Research on Financing Constraints and Corporate Value
Under Financial Crisis Shock
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Abstract. Since the difference between internal and external financing costs, enterprises are facing financing constraints. Outbreak of financial crisis affected the degree of financing constraints, then influenced corporate value. This paper uses financial data of Chinese listed manufacturing enterprises from 2005 to 2013, builds a model of financing constraints index with logistic regression and a model of financing constraints-corporate value with panel regression method to assess the impact of financial crisis on financing constraints and corporate value. The findings are shown as follow: (1) Reducing asset-liability ratio, increasing liquidity ratio, enterprise scale and return on equity will improve financing constraints. (2) Loosening financing constraints, decreasing asset-liability ratio, increasing gross profit margin, enterprise scale and earnings per share will promote corporate value. (3) Shock of financial crisis affects financing constraints significantly. (4) Outbreak of financial crisis deepens the degree of financing constraints, then reduces corporate value significantly.

1. Introduction
Outbreak of subprime crisis and European debt crisis brought huge impact to Chinese enterprises. Many enterprises have been facing financing constraints since then, which became a crucial bottle-neck to the survival and development. Corporate value embodies the real economic value and profitability of enterprises, which is effected by investment decision making. Financial crises influenced the degree of financing constraints and then caused the change of corporate value. Recently researches on financing constraints have been a hotspot in Chinese academic community. But rare concerned on the impact of loosening financing constraints on corporate value from micro subject. Therefore, this paper discusses the relationship between financial crisis shock, financing constraints and corporate value on the background of post financial crisis. A model of financing constraints index and a model of financing constraints-corporate value are built, the financial data of Chinese listed manufacturing enterprises are used to assess the impact of financial crisis on financing constraints and then corporate value. Finally, some countermeasures are proposed to promote corporate value from the view of loosening financing constraints.

2. Literature Review
2.1 Financing constraints and their measurement
The problem of financial constraints is caused by the difference between internal and external financing cost due to information asymmetry, principal-agent problem, etc [1]. Kaplan & Zingale (1997) thought that risk-free interest rate is internal capital rate, which will constitute external capital rate if it is added risk premium [2]. The capital supply problem determined by external investment environment can also lead to financing restrict problem [3].

Because financing constraints cannot be observed directly, how to measure it lies in calculation of risk premium [4]. There are some single variable as well as multivariable used to measure financing constraints. Dividend payout ratio [5], interest cover ratio [6], enterprise scale [7] and liability level [8] are some representative single variables.
Majority of scholars use multivariable. The general practice is to divide into groups firstly, then select a series of financial indexes, and finally use multivariate discriminant analysis and logistic regression method to develop financing constraints index model. Lamont used cash flow, Tobin’s Q, asset-liability ratio, dividend payout and cash holding, and adopted logistic regression method to develop KZ index [9]. Cleary (1999) divided into groups according to dividend payout ratio, selected liquidity ratio, interest cover ratio, financial slack, net profit rate, sales revenue growth rate and asset-liability ratio, and adopted multivariate discriminant analysis to build model [10]. Kuang Xuewen et.al chose asset-liability ratio, net working capital, return on equity and adopted multivariate discriminant analysis to build logistic regression model [11]. Zhu Min (2012) selected interest cover ratio and equity capital book value as grouping variables to sort study objects [12].

2.2 Impact of financial crisis on financing constraints

It is undoubted that the outbreak of financial crisis can shock enterprises financing, enterprises will think over internal and external financing cost. Shan Jiao et.al (2012) found that the relationship between banks and enterprises became more and more important during financial crisis and assets cover value affected corporate financing significantly. Especially in the post-crisis era, corporate growth ability affects it greatly [13]. To some enterprises with lower financing constraints and less influence from crisis will take advantage of crisis and cheap capital cost to expand business [14]. Deng Xiang et.al found that perfect competition industry would face much more serious financing constraints due to greatly and sensitively impacted by business cycle and macro policies [15].

