The Research on External Financing Costs of National and Non National Firms Under Asymmetric Information

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KEYWORDS

External financing costs,
Asymmetric information,
Financing accelerator

ABSTRACT

This paper proposes that the external financing costs would be positively related with the level of information asymmetries theory empirical work and simulation. In the credit market, the non national firms play as the credit buff. In the real economy, the non national firms play as the financing accelerator.

1 Introduction

Would the information asymmetries enhance the financing accelerator effects through the balance sheet of the firms? Would the flight to equity be more serious in the financial crises? According to the results of this paper, the answer is yes.

1.1 Background and related literature

In the credit market of China, there is congenital credit market segmentation. The credit gap of the non national firms is common. What is worse more, the non national firms face more serious condition under the financial crisis. Thus, relevant policies are necessary under the background of 'the state advances as the private sector retreats'.

The information asymmetries widely exist in the theory of pricing, corporate financing, and monetary policy theory. The credit rationing would be involved from the aspect of banking under the asymmetric information. The problem of information asymmetries are firstly introduced by Jaffee & Russell in 1976. It is proposed that the market clear would be achieved by the demand and supply side because of the information asymmetries (Jaffee & Stiglitz, 1990).

Tirol (2006) claims that firms are the most important components and influenced by the macro economy. Credit is one of the main channels of the influences. The results of Leary (2009) suggest that the leverage ratio would be influenced by the credit shocks. Moreover, the small firms are more influenced than the large firms under the credit shock. Additionally, the level of information asymmetries would be influenced by the macro economy as well. It is suggested that market participants reflected more to the negative move of price in the cold market than in the hot market. The market would reflect to the market information differently under different market condition. The information asymmetries increase in the cold market. However, the credit rationing has not been discussed under the general equilibrium framework. And this paper would propose the first try.

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1.2 Main findings and contribution

This paper uses historical closed prices of 552 stocks from Jan. 1, 2001 to Dec. 31, 2010 and overall credit volume of commercial banks of China to analysis and build up a general equilibrium model with asymmetric information. The following conclusions are derived:

(1) It is found that the leverage ratio of non national firms drops more than the national firms in credit crunch and increase more in the credit expansion using the DID method and case study.

(2) It is derived that the information asymmetries would increase the fluctuation of the economy through the impulse response under the hypothesis that the information asymmetries increase in the credit crunch.

There are mainly three contributions of this paper:

(1) This paper considers the heterogeneous contract under the general equilibrium framework. In the previous literature, the heterogeneity is constructed through heterogeneous firms or banks. However, this paper constructed the model through heterogeneous information structure under homogeneous firms and banks.

(2) This paper distinguishes the financing activities of the national and non national firms through the event study to focus on the external financing costs under different situation. The previous paper on the Chinese firms focuses mainly on the industries or scales of firms. However, the distinguishing through the ownership of firms in China is essential and necessary.

(3) The rests of this paper proceeds as follows. The second section is the theoretical analysis of model concerning the information asymmetries in general equilibrium. This section is the basis of the next section. Third section is the data, empirical results and simulation. The final section concludes.

2 Model and Analyses

Auditing costs was introduced to describe the bankruptcy costs in the work of Townsend (1979). The banks and firms could both observe the real returns of firms when no bankruptcy happens. However, the banks must pay some costs to observe the real returns if the firms choose to default when return is low. The auditing cost was deemed as the external financing costs in the contract between banks and firms in the work of Bernanke, Gertler & Gilchrist (1999).

The credit supply side is the banks. Banks get the deposits from householder and supple them to firms as loans.

$$B_{t+1}^j = Q_t K_{t+1}^j - N_{t+1}^j$$

Where K_{t+1}^j is the capital of firm j using for the production in period t+1. And Q_t is the price of K_{t+1}^j at time t. N_{t+1}^j is the equity owned by firm j at time t. The gap between $Q_t K_{t+1}^j$ and N_{t+1}^j is to fill by the loan from banks.

