State Ownership Structure and Asset Prices: Return Predictability in China*

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Abstract

We investigate the impact of state ownership structure on asset prices and corporate policies. By primarily focusing on China's corporations, we show that the return predictability by capital investment varies significantly across state owned enterprises and private owned enterprises. In particular, a portfolio that longs low investment and shorts high investment firms earns an average annual excess stock return of 3.5% in the SOE sector. In contrast, there is no relationship between investment and expected returns in the POE sector. We show that the difference in return predictability across SOE and POE firms is driven by their differential exposures to the China monetary supply shock as SOE firms have easier access to the debt market. This makes the high investment SOE firms more able to raise debt in bad times and hence are less risky. We develop a dynamic model with SOE and POE firms facing different frictions in debt markets. The economic mechanism emphasizes that heterogeneous access to the debt market is an important determinant of equilibrium risk premiums across sectors with different state ownership.

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1 Introduction

Over the last 40 years, China has experienced a large economic transformation involving fast growth in both the real economy and financial markets. Moreover, the economic expansion occurs in both state owned enterprise (SOE) and private owned enterprise (POE) sectors, despite distinct owership structures and different access to the financial market. An important under-explored question is to understand the impact of state ownership on asset prices and corporate policies. Empirically, we show that high investment firms are associated with lower expected stock returns in China's SOE sector. However, there is no relationship between firms' investment and expected returns in the POE sector. Furthermore, we show that their differential exposures drive the difference in return predictability across SOE and POE firms to the monetary supply (M2) shock in China. In particular, high investment firms in the SOE sector are able to increase the debt issuance in times of shrinking monetary supply. They hence are less exposed to monetary supply shocks. In contrast, POE firms in China do not have easy access to the debt market. Thus, there is no significant variation across high and low investment firms' exposures to the monetary supply shock in the POE sector. We develop a dynamic model economy wherein financial frictions play an important role in driving the variations of expected returns and corporate policies in SOE and POE firms. The economic mechanism emphasizes that heterogeneous access to the debt market is an important determinant of equilibrium risk premiums across sectors with different state ownership.

We start by showing that stock return predictability by investment varies across the SOE and POE firms in China. Specifically, in the SOE sector, firms with higher investment rates earn lower expected stock returns. A long low investment–short high investment firms portfolio earns an average annual excess stock return of 3.5%. In contrast, there is no significant relationship between investment and expected stock returns in POE firms. Furthermore, we show that the difference between the return predictability in SOE and POE firms is primarily driven by the differential impact of the monetary supply shock on these two sectors' debt issuance policies. In particular, in the SOE sector, high investment firms increase the new debt issuance despite in times of the contractionary monetary supply. This in turn implies that high investment SOE firms are more able to use debt to finance investment and increase profitability even in bad times. Hence they are less exposed to the adverse monetary supply shocks than low investment SOE firms. However, in the POE sector, neither high investment firms nor low investment firms can raise new debt when the monetary supply shrinks. As a result, they do not significantly respond to monetary supply shocks. Therefore high and low investment firms in the POE sector are not differentially exposed to the monetary supply shock. We interpret the results as evidence consistent with the view that SOE firms have easier access to the debt market in China and are more able to raise debt than POE firms (see, e.g., Song, Storesletten and Zilibotti 2011).

Theoretically, we develop a dynamic model economy wherein SOE firms and POE firms have heterogeneous access to the debt market. In particular, SOE firms face lower issuance costs in raising debt than POE firms, which is consistent with the view that SOE firms, due to the nature of being state-owned, usually have explicit or implicit advantages in raising loans from banks. In contrast, POE firms do not (see, e.g., Allen, Qian and Qian 2005 and Chang, Liu, Spiegel and Zhang 2019). Furthermore, the debt issuance cost is stochastic and varies over time due to an aggregate debt adjustment cost shock. We interpret the debt issuance cost shock as an aggregate shock to the supply of debt to firms, which captures the fact that China's monetary supply drives the debt supply to firms. More broadly and consistent with Bolton, Chen, and Wang (2013) and Eisfeldt and Muir (2016), the debt issuance cost shock acts as an additional source of aggregate economic fluctuations that is independent of aggregate productivity shocks, and is correlated with investor's marginal utility (stochastic discount factor). In particular, increases in the aggregate cost of issuing debt are associated with high marginal utility periods, that is, adverse economic times. Lastly, within the SOE and POE sectors, debt issuance is limited by a standard collateral constraint. Firms have different idiosyncratic productivity; they invest in physical capital, issue equity, and debt to maximize the firm's value for existing shareholders.

The model generates cross-sectional variation in expected stock returns across investment rate portfolios for SOE firms that is consistent with that observed in the data. This variation arises endogenously in the model due to the interaction between firms' productivity, investment, debt issuance cost shock, and costly equity financing. The economic mechanism driving the results relies on the time variation in firms' ability to raise different marginal sources of external financing (equity and debt) during bad economic times (high marginal utility states). Because high investment firms can raise debt more easily even when the supply of debt decreases, which are high marginal utility states, these firms are less risky in equilibrium. Furthermore, the model also generates the no-relationship between investment and expected stock returns for POE firms.

The exact economic mechanism in the model operates as follows. Within the SOE sector, firms with high idiosyncratic productivity are expanding firms with high investment demand. When a negative debt issuance cost shock hits the economy, it becomes more difficult for all firms to raise debt. But the high productivity firms can still finance investment through debt because their collateral constraint is less binding and hence are still able to increase their future dividend payout allowing its continuation value to increase. As a result, these firms are relatively less affected by the debt issuance cost shock, and hence their returns covary less with the debt shock. Therefore, these firms have relatively lower risks and thus lower expected stock returns in equilibrium.

Compared with the SOE firms with high idiosyncratic productivity, the SOE firms with low idiosyncratic productivity are relatively more affected by the negative debt issuance cost shock. These firms are experiencing a decrease in their productivity, causing sales and profits to fall. These firms want to downsize, and hence the capital stock of these firms is shrinking. Because of the decrease in internal funds (sales), and more importantly, the increase in the cost of debt financing (external equity is costly and hence it is hard for them to use the equity to payoff the debt), the low productivity firms de-leverage to avoid hitting the binding collateral constraint as their collateral value falls. Their dividend payout falls below the steady-state level for a long time, and their continuation value falls. As a result, these firms are relatively more affected by the debt issuance cost shock, and hence their returns covary more with this aggregate shock.

Therefore, these firms have relatively higher risks and, thus, higher expected stock returns in equilibrium. In the model, and consistent with the data (see, e.g., Imrohoroglu and Tuzel, 2014), the high productivity firms tend to be high investment firms. Thus, the model generates a sizable investment return spread for SOE firms consistent with the data.

In contrast, for the POE firms, debt issuance cost is much higher than that of the SOE firms. As a result, when a negative debt issuance cost shock hits the economy, neither high productivity firms nor low productivity firms can raise new debt to finance investment or existing debt payment due. Moreover, since equity financing is costly, both high and low investment firms cannot use equity to smooth their responses to debt issuance cost shocks. Thus, there is no significant difference in their exposures to the debt issuance cost shock. Therefore, high investment firms and low investment in the POE sector earn similar expected returns in equilibrium.

2 Related literature

A fast-growing literature investigates the relationship between the China economy and China's financial markets. Empirical research on China's stock market usually applies the three factors proposed by Fama and French (1993), the volatility factor, the momentum factor, etc., to study the stock return variations in China. For example, Liu et al (2019) construct a Chinese three-factor model and find that the investment factor is not significant in China stock market. We differ from Liu et al by showing that investment predicts expected returns in the SOE sector and this is driven by SOE investment firms' exposure to the monetary supply shock.

This paper is closely related to the extensive literature on capital misallocation in China, particularly between the SOE and POE sectors. Hsieh and Klenow (2009) qualify the misallocation in China and show that if capital and labor are as efficiently allocated as in the US, China's manufacturing TFP can increase by 30% - 50%. Song et al. (2011) show that low aggregate TFP in China results from micro-level resource misallocation between SOEs and POEs, and SOEs are, on average, less productive and have better access to credit markets than

POEs. Whited and Zhao (2020) show that financial friction plays a great role in explaining capital misallocation in China. Bai et al. (2018) find that SOE firms in China get cheap loans relative to POEs. Chang et al. (2019) also point out that because of the explicit or implicit guarantees of Chinese governments, SOEs are more likely to obtain loans from banks than POEs. Carpenter et al. (2020) find a significant correlation between stock price informativeness and investment efficiency for POEs, but not for SOEs because of the benefits from the Chinese government. Song and Xiong (2018) provide a comprehensive study of China's financial system. We differ from these papers by focusing on the impact of misallocation between SOE and POE firms on expected stock return predictability.

This paper is also related to the literature that examines the impact of financial frictions on corporate investment and asset prices.[1] The work most closely related to ours is Bolton, Chen, and Wang (2013), who study firms' investment, financing, and cash management decisions in a dynamic q-theoretic framework in which, similar to our model, external financing conditions are stochastic, and Eisfeldt and Muir (2016), who infer the aggregate cost of external (debt and equity) finance by using firms' cross-sectional investment, financing, and saving decisions in a dynamic model. Indeed, the use of firm-level cross-sectional data to construct an empirical proxy of the aggregate shock to the cost of equity issuance closely follows the empirical approach in Eisfeldt and Muir (2016). Our analysis is complementary to these studies in that we focus on the impact of the time-varying debt issuance cost on risk premiums in the cross-section. This dimension is not examined in these studies. Additionally, Lamont, Polk, and Saa-Requejo (2001) find that constrained firms are subject to common shocks but have low average returns in a sample of manufacturing firms from 1968 to 1997. We differ in that we explore both theoretically and empirically the implications of debt issuance cost shock for asset prices and corporate financing policies across sectors with different state ownership.

A related literature that studies asset prices in production economies has primarily focused on aggregate shocks that originate in the real sector, for example, aggregate productivity shocks,

[1] See, for example, Hennessy and Whited (2005, 2007), Carlson, Fisher, and Giammarino (2006), Bolton, Chen, and Wang (2011), DeMarzo et al. (2012), and Bolton, Wang, and Yang (2014), among others.

investment-specific shocks (e.g., Kogan and Papanikolaou, 2013, 2014) and adjustment cost shocks (e.g., Belo, Lin, and Bazdresch, 2014), or shocks that originate from changes in monetary and fiscal policies.[2] Our paper differs in that we focus on the variations in the state ownership along with financial shocks which allow us to provide a novel mechanism to explain the return predictability across sectors. This mechanism is also different from Koijen, Lustig, and Van Nieuwerburgh (2017), who highlight the different exposure of value and growth firms to shocks signaling future economic growth, and Garleanu, Kogan, and Panageas (2011), who study the link between displacement risk and asset returns

Recent work in macroeconomics investigates the impact of financial shocks (frictions) on aggregate quantities. Unlike the shocks to the credit supply highlighted in Jermann and Quadrini (2012) and Khan and Thomas (2013), we focus on an aggregate shock to the cost of debt issuance on the implications of this shock for risk premiums in the cross-section. The financial frictions in our model are similar in spirit to Bernanke and Gertler (1989), Kiyotaki and Moore (1997), and Bernanke, Gertler, and Gilchrist (1999), among others. The difference is that disturbance in the financial sector acts as a source of aggregate economic fluctuations in our model (like in Jermann and Quadrini, 2012; Khan and Thomas, 2013) instead of propagating shocks that originate in other sectors of the economy.

