect minority shareholder interests, deter stock price manipulation, and deter accounting and audit fraud. Gul, Kim, and Qiu (2010) show that stock price synchronicity in China significantly declined with the increase in foreign shareholding, audit quality, and the decrease of ownership concentration.

In 2005, the CSRC introduced the Split-Share Structure Reform to unlock nontradable shares and privatize them through a firm-by-firm negotiation process that compensated holders of tradable shares. The trend plotted in Figure 4 suggests that this expansion of the base of market participants may have further boosted stock price informativeness. Liao, Liu, and Wang (2011) and Li, Wang, Cheung, and Jiang (2011) document the improvements in information discovery and risk sharing that this reform enabled. In 2006, the Shanghai and Shenzhen Stock Exchanges introduced margin trading and short selling pilot programs, which expanded gradually in the subsequent years. In a study of 46 countries, Bris, Goetzmann, and Zhu (2007) find evidence that allowing short sales permits prices to incorporate negative information more quickly. The final years, from 2007, are those of the financial crisis and subsequent reconstruction, during which price informativeness declined somewhat.

2.1.3 Privately-owned firms vs. SOEs

As discussed earlier, we hypothesize that stock price informativeness about future profit is lower for SOEs than for privately-owned firms because state subsidies make earnings harder to predict, especially after the post-crisis economic stimulus program. To test this hypothesis, we estimate an extended version of Equation (1) that includes an interaction of the stock price regressor $\log(\frac{M}{A})$ with the state-owned fraction of equity, X, and we allow

this interaction to differ in the two subperiods 1995 to 2008 and 2009 to 2016-k, as follows:

$$\frac{E_{i,t+k}}{A_{i,t}} = a_{0t}+a_{1t}X_{i,t}+(b_{0t}+(b_1 1_{t<2009}+b_2 1_{t\geq 2009})X_{i,t})\log(\frac{M_{i,t}}{A_{i,t}})+c_t(\frac{E_{i,t}}{A_{i,t}})+d_t^s 1_{i,t}^s+\varepsilon_{i,t+k}\ . \quad (4)$$

The estimates of b_1 and b_2 from this equation indicate how the stock price informativeness coefficient varies with state ownership during the two subperiods.

To measure state ownership $X_{i,t}$, we augment data on state holdings from CSMAR with data from Wind. Prior to the Split-Share Structure Reform of 2005, state ownership was large and heavily concentrated in non-tradable shares. Subsequent to the 2005 reform, large numbers of these shares became tradable. However, the CSMAR data do not indicate the extent to which state entities sold their shares. To measure state ownership after the 2005 reform, we turn to holdings data from the Wind database and aggregate the number of shares held by the top ten holders that are state entities. These data include holdings of both tradable and non-tradable shares. For years prior to the 2005 reform, we use the non-tradable state-owned share data from CSMAR, which we believe is a good proxy for total state ownership. Through 2005, value-weighted mean and median state ownership are stable at between 30% and 40%. Pursuant to Deng Xiaoping's privatization guideline to "grasp the large and let go of the small," state ownership is much higher in large firms than in small firms. After the 2005 reform, mean state ownership falls to less than 20% and median ownership falls close to zero. The state sells its stakes in the smallest firms and the distribution becomes much more right skewed. In other words, the state holds on to its ownership in the small number of large companies that it thinks are most strategically and economically important.

Table 2 contains estimates of the interaction of price informativeness with state ownership for the two subperiods, 1995 to 2008 and 2009 to 2016-k. The top two rows show estimates of the coefficients b_1 and b_2 from the panel regression in Equation (4), as well as the difference between subperiods, $b_2 - b_1$, and their t-statistics. As the table shows, the estimates of b_1 are small and statistically insignificant, but the estimates of b_2 and $b_2 - b_1$ for both forecasting horizons $k = 3$ and $k = 5$ are highly significantly negative. There is little or no difference between the price informativeness of privately-owned and state-owned firms in the first subperiod, but the state-owned firms have prices that are economically and statistically less informative in the latter subperiod. This evidence is consistent with the result of Harrison et al. (2019) that government support to SOEs in China became more pronounced with the post-crisis stimulus and confirms our hypothesis that this post-crisis support made earnings at firms with greater state ownership harder to predict.

To examine the extent to which the variation in stock price informativeness with respect

to state ownership in China is driven by cross-sectional variation, we extend Equation (1) further to allow the interaction of the stock price regressor $\log(\frac{M}{A})$ with the state-owned fraction of equity, X to vary year by year:

$$\frac{E_{i,t+k}}{A_{i,t}} = a_{0t} + a_{1t}X_{i,t} + (b_{0t} + b_{1t}X_{i,t}) \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ . \tag{5}$$

The bottom row of Table 2 presents subperiod averages of the yearly estimates of the coefficients b_{1t} for $k = 3$ and $k = 5$. These averages of cross-sectional coefficients are similar in magnitude to the panel-regression subperiod estimates, suggesting that the results are driven by variation in state ownership across firms rather than by variation in the effect of state ownership over time.

Figure 5A provides a graphical illustration of the gap in price informativeness between privately-owned firms and SOEs that opens up in 2009. The solid line plots the time series of the predicted variation of profit from prices for firms with less than 40% of their equity owned by the state, while the dotted line plots the predicted variation for firms with a state-owned fraction of equity greater than 40%.[8] The firms with the greater state ownership exhibit consistently lower predicted variation of profit from prices from 2009 on.

2.1.4 Dual listing and QFII ownership and stock price informativeness

This section examines two additional China-specific firm characteristics that may plausibly explain cross-sectional variation in price informativeness. One characteristic is whether the firm has a twin H share with identical cash flow and voting rights dual-listed in Hong Kong. The other is the extent of foreign ownership under the QFII program. Given the importance of China's economy and markets, understanding more about the efficiency of China's stock market is of interest in its own right. In addition, given that increasing price informativeness might improve capital allocation and economic growth, this examination may have important policy implications.

Dual listing of Chinese firms is only allowed in Hong Kong and there are now about 100 such firms. Due to the effective legal segmentation between the Chinese and Hong Kong markets for much of our sample, these stocks are traded and owned by very different investor clienteles. This segmentation is evidenced by large violations of the law of one price across the two markets, wherein the shares in China trade at a substantial average premium relative to their Hong Kong counterparts.

The literature on the effect of dual listing on stock price informativeness yields mixed

[8] John, Xu, Xue, and Zhuang (2018) suggest that a 40% ownership stake is sufficiently large to confer direct influence over firm governance decisions.

results. On one hand, the theoretical model of Foucault and Gehrig (2008) predicts that dual listing enables firms to obtain more precise information about their growth opportunities from the stock market and thus make better investment decisions. On the other hand, the empirical evidence in Fernandes and Ferreira (2008) suggests that dual listing on US exchanges reduces price informativeness for firms from emerging markets. We hypothesize that because investors trading Hong Kong H shares price Chinese firms so differently than Chinese investors trading mainland A shares, dual listing reduces stock price informativeness by introducing noise into the A-share prices associated with Hong Kong investors' discount rate shocks.

The QFII program, which enables qualified foreign institutional investors to hold A shares, was initiated in 2002. Ownership numbers, based on holdings data from Wind, are small throughout the sample, with the cross-sectional average ownership never exceeding 0.2%. Not surprisingly, this ownership is concentrated in a relatively small number of stocks, with even the 75th percentile of the cross-sectional distribution equal to zero in every year. Nevertheless, we hypothesize that the trading of foreign institutional investors in these stocks makes their prices more informative about future earnings.