The return of capital $R_{t+1}^k \omega^j$ of firm j is $R_{t+1}^k \omega^j$ which is both influenced by the overall risk R_{t+1}^k and individual risk ω^j. For different time and firms, ω^j is r.r.d. whose distribution function and expect value are $F(\omega)$ and $E[\omega^j] = 1$ respectively.

$$h(\omega) = \frac{dF(\omega)}{1 - F(\omega)}, \frac{\partial h(\omega)}{\partial \omega} > 0$$

Suppose Z_{t+1}^j is the interest paid by the firms when no default happens. And a threshold value is defined as:

$$\overline{\omega}^j R_{t+1}^k Q_t K_{t+1}^j = Z_{t+1}^j B_{t+1}^j$$

When the individual risk of firms $\omega^j > \overline{\omega}^j$, the banks get $Z_{t+1}^j B_{t+1}^j$ and the firm get $\omega^j R_{t+1}^k Q_t K_{t+1}^j - Z_{t+1}^j B_{t+1}^j$. However, once the individual risk of firms $\omega^j < \overline{\omega}^j$, the firms would default. When default happens, banks should pay some expenses to observe the real returns of the firms ω^j. This expense is called auditing costs. The banks would pay auditing costs of $\mu \omega^j R_{t+1}^k Q_t K_{t+1}^j$ and keep $(1 - \mu)\omega^j R_{t+1}^k Q_t K_{t+1}^j$.

$\overline{\omega}^j$ is determined by the contract between the firms and banks. The banks disperses the individual risks in the economy for a riskless return R_{t+1}. Solving the optimal contract of banks and the following condition would be derived:

$$Q_t K_{t+1}^j = \psi(s)N_{t+1}^j, \text{ and } \psi'(s) > 0, \ \psi(1) = 1$$

The formula above suggests that K_{t+1}^j is the increasing function of N_{t+1}^j given Q_t and $\psi(s)$. That is to say, the loans from banks would increase with the scale of the equity.

$$E\{R_{t+1}^k\} = s\left(\frac{N_{t+1}^j}{Q_t K_{t+1}^j}\right) R_{t+1}, \text{ and } s'(\cdot) < 0$$

The formula above is in fact the supply function of the credit market. $K_{t+1}^j - N_{t+1}^j$ increase with R_{t+1}^k.

The exact representation of $\psi(s)$ is:

$$\psi(s) = 1 + \frac{[\Gamma(\overline{\omega}) - \mu G(\overline{\omega})]}{1 - (\Gamma(\overline{\omega}) - \mu G(\overline{\omega}))s}$$

In the literature review above, it is suggested that the fluctuation of macro economy would generate two consequences. One is from the change of equity in Bernanke, Gertler & Gilchrist (1999). Moreover, the level of information asymmetries would be influenced as well. In the model above, the information asymmetries are mainly described using the auditing costs μ.

$$\frac{\partial \psi(s)}{\partial \mu} > 0$$

Thus, $\psi(s)$ is the increasing function of μ. Moreover, as $\psi'(s) > 0$, $\psi(s)$ is an increasing function of s as well. As results, s is the monotony function of μ. Finally, $s'(\mu) > 0$. Therefore, the information asymmetries level would increase the required returns from the credit supply side. The banks would require more returns when information asymmetries get harder. Thus, the channel of macroeconomic fluctuation could be investigated from two aspects. On one hand, the net assets are treated as kind of collateral. The credit costs would drop in economic booms. On the other hand, as mentioned, it is proved that the credit costs would decrease when economic booms as well because the information asymmetries level drops. However, the credit costs would increase in recession because of the adverse effect of information asymmetries. Thus, it could be expected that the model of this paper would get more intensive fluctuation effect than the model of Bernanke, Gertler & Gilchrist (1999). From the view of small firms in credit market, they are in harder position now.

3 Data, Empirical Results and Simulation

3.1 Data source

This section provides the empirical results using the data of listed national and non national firms and simulation results of the linear system with expectation. The empirical work is based on the data of about 1500 listed companies in China. The closed prices of 552 companies are selected from Jan 1, 2001 to Dec 31, 2010. The credit marked data are from the web of People's bank of China. The credit data covers from Jan 1, 2001 to Dec 31, 2010 as well. The leverage ratio is calculated based on the financial data from Wind data base.