2.3 Corporate value and its measurement

Modigliani & Miller (1958) defined corporate value as the present value of cash flow accomplished by enterprises in the future [16]. A popular method to measure it is market assessment, which adopts Tobin’s Q, an asset’s the ratio of market transaction price to its repurchasing exchange value. Furthermore, the book value of the historical cost [17], and the asset ratio of the market value to net value [18] are substituted for Tobin’s Q to describe corporate value.

The second method is financial evaluation, which selects some financial index such as return on total assets (ROA), return on equity (ROE), and return on assets of main business to measure corporate value. Li Ke et.al (2011) used ROA and ROS to evaluate performance [19]. Du De (2013) thought corporate is positively related with return on equity, operating profit ratio, asset-liability ratio, Tobin’s Q and intangible asset ratio [20].

The third method is economic evaluation, which uses economic value added (EVA) to evaluate corporate value. This method overcomes the shortcoming of traditional accounting statement’s absence of opportunity cost and reflects accurately investor’s benefit [21].

2.4 Financing constraints and corporate value

Financing constraints affect financing and investment decision-making directly [22]. Li Hongya et.al (2014) believed that financing constraints restricted corporate growth, especially to the listed small and medium-sized enterprises [23]. Li Ke et.al (2011) found that easing financing constraints could improve financing action and promote sustainable growth of the enterprise [19]. Tan Yanyan et.al (2013) pointed out that improving financing constraints could guarantee excess cash holdings and maximize corporate value [24].

3. Empirical Research

3.1 Financing constraints model and variables explanation

Adopting logistic regression method, financing constraints model is built as Eq.1:

\[ Y = \alpha \ast CR + \beta \ast SIZE + \gamma \ast ROE + \delta \ast LEV \] (1)

Here, \( \alpha, \beta, \gamma \) and \( \delta \) are regression coefficients. Explained variable \( y \) is a 0-1 dummy variable, which is defined as 0 and 1 when sample enterprises belong to low and high financing constraints group.
respectively. Among independent variables, CR is liquidity ratio, which reflects short-term debt paying ability through current assets realization. The less CR means the lower rate of capital turnover and then the greater financing constraints degree. SIZE means enterprise scale, which is the logarithm of total assets and is negatively related to financing constraints. ROE is return on equity, which is the ratio of net profit to net asset and is the index used to measure profitability. The more ROE means the higher internal capital gain and then the lower financing constraints degree. LEV is asset-liability ratio, which is the ratio of total liabilities to total assets. The less LEV means the more internal fund and the lower financing constraints degree.

3.2 Sample selection and data resources

We select manufacturing listed companies from Shanghai and Shenzhen Stock Exchange during 2005 to 2013 and get rid of st and *st companies and some companies with default or unusual financial data. After sample selection and data processing, 853 sample enterprises are confirmed. All financial indexes are from Straight Flush Data Center. According to interest cover ratio, we obtain 284 low group and 284 high group observations from 853 sample enterprises ultimately.

3.3 Regression results of financing constraints model

We adopt Eviews7.1 to logistic regress CR, SIZE, ROE and LEV, the estimation results are shown as table 1. The P value of these four regressor variables equal 0.0000, which indicates that they are significantly related to financing constraints index at the 1% significance level. LEV is positively related to financing constraints, while CR, SIZE and ROE are negatively related to it. The results are accorded with the previous assumption. Financing constraint index is influenced by ROE greatly, which means if ROE increases 1 unit, it will decrease by 5.379 units respectively when other variables remain constant. LEV and CR affect financing constraints in turn, while SIZE has little effect on it. When enterprise expands scale by 1 unit, its financing constraints degree only reduces by 0.076 units.