The paper proceeds as follows. Section 3 shows the empirical links between investment and stock returns in the SOE and POE sectors. Section 4 presents an production-based asset pricing model with financial frictions that we use to understand the empirical evidence. Section 5 calibrates and solves the model numerically, reports the fit of the model on the cross section of stock returns and also provides a detailed analysis of the economic mechanisms driving the results. Finally, Section 6 concludes. A separate appendix with additional results and robustness checks is posted online.

[2]For example, Jermann (1998), Kaltenbrunner and Lochstoer (2010), and Favilukis and Lin (2016), among others, study the asset pricing implications of aggregate productivity shocks. Papanikolaou (2011) and Kogan and Papanikolaou (2013, 2014) focuses on investment-specific shocks. Gilchrist and Leahy (2002) study the relationship between monetary policy and asset prices. Kung et al. (2012) explore the market price of fiscal policy risk.

3 Empirical evidence

In this section, we investigate the empirical links between investment, debt issuance, stock returns and monetary shocks (M2 shock) in the POE and SOE firms in China. We use the results reported here to motivate the model with financial frictions that we present in Section 4.

3.1 Data

We describe the data used in the empirical tests and report the characteristics of typical firms for both SOEs and POEs. The China's domestic stock exchanges, located in Shanghai and Shenzhen, were established in 1990, which also known as the A-share market. By the end of 2019, there were 3760 listed firms in China's A-share market. The total market value of these listed firms is 59.2 trillion RMB, which accounts for about 60% of China's GDP. Since 2014, China's A-share market became the second largest stock market, next to the US market, in the world.

According to the nature of the property rights of actual controlling shareholders, Chinese listed firms can be divided into state-owned (SOEs), private (POEs), foreign-funded, and other firms. The observations of state-owned and private firms account for more than 90% of the overall observations. The state-owned firms have very close relationship to the central government and may enjoy some investment and financing advantages (Amstad, Sun and Xiong, 2020). Hence, we use the annual the nature of the property rights data to identify state-owned and private firms.

The stock return data we use are from China Stock Market & Accounting Research Database (CSMAR), one of the major financial data providers in China. The period for trading data is from July 2004 to June 2019, and the period for firm financial data is from 2003 to 2018. The sample includes firms listed in China's domestic stock market, Shanghai and Shenzhen exchanges. We exclude financial firms and observations in the first six months since the listing.[3]

[3]Since the Chinese stock market has not yet implemented the registration system, the stock prices of Chinese listed firms tend to rise significantly in the first few months of listing.

The key variable for the empirical work is the firm's investment rate. The firm-level investment rate is given by

$$IK_t = \frac{I_t}{0.5\,(K_{t-1} + K_t)},$$

in which the physical capital stock K_t is given by net fixed assets, and physical capital investment I_t is given by the change of gross fixed assets plus the decrease in accumulated depreciation.[4]

3.2 Returns of SOE and POE sectors

Table 1 reports the aggregate annual returns and excess returns of SOE and POE sectors. The equal-weighted and value-weighted annual returns of the POE sector are 24.14% and 17.84%, respectively, 3.47% and 4.89% higher than those of the SOE sector. Moreover, the standard deviation (STD) of the POE return is also higher than that of the SOE sector.

[Insert Table 1 here]

Table 2 reports the exposures of the aggregate returns of SOE and POE sectors to the China monetary supply shock constructed by Chen et al. (2018). For the SOE sector, the slope of the monetary supply shocks is statistically significant and positive, indicating that the monetary supply shocks have a positive impact on the returns of SOE sector. Similarly, for the POE sector, the slope of the monetary shocks is significantly positive as well, but higher than that of SOE sector. This implies that the monetary supply shock has a bigger influence on the returns of the POE sector as a whole. Futhermore, we find similar result using excess returns of POE and SOE sectors.

[Insert Table 2 here]

[4]According to accounting standards, gross fixed assets at time t - gross fixed assets at time t-1 = the changes in gross fixed assets = the purchase of gross fixed assets at time t - the gross value of the sales of gross fixed assets at time t = (the purchase of gross fixed assets at time t - (the net value of the sales of gross fixed assets at time t + the decrease in accumulated depreciation at time t) = physical capital investment at time t - the decrease in accumulated depreciation at time t.

3.3 Investment and returns of SOE and POE firms

In this section, we show the empirical links between the nature of the property rights heterogeneity and asset prices in the cross-section. Consistent with the standard neoclassical theory of investment (e.g., Cochrane 1991), we focus on the link between the firm's investment rate and future stock returns, and investigate how this link varies across Chinese state-owned and private firms. We follow two complementary empirical methodologies to examine this link: a regression approach and a portfolio approach. We present the firm characteristics of both SOEs and POEs in Table 3.

[Insert Table 3 here]

3.3.1 Firm-level Regression analysis

We first examine the link between the firm's investment rate and future stock returns using firm-level regressions. Specifically, we run standard firm-level cross-sectional regressions (Fama and MacBeth,1973) as well as pooled OLS firm-level stock return predictability regressions of the form:

$$\begin{aligned} r_{i,t} &= a + b \times IK_{i,t-1} + c \times HN_{i,t-1} + d \times IK_{i,t-1} \times Nature_{i,t-1} \\ &\quad + e \times HN_{i,t-1} \times Nature_{i,t-1} + f \times Nature_{i,t-1} + Controls_{i,t-1} + \epsilon_{i,t} \end{aligned} \tag{1}$$

in which $r_{i,t}$ is the firm i stock return, $IK_{i,t-1}$ and $HN_{i,t-1}$ are the lagged value of firm i investment and hiring rates, $Nature_{i,t-1}$ is a dummy variable that is equal to one if firm i is private-owned firm at year $t-1$, and $Controls_{i,t-1}$ are firm-level control variables including firm size, ROA, and leverage ratio.

[Insert Table 4 Here]

Table 2, columns 1 to 4, report the results from cross-sectional predictability regressions performed at a monthly frequency. The investment slope coefficient b is negative. When adding the interaction between investment rate and the nature dummy, the slope coefficients b and d become statistically significant. And the results are, in general, robust to the inclusion of lagged hiring rate, the interaction between lagged hiring rate and the nature dummy, and control variables. The regression's main coefficient of interest is the coefficient d on the interaction between investment rate and the nature dummy, which is reported in row 3. Across all specifications, the slope coefficient d is estimated to be positive, and is statistically significant. Thus, the negative investment-future return relation is significantly steeper in SOEs sector than in POEs sector.

The results from pooled OLS predictability regressions reported in table 2, columns 5–8, are also consistent with the previous analysis. The estimation here is performed at an annual frequency and includes firm and year fixed effects. The difference in the investment rate slope coefficient in SOEs and in POEs sector is economically large. In column 6, the slope coefficient on the interaction of investment rate and the nature dummy is 0.044, whereas the slope coefficient on the investment rate variable alone is -0.076. This difference is large in economic terms: A 10% increase in the firm's investment rate, is associated with a decrease of 0.76% in firms' expected stock return in the SOEs sector, and with a decrease of 0.44% in firm's expected stock return in the POEs sector. The previous qualitative analysis does not change significantly when we include firm's lagged hiring rate, the interaction between lagged hiring rate and the nature dummy, and control variables in columns 7-8.

3.3.2 Portfolio-level analysis

We form three one-way-sorted on investment rate portfolios separately in the SOEs and in POEs sector, and compute the post-formation average excess stock returns (in excess of the risk-free rate) of each portfolio. Specifically, at the end of June of year t, we sort all firms in a given sector into three portfolios based on the firm's investment rate at the end of year $t-1$. The investment rate breakpoints used to allocate firms into portfolios are the quintiles of the hiring rate cross-sectional distribution of all firms in the sector. Once the portfolios are formed, their returns are tracked from July of year t to June of year $t+1$. The procedure is repeated at the end of June of year $t + 1$.

[Insert Table 5 Here]

To compute the portfolio-level average excess stock return in each period, we weigh each firm equally in the portfolio because the influence of large-cap firms. Table 5 reports our empirical findings in portfolios level. The table reports the average excess stock returns (r^e), Sharpe ratios (SR), CAPM alphas (α), and market betas (β) of the investment portfolios in the SOEs sector (left columns) and POEs sector (right columns). The average stock return of a long low investment rate–short high investment rate firms portfolio is positive in SOEs and POEs sectors. This means that the relation between firms' current investment rate and future stock returns is negative. The investment return spread is significantly higher in the SOEs sector than in the POEs sector. In particular, the investment return spread is 3.47% per annum in the SOEs sector, and this value is more than 2 standard errors from zero. In the POEs sector, the investment return spread is only 0.33% per annum, and this value is 0.13 standard errors from zero. The difference (in absolute terms) of the investment return spread in the SOEs and POEs sectors is economically large, about 3.14% per annum, and the Sharpe ratio of the investment spread portfolio is also significantly higher in SOEs sector than in POEs sector, 0.56 versus 0.04, respectively. These results are consistent with the results from the firm-level regression approach.

The asset pricing tests of the CAPM reported in Table 5 show that the CAPM performs reasonably well in the POEs sector, but it performs poorly in the SOEs sector. In particular, the CAPM alpha of the investment spread portfolio in the SOEs sector is economically large, 3.31% per annum, which is more than 2 standard errors from zero, and is significantly higher than the alpha of the investment return spread in the POEs sector.

3.4 Asset prices, debt issuance and monetary supply shocks

In this section, we provide empirical support for link between return predictability in SOE and POE firms and the Chinese monetary supply shock.

To understand the economic mechanism driving the different relationship between capital investment and expected stock returns in the SOE and POE sectors, we examine the links between firms' investment, debt issuance, profitability and expected returns and the supply shock to debt, which we use the monetary supply shock to proxy for.

3.4.1 The Chinese monetary supply shock

In the model, the aggregate adjustment cost shock changes the firm's ability to adjust its debt (See the detailed discussion in the model session). As a result, the debt adjustment cost shock has a direct impact on the amount of debt adjustments in the economy: when adjustment costs are low, one should expect relatively more firms to be adjusting its debt, and vice-versa when adjustment costs are high.