To study variation in price informativeness with respect to dual-listing status, we extend Equation (1) to include the interaction of price informativeness with a dummy variable that indicates whether a stock that is traded as an A share on the Shanghai or Shenzhen exchange also has a twin H share dual-listed in Hong Kong. To study variation in price informativeness with respect to QFII ownership, we extend Equation (1) to include the interaction of price informativeness with the fraction of firm shares held by QFIIs. Specifically, we estimate panel regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_{0t} + a_{1t}X_{i,t} + (b_{0t} + b_1 X_{i,t}) \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ , \tag{6}$$

where $X_{i,t}$ is the firm characteristic in question, or the vector of all characteristics, and the time subscripts on the basic coefficients $a_{0t}, a_{1t}, b_{0t}, c_t$, and d_t^s are a shorthand to indicate that year dummies are incorporated to allow these coefficients to vary across time. We estimate only a constant average dual-listing or QFII effect b_1 across time to increase power.

Table 3 reports estimates of these b_1 coefficients and their t-statistics for forecasting horizons $k = 3$ and $k = 5$. The top panel shows the results for dual listing of H shares, while the bottom panel shows the results for QFII ownership. In both cases, three sets of coefficients are reported. The top set is for the panel regression with only the firm characteristic of interest included. The second set includes additional controls for the other two firm characteristics, i.e., state ownership and QFII ownership in the case of dual listing and state

ownership and dual listing in the case of QFII ownership. Finally, the last set reports the average coefficient from a sequence of yearly cross-sectional regressions to illustrate the extent to which the panel coefficients above it are driven primarily by cross-sectional variation. If they are, then the average cross-sectional coefficient will be close to the panel regression coefficient.

As the table shows, the presence of dual-listed H shares is associated with lower levels of A-share price informativeness. Although this runs counter to the theory in Foucault and Gehrig (2008), it is consistent with the evidence in Fernandes and Ferreira (2008), and consistent with our hypothesis that discount rate shocks in Hong Kong leak into A-share prices and create variation unrelated to expectations about future earnings. Including the control variables reduces the magnitude of the effect somewhat due to the relatively small but positive correlation between dual listing and the degree of state ownership. The similarity in magnitudes of the average of the cross-sectional coefficients to those from the panel regression suggests that the effect is coming from cross-sectional rather than time-series variation, which is hardly surprising given that the dual-listing dummy changes only once for firms as they become dual listed. In terms of economic magnitude, the effect is smaller than that of state ownership in the post-crisis period, but still quite statistically significant.

To illustrate the effect of QFII ownership on stock price informativeness, the second panel of Table 3 presents estimates of the coefficient on the interaction of the fraction of firm shares that are QFII-owned with the stock price regressor $\log(\frac{M}{A})$. The effect is weak and economically insignificant, but the point estimates suggest that QFII ownership is generally associated with higher levels of price informativeness. This result is consistent with that in Kacperczyk et al. (2018), who report that foreign institutional ownership generates increased price informativeness. The effect of QFII ownership is strengthened somewhat by including the other variables as controls, since QFII ownership is positively correlated with both state ownership and dual listing, although it remains economically insignificant. The average of the cross-sectional coefficients is slightly larger still. While these results are consistent with foreign institutional investors increasing price informativeness, we acknowledge that these specifications do not demonstrate a causal relation. It could also be that foreign institutional investors choose to invest in firms whose prices are already more informative about future profits.

Together these results suggest that, while promoting dual listing as a way for firms to raise additional equity capital may be to some extent counterproductive in that it appears to degrade price informativeness, the presence of international investors in China may boost stock price informativeness.

2.2 Stock price informativeness about future investment

The model of Bai et al. (2016) predicts that as prices become more informative about future earnings, they should predict investment more strongly. In other words, as prices become more informative about future earnings, the potential value of price informativeness for real firm decisions should become more evident in the responsiveness of investment to market prices. Bai et al. (2016) measure this as the predicted variation $b_t \times \sigma_t(\log(M/A))$ in Equation (2). Table 4 presents the predicted variation $b_t \times \sigma_t(\log(M/A))$ and its t-statistic for $k = 1, 3$, and 5, for each year 1995 to 2016$-k$. As the table shows, consistent with the predictions of Bai et al. (2016), the predicted variation of investment from prices becomes increasingly significantly positive from 2003 on for $k = 3$ and $k = 5$, like that of the price informativeness about future profit reported in Table 1.

As discussed earlier, we hypothesize that investment policy at privately-owned firms reflects value maximization and thus should bear out the predictions of Bai et al. (2016) that the trend of price informativeness about future investment should follow that of the price informativeness about future profit. However, because the investment policies of SOEs potentially reflect other objectives of the government, the link between price informativeness about future profit and price informativeness about future investment should be weaker. Moreover, we hypothesize that price informativeness about future investment should be lower at firms with greater state ownership, especially after the post-crisis stimulus.

Figure 5B plots the time series of predicted variation of investment from prices for $k = 3$ and $k = 5$ for privately-owned firms and SOEs, defined again as those with less and more than 40% state ownership, respectively. As the figure shows, the time-series pattern of the predicted variation of investment from prices in Panel B is quite similar to that of price informativeness about future profit in Panel A, with a pronounced upward trend from 2001 on. More formally, we find that the time-series correlation between the average predicted variation from Equation (1) across $k = 1$ to 5 and the average predicted variation from Equation (2) across $k = 1$ to 5 is 84% for private firms, with a t-statistic of 6.63. The corresponding correlation for SOEs is 52%, with a t-statistic of 2.67. This is consistent with the hypothesis that prices contain information that is incremental to managers' private signals and is relevant for real investment decisions, especially for private firms. In addition, the weaker correlation for SOEs is consistent with our hypothesis about their weaker incentives to maximize profit.

Next, we formally test the hypothesis that the responsiveness of investment to prices is lower at firms with greater state ownership, especially after the post-crisis stimulus initiated in 2009. As in Section 2.1.3, we estimate an extended version of Equation (2) that includes the interaction of state-ownership with prices, and we allow the interaction to vary with the

subperiods 1995 to 2008 and 2009 to 2016-k, as follows:

$$\frac{I_{i,t+k}}{A_{i,t}} = a_{0t}+a_{1t}X_{i,t}+(b_{0t}+(b_1 1_{t<2009}+b_2 1_{t\geq 2009})X_{i,t})\log(\frac{M_{i,t}}{A_{i,t}})+c_t(\frac{E_{i,t}}{A_{i,t}})+d_t(\frac{I_{i,t}}{A_{i,t}})+e_t^s 1_{i,t}^s+\varepsilon_{i,t+k}\,. \tag{7}$$

The first two rows of Table 5 present estimates of b_1, b_2, $b_2 - b_1$, and their t-statistics. While the estimates of the interaction between state ownership and stock price informativeness about future investment for the subperiod 1995 to 2008 are negative, they are insignificantly different from zero. However, the interaction estimates for the subperiod 2009 to 2016-k are significantly negative for both $k = 3$ and $k = 5$, and they are significantly larger in magnitude than in the earlier subperiod. To assess how much these results are driven by cross-sectional variation in price informativeness about future investment, we further extend Equation (2) to allow the interaction of state ownership with price informativeness to vary year by year. The last row of Table 5 presents the subperiod averages of the yearly interaction coefficients. These cross-sectional estimates of the subperiod results are in line with the panel estimates. While the relation between state ownership and price informativeness about future investment is near zero for the 1995 to 2008 subperiod, the relation is large and negative for the 2009 to 2016-k subperiod, especially for $k = 5$.