3.2 Empirical results

The change of leverage ratio is concerned in both the credit expansion and crunch period. The methodology follows the work of Leary (2009). Two windows are selected and difference in difference is adopted to investigate the response of national and non national firms toward credit shocks. The following equation is regressed.

$$\text{Leverage}_{it}^{j} = \alpha + \alpha_1 d_t + \alpha_2 d^j + \alpha_3 d_t d^j + X_{it}^{j'}\beta + Z_t'\gamma + \varepsilon_{it}^{j}$$

Leverage_{it}^{j} is the leverage ratio of ith firm at time t. d^j is dummy variable which is 1 for non national firms and 0 for national firms. d_t is dummy as well and is 0 before the window and 1 after the window. α_3 represents the influences of credit shocks on the non national firms. If it is significant, it suggests that the national firms and non national firms would react differently towards credit shocks. X_{it}^{j} and Z_t' are control variables from sectional and time series respectively.

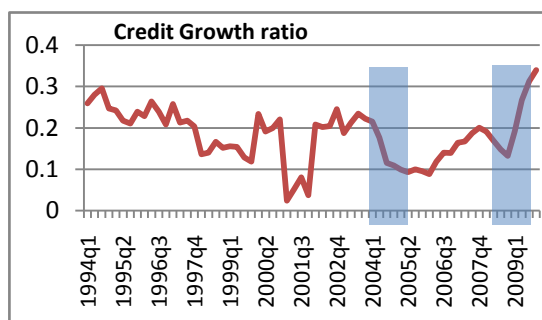The window is chosen based on the credit growth ratio in the following:

Figure 1 Credit growth ratio of China from 1994 to 2009

Data is from the web of People's Bank of China.

It is suggested in the graph above that the credit was declining in 2003 and increasing in 2009. In 2003, the government introduced new regulation systems and thus the credit supply in the economy is influenced. In 2009, the government put 4 trillion into the market and the credit increased. Thus, these two cases are selected as the window event to study the reaction of the firms. The regression results are as follows.

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It is suggested that α_3 is significantly positive at the confidence level of 1% in credit expansion. However, it is significantly negative in the credit contraction period. The small non national firms could access more credit in the expansion period leading to a higher leverage ratio. And they could get few credits relative to national firms leading to lower leverage ratio.

Two findings would be derived based on the analyses above. Firstly, the national firms have advantages in the credit market. The leverage ratio of national firms fluctuates less than the leverage of non national firms. It is influenced less than non national firms. This advantage comes from two reasons. One is that the national firms are usually larger and thus could afford more collateral. Thus the risks of the loans are smaller. The other is that the banks in China are national firms as well. The managers of banks are more familiar with the managers of other national firms. They could exchange information more easily. The information asymmetries are limited. Secondly, the nonational firms play as the credit buffer of the credit market and the financial accelerator of the economy. The credit shocks are mainly absorbed by the non national firms. And thus the national firms would be influenced little by these shocks. However, as the non national firms are so many and the main component of economy as well, the limitation in the credit market of the non national firms would influence the entire economy. The fluctuation of the economy is more intensively.

Table 1 The change of leverage ratio in credit expansion

Debt Ratio	Coef.	Std.Err.	z	P>|z|
α_1	.012821	.002080	6.16	0.000
α_2	-.01275	.003947	-3.23	0.001
α_3	.00290	.001005	2.89	0.004
Intangibles	-.85651	.003019	-283.6	0.000
ROA	-.04485	.005339	-8.40	0.000
GDP	.130389	.014377	9.07	0.000
National asset ratio	.002401	.009997	0.24	0.810
Substantial Shareholder ratio	-.00037	.000357	-1.06	0.288
Age of firms	.01166	.006567	1.78	0.076
Noncurrent asset ratio	.83049	.006581	126.1	0.000
Cons	.01282	.002080	6.16	0.000