China has a unique quantity-based monetary system and always use M2 growth as the intermediate target to support growth of gross domestic product (GDP). M2 is the most important monetary policy tool used by the Chinese central government. The money supply can affect the lending capacity of Chinese financial institutions, which can significantly affect the cost of loans for firms. Chen et al. (2018) develop and estimate the endogenously switching monetary policy rule that is tractable in the spirit of Taylor (1993). They use M2 growth as the intermediate tool of Chinese central bank instead of interest rates, and obtain a time series of monetary policy shock. Hence, we use the monetary policy shocks constructed by Chen et al. (2018) as the adjustment cost shock of debts for firms.

3.4.2 Heterogeneous impact of monetary shocks for SOE and POE firms

To further test the model's economic mechanism, we use the adjustment cost shock proxy to compare the responses of the firm's main accounting variables to the monetary supply shock in both the model and in the real data. To examine these responses, we estimate the following panel OLS regression:

$$\begin{aligned} \Pi_{i,t+h} &= a + b \times \Pi_{i,t-1} + c \times M_t + \\ & \sum_{j=2}^{3} (d_j \times Pj_t + e_j \times Pj_t \times M_t) + \epsilon_{i,t} \\ \text{where } h &= 0, 1 \end{aligned} \tag{2}$$

$\Pi_{i,t+h}$ is the change of accounting variables (including the differences of cash-flow, debt-flow, investment rate) of listed firm i at time $t+h$. M_t is the monetary policy shocks constructed by Chen et al. (2018). Pj_t is the investment portfolios for $j = 2, 3$ quintile dummy, respectively. The regression coefficients of interest are the slope coefficients c and e_j. In particular, the coefficient e_j measures the differential exposure of the change of accounting variables for firms in the investment portfolio j relative to the exposure of the change of accounting variables for the firms in the low ($j = 1$) investment portfolio. When $h = 0$, the previous coefficients give the contemporaneous responses of the change of accounting variables to the adjustment cost shock, and when $h = 1$, the previous coefficients give the one year ahead responses. As such, Equation (2) can be interpreted as an impulse response function of the firm's the change of accounting variables to a positive one-standard-deviation adjustment cost shock. We estimate the equation separately across firms in the SOEs and POEs sectors.

[Insert Tables 6, 7 and 8 Here]

Tables 4, 5 and 6 report the estimates of the relevant slope coefficients of Equation (2). When adding control variables (including physical capital to market equity ratio, book capital to market equity ratio, Tobin Q, size, and leverage), the regression R-squared values adjusted for degree of freedom become better, and the results are also robust. Based on the results in Tables 6, 7, and 8, the responses of the firm's contemporaneous total debt and investment flows, and future cash flows to the monetary supply shock are in general strongly decreasing across the investment portfolios in SOEs sector. However, this decreasing pattern is not pronounced in POEs sector. This means that the SOEs that are investing relatively more (firms in the high investment portfolio) get relatively more loans and invest more when facing a negative monetary supply shock than the firms that are investing less. Because SOEs can obtain cheaper loans than POEs, firms with relatively more investment benefit more from a negative monetary supply shock than the firms with less investment. This differential exposures across the investment portfolios are much weaker in the POEs sector.

Taken together, the results from this analysis show that firms' differential exposures to the monetary supply shock is a plausible driver for the return comovement across the investment portfolios in the SOEs sector.

4 Model

The empirical results show that debt frictions account for the difference in investment return relations between SOE and POE. In this section, we present a dynamic investment-based model with financial frictions to understand the economic mechanism behind the empirical results.

4.1 Technology

There are two types of firms (each type contains a continuum firms): type $\mathcal{S}$ denote the set state-owned enterprises, and $\mathcal{P}$ is the index for private-owned enterprises. Both types of firms apply the same production technology. A firm j uses physical capital ($K_{j,t}$) to produce output $Y_{j,t}$. To save on notation, we omit firm index j whenever possible. The production function is give by

$$Y_t = A_t Z_t K_t \tag{3}$$

in which A_t is aggregate productivity and Z_t is firm-specific productivity. The production function exhibits constant returns to scale, which allows us to reduce the number of endogenous state variable by 1.

Aggregate productivity shock A_t follows an AR(1) process.

$$a_{t+1} = \rho_a a_t + \sigma_a \varepsilon^a_{t+1} \tag{4}$$

in which $a_{t+1} = log(A_{t+1}), \epsilon^a_{t+1}$ is an i.i.d standard normal shock and σ_a is the conditional volatility of aggregate productivity.

Firm-specific productivity Z_t also follows AR(1) processes.

$$z_{t+1} = \bar{z}\left(1 - \rho_z\right) + \rho_z z_t + \sigma_z \varepsilon^z_{t+1} \tag{5}$$

in which $z_{t+1} = log(Z_{t+1}), \epsilon^z_{t+1}$ is an i.i.d. standard normal shock that is uncorrelated across all firms in the economy and independent of ϵ^a_{t+1}. $\bar{z}, \rho_z$ and σ_z are the mean, autocorrelation, and conditional volatility of firm-specific productivity, respectively.

Physical capital accumulation is given by

$$K_{t+1} = (1 - \delta)K_t + I_t \tag{6}$$

where I_t represents investment and δ_t denotes the capital depreciation rate.

We assume that capital investment entails convex asymmetric adjustment costs, denoted as G_t, which are given by:

$$G_t = \begin{cases} \frac{c_k^+}{2}\left(\frac{I_t}{K_t} - \delta\right)^2 K_t, & I_t \geq \delta K_t \\ \frac{c_k^-}{2}\left(\frac{I_t}{K_t} - \delta\right)^2 K_t, & I_t < \delta K_t \end{cases} \tag{7}$$

where c_k^+ and c_k^- determine the upward and downward speed of adjustment. The capital adjustment costs represent costs associated with transforming new investment into productive capital. Such costs include installation costs, transportation costs of machines, or the interruption to ongoing production process. We model capital adjustment that exhibit some degree of asymmetry to capture costly reversibility of capital, that is, the assumption that downsizing capital stock costs more than expanding it. The costly reversibility can be micro-founded with resale losses or lemon problem in the market for used capital.

4.2 Costly debt financing

Firms use equity and short-term debt to finance investment. At time t, firms optimally choose the amount of borrowing B_t, which must be repaid at $t+1$. The firm's ability to borrow is bounded by the limited enforceability as firms can default on their obligations. Following Hennessy and Whited (2005, 2007), we assume that the only asset available for liquidation is the physical capital K_{t+1}. In particular, we require that the liquidation value of capital is greater than or equal to the debt payment. It follows that the collateral constraint is given by

$$B_{t+1} \leq \psi K_{t+1} \tag{8}$$

The parameter $\psi \in (0,1)$, measures the collateralizability of physical capital as well as the borrowing capacity of the firm. Because firms' lending are secured with collateral, the interest rate on the loan coincides with risk-free rate r_f, which is also constant due to the specification of the stochastic discount factor.

Firms also incur adjustment costs, denoted by Φ_t^B when issuing new debt. Importantly, we assume that new issuance cost depends on a firm's type. For example, a firm that belongs to the SOE ($\mathcal{S}$) group has debt issuance cost that is specific to that type,

$$\Phi_t^B = F^B(\mathcal{S})\Big(\frac{\Delta B_t}{B_t}\Big)\exp(-\eta\xi_t)\mathbf{I}_{\{\Delta B_t>0\}} \tag{9}$$

in which ξ_t captures the time-varying cost of new debt issuance. This shock follows an AR(1) process,

$$\xi_{t+1} = \rho_\xi \xi_t + \sigma_\xi \varepsilon_{t+1}^\xi \tag{10}$$

in which ρ_ξ and σ_ξ are the first-order autocorrelation coefficient and conditional volatility of ξ_{t+1}. ϵ_{t+1}^ξ is an i.i.d standard normal shock that is independent of aggregate and firm-specific productivity shocks.

The key feature of the formulation of issuance costs is that debt issuance costs are subject to an aggregate disturbance different from aggregate shocks to productivity. We interpret this shock as perturbations of debt financing that are not driven by firm's capital demand originated from the real sector; rather this shock directly originates from the financial sector due to changes in money supply.

SOE and POE firms differ in the debt issuance frictions they experience. As we show in later section, differences in debt frictions result in the difference in investment-return relations across the two groups of firms. Heterogeneity in debt frictions can be interpreted as the fact that SOE are favored by national banks. Therefore, their borrowing rates are lower and less affected by money supply changes in China, than POE firms.

4.3 Equity financing

Corporate payout E_t can be written as

$$E_t = (1-\tau)Y_t + \tau\delta K_t + \tau r_f B_t \mathbf{1}_{\{B_t \geq 0\}} - I_t - G_t + B_{t+1} - (1+r_f)\, B_t - \Phi_t^B \tag{11}$$

in which τ is t he corporate tax rate, $\eta\delta K_t$ is the depreciation tax shield, $\tau r_f B_t \mathbf{I}_{\{B_t \geq 0\}}$ is the interest tax shield.

When cost of operating a firm (the sum of investment and all costs) exceeds the sum of profits and debt financing, a firm can take external funds by issuing equity. External equity issuance H_t is given by

$$H_t = \max\left(-E_t, 0\right) \tag{12}$$

Following a large literature that documents costly equity financing (see Hennessy and Whited (2005, 2007), Bolton, Chen and Wang (2016)), we assume the external equity costs to be linear in the amount of equity issued. More specifically, we parameterize the equity issuance costs as:

$$\Psi\left(H_t\right) = \phi H_t \mathbf{1}_{\{H_t > 0\}} \tag{13}$$

in which parameter ϕ controls the per unit cost of issuing equity. Firms do not incur costs when paying dividends or repurchasing shares. The effective cash flow D_t distributed to shareholders is given by

$$D_t = E_t - \Psi_t \tag{14}$$

4.4 Firm's maximization problem

We specify the SDF as a function of the two aggregate shocks:

$$\Lambda_{t,t+1} = \frac{1}{1+r_f} \frac{e^{-\gamma_A \Delta A_{t+1} - \gamma_\xi \Delta \xi_{t+1}}}{\mathbb{E}_t \left[e^{-\gamma_A \Delta A_{t+1} - \gamma_\xi \Delta \xi_{t+1}} \right]} \tag{15}$$

where r_f is the risk-free rate. The prices of risk (γ_A, γ_ξ) for both types of shocks are positive. A positive price for debt issuance risk is consistent with the empirical evidence that a tightened money supply is associated with a contraction in economic activities, reported in later sections. We assume that the risk-free rate is constant.

Firms take the pricing kernel as given and choose investment, debt/equity issuance to maximize the present value of future dividend:

$$V_t(K_t, B_t, A_t, \xi_t, Z_t) = \max_{I_t, B_{t+1}, K_{t+1}} D_t + (1-\kappa_D)\mathbb{E}_t[\Lambda_{t,t+1} V_{t+1}(K_{t+1}, B_{t+1}, A_{t+1}, \xi_{t+1}, Z_{t+1})] \tag{16}$$

subject to capital accumulation equation (Eq. 6), collateral constraint (Eq. 8), the definition of payout (Eq. 11) and the definition of cash flow (Eq. 14). κ_D refers to a death shock which will be explained next.