These results suggest that after 2009, SOE investment became less predictable by prices than investment of privately-owned firms, consistent with our hypothesis above. This may have been a result of the relative reduction in price informativeness about future profit, documented in Table 2 and Figure 5A, i.e., a reduction in RPE. Alternatively, it may have resulted from government directives to invest according to centrally planned economic stimulus objectives rather than according to growth opportunities capitalized in market prices, i.e., reduced use of prices in managerial decision making.

2.3 Efficiency of capital allocation

Finally, we consider whether the increase in stock price informativeness since 2001 documented in Section 2.1 reflects an increase only in FPE or also in RPE, i.e., whether prices are capturing information already possessed by managers or whether prices signal new information to managers. As Bai et al. (2016) explain, under the assumption of profit maximization, a necessary condition for an increase in RPE is an increase in the efficiency of capital allocation, as measured by the predicted variation of profit from investment in Equation (3). Table 6 lists these predicted variations and their t-statistics from Equation (3) for each year 1995 to 2016$-k$, for $k = 1$, 3, and 5. While the table shows that the predicted variation is significantly positive for $k = 1$ and $k = 3$ for most years in the sample period, their time

trends are less pronounced than those of the price informativeness measures in Table 1. However, as Tables 2 and 5 show, it is important to control for the effects of state ownership in these measures. As discussed earlier, we hypothesize that the efficiency of capital allocation is lower at firms with greater state-ownership, especially in the post-2009 subperiod.

Analogous to the methodology in Equations (4) and (7), we test this hypothesis by introducing a subperiod-dependent interaction between $\frac{I}{A}$ and the state-owned fraction of equity X in Equation (3) and estimating the following panel regression:

$$\frac{E_{i,t+k}}{A_{i,t}} = a_{0t} + a_{1t}X_{i,t} + (b_{0t} + (b_1 1_{t<2009} + b_2 1_{t\geq 2009})X_{i,t})(\frac{I_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ . \quad (8)$$

The top two rows of Table 7 report the estimates of the coefficients b_1, b_2, and $b_2 - b_1$, as well as their t-statistics for forecasting horizons $k = 3$ and $k = 5$. For the pre-2009 subperiod, the estimates of the coefficient b_1 are actually slightly positive and statistically significant, counter to our hypothesis. However, for the post-2009 subperiod, the estimates of b_2 and $b_2 - b_1$ are large, negative, and highly statistically significant, suggesting that allocational efficiency at firms with greater state ownership was indeed lower after the post-crisis stimulus. The bottom row contains subperiod averages of yearly estimates of the interaction between state ownership and investment in cross-sectional regressions. These subperiod averages of yearly cross-sectional estimates are similar in magnitude to the subperiod estimates from the panel regression in Equation (8), again indicating that the panel results are largely driven by cross-sectional variation.

To illustrate the difference in the predicted variation of profit from investment between privately-owned firms and SOEs, Figure 5C plots the times series of these predicted variations from Equation (3) for $k = 3$ and $k = 5$ for private firms and SOEs, defined again as those with less and more than 40% state ownership, respectively. The figure shows that while private firms experienced a modest upward trend in investment efficiency, efficiency for SOEs was flat or even declined in recent years. The time-series correlation between the average predicted variation from Equation (1) across $k = 1$ to 5 and the average predicted variation from Equation (3) across $k = 1$ to 5 is 51% for private firms, with a t-statistic of 2.58. By contrast, the corresponding correlation for SOEs is -37%, with a t-statistic of -1.73. Directives to SOEs to invest according to centrally planned economic stimulus objectives may be to blame.

To summarize, our results suggest that for privately-owned firms, stock price informativeness about both future earnings and future investment has increased since 2001 and has precipitated an increase in corporate investment efficiency. However, for SOEs, price informativeness and investment efficiency declined after 2008, relative to private firms, which we

attribute to a decline in the efficiency of SOE investment associated with China's massive post-crisis stimulus. Our findings for private firms suggest that China's stock market has real value for the economy as a channel for efficient capital allocation, whose potential is not fully realized by the state-owned sector.

3 Cost of capital

Another way in which the stock market potentially affects the real investment decisions of managers is through the cost of capital it determines, i.e., through the returns investors require to compensate them for risk. For firms that maximize NPV, this required return becomes the hurdle rate that projects under consideration must clear. A reasonable summary measure of the cost of equity capital in a given market is the value-weighted average expected return across stocks in excess of the riskless rate, also termed "the equity premium."

We look at the equity premium in China in two ways. From the perspective of domestic investors, who hold virtually all of China's stock market in the current equilibrium, the relevant premium is the expected CNY stock market return in excess of the CNY riskless rate. From the perspective of USD investors outside China, who are considering increasing their portfolio weight in China, the relevant premium is the USD return in excess of the USD riskless rate.

Our first hypothesis is that because Chinese investors operate in a developing market with a relatively high degree of economic risk, and because they hold virtually all of China's stock market in the current equilibrium with relatively few opportunities for international diversification, due to capital controls and softer barriers to market integration, they require a higher equity premium in China than do their counterparts in the US. Our second hypothesis is that because of repatriation risks and other illiquidity concerns, USD investors require a positive alpha relative to traditional US and global equity benchmark portfolios to hold even the small fraction of China's stock market that they hold in the current equilibrium.

As is traditional in the literature, we test these hypotheses using averages of past excess returns on the market portfolio as estimates of the expected or required excess return on the market. However, as Elton (1999) emphasizes, average realized returns may not be equal to expected returns. This is especially true in short sample periods and our 22-year sample period is relatively short. For this reason, we regard our results as suggestive, rather than conclusive.

Table 8 presents annualized means and volatilities of the monthly tradable-value-weighted market returns of China, the US, and other large economies over the period 1995 to 2016. The column labeled China CNY summarizes the CNY returns on China's stock market in

excess of the CNY riskless rate. The column labeled US USD summarizes the USD returns on the US stock market in excess of the USD riskless rate. As the table shows, the mean and volatility of the market excess returns in China are much larger than those in the US. The equity premium in China over the sample period was 12.76% compared to 7.83% in the US, consistent with our hypothesis that Chinese investors require higher equity returns than do US investors.[9] This economically large difference of 4.92% represents a meaningfully higher cost of capital for firms in China. However, the difference is statistically insignificant with a Newey-West t-statistic of only 0.64. Moreover, since we are using realized returns as a proxy for expected returns, it is also possible that equity returns in China were unexpectedly high during this period and that there was little or no difference in expected returns in the two countries.

We next turn to the USD return on China's stock market relative to that of other global stock markets to derive further implications about the cost of equity capital in China. China's stock market accounts for about 10% of the $80-trillion global equity market, but foreign investment in China's stock market remains extremely low. Although China ratified the QFII program in 2002, the RQFII program in 2011, the Shanghai-Hong Kong Connect program in 2014, and the Shenzhen-Hong Kong Connect program in 2016, the quotas approved across these programs total only about $230 billion and the quotas themselves are not filled. These limited holdings imply a significant underweighting by foreign investors, even relative to documented home biases in international investing, such as those reported by Cooper, Sercu, and Vanpee (2013) and other authors cited therein.

The recent negotiations surrounding the decision by MSCI to include China A shares in its emerging market index clarified many of the reasons why foreign investors have been reluctant to hold Chinese A shares. Although the CSRC signaled a willingness to work out the necessary market reforms early on, MSCI postponed A-share inclusion in both 2015 and 2016, citing investor concerns about repatriation risk associated with limits on foreign withdrawals, liquidity risks associated with trading suspensions, one-day minimum holding periods, and other administrative issues. In 2017, MSCI began gradually adding small weightings of Chinese A shares to its indices, but the severe underweighting of China in

[9]Allen et al. (2017) report that in terms of buy-and-hold return, China's stock market was an underperformer over the period 2001 to 2014, relative to other global stock markets, delivering an annualized inflation-adjusted CNY buy-and-hold-return of -0.44%. The difference between their result and ours reflects their shorter sample period, the fact that they use total-market-value weighting in their cross-sectional averaging, and also the fact that annualized buy-and-hold returns are lower than average per-period returns by about one-half the variance of the per-period returns, which is a large downward adjustment for a market as highly volatile as China's. While buy-and-hold returns may be useful to consider for investors holding a single asset over a long term, in the corporate finance context, cost of capital is typically measured in expected per-period required returns.

global equity portfolios persists.