Table 1. Logistic regression results of financing constraints model.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>z-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CR</td>
<td>-0.349073</td>
<td>0.032861</td>
<td>10.62269</td>
<td>0.0000</td>
</tr>
<tr>
<td>SIZE</td>
<td>-0.076051</td>
<td>0.007556</td>
<td>-10.06539</td>
<td>0.0000</td>
</tr>
<tr>
<td>ROE</td>
<td>-5.379219</td>
<td>0.314345</td>
<td>-17.11249</td>
<td>0.0000</td>
</tr>
<tr>
<td>LEV</td>
<td>2.998594</td>
<td>0.247242</td>
<td>12.12820</td>
<td>0.0000</td>
</tr>
</tbody>
</table>

The final financing constraints index FC is shown as Eq.2 and Eq.3:

\[ FC = \frac{e^y}{1 + e^y} \] (2)

\[ y = -0.349073 \times CR - 0.076051 \times SIZE - 5.379219 \times ROE + 2.998594 \times LEV \] (3)

Substituting the data of 568 sample enterprises from 2005 to 2013 into Eq.2 and Eq.3 will calculate annual index FC. If FC is close to 1, it means the enterprise is facing huge financing constraints. While if FC is close to 0, it’s constraints degree is small.

3.4 Impact of financing constraints on corporate value model

Reference to domestic and overseas financial evaluation method to measure corporate value, we develop panel regression model shown as Eq.4:

\[ \text{ROA}_{it} = \alpha + \beta_1 \times D + \beta_2 \times \text{PROFIT}_{it} + \beta_3 \times \text{MARGIN}_{it} + \beta_4 \times \text{LEV}_{it} + \beta_5 \times \text{SIZE}_{it} + \beta_6 \times \text{EPS}_{it} + u_{it} \] (4)

Here, i represents different sample enterprises, t is time, \( \alpha \) is constant term, \( u_{it} \) is random disturbance, \( \beta_n \) is regression coefficient. Explained variable ROA is return on total asset, which equals (total profit + financial cost)/total assets, and can be used to measure corporate value. Among independent variables, D is 0-1 dummy variable to represent financing constraints, which is defined as 1 when financing constraints index FC is greater than or equal to 0.5. Otherwise, it is defined as 0. PROFIT is net asset growth rate, which equals (current net profit-prior period net profit)/current net
profit, and reflects net income level of business operation. MARGIN is gross profit margin, which equals (net income-product cost)/net income, and shows profitability. LEV is asset-liability ratio, which equals total liabilities/total assets, and indicates debt paying ability. SIZE is enterprise scale, which is the logarithm of total assets, and reflects future development prospect. EPS is earnings per share, which is the ratio of net profit to general capital, evaluates profitability and investment risk.

3.5 Regression results of impact of financing constraints on corporate value model

We adopt Eviews7.1 to panel regress impact of financing constraints on corporate value model, eliminate PROFIT because it is non-significant and not accord with economics assumption, the estimation results are shown as table 2.

Table 2. Regression results of impact of financing constraints on corporate value model.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Std. Error</th>
<th>t-Statistic</th>
<th>Prob.</th>
</tr>
</thead>
<tbody>
<tr>
<td>α</td>
<td>0.054856</td>
<td>0.020837</td>
<td>3.632592</td>
<td>0.0000</td>
</tr>
<tr>
<td>D</td>
<td>-0.020752</td>
<td>0.002793</td>
<td>-7.428902</td>
<td>0.0000</td>
</tr>
<tr>
<td>MARGIN</td>
<td>0.027889</td>
<td>0.007907</td>
<td>3.526899</td>
<td>0.0000</td>
</tr>
<tr>
<td>LEV</td>
<td>-0.037735</td>
<td>0.008236</td>
<td>-4.581903</td>
<td>0.0000</td>
</tr>
<tr>
<td>SIZE</td>
<td>0.001229</td>
<td>0.000989</td>
<td>18.242783</td>
<td>0.0000</td>
</tr>
<tr>
<td>EPS</td>
<td>0.029196</td>
<td>0.002407</td>
<td>12.12902</td>
<td>0.0000</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.699304</td>
<td></td>
<td></td>
<td>0.071511</td>
</tr>
</tbody>
</table>