4.5 Entry and exit

The production technology (Eq. 3) features a "AK" type of technology. The homogeneity property of production function, capital/debt/equity cost specification allows us to scale all variables by capital K_t, which essentially reduces the number of state variables by 1.

To guarantee stationarity for the endogenous firm distribution, we introduce exogenous entry and exit dynamics. In particular, at time t, if a firm is hit by a random death shock with probability κ_D, it immediately disappears from the economy and investors lose the stream of cash flow from it. New entrants enter the economy and the number of new entrants is identical to that of exiting firms. New entrants start with median level of firm level state variables and start to produce immediately upon entry.

4.6 Equilibrium risk and return

In the model, risk and return relations are determined endogenously in line with firm's optimal decisions. Our model features a two factor structure, and a firm's exposures to aggregate productivity and debt financing risks determine its expected returns. In particular,

$$E_t\left[r^e_{t+1}\right] = \gamma_A \times \text{Cov}\left(r^e_{t+1}, \Delta A_{t+1}\right) + \gamma_\xi \times \text{Cov}\left(r^e_{t+1}, \Delta \xi_{t+1}\right) \tag{17}$$

in which r^e_{t+1} is the excess return for stock. Recall that the prices of risk for both types of shocks are positive. This implies that all else equal, assets with returns that have a high positive covariance with the aggregate productivity shock are risky and offer high average returns in equilibrium. Similarly, all else equal, assets with returns that have a high positive covariance with the aggregate debt issuance cost shock are risky and offer high average returns in equilibrium.

5 Model results

In this section we calibrate the model to the data. All of the endogenous variables in the model are functions of the state variables. Because the functional forms are not available analytically, we solve for these functions numerically. We provide additional details for the solution algorithm and the numerical implementation of the model.

5.1 Calibration

The model is solved at quarterly frequency. We then time-aggregate the simulated accounting data so that model-implied moments are comparable with those in the data which typically comes in annual frequency.

Table 9 reports the parameter values used in the baseline calibration of the model. The model is calibrated using parameter values reported in previous studies, whenever possible, or by matching the selected moments in the data reported in Table 10.

To generate the model's implied moments, we simulate 3000 firms for each type (SOE and POE), for 10000 quarters. We drop the first quarter of the sample as warm-up period. We then simulate 30 parallel samples and report the cross-sample average results as model moments. We discipline our model using key firm-level quantities moments and do not explicitly target the cross section of return spread in the baseline calibration.

Firm's technology parameters. The collateralizability parameter ψ, as well as capital depreciation rate are standard in the literature that examines Chinese macro economy through the lens of DSGE models. See Song et al. (2011), Whited and Zhao (2016).

Firm's technology: adjustment cost and issuance costs. We calibrate the capital adjustment cost parameters to match several cross-sectional and time-series moments of firms' investment rates and debt growth rates. The asymmetric adjustment cost are to be $c_k^+ = 5.5$, $c_k^- = 15.5$. Because of the AK specification, firms endogenously grow depending on investment rate. An upward capital capital adjustment cost is set to 5.5 so that the average growth rate of firm size is close to the data. Together with a high downsize cost, our model is able to account for a large cross-sectional volatility of firm investment rate. Similarly, the quadratic debt adjustment cost parameter is chosen to match the cross-sectional standard deviation of debt issuance. We calibrate the fixed equity issuance cost to be consistent with the fact that Chinese firms tend to issue much less seasoned equity to finance their operations. *Stochastic processes.* In the model, the aggregate productivity shock is essentially a profitability shock. We set the conditional volatility of the aggregate productivity shock to be $\sigma_a = 0.055$ to match the volatility of aggregate profits. The stochastic process that determines debt issuance cost is pinned down by matching the aggregate debt-issuance-to-output ratio.

At the firm level, the persistence of conditional volatility of firm productivity are chosen to match the firm level return volatility. Because of the AK specification, the long-run average level of firm-level productivity, $\bar{z}$ determines the average investment rate in the model. To calibrate the stochastic discount factor, we set the real risk-free rate to be 2.25% per annum. The prices for productivity and debt issuance risks implies that the market excess return and Sharpe ratio are consistent with the key findings in the Chinese equity market. We conduct comparative statics in later section to evaluate the impact of these risk prices on the model's performance.

5.2 Main results

We replicate the portfolio sorts in the empirical section using the simulated data. We compare the model implied debt flows across the investment sorted portfolios with those in the data.

Panel A and B in Table 11 reports the average excess returns, debt flows, leverage, investment rate, and firm productivity across investment sorted portfolios, for each type of firms.

5.2.1 Risk premiums in the model: a tale of two sectors

The calibration of the baseline model generates a pattern of average excess returns across the investment portfolios that is similar to the pattern in the data. More importantly, the model replicates the negative relations between investment and excess return in the SOE sector as well as the insignificant investment return patterns in the POE sector. In the SOE sector, low investment (L) firms earn subsequently higher returns on average than high investment (H) firms. The size of the investment return spread is comparable with the data (2.02% per annum in the model versus 3.47% in the data). For the POE sector, the investment return spread is statistically indistinguishable from 0, a fact that is captured by our model.

The left panel in figure 1 reports the covariances of the investment sorted portfolios' returns with aggregate productivity shock and debt issuance shock, for firms in the SOE sector. The covariance with the debt issuance shock is decreasing in investment rate. More importantly, the difference between debt issuance βs for high low investment firms is sizable which indicate that the negative investment return relation in the SOE sector is mainly driven by exposure to the debt issuance cost shocks. On the other hand, the difference of productivity βs is small which cannot justify the sizable investment return spread between high and low investment portfolios in the SOE sector.

The right panel in figure 1 shows the covariances of the investment sorted portfolios' returns with aggregate productivity shock and debt issuance shock, for firms in the POE sector. High investment firms finance their investment through debt. Because POE firms face more severe frictions to issue new debt, high investment firms are more exposed to debt issuance shocks in the POE sector. Since excess returns are mostly driven by exposures to debt issuance shock, slightly higher exposures to issuance shock for high investment firms is translated into high excess returns than low investment firms in the POE sector.

5.2.2 Investment and debt flows across portfolios

The differential exposures to the debt issuance shock across investment sorted portfolios naturally reflects differences in the characteristics of the firms in these portfolios. To understand these differences and evaluate if the model is consistent with them, table 11 reports selected characteristics of the firms in the low investment (L), high investment (H), and spread (H-L) portfolios in both the real data (column "Data") and in the model (column "Model"). Panel A exhibits characteristics for SOEs and the lower panel B shows results for POEs.

We focus on the following firm characteristics that characterize the investment policies, debt financing flows, book leverage ratio, productivity of the firms, in each portfolio at the time of portfolio formation. We construct the average characteristics for each portfolio by first computing the median of each characteristic across all firms in the portfolio in a given year, and then report the corresponding time series averages.

Overall, for both POE and SOE firms, we document the patterns between investment, return, debt flow and productivity. Typically, L (H) firms are associated with low (high) productivities, low (high) investment rate, low (high) debt issuance, and high book leverage ratio. Table 11 shows that our quantitative model matches the pattern of the characteristics of these portfolios.

5.3 Inspecting the mechanism

In this section we perform several analyzes to understand the economic forces driving the overall good fit of the model.

To illustrate the economic mechanism behind the results reported in the previous sections, Figure 2 shows impulse response function of investment, dividend and continuation value to a one standard deviation negative aggregate debt issuance cost shock (an increase in debt issuance cost is associated with high marginal utility of the investors), for SOE firms respectively. We report the responses of each variable relative to its (time-detrended) long-run average level. Because all firms in the economy are ex-ante identical, we generate cross-sectional heterogeneity by examining the response of two firms in which their respective firm-specific productivity level is set at the highest (lowest) firm productivity state (we label these two firms as high and low productivity firms, respectively); furthermore, their productivity levels revert to the average level in 5 periods. The high and low productivity firms correspond to the high and low investment firms, for both the SOE and POE sectors. We focus on idiosyncratic productivity to distinguish firms because firm-specific productivity is the primary driver of cross-sectional heterogeneity.

Figure 2 displays the optimal investment, payout and continuation policies for SOEs, after an adverse debt issuance shock. High productivity firms increase their investment and expand in size while it is quite the opposite for low productivity firms. The increase in investment and adjustment costs associated with it are financed through issuing more debt. High productivity firms's dividend and continuation value both increase, which makes its equity a good hedge for debt financing risk, explaining the low debt issuance shock β for high investment firms in SOE sector (see the first subplot in 1). On the contrary, low productivity firms' dividend and continuation both fall below steady state level as the adverse shock hit the economy, leading to significant exposures to aggregate debt financing risks. This explains low productivity firms' aggregate debt financing βs.

6 Conclusion

This paper investigates the impact of state ownership on expected stock returns and corporate policies. By focusing primarily on China's state owned enterprise and privately owned enterprise, we show empirically and theoretically that state ownership is an important driving for firms' asset pricing and real and financing decisions. Specifically we show that stock return predictability by investment varies across the SOE and the POE firms in China. In the SOE sector, high investment predicts lower expected stock returns, whereas there is no significant relationship between investment and expected stock returns in POE firms. Furthermore we show that the difference between the return predictability in SOE and POE firms is driven by the differential impact of the monetary supply shock on debt issuance policies of these two sectors. In the SOE sector, high investment firms increase the new debt issuance despite in times of the contractionary monetary supply. This in turn implies that high investment firms are more able to use debt to finance investment and raise profitability even in bad times, and hence are less exposed to the negative monetary supply shocks than low investment firms. However, in the POE sector neither high investment firms nor low investment firms are able to raise new debt when the monetary supply shrinks, and hence they do not significantly respond to monetary supply shocks. As a result, high and low investment firms in the POE sector are not differentially exposed to the monetary supply shock. We develop a dynamic model economy wherein SOE and POE firms have heterogeneous access to the debt market. We show that this is an important determinant of equilibrium risk premiums across sectors with different state ownership.

The results reported here have implications for asset pricing, corporate finance, and macroeconomics literature. The findings suggest that 1) state ownership structure and 2) time variation in the aggregate cost of debt financing have significant impact on asset prices, real quantities, and financial flows in the cross-section. By affecting firms' investment and financing decisions, state ownership and financial shocks are likely to affect aggregate quantities as well. Thus, going forward, incorporating state ownership and aggregate shocks to the cost of debt financing in current dynamic stochastic general equilibrium (DSGE) models may be important for an accurate understanding of aggregate quantity dynamics, time-varying risk premiums, and financial flows over the business cycle for countries with heterogeneous state ownership structure in firms.