We hypothesize that this underweighting of China in global equity portfolios, a consequence of both hard and soft barriers to investing in China, is associated with an underpricing of Chinese shares and a corresponding elevated cost of capital for China. Table 8 summarizes the menu of risks and returns available to global USD equity investors, based on tradable-value-weighted monthly stock market returns from 1995 to 2016. As the table shows, mean monthly USD excess returns in China have been almost double those of the US and Europe over the period. Stock market volatility in China has also been double that of the western markets. However, from the viewpoint of a well-diversified investor considering adding a new asset to his or her portfolio, volatility is not the relevant measure of the asset's contribution to portfolio risk. Instead, an asset's contribution to portfolio risk is measured by its covariance with the portfolio return. By this measure, China's stock market looks very attractive. Whereas the stock market returns across the developed economies are highly correlated, likely reflecting a high degree of financial market integration, China's stock returns have very low correlation with the other markets. China's stock market offers global investors the opportunity for diversification as well as high average returns. This point has not to our knowledge been emphasized in the literature.[10]

To quantify the extra return China's stock market offers global USD investors given its high mean and low correlation, and thus the elevation in China's cost of capital, Table 9 presents its alphas with respect to the US and global Fama-French-Carhart factors over the period 1995–2016. As the table shows, China's stock market delivered an alpha of almost 1% per month to USD investors over the period. These high potential returns for global investors also amount to a high cost of capital for Chinese firms. A large literature provides both theory and evidence on the positive effects of liberalization and integration on emerging markets' cost of capital, investment, growth, and investment opportunities for foreign investors through improvements in risk sharing across countries. In samples of up to 25 countries, Henry (2000a,b, 2003) and Chari, Henry, and Sasson (2012) find that stock market liberalizations reduce cost of capital and boost investment, growth, and wages. Chari and Henry (2004, 2008) study the effect of market liberalization at the firm level and show how stock prices and corporate investment respond to reductions in cost of capital that occur after liberalization. Our evidence suggests that China has much to gain from lowering explicit and implicit barriers to its stock market and accelerating reforms that would attract foreign capital.

[10]In fact, Cotter, Gabriel, and Roll (2018) emphasize just the opposite.

4 Conclusions

China's stock market is the world's second largest, yet it is not a significant channel for capital allocation in an investment-driven economy dominated by the state-owned banking sector. However, there is increasing skepticism as to whether this bank-centered model, which has been responsible for unprecedented levels of growth in the past, is capable of sustaining such growth going forward. Is the stock market ready to take on a greater role? This paper presents evidence that it is.

We show that, counter to common perception, stock prices in China have become as informative about firm future profits as they are in the US. The rise in stock price informativeness in China since the reforms of the early 2000s has coincided with an increase in corporate investment efficiency among private firms. However, price informativeness for SOEs fell below that of private firms after the post-crisis economic stimulus and failed to precipitate a parallel increase in investment efficiency. These results suggest that China's stock market has the potential to allocate capital and guide corporate investment efficiently, highlighting the urgency of reforming the listing registration process to open China's stock market to a wider range of issuing firms. Interestingly, allowing Chinese companies to raise equity capital by dual listing on foreign exchanges may degrade the power of the market to aggregate information efficiently, whereas allowing foreign investors to invest in the Chinese market appears to have no such negative effect, emphasizing further the important role of domestic markets.

Finally we present preliminary evidence on the cost of equity capital faced by Chinese firms based on average realized returns over the period 1995 to 2016. We find that the realized CNY equity premium in China was higher than the USD equity premium in the US, consistent with the higher volatility of returns in China and lower opportunities for international diversification. In addition, China's stock market delivered a USD alpha of almost 1% per month relative to traditional US and global benchmarks, consistent with the hypothesis that the risk of trading and repatriation suspensions faced by foreign investors is elevating China's equity cost of capital.

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Table 1: Stock price informativeness about future profit: China vs. the US

Predicted variation $b_t \times \sigma_t(\log(M/A))$ and White-heteroscedasticity-consistent t-statistics (in parentheses) from annual cross-sectional regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_t + b_t \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k}$$

for China and the US for forecasting horizons $k = 3$ and 5. The columns labeled p-val report the probability level in percent at which the null hypothesis that the coefficients in the US and China are equal can be rejected in favor of the alternative hypothesis that the US coefficient is greater, under the assumption that the coefficient estimates are uncorrelated across countries.

	$k=3$					$k=5$				
	China		US			China		US		
	Pred var	t-stat	Pred var	t-stat	p-val	Pred var	t-stat	Pred var	t-stat	p-val
1995	0.018	(2.82)	0.056	(8.85)	0.0	0.028	(3.98)	0.057	(5.57)	1.1
1996	0.035	(5.43)	0.039	(5.82)	34.9	0.028	(2.65)	0.084	(9.16)	0.0
1997	0.037	(6.01)	0.049	(8.29)	7.1	0.020	(2.69)	0.022	(1.72)	46.3
1998	0.021	(4.44)	0.060	(12.07)	0.0	0.001	(0.12)	0.024	(2.14)	3.3
1999	0.006	(1.43)	-0.005	(-0.52)	85.3	-0.002	(-0.41)	0.029	(3.55)	0.1
2000	0.001	(0.37)	-0.027	(-2.21)	98.7	-0.010	(-2.12)	0.047	(6.84)	0.0
2001	0.011	(2.98)	0.044	(6.88)	0.0	0.006	(1.27)	0.059	(8.09)	0.0
2002	0.006	(1.59)	0.062	(14.79)	0.0	0.016	(2.28)	0.065	(9.84)	0.0
2003	0.021	(6.04)	0.059	(14.64)	0.0	0.032	(4.58)	0.057	(6.99)	1.0
2004	0.038	(6.71)	0.037	(6.02)	57.0	0.050	(5.97)	0.073	(7.20)	3.9
2005	0.043	(6.12)	0.041	(5.50)	54.6	0.041	(4.53)	0.046	(4.57)	34.5
2006	0.050	(7.08)	0.039	(3.60)	82.2	0.090	(4.45)	0.067	(8.97)	86.3
2007	0.048	(5.97)	0.061	(10.35)	9.9	0.062	(4.65)	0.063	(8.99)	47.9
2008	0.059	(6.71)	0.046	(12.29)	90.3	0.073	(6.73)	0.055	(9.53)	93.3
2009	0.057	(5.48)	0.064	(15.23)	24.6	0.046	(6.21)	0.063	(12.23)	3.1
2010	0.051	(7.22)	0.055	(12.06)	33.6	0.077	(7.16)			
2011	0.031	(8.38)	0.041	(10.41)	3.4	0.076	(7.59)			
2012	0.035	(7.70)								
2013	0.047	(8.26)								