Table 2 The change of leverage ratio in credit contraction

Debt Ratio	Coef.	Std.Err.	z	P>|z|
α_1	-.00746	.003556	-2.10	0.036
α_2	.00012	.001102	0.11	0.909
α_3	-.0014	.000996	-1.45	0.148
Intangibles	-.8496	.002454	-346.1	0.000
ROA	-.0779	.007025	-11.09	0.000
GDP	-.0045	.017225	-0.27	0.790
National asset ratio	.0106	.009658	1.11	0.268
Substantial Shareholder ratio	-.0026	.000328	-8.05	0.000
Age of firms	-.0075	.006241	-1.20	0.228
Noncurrent asset ratio	.8916	.005852	152.3	0.000
Cons	-.007	.003556	-2.10	0.036

3.3 Impulse response

In the following the impact of non nation firms on the economy would be investigated through the auditing costs reflecting the information asymmetries.

Table 3 Calibration of the linear system with xpectation

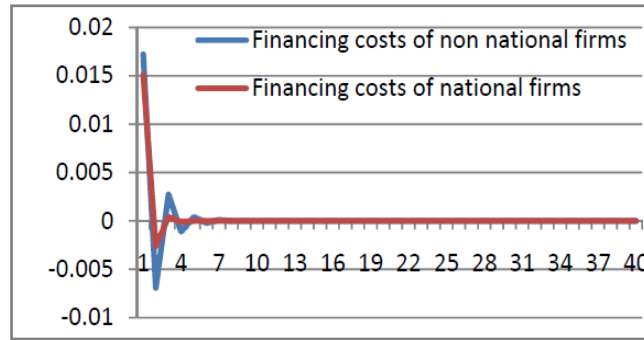|					
$\theta = 0.75$	$\varphi = 0.25$	$\alpha = 0.35$	$\Omega = 0.01$	$\eta = 3$	$\beta = 0.9753$
$\delta = 0.025$	$\gamma = 0.9728$	$\zeta = 0.55$	$\rho = 0.9$	$\rho_g = 1.0$	$\rho_a = 0.95$

Figure 2 Impulse response of external financial costs towards credit shocks

The change of external financing costs with respect to the change of 10% nominal interest rate is illustrated above. Two findings could be derived. Firstly, the external financing costs of the non national firms increase more, by about 18%. However the external financing costs of national firms increase about 15%. Nevertheless, both of the results suggest that the nominal variable imposes real effect through the financial system. Secondly, the influences on the national firms are longer. The change of national firms retreated after about 4 period. However, the influence on the non national firms last about 8 periods. However, the interest policy has no lasting effect for both types of firms.
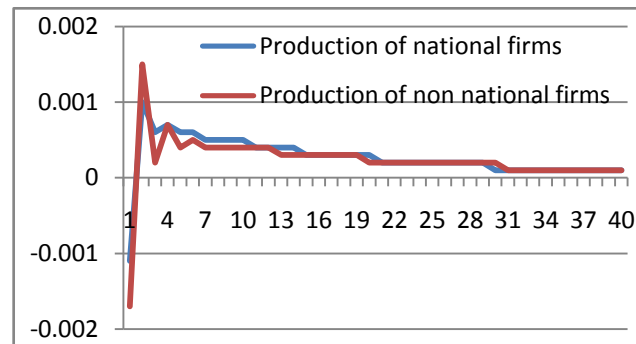

Figure 2 Impulse response of production towards credit shocks

It is suggested that the production of both national and non national firms would decrease with the increase of interest rate. And the production of non national firms drops more. Moreover, this adverse effect last more than 20 periods for both national and non national firms. And the national firms are influenced less.

4 Conclusion

This paper investigates the change of external financing costs of national and non national firms through empirical work and simulation under the condition of information asymmetries. The empirical results suggest that the national firms have advantage in the credit market. The leverage ratio of the non national firms drops more in the credit contraction period, and increase more in the credit expansion period. The large fluctuation of leverage ratio is not the volunteered results of the firms if an optima capital structure exists. Moreover, the non national firms act as the credit buffer in the economy. The simulation results suggest that the external financing costs indeed react differently towards the information asymmetries level. The external financing costs increase more and last long in the credit contraction period under the condition that the non national firms have more asymmetric information. Therefore, this paper proposes further insights on the differences of external financing between national and non national firms.

Acknowledgment:

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