Finally, in our analysis, we treat the aggregate debt issuance cost shock as exogenous, as a first step towards understanding the joint behavior of financing frictions, asset prices, and financial flows in the cross-section. To help us better understand the links between the financial sector and the real economy, future research should endogenize the source of the debt issuance cost shock in a DSGE model.

References

Amstad M, Sun G, Xiong W. The Handbook of China's Financial System. Princeton University Press, 2020.

Anzoategui D, Chivakul M, Maliszewski W S. Financial Distortions in China: A General Equilibrium Approach. 2015.

Altinkilic, Oya, and Robert S. Hansen, 2000, Are there economies of scale in underwriting fees? Evidence of rising external financing costs, *Review of Financial Studies* 13, 191-218.

Bai Y, Lu D, Tian X. Do Financial Frictions Explain Chinese Firms' Saving and Misallocation?. National Bureau of Economic Research, 2018.

Belo, Frederico, Lin, X., and S Bazdresch, 2014, Labor hiring, investment, and stock return predictability in the cross section, *Journal of Political Economy,* 122, 129 – 177.

Bernanke, Ben, and Mark Gertler, 1989, Agency costs, net worth, and business fluctuations, *American Economic Review*, 79(1): 14-31.

Bernanke, Ben, Mark Gertler, and Simon Gilchrist, 1999, The financial accelerator in a quantitative business cycle framework, in Taylor, J. B. and M. Woodford (editors), Handbook of Macroeconomics, Volume 1C, chapter 21, Amsterdam: Elsevier Science.

Bloom, Nicholas, 2009, The impact of uncertainty shocks, *Econometrica*, 77(3), 623–685.

Bolton, P., Chen, H., and Wang, N., 2011. A unified theory of Tobin's q, corporate investment, financing, and risk management, *Journal of Finance*, 106(1), 1-23.

Bolton, P., Chen, H., and Wang, N., 2013, Market timing, investment, and risk management, *Journal of Financial Economics*, 109, 40-62, 2013

Bolton, P., Chen, H., and Wang, N., 2014, Debt, taxes, and liquidity, Working paper, Columbia University

Bolton, P., Wang, N., and J Yang, 2014, Investment under Uncertainty and the Value of Real and Financial Flexibility, Working paper, Columbia University

Boudoukh, Jacob, Roni Michaely, Matthew Richardson, and Michael R. Roberts, 2007, On the Importance of Measuring Payout Yield: Implications for Empirical Asset Pricing, *Journal of Finance*, 62, 877-915.

Campbell, John Y., Martin Lettau, Burton G. Malkiel, and Yexiao Xu, 2001, Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk, *Journal of Finance* 56(1), 1-43

Carlson, Murray, Adlai Fisher, and Ron Giammarino, 2006, Corporate Investment and Asset Price Dynamics: Implications for SEO Event Studies and Long-Run Performance, *Journal of Finance*, 61(3), $1009 - 1034$

Carlstrom, Charles T. and Timothy S. Fuerst, 1997, Agency costs, net worth, and business fluctuations: A computable general equilibrium analysis, *American Economic Review*, 87(5), $893 - 910$

Carpenter J N, Lu F, Whitelaw R F. The real value of China's stock market[J]. *Journal of Financial Economics*, 2020, forthcoming.

Chang C, Liu Z, Spiegel M M, et al. Reserve requirements and optimal Chinese stabilization policy. *Journal of Monetary Economics*, 2019, 103: 33-51.

Chen K, Ren J, Zha T. The nexus of monetary policy and shadow banking in China. *American Economic Review*, 2018, 108(12): 3891-3936.

Cheung C, Hoguet G, Ng S. Value, Size, Momentum, Dividend Yield, and Volatility in China's A-Share Market. *Journal of Portfolio Management*, 2015, 41(5): 57.

Cochrane J H. Production-based asset pricing and the link between stock returns and economic fluctuations. *The Journal of Finance*, 1991, 46(1): 209-237.

Choe, H.; R.W. Masulis; and V. Nanda. 1993, Common Stock Offerings across the Business Cycle: Theory and Evidence. *Journal of Empirical Finance* 1, 3–31.

Cooper, Russell, and J. Ejarque. 2001. Exhuming Q: Market power vs. capital market imperfections, Working Paper #8182, NBER.

Covas, Francisco, and Wouter J. Den Haan, 2011, The Cyclical Behavior of Debt and Equity Finance, *American Economic Review*, 101(2), $877-899$

Dang, Tri Vi, Gary Gorton, and Bengt Holmström, 2015, Ignorance, Debt, and Financial Crises, Working Paper.

DeMarzo, P., Fishman, M., He, Z., Wang, N., 2012. Dynamic agency and the q theory of investment. *Journal of Finance* 67(6): 2295-2340

Dow, James, Itay Goldstein, and Alexander Guembel, 2015, Incentives for information production in markets where prices affect real investment, *Journal of the European Economic Association*, forthcoming.

Eisfeldt, Andrea L, 2004, Endogenous liquidity in asset markets, *Journal of Finance*, 59(1), $1-30$.

Eisfeldt, Andrea., and Tyler Muir, 2016, Aggregate Issuance and Savings Waves, *Journal of Monetary Economics*, 84, 116-133.

Erel, Isil., Brandon Julio, Woojin Kim, and Mike Weisbach, 2012, Macroeconomic Conditions and Capital Raising, *Review of Financial Studies* 25: 341-376

Fama, Eugene F., and French, Kenneth R., 1992, The cross section of expected stock returns. *Journal of Finance* 47, $427-465$.

Fama, Eugene F., and French, Kenneth R., 1993, Common risk factors in return of stocks and bonds. *Journal of Financial Economics* 33, 3–56.

Fama, Eugene F., and French, Kenneth R., 2005, Financing decisions: Who issues stock? *Journal of Financial Economics* 76, 549-582.

Fama, Eugene F., and French, Kenneth R., 2008, Dissecting anomalies. *Journal of Finance* 63(4), $1653 - 1678$.

Favilukis, Jack, and Xiaoji Lin, 2016, Wage rigidity: A quantitative solution to several asset pricing puzzles. *Review of Financial Studies*, $29(1), 148 - 192$

Garleanu, Nicolae, Leonid Kogan, and Stavros Panageas, 2011, Displacement risk and asset returns, *Journal of Financial Economics*, 105(3), $491 - 510$

Graham J. 2000, How big are the tax benefits of debt?. *Journal of Finance* 55(5), $1901 - 1941$.

Gomes, J., and Lukas Schmid 2010, Levered returns. *Journal of Finance* 65(2), $467 - 494$.

Gorton, Gary B, 2016, The History and Economics of Safe Assets, NBER Working paper #22210.

Gilchrist, Simon., and John Leahy, 2002. Monetary policy and asset prices, *Journal of Monetary Economics*, 75–97.

Grullon, G., and Roni Michaely 2002, Dividends, Share Repurchases, and the Substitution Hypothesis. *Journal of Finance* 57(4), 1649-1684.

Hamermesh, Daniel S., and Gerard A. Pfann, 1996. Adjustment Costs in Factor Demand, *Journal of Economic Literature*, 34(3), 1264-1292.

He, Zhiguo, Brian Kelly, and Asaf Manela, 2016, Intermediary asset pricing: new evidence from many asset classes, Working paper, University of Chicago, Booth School of Business.

Hennessy, Christopher A., Amnon Levy, and Toni M. Whited, 2007, Testing Q theory with financing frictions. *Journal of Financial Economics*, 83: 691-717.

Hennessy, Christopher A., and Toni M. Whited, 2005, Debt Dynamics". *Journal of Finance*, 60(3): 1129-65.

Hennessy, Christopher A., and Toni M. Whited, 2007, How costly is external financing? Evidence from a structural estimation, *Journal of Finance*, 2007, 1705-1745.

Hsieh C T, Klenow P J. Misallocation and manufacturing TFP in China and India. *The Quarterly journal of economics*, 2009, 124(4): 1403-1448.

Hu G X, Chen C, Shao Y, et al. Fama-French in China: Size and value factors in Chinese stock returns. *International Review of Finance*, 2019, 19(1): 3-44.

Imrohoroglu, Ayse., Tuzel, Selale, 2014, Firm level productivity, risk and return, *Management Science*, 60

Jermann, Urban, and Vicenzo Quadrini, 2012, Macroeconomic Effects of Financial Shocks, *American Economic Review*, 238-71.

Kaltenbrunner, Georg, and Lars Lochstoer, 2010, Long-run risk through consumption smoothing, *Review of Financial Studies* 23, 3141–3189

Khan, Aubhik, and Julia Thomas, 2013, Credit shocks and aggregate fluctuations in an economy with production heterogeneity. *Journal of Political Economy*, 121(6), 1055-1107.

Kiyotaki, Nobuhiro, and John H. Moore, 1997, Credit Cycles. *Journal of Political Economy*, 105(2): 211-48.

Kogan, Leonid and Dimitris Papanikolaou, 2014, Growth Opportunities, Technology Shocks and Asset Prices, *Journal of Finance,* 69(2).

Kogan, Leonid and Dimitris Papanikolaou, 2013, Firm characteristics and stock returns: The role of investment-specific shocks, *Review of Financial Studies,* 26(11), 2718-2759.

Koijen, Ralph., Hanno Lustig, and Stijn Van Nieuwerburgh, 2017, The cross-section and time-series of stock and bond returns, *Journal of Monetary Economics,* 88, 50-69.

Krasker, William S., 1986, Stock price movements in response to stock issues under asymmetric information, *Journal of Finance* 41, 93-105.

Kung, H., Croce, Max., T. Nguyen and L. Schmid, 2012, Fiscal Policies and Asset Prices. *Review of Financial Studies*, 25(9): 1-38.

Kurlat, Pablo, 2013, Lemons markets and the transmission of aggregate shocks, *American Economic Review*, 103(4), 1463 – 1489.

Lamont, Owen, Christopher Polk, and Jesus Saaa-Requejo 2001, Financial constraints and stock returns, *Review of Financial Studies,* 14(2), 529-554.

Leary, M. and Michael Roberts. 2005. Do firms rebalance their capital structures, *Journal of Finance* 60, 2575–2619.

Lewellen, Jonathan., Stephan Nagel, and Jay Shanken, 2010, A Skeptical Appraisal of Asset Pricing Tests, *Journal of Financial Economics*, 96 (2), 174-194

Livdan, D., Sapriza, H., Zhang, L., 2009. Financially constrained stock returns, *Journal of Finance* 64, 1827–1862.

Liu J, Robert F S, Yu Y. Size and Value in China. *Journal of Financial Economics*, 2019, forthcoming.

McKeon, Stephen B., 2015, Employee Option Exercise and Equity Issuance Motives, Working paper, University of Oregon, Lundquist College of Business

McLean, R. David and Mengxin Zhao, 2014, The business cycle, investor sentiment, and costly external finance, *Journal of Finance*, 69(3), 1377-1409.