Table 2: State ownership and stock price informativeness about future profit

Estimates of the coefficients b_1, b_2, and $b_2 - b_1$ along with their White-heteroscedasticity-consistent t-statistics (in parentheses) from panel regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_{0t} + a_{1t}X_{i,t} + (b_{0t} + (b_1 1_{t<2009} + b_2 1_{t\geq 2009})X_{i,t}) \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ ,$$

where $X_{i,t}$ is the firm's fraction of shares that are state-owned, for China for forecasting horizons $k = 3$ and 5 over the period 1995 to $2016 - k$. The row labeled Cross-sectional contains the corresponding subperiod averages of estimates of yearly interaction coefficients b_{1t} from annual cross-sectional regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_{0t} + a_{1t}X_{i,t} + (b_{0t} + b_{1t}X_{i,t}) \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ .$$

	$k=3$			$k=5$		
	b_1	b_2	$b_2 - b_1$	b_1	b_2	$b_2 - b_1$
	0.009	-0.055	-0.064	0.012	-0.115	-0.127
	(1.63)	(-6.79)	(-6.52)	(1.29)	(-7.18)	(-7.07)
Cross-sectional	0.012	-0.062	-0.075	-0.004	-0.132	-0.128

Table 3: Dual listing and QFII ownership and stock price informativeness

Estimates of the coefficient b_1 and their White-heteroscedasticity-consistent t-statistics (in parentheses) in panel regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_{0t} + a_{1t}X_{i,t} + (b_{0t} + b_1 X_{i,t}) \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k}$$

for China for forecasting horizon $k = 3$ and 5 over the period 1995 to 2016-k. In the first panel, $X_{i,t}$ indicates whether firm i has dual-listed H shares in year t. In the second panel, $X_{i,t}$ is the fraction of firm i's shares that are owned by qualified foreign institutional investors in year t. The last row in each panel reports the average of cross-sectional interaction coefficients estimated on a year-by-year basis. "Controls" indicates the inclusion of the dual-listing indicator, QFII ownership, and state ownership in the specification.

H shares listed			
	k=3	k=5	Controls
	-0.015	-0.035	No
	(-4.09)	(-5.23)	
	-0.010	-0.024	Yes
	(-2.48)	(-3.42)	
Cross-sectional	-0.008	-0.029	Yes
QFII ownership			
	k=3	k=5	Controls
	0.005	0.003	No
	(0.93)	(0.39)	
	0.007	0.008	Yes
	(1.34)	(0.89)	
Cross-sectional	0.023	0.024	Yes

Table 4: Stock price informativeness about future investment

Predicted variation $b_t \times \sigma_t(\log(M/A))$ and White-heteroscedasticity-consistent t-statistics (in parentheses) from annual cross-sectional regressions of the form

$$\frac{I_{i,t+k}}{A_{i,t}} = a_t + b_t \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t \frac{I_{i,t}}{A_{i,t}} + e_t^s 1_{i,t}^s + \varepsilon_{i,t+k}$$

for China for forecasting horizons $k = 1$, 3, and 5.

	$k=1$		$k=3$		$k=5$	
	Pred var	t-stat	Pred var	t-stat	Pred var	t-stat
1995	0.009	(1.23)	0.034	(2.48)	0.067	(3.04)
1996	0.022	(2.72)	0.058	(3.54)	0.104	(3.27)
1997	0.011	(1.70)	0.051	(3.72)	0.087	(4.30)
1998	0.006	(1.26)	0.039	(3.42)	0.051	(2.63)
1999	-0.003	(-0.67)	0.006	(0.64)	0.008	(0.52)
2000	-0.002	(-0.70)	-0.002	(-0.20)	-0.026	(-1.73)
2001	0.000	(-0.09)	0.001	(0.17)	0.036	(1.47)
2002	0.000	(0.10)	-0.009	(-1.01)	0.055	(2.06)
2003	0.002	(0.50)	0.032	(2.43)	0.085	(3.56)
2004	0.006	(1.59)	0.048	(3.24)	0.086	(3.20)
2005	0.002	(0.56)	0.040	(3.20)	0.099	(3.87)
2006	0.008	(1.86)	0.030	(2.25)	0.113	(3.96)
2007	0.006	(1.44)	0.040	(2.75)	0.170	(4.67)
2008	-0.003	(-0.83)	0.047	(3.14)	0.195	(5.56)
2009	0.006	(1.73)	0.090	(5.24)	0.217	(6.32)
2010	0.010	(2.62)	0.086	(5.59)	0.235	(7.09)
2011	0.011	(3.05)	0.069	(5.66)	0.153	(6.04)
2012	0.003	(1.12)	0.045	(4.31)		
2013	0.007	(2.50)	0.034	(3.55)		
2014	0.001	(0.22)				
2015	0.001	(0.42)				

Table 5: State ownership and stock price informativeness about future investment

Estimates of the coefficients b_1, b_2, and $b_2 - b_1$ along with their White-heteroscedasticity-consistent t-statistics (in parentheses) from panel regressions of the form

$$\frac{I_{i,t+k}}{A_{i,t}} = a_{0t} + a_{1t}X_{i,t} + (b_{0t} + (b_1 1_{t<2009} + b_2 1_{t\geq 2009})X_{i,t}) \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t(\frac{I_{i,t}}{A_{i,t}}) + e_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ ,$$

where $X_{i,t}$ is the firm's fraction of shares that are state-owned, for China for forecasting horizons $k = 3$ and 5 over the period 1995 to $2016 - k$. The row labeled Cross-sectional contains the corresponding subperiod averages of yearly interaction coefficient estimates b_{1t} from annual cross-sectional regressions of the form

$$\frac{I_{i,t+k}}{A_{i,t}} = a_{0t} + a_{1t}X_{i,t} + (b_{0t} + b_{1t}X_{i,t}) \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t(\frac{I_{i,t}}{A_{i,t}}) + e_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ .$$

	$k=3$			$k=5$		
	b_1	b_2	$b_2 - b_1$	b_1	b_2	$b_2 - b_1$
	-0.009	-0.063	-0.054	-0.042	-0.157	-0.115
	(-0.61)	(-3.62)	(-2.49)	(-1.37)	(-3.28)	(-2.14)
Cross-sectional	0.020	-0.084	-0.104	0.027	-0.203	-0.230

Table 6: Efficiency of capital allocation

Predicted variation $b_t \times \sigma_t(I/A)$ and White-heteroscedasticity-consistent t-statistics (in parentheses) from annual cross-sectional regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_t + b_t \frac{I_{i,t}}{A_{i,t}} + c_t \frac{E_{i,t}}{A_{i,t}} + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k}$$

for China for forecasting horizons $k = 1, 3$, and 5.

	$k=1$		$k=3$		$k=5$	
	Pred var	t-stat	Pred var	t-stat	Pred var	t-stat
1995	0.003	(0.90)	0.005	(0.88)	0.008	(0.95)
1996	0.007	(2.56)	0.004	(0.58)	0.002	(0.29)
1997	0.018	(5.08)	0.014	(2.66)	0.015	(2.48)
1998	0.011	(4.81)	0.012	(3.54)	0.011	(1.82)
1999	0.010	(3.94)	0.012	(3.60)	0.013	(2.07)
2000	0.011	(5.32)	0.012	(4.32)	0.000	(0.00)
2001	0.011	(5.48)	0.018	(4.62)	0.002	(0.44)
2002	0.010	(4.87)	0.007	(2.19)	0.005	(0.78)
2003	0.018	(7.65)	0.009	(2.82)	0.009	(1.36)
2004	0.014	(5.91)	0.010	(2.19)	0.004	(0.87)
2005	0.010	(4.78)	0.004	(0.84)	0.010	(1.22)
2006	0.015	(3.67)	0.006	(1.20)	-0.005	(-0.40)
2007	0.027	(4.31)	0.020	(2.40)	0.010	(0.75)
2008	0.017	(4.58)	0.017	(2.16)	-0.008	(-1.01)
2009	0.012	(3.26)	0.004	(0.52)	0.003	(0.49)
2010	0.019	(6.67)	0.026	(3.64)	0.025	(2.29)
2011	0.014	(4.30)	0.013	(3.27)	0.013	(1.48)
2012	0.013	(4.74)	0.014	(2.81)		
2013	0.006	(2.72)	0.016	(2.38)		
2014	0.013	(5.68)				
2015	0.019	(7.37)				