Results show that R-squared is 0.699, F-statistic is 205.0651, which indicate the model has high fitting degree as a whole. Durbin-Watson stat is 1.986 and is close to 2, which shows that residual sequence is not self-contradiction. The P value of each variables equal 0.0000, which indicate that they are all significant at the 1% significance level. Regression coefficient of D is 0.021, which means corporate value will decrease by 0.021% when financing constraints degree increase by 1%. When MARGIN, SIZE and EPS rise by 1%, corporate value will increase by 0.028%, 0.001% and 0.029% respectively. While corporate value will decrease by 0.038% when LEV increases by 1%.

3.6 Impact of financing constraints on corporate value under financial crisis shock

To measure the impact of financing constraints on corporate value under financial crisis shock, we regress to Eq.4 again according to pre-crisis period (2005-2007), crisis period (2008-2009) and post crisis period (2010-2013). Regression results are shown as table 3.

Table 3. Regression results of impact of financing constraints on corporate value under financial crisis shock.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Coefficient</th>
<th>Coefficient</th>
<th>Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>α</td>
<td>0.068542***</td>
<td>0.021197***</td>
<td>0.059238***</td>
</tr>
<tr>
<td>D</td>
<td>-0.025727***</td>
<td>-0.026705***</td>
<td>-0.009283**</td>
</tr>
<tr>
<td>MARGIN</td>
<td>-0.053312***</td>
<td>-0.027832***</td>
<td>-0.031268***</td>
</tr>
<tr>
<td>LEV</td>
<td>-0.049017***</td>
<td>0.029372***</td>
<td></td>
</tr>
<tr>
<td>SIZE</td>
<td>0.001223***</td>
<td>0.002430***</td>
<td>0.000707***</td>
</tr>
<tr>
<td>EPS</td>
<td>0.001123***</td>
<td>0.002569***</td>
<td>0.0025946***</td>
</tr>
</tbody>
</table>
Notes: Figures in the parentheses denote values of the t-statistics; *, **, and *** indicates statistical significance at the 10%, 5% and 1% respectively.

Compared with three sample period, regression coefficients of D are -0.0257, -0.0267 and -0.0093 respectively, which indicate that deepening financing constraints can reduce corporate value, but the effect degree varies in different period. During the financial period, the absolute value of regression coefficient is maximum, which means the outbreak of crisis worsen financing constraints degree can reduce corporate value dramatically. While the absolute value in the post financial crisis period is the smallest, which shows that financing constraints remit in the later stage of crisis can affect corporate value slightly.

4. Conclusion and Policy Implication

This paper selects financial data of manufacturing listed enterprises from 2005 to 2013, builds a logistic regression model of financing constraints index and a panel regression model of financing constraints-corporate value to assess the impact of financial crisis on financing constraints and corporate value. The findings are shown as follow:

(1) Financing constraints are influenced by liquid ratio, enterprise scale, returning on equity and asset-liability ratio significantly. Among these factors, return on equity and asset-liability ratio affect financing constraints dramatically. Reducing asset-liability ratio, increasing liquidity ratio, enterprise scale and return on equity will improve financing constraints.

(2) Return on total asset can be used to measure corporate value, which is significantly and negatively related to financing constraints and asset-liability, and is significantly and positively related to gross profit margin, enterprise scale and earnings per share. Loosening financing constraints, decreasing asset-liability ratio, increasing gross profit margin, enterprise scale and earnings per share will promote corporate value.

(3) Shock of financial crisis affects financing constraints significantly. During the financial crisis, financial situation of enterprises face huge difficulties, shortage of internal fund and then worse financial constraints.

(4) Financing constraints affect corporate value greatly. Especially outbreak of financial crisis deepens the degree of financing constraints, then reduces corporate value significantly.

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