McGrattan, E. 1999. Application of weighted residual methods to dynamic economic models. In *Computational Methods for the Study of Dynamic Economies*, Chapter 6, eds. R. Marimon and A. Scott. Oxford: Oxford University Press.

Myers, Stewart C. and Nicholas Majluf, 1984, Corporate financing and investment decisions when firms have information that investors do not have, *Journal of Financial Economics* 13, 187-221

Papanikolaou, Dimitris. 2011. Investment shocks and asset prices, *Journal of Political Economy*, 119(4): 639-685

Pastor, Lubos, and Robert Stambaugh, 2003, Liquidity Risk and Expected Stock Returns, *Journal of Political Economy* 111, 642–685

Rouwenhorst, G., 1995. Asset pricing implications of equilibrium business cycle models. In: Cooley, T. F. (Ed.), Frontiers of Business Cycle Research. Princeton University Press, Princeton, NJ, pp. 294–330.

Shumway, Tyler., 1997, The Delisting Bias in CRSP Data, *Journal of Finance*, 327-340.

Song Z, Storesletten K, Zilibotti F. Growing like china. *American economic review*, 2011, 101(1): 196-233.

Song Z, Xiong W. Risks in China's financial system. *Annual review of financial economics*, 2018, 10: 261-286.

Tauchen, J., and R. Hussey. 1991. Quadrature-based methods for obtaining approximate solutions to nonlinear asset pricing models. *Econometrica* 59 (2): 371-396.

Taylor J B. Discretion versus policy rules in practice, Carnegie-Rochester conference series on public policy. North-Holland, 1993, 39: 195-214.

Whited T M, Zhao J. The misallocation of finance. Forcoming Journal of Finance, 2020.

Table 1 Aggregate returns of SOE and POE sectors

	SOE				POE			
	EW		VW		EW		VW	
	Return	ExRet	Return	ExRet	Return	ExRet	Return	ExRet
Mean	20.67	18.20	12.94	10.47	24.14	21.66	17.84	15.36
STD	35.01	35.03	30.06	30.07	38.00	38.01	34.78	34.79

The table reports the mean and standard deviation (STD) of the aggregate annual returns (Return) and excess returns (ExRet) of the China's SOE and POE sectors. The return is reported in annual percentage($\times$1200) terms, and the standard deviation is the monthly standard deviation times the square root of 12.

Table 2 Exposures of the aggregate returns of SOE and POE sectors to monetary supply shocks

	SOE		POE		Difference	
	EW	VE	EW	VE	EW	VW
M_t	4.01	-1.74	6.71	5.23	2.70	6.97
t	2.05	-1.18	1.89	2.96	1.17	2.46
MKT_t	1.07	0.97	1.13	1.04	0.06	0.07
t	29.12	35.88	14.59	22.22	1.08	0.97
Constant	0.06	-0.01	0.09	0.03	0.03	0.04
t	1.77	-0.48	1.47	0.99	0.95	0.98
N	15	15	15	15	15	15
R^2	0.97	0.98	0.87	0.95	-0.07	0.08

This table reports the slope coefficients from the following OLS regression:

$$XR_{i,t} = a + b \times M_t + c \times MKT_t + \varepsilon_{i,t},$$

where $XR_{i,t}$ is excess returns of SOE or POE sectors using equal-weighting(EW) and value-weighting(VW), or the difference of excess return between POE and SOE sectors at time t. M_t is monetary supply shocks constructed by Chen et al. (2018). $MKT_t$is market factor. t's are the heteroscedasticity and autocorrelation consistent t-statistics (Newey-West). N is the total number of observations. R^2 is the regression R-squared adjusted for degree of freedom. The sample period is 2004 to 2018.

Table 3 Firm characteristics in Chinese state-owned and private sectors

	A. Data(SOEs)				A. Data(POEs)			
	Low	M	High	H-L	Low	M	High	H-L
Hiring rate								
HN_t	-0.009	0.007	0.021	0.030	-0.003	0.033	0.066	0.069
HN_{t+1}	-0.005	0.007	0.017	0.022	0.002	0.027	0.049	0.046
Investment rate:								
IK_t	0.053	0.123	0.174	0.122	0.053	0.161	0.221	0.168
IK_{t+1}	0.058	0.116	0.155	0.097	0.057	0.144	0.167	0.111
Productivity and profitability								
TFP_t	0.394	0.449	0.467	0.073	0.422	0.490	0.508	0.085
TFP_{t+1}	0.401	0.444	0.456	0.055	0.427	0.488	0.492	0.064
ROA_t	0.021	0.029	0.031	0.010	0.022	0.036	0.040	0.018
ROA_{t+1}	0.023	0.028	0.029	0.006	0.023	0.034	0.036	0.013
Valuation								
BM_t	0.439	0.490	0.489	0.050	0.305	0.373	0.365	0.060
BM_{t+1}	0.432	0.480	0.492	0.060	0.302	0.370	0.362	0.060
Size_t	3.398	3.690	3.823	0.425	3.111	3.394	3.466	0.355
Size_{t+1}	3.462	3.748	3.866	0.404	3.160	3.496	3.550	0.390
Risk and borrowing capacity								
Leverage ratio_t	0.521	0.528	0.551	0.031	0.477	0.447	0.442	-0.035
Leverage ratio_{t+1}	0.518	0.536	0.557	0.039	0.478	0.458	0.450	-0.028
Total debt flow_t	0.022	0.046	0.061	0.038	0.023	0.056	0.065	0.042
Total debt flow_{t+1}	0.028	0.042	0.055	0.027	0.024	0.046	0.058	0.034
Total loan flow_t	0.000	0.006	0.014	0.013	-0.004	0.009	0.014	0.018
Total loan flow_{t+1}	0.001	0.006	0.010	0.009	-0.003	0.007	0.012	0.015
Other financing sources								
Internal funding_t	0.013	0.017	0.019	0.006	0.015	0.024	0.028	0.013
Internal funding_{t+1}	0.014	0.017	0.018	0.003	0.016	0.023	0.024	0.008
Equity issuance ratio_t	0.083	0.098	0.119	0.037	0.101	0.125	0.151	0.050
Equity issuance ratio_{t+1}	0.086	0.108	0.122	0.036	0.108	0.135	0.152	0.043

This table reports the time-series averages of the following portfolio-level characteristics of 3 portfolios one-way sorted on investment rate. IK is the investment rate; HN is the hiring rate; TFP is total factor productivity estimated by the method in Ä°mrohoroÄŸlu and TÃ$\frac{1}{4}$zel (2014); ROA is return on assets; BM is the book-to-market-equity ratio; size is the log market capitalization; leverage is total-debt-to-total-asset ratio; DF is total debt flow that is the change of total debt at time t divided by the average of total capital at time t and t-1; LF is total loan flow that is the change of total loan at time t divided by the average of total capital at time t and t-1; IFR is internal funding ratio that is retained earnings time t divided by the average of total capital at time t and t-1; EIR is equity issuance ratio that is the number of firms with additional stock issuance divided by the total number of firms in sample at time t. H-L stands for the high-minus-low investment portfolio. The subscripts t and t+1 stand for portfolio-level characteristics measured at the time of portfolio formation (t) or 1 year after portfolio formation (t+1). The portfolio-level characteristics are computed as the median value of each characteristic across all firms in the portfolio.

Table 4 Firm-level Stock Return Predictability Regressions

		Cross-sectional Regressions				Pooled OLS Regressions			
Row		1	2	3	4	5	6	7	8
1	IK	-0.002	-0.004	-0.003	-0.003	-0.050	-0.076	-0.067	-0.065
	t	-1.779	-3.013	-2.694	-2.602	-4.049	-4.612	-4.070	-3.928
2	HN			-0.003	-0.003			-0.041	-0.042
	t			-1.788	-2.006			-2.765	-2.849
3	IK×Nature		0.004	0.004	0.004		0.044	0.052	0.053
	t		2.034	2.049	2.100		1.835	2.112	2.111
4	HN×Nature			0.0002	0.0003			-0.028	-0.026
	t			0.136	0.204			-1.202	-1.103
5	Nature	0.003	0.002	0.002	0.002	0.014	0.007	0.006	-0.001
	t	1.387	1.100	1.116	1.062	0.554	0.276	0.242	-0.034
	Control Variables	No	No	No	Yes	No	No	No	Yes
	N	306105	306105	306105	298417	26398	26398	26398	25701
	R^2	0.012	0.013	0.016	0.030	0.514	0.514	0.514	0.516

The table reports the estimation results from several variations of stock return predictability regressions of the form:

$$r_{i,t} = a + b \times IK_{i,t-1} + c \times HN_{i,t-1} + d \times IK_{i,t-1} \times Nature_{i,t-1}$$
$$+ e \times HN_{i,t-1} \times Nature_{i,t-1} + f \times Nature_{i,t-1} + Controls_{i,t-1} + \varepsilon_{i,t}$$

in which $r_{i,t}$is the firm i stock return. $IK_{i,t-1}$ and $HN_{i,t-1}$ are the lagged values of firm i's investment and hiring rates, $Nature_{i,t-1}$ is a dummy variable that is equal to one if firm i is private-owned firm at time t-1. Two alternative methodologies are used to estimate the regression.$Controls_{i,t-1}$ are firm-level control variables including firm size, ROA, and leverage ratio. Columns 1-4 report the estimated average slope in the previous equation from Fama-MacBeth (1973) cross-sectional regressions estimated at the monthly frequency; t are heteroscedasticity and autocorrelation consistent t-statistics (Newey-West); N is the average number of firms in each cross section. R2 is the average of regression R-squared. Columns 5–8 report the estimated slope coefficients in the previous equation obtained by pooled OLS regressions in which $r_{i,t}$ is firm i's compounded annual stock return from July of year t to June of year t+1. The regression includes both year and firm fixed effects; t are t-statistics computed from standard errors clustered by firm; and N is the number of firm-year observations included in the estimation. R2 is the regression R-squared adjusted for degrees of freedom. The investment rate is winsorized at the top and bottom 0.5 percent in each cross section to decrease the influence of outliers. The estimates of the intercepts a and control variables' coefficients are omitted. The sample is from July 2004 to June 2019.