Table 7: State ownership and efficiency of capital allocation

Estimates of the coefficients b_1, b_2, and $b_2 - b_1$ along with their White-heteroscedasticity-consistent t-statistics (in parentheses) from panel regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_{0t} + a_{1t}X_{i,t} + (b_{0t} + (b_1 1_{t<2009} + b_2 1_{t\geq 2009})X_{i,t})\frac{I_{i,t}}{A_{i,t}} + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ ,$$

where $X_{i,t}$ is the firm's fraction of shares that are state-owned, for China for forecasting horizons $k = 3$ and 5 over the period 1995 to $2016 - k$. The row labeled Cross-sectional contains the corresponding subperiod averages of yearly interaction coefficient estimates b_{1t} from annual cross-sectional regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_{0t} + a_{1t}X_{i,t} + (b_{0t} + b_{1t}X_{i,t})\frac{I_{i,t}}{A_{i,t}} + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k} \ .$$

	$k=3$			$k=5$		
	b_1	b_2	$b_2 - b_1$	b_1	b_2	$b_2 - b_1$
	0.178	-0.390	-0.567	0.201	-0.569	-0.770
	(3.55)	(-4.73)	(-6.28)	(2.29)	(-3.60)	(-4.56)
Cross-sectional	0.052	-0.270	-0.322	0.065	-0.472	-0.537

Table 8: Excess returns on stock markets in large economies 1995–2016

Annualized means and volatilities (in %) of monthly excess returns in stock markets in four large economies and their correlations over the period January 1995 to December 2016.

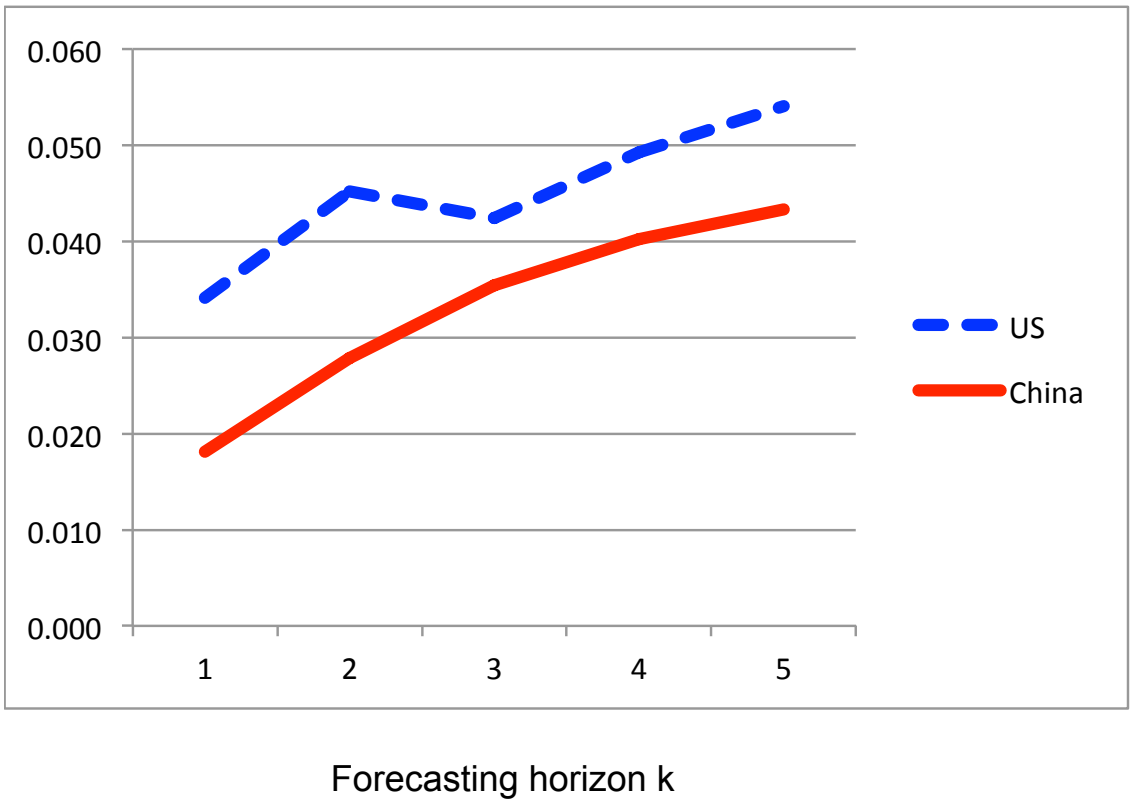
	China CNY	China USD	US USD	Europe USD	Japan USD
Mean	12.76	14.77	7.83	6.44	0.24
Volatility	31.53	31.63	15.32	17.51	17.95
Corr. with US		0.19			
Corr. with Europe		0.23	0.80		
Corr. with Japan		0.13	0.45	0.50	

Table 9: Alphas of China's stock market with respect to US and global factors 1995–2016

Monthly alphas (in %) of USD returns on China's tradable-value-weighted stock market portfolio with respect to the US and global Fama-French factors, and their Newey-West adjusted t-statistics (in parentheses) over the period January 1995 to December 2016.

US factors			Global factors		
1-factor	3-factor	5-factor	1-factor	3-factor	5-factor
0.97	0.97	0.90	0.99	0.90	0.81
(1.39)	(1.35)	(1.25)	(1.47)	(1.28)	(1.14)

Figure 1: Stock price informativeness about future profit by forecasting horizon

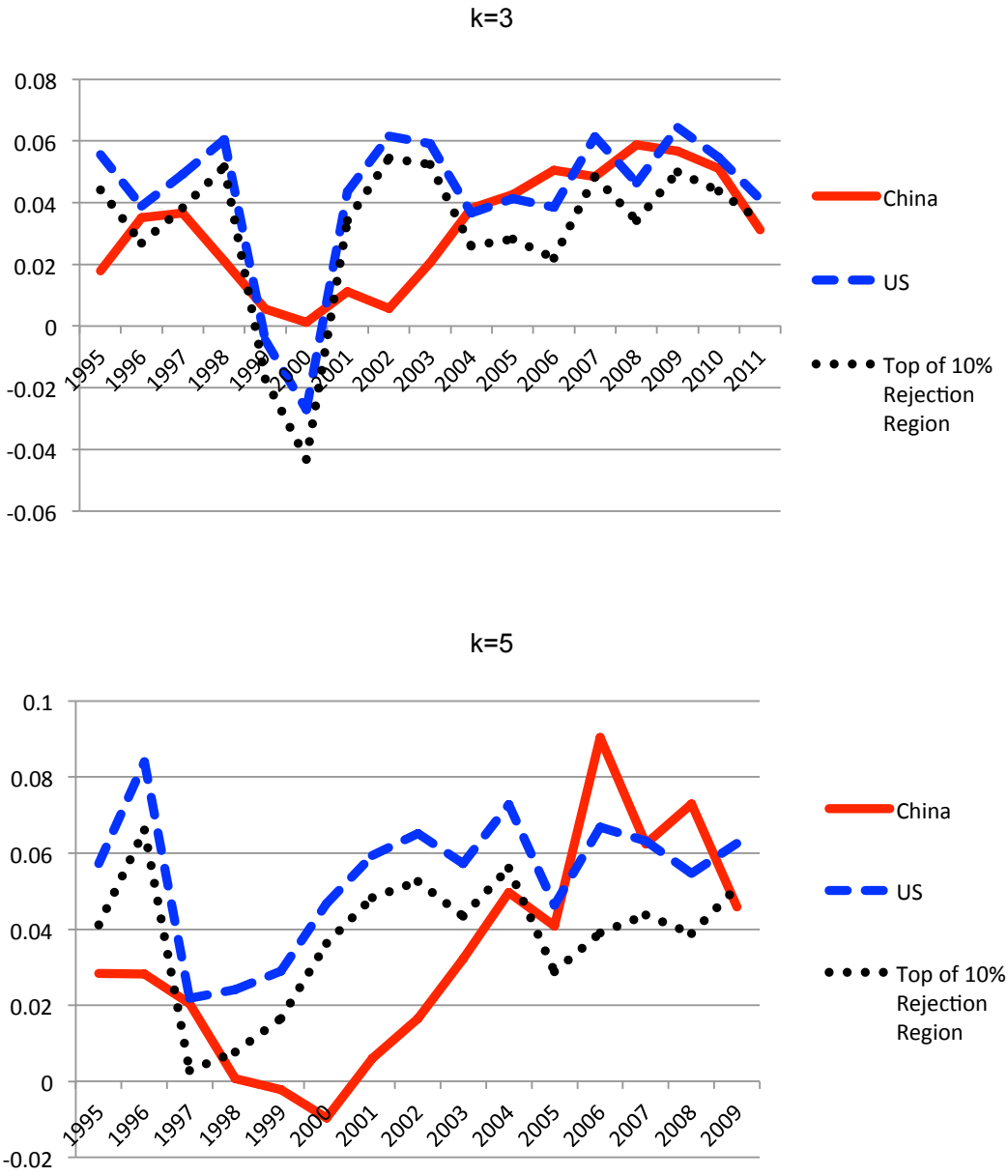


Time series averages of the predicted variation $b_t \times \sigma_t(\log(\frac{M_{i,t}}{A_{i,t}}))$ from annual cross-sectional regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_t + b_t \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k}$$

for forecasting horizons $k = 1$ to 5 over the period 1995 to $2016 - k$ for China and 1995 to $2014 - k$ for the US.

Figure 2: Stock price informativeness about future profit: China vs. US

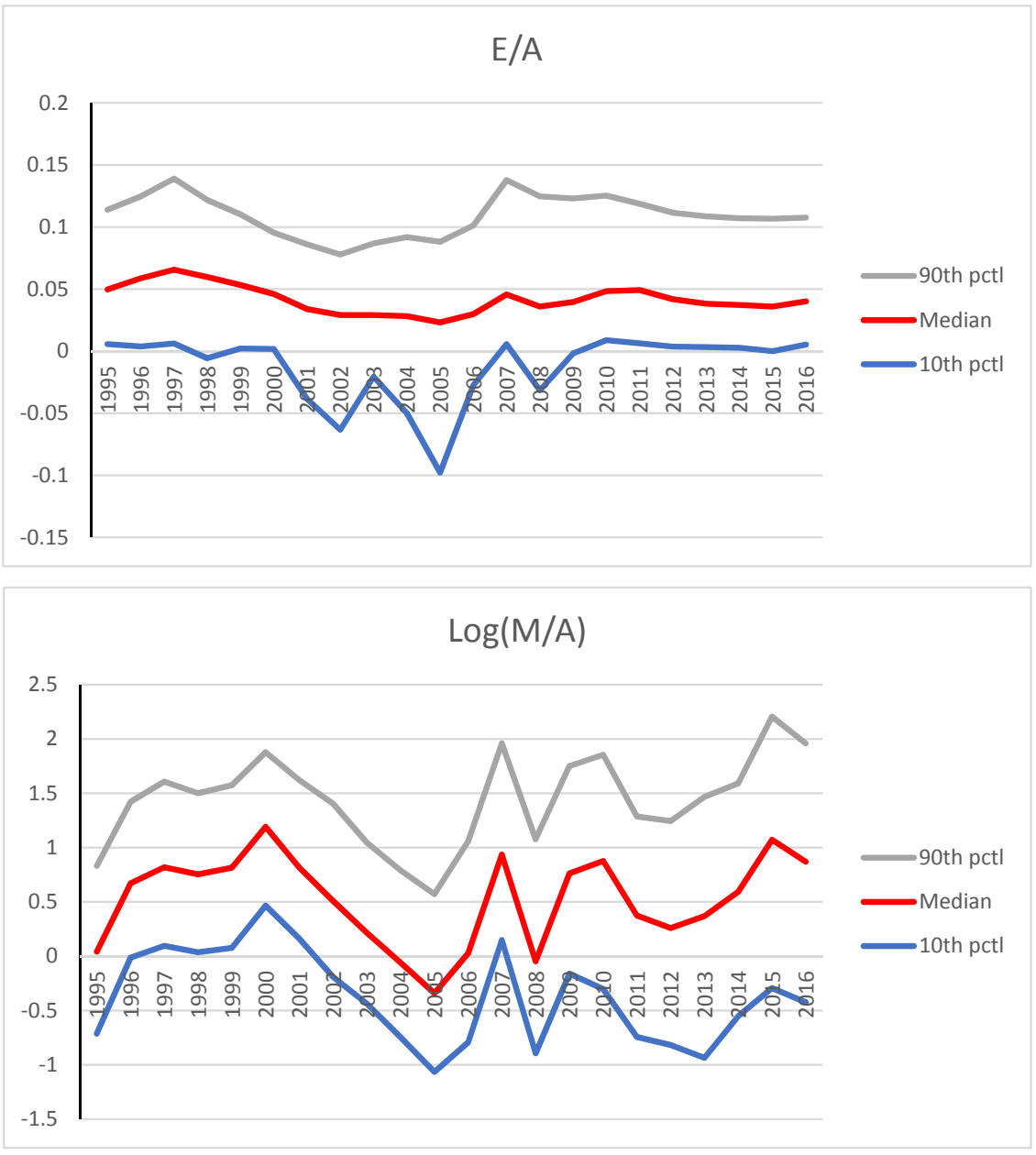


The solid and dashed lines plot the predicted variation $b_t \times \sigma_t(\log(\frac{M_{i,t}}{A_{i,t}}))$ from annual regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_t + b_t \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k}$$