Table 5 Investment Portfolios

	SOEs				POEs			
	L	2	H	L-H	L	2	H	L-H
	Excess Returns							
Re	20.03	18.06	16.57	3.47	21.68	22.23	21.34	0.33
t	1.78	1.67	1.56	2.05	1.74	2.02	1.92	0.13
SR	0.56	0.52	0.48	0.56	0.54	0.60	0.56	0.04
	CAPM							
α	7.61	5.79	4.30	3.31	8.50	9.82	8.69	-0.19
t	2.32	2.31	1.77	2.10	1.84	2.40	2.08	-0.09
b	1.10	1.09	1.09	0.01	1.17	1.10	1.12	0.05
t	29.49	38.43	42.63	0.62	22.48	25.33	27.52	1.41
R^2	0.89	0.93	0.94	0.00	0.81	0.84	0.84	0.03

This table reports the average excess stock returns and CAPM alphas (abnormal returns) of three one-way sorted on investment rate portfolios across firms belonging to SOEs sector (left panel), and across firms belonging to POEs sector (right panel). re is the average annualized ($\times$1200) portfolio excess stock return; t are heteroscedasticity and autocorrelation consistent t-statistics (Newey-West). SR is the portfolio Sharpe ratio; α and b are the portfolio average CAPM alpha (reported in annual percentage($\times$1200)) and market beta, obtained as the intercept and slope coefficient from monthly CAPM regressions. L and H stands for the low and high investment portfolio, respectively. L-H stands for the low-minus-high investment portfolio. Diff L-H stands for the difference in the L-H in SOEs and POEs. The sample is from July 2004 to June 2019.

Table 6 Debt-flow comovement of SOEs and POEs

	SOEs				POEs			
	TD_t	TD_{t+1}	TD_t	TD_{t+1}	TD_t	TD_{t+1}	TD_t	TD_{t+1}
M	0.575	-0.118	0.597	0.009	0.793	0.149	0.753	0.311
t	2.291	-0.369	2.387	0.028	2.529	0.400	2.317	0.818
P2×M	-0.506	0.204	-0.617	0.124	-0.640	0.451	-0.640	0.385
t	-1.583	0.501	-1.944	0.310	-1.638	0.947	-1.609	0.813
P3×M	-0.852	-0.241	-0.925	-0.106	-0.223	0.125	-0.138	-0.052
t	-2.482	-0.574	-2.731	-0.260	-0.508	0.247	-0.311	-0.104
Control Variables	No	No	Yes	Yes	No	No	Yes	Yes
N	12348	11045	11901	10694	10475	8686	9727	8067
R^2	0.211	0.000	0.218	0.044	0.109	0.002	0.122	0.027

This table reports the relevant slope coefficients from a panel ols regressions of the form:

$$Debt_{i,t+h} = a + b \times Debt_{i,t-1} + c \times M_t + \sum\nolimits_{j=2}^{3} (d_j \times Pj_t + e_j \times Pj_t \times M_t) + \varepsilon_{i,t},\ h = 0, 1,$$

$Debt_{i,t}$ is the first difference of the change of Chinese listed firm's i total debt at time t divided by the average of total capital at time t and t-1. $M_t$is monetary policy shocks constructed by Chen et al. (2018). $Pj_t$is the investment rate portfolios j = 2, 3quintile dummy, respectively; The control variables include firm's physical capital to market equity ratio (KM), book capital to market equity ratio (BM), Tobin Q, size and leverage. t are heteroscedasticity and autocorrelation consistent t-statistics (Newey-West), the lag in Newey-West is 3. N is the total number of firm-year observations. R2 is the regression R-squared adjusted for degree of freedom. All dependent variables are winsorized at the top and bottom 1 percent in each year to decrease the influence of outliers. The sample period in the real data is 2003 to 2018.

Table 7 Investment-flow comovement of SOEs and POEs

	SOEs				POEs			
	IK_t	IK_{t+1}	IK_t	IK_{t+1}	IK_t	IK_{t+1}	IK_t	IK_{t+1}
M	0.652	0.221	1.123	0.401	0.399	0.223	1.429	0.234
t	1.562	0.414	2.607	0.752	0.683	0.279	2.325	0.274
P2 × M	-0.689	0.592	-0.768	0.425	0.572	0.097	0.380	0.253
t	-1.335	0.872	-1.464	0.632	0.773	0.094	0.506	0.240
P3 × M	-1.564	0.088	-1.815	0.088	-0.265	0.658	-0.513	0.792
t	-2.591	0.120	-2.979	0.121	-0.306	0.594	-0.579	0.700
Control Variables	No	No	Yes	Yes	No	No	Yes	Yes
N	12336	11038	11894	10687	10472	8684	9724	8065
R^2	0.285	0.001	0.295	0.010	0.302	0.001	0.311	0.012

This table reports the relevant slope coefficients from a panel ols regressions of the form:

$$IK_{i,t+h} = a + b \times IK_{i,t-1} + c \times M_t + \sum\nolimits_{j=2}^{3} (d_j \times Pj_t + e_j \times Pj_t \times M_t) + \varepsilon_{i,t},\ h = 0, 1,$$

$IK_{i,t}$ is the first difference of firm's i investment rate at time t. $M_t$is monetary policy shocks constructed by Chen et al. (2018). $Pj_t$is the investment rate portfolios $j = 2$, 3quintile dummy, respectively; The control variables include firm's physical capital to market equity ratio (KM), book capital to market equity ratio (BM), Tobin Q, size and leverage. t are heteroscedasticity and autocorrelation consistent t-statistics (Newey-West), the lag in Newey-West is 3. N is the total number of firm-year observations. R2 is the regression R-squared adjusted for degree of freedom. All dependent variables are winsorized at the top and bottom 1 percent in each year to decrease the influence of outliers. The sample period in the real data is 2003 to 2018.

Table 8 Cash-flow comovement of SOEs and POEs

	SOEs				POEs			
	CF_t	CF_{t+1}	CF_t	CF_{t+1}	CF_t	CF_{t+1}	CF_t	CF_{t+1}
M	0.157	0.160	0.087	0.167	0.613	0.685	0.558	0.397
t	1.740	1.720	0.964	1.815	3.504	4.057	2.710	2.400
P2×M	-0.137	-0.041	-0.095	-0.081	-0.323	-0.252	-0.293	-0.109
t	-1.268	-0.359	-0.884	-0.713	-1.616	-1.226	-1.440	-0.535
P3×M	-0.022	-0.199	0.056	-0.237	-0.039	-0.250	-0.055	-0.053
t	-0.192	-1.720	0.495	-2.062	-0.183	-1.156	-0.255	-0.250
Control Variables	No	No	Yes	Yes	No	No	Yes	Yes
N	12045	10766	11624	10437	10294	8525	9570	7930
R^2	0.067	0.002	0.074	0.022	0.017	0.006	0.023	0.026

This table reports the relevant slope coefficients from a panel ols regressions of the form:

$$CF_{i,t+h} = a + b \times CF_{i,t-1} + c \times M_t + \sum_{j=2}^{3} (d_j \times Pj_t + e_j \times Pj_t \times M_t) + \varepsilon_{i,t},\ h = 0, 1,$$

$CF_{i,t}$ is the change of Chinese listed firm's i EBIT at time t divided by the average of total capital at time t and t-1. $M_t$is monetary policy shocks constructed by Chen et al. (2018). $Pj_t$is the investment rate portfolios $j = 2,\ 3$quintile dummy, respectively; The control variables include firm's physical capital to market equity ratio (KM), book capital to market equity ratio (BM), Tobin Q, size and leverage. t are heteroscedasticity and autocorrelation consistent t-statistics (Newey-West), the lag in Newey-West is 3. N is the total number of firm-year observations. R2 is the regression R-squared adjusted for degree of freedom. All dependent variables are winsorized at the top and bottom 1 percent in each year to decrease the influence of outliers. The sample period in the real data is 2003 to 2018.

Table 9 Calibration

parameter	Symbol	Value
technology		
Corporate tax rate	τ	0.17
Capital depreciation rate	δ	0.023
Adjustment cost parameters in capital	c_k^+/c_k^-	5.5/15.5
Fix cost of debt issuance for SOE	$F^B(\mathcal{S})$	0
Fix cost of debt issuance for POE	$F^B(\mathcal{P})$	0.0225
Collateralizability of capital	ψ	0.6
Fixed equity issuance cost	ϕ	1
Parameter of time varying debt issuance cost	η	10
Stochastic processes		
Conditional volatility of aggregate productivity	σ_a	0.055
Persistence of firm-specific productivity	ρ_a	0.91
Average level of firm-specific productivity	μ_z	0.08
Persistence of firm-specific productivity	ρ_z	0.6
Conditional volatility of firm-specific productivity	σ_z	0.4
Persistence coefficient of issuance cost	ρ_ξ	0.85
Conditional volatility of issuance cost	σ_ξ	0.105
Real risk-free rate (%)	r_f	2.25
Price of risk: aggregate productivity shock	γ_a	2
Price of risk: debt issuance cost shock	γ_ξ	100

This table presents the calibrated parameter values of the baseline model

Table 10 Target moments

Moments	Data	Model
Asset prices		
Aggregate stock market excess return %	12.7	11.4
Sharpe ratio of stock market returns	0.36	0.36
Real risk-free rate %	2.25	2.25
Real quantities: Aggregate-level		
Standard dev. of profits	0.035	0.04
standard dev of debt growth rate	0.06	0.03
average frequency of equity issuance	0.1	0.08
Real quantities: Cross section		
Standard dev. of net issuance	0.14	0.1
Standard dev. of investment rate	0.24	0.17
Interquatile range of investment rate	0.21	0.19

This table presents the selected target moments used for the calibration of the baseline model. We compare the moments in the data with moments of simulated data. The model-implied moments are the mean value of the corresponding moments across simulations. The cross-sectional firm-level moments are computed by first computing the cross sectional moments and then taking the average of these moments across years. The reported statistics for the model are obtained from 30 samples of simulated data, each with 3,000 firms for both types and 7500 quarterly observations.

Table 11 POE vs SOE: Investment, financial flows, and returns in the data versus model