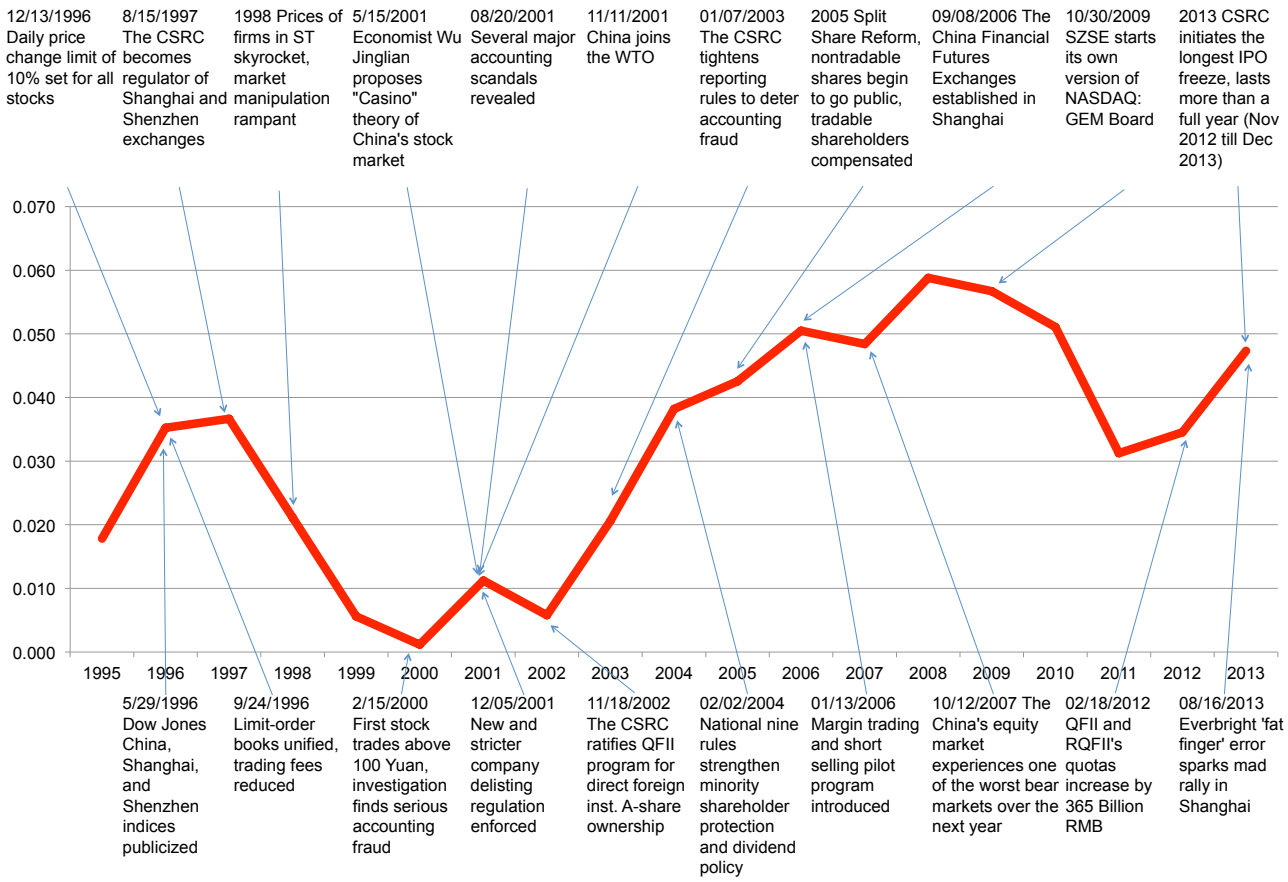
for China and the US. The dotted line shows the highest China price informativeness level for which the hypothesis that prices in China are as informative as in the US can be rejected at the 10% level in a one-sided test.

Figure 3: Descriptive statistics for profit and price ratios.



Annual, cross-sectional medians and the 10th and 90th percentiles of the profit ratio E/A and the valuation ratio $\log(M/A)$ in China for the period 1995-2016.

Figure 4: Stock price informativeness, regulatory reforms, and news events

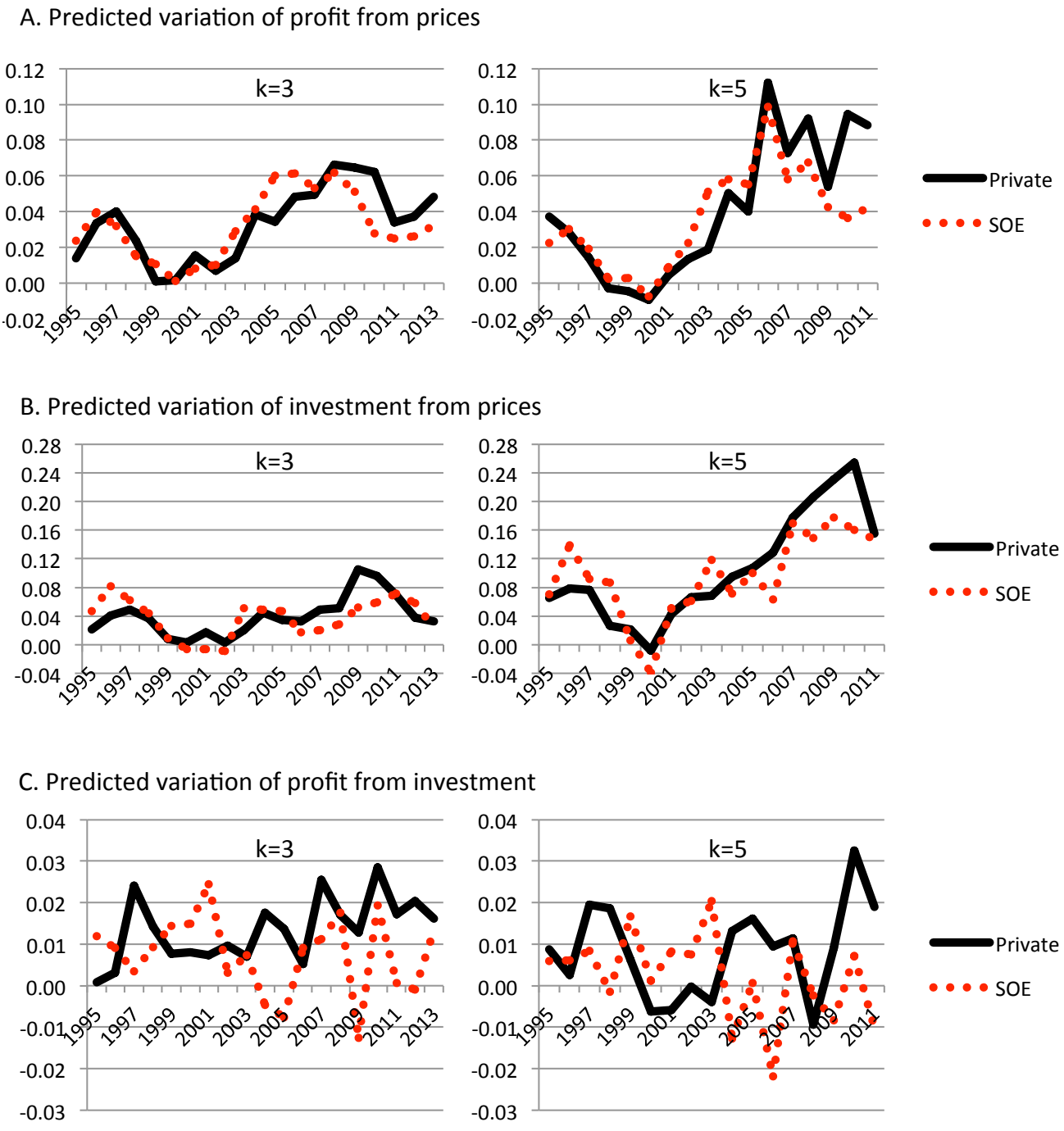


Predicted variation $b_t \times \sigma_t(\log(\frac{M_{i,t}}{A_{i,t}}))$ from annual cross-sectional regressions of the form

$$\frac{E_{i,t+k}}{A_{i,t}} = a_t + b_t \log(\frac{M_{i,t}}{A_{i,t}}) + c_t(\frac{E_{i,t}}{A_{i,t}}) + d_t^s 1_{i,t}^s + \varepsilon_{i,t+k}$$

for forecasting horizon $k = 3$, and the timing of various reforms and events that plausibly affected this predicted variation.

Figure 5: Privately-owned firms vs. SOEs in China



Privately-owned firms are defined as those with less than or equal to 40% of equity owned by the state and SOEs are defined as those with more than 40% state ownership. Panels A, B, and C show predicted variations from annual regressions specified in Equations (1), (2), and (3), respectively, for each subsample of firms.