Panel A : SOE, Firm Characteristics and Investment Sorted Portfolio

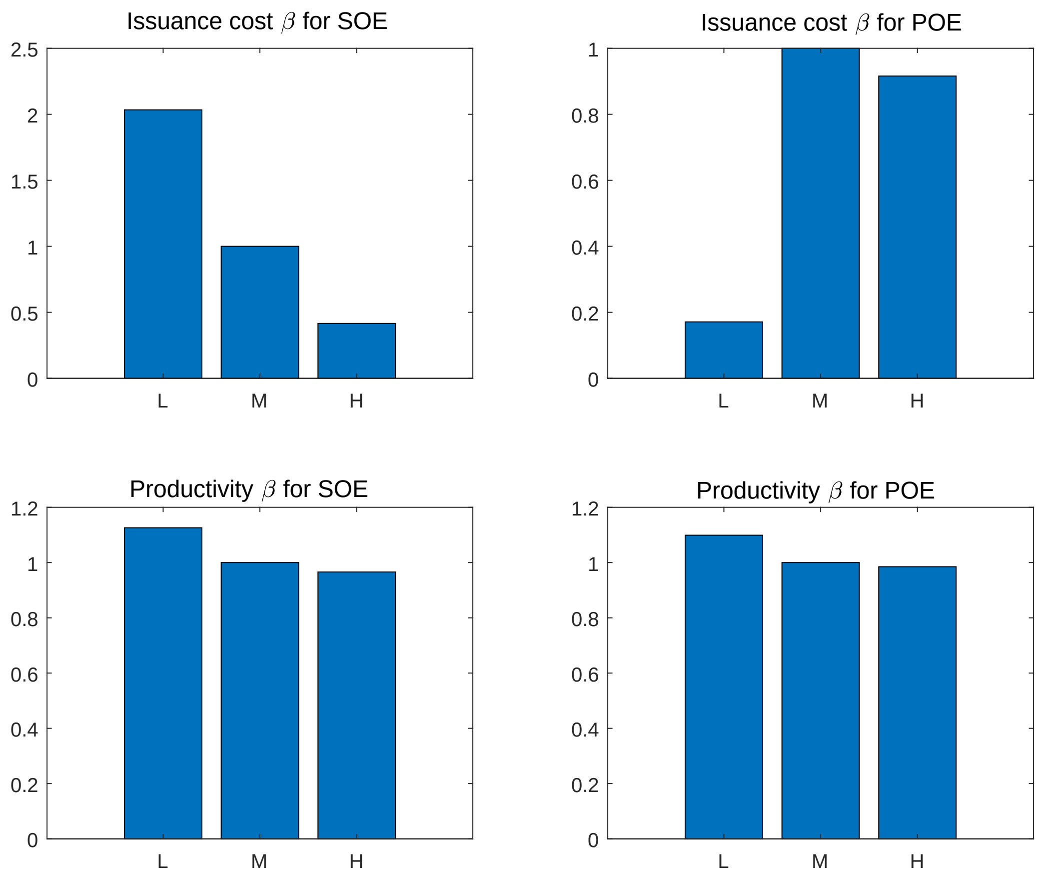
	Data			Model		
Characteristic	L	H	H-L	L	H	H-L
Excess return	12.73	10.54	-2.18	13.23	10.87	-2.36
IK	0.05	0.17	0.12	0.02	0.15	0.13
Leverage	0.52	0.55	0.03	0.21	0.20	-0.01
New Debt Issuance	0.02	0.06	0.04	0.01	0.05	0.04
Firm Productivity	0.39	0.47	0.07	-0.25	0.29	0.54

Panel A : POE, Firm Characteristics and Investment Sorted Portfolio

	Data			Model		
Characteristic	L	H	H-L	L	H	H-L
Excess return	13.94	14.93	0.99	11.21	12.11	0.90
IK	0.05	0.22	0.17	0.02	0.13	0.11
Leverage	0.48	0.44	-0.04	0.28	0.26	-0.02
New Debt Issuance	0.02	0.07	0.04	0.06	0.12	0.06
Firm Productivity	0.42	0.51	0.09	-0.34	0.65	0.99

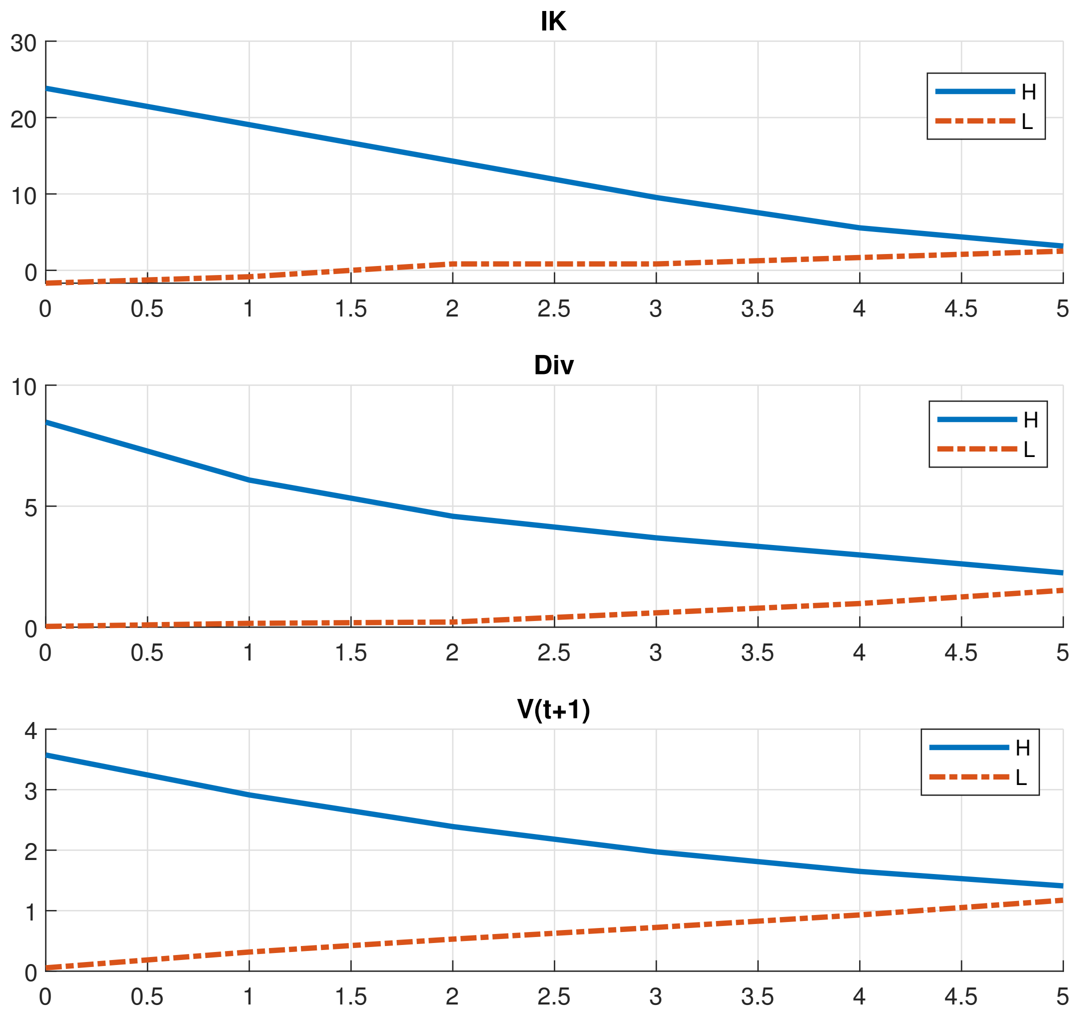
This table reports the average portfolio characteristics of 5 investment rate portfolios in the real data (column "Data"), and in data simulated from the model (column "Model"). For each portfolio, we report the characteristics of portfolios 1 (Low, L), and 3 (High, H). H-L stands for the high-minus-low portfolio. IK is investment rate; New debt issuance is the growth rate in total debt; Leverage is the firms' book leverage ratio; Firm productivity is firms' total factor productivity, a measure of productivity (in the model, TFP=log(Z), and in the real data. The portfolio-level characteristic is the time series average of the median characteristic across the firms in the portfolio in each year. The reported statistics for the model are obtained from 30 samples of simulated data, each with 3,000 firms for both types and 7500 quarterly observations. The data sample ranges from 2003 to 2019.

Figure 1 Productivity and debt issuance shock covariances



This figure reports the risk exposures (covariances or β for short) of the excess returns of the three investment sorted portfolios with respect to changes in aggregate productivity and debt issuance, for POE and SOE respectively. The covariances are expressed relative to the covariance of the middle ("M") portfolio in each sort to emphasize the cross sectional variation. The reported statistics for the model are obtained from 30 samples of simulated data, each with 3,000 firms for both types and 7500 quarterly observations.

Figure 2 Impulse responses to an aggregate equity issuance cost shock: SOE



Impulse responses of selected endogenous variables in the baseline calibration of the model to a one standard deviation negative aggregate debt issuance cost shock (higher cost of issuing debt, bad times with high marginal utility). The responses are measured in percent deviation relative to the long-run average values (time detrended, when applicable). To generate the response of a high productivity (H) firm, we add a positive one standard deviation firm-specific productivity shock. To generate the response of a low productivity firm (L), we add a negative one standard deviation firm-specific productivity shock. The frequency of the data is quarterly. IK is firms' investment rate, Div is firms' dividends, and V is the continuation value of the firm (price of the firm after dividends).

Appendix For Online Publication

A. Data

A.1. Data Details

Our stock trading data and firm financial data are from CSMAR (China Stock Market & Accounting Research Database). In China, each stock in exchange market has a unique six-digit ticker. Based on the first two digits of stock tickers, we can broadly identify different stock types. Our sample includes all A-share stocks from the main boards of the Shanghai and Shenzhen exchanges as well as the board of the GEM (Growth Enterprises Market), and their first two digits of ticker are 60, 00, and 30, respectively. The gross fixed assets and accumulated depreciation of fixed assets come from the notes to firm financial statements, and start form 2003. The trading data is monthly from July 2004 to June 2019, and firm financial data is annual from 2003 to 2018.

The firm actual controlling shareholders data is annual since 2003, and comes from CSMAR. CSMAR uses the information disclosed in the firm financial annual report to identify the actual controlling shareholder. If the information is not disclosed, CSMAR identifies the actual controlling shareholder based on the shareholding chain. Following Liu et al. (2019), we use the one-year deposit rate as the risk-free rate, which is obtained from the CEIC database. The Chinaâ€™s monetary policy shocks data comes from the personal website of Tao Zha.

We impose two filters. First, we omit the financial firms in accordance with the industry classification guidelines for listed firms issued by the China Securities Regulatory Commission. Their codes are J-66, J-67, J-68, and J-69. Second, we exclude observations within the first six months since stocks become public since the stock prices of Chinese listed firms tend to rise significantly in the first few months of listing.

B. Model solution

Before solving the model numerically, we exploit the homogeneity property of firm optimization problem 16 and reduce the number of state variable by 1. Note that all variables can be scaled by physical capital K_t,

$$v_t = \frac{V_t}{K_t}, \quad b_t = \frac{B_t}{K_t}, \quad i_t = \frac{I_t}{K_t}, \quad h_t = \frac{H_t}{K_t}, \quad d_t = \frac{D_t}{K_t}, \quad y_t = \frac{Y_t}{K_t}, \quad e_t = \frac{E_t}{K_t}, \quad g_t = \frac{G_t}{K_t}$$

The scaled Bellman equation now reads as

$$v_t(b_t, A_t, \xi_t, Z_t) = \max d_t + (1 - \kappa_D)(1 - \delta + i_t)\mathbb{E}[\Lambda_{t,t+1} v_{t+1}(b_{t+1}, A_{t+1}, \xi_{t+1}, Z_{t+1})]$$

subject to the collateral constraint that comes in scaled form

$$b_{t+1} \leq \psi$$

Normalized earning is given by

$$e_t = (1 - \tau)y_t + \tau\delta + \tau r_f b_t \mathbf{I}_{b_t \geq 0} - i_t - g_t + (1 - delta + i_t)b_{t+1} - (1 + r_f)b_t - \Phi_t^B$$

Normalized dividend is therefore,

$$d_t = e_t - \phi \max(-e_t, 0)\mathbf{I}_{\{\max(-e_t,0)>0\}}$$