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## FINANCIAL ECONOMICS | RESEARCH ARTICLE

# Financing behavior of firms in tranquil and crisis period: Evidence from China

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**Abstract:** This study investigates the financing behavior of Chinese firms in tranquil and crisis situation over the period 2002–2014. We divide the sample into three sub-periods; pre-crisis, during-crisis, and post-crisis. The results indicate some noteworthy findings as this study incorporates firm and country-level factors. We find that the firms' financing choice depends on the market conditions. The results show that Chinese firms have significantly decreased their dependence on leverage after the eruption of global financial crisis. Furthermore, we find that financial crisis of 2007–2008 has significantly affected the explanatory power of all factors. Moreover, profitability, size, and liquidity are important factors determining capital structure of the firm in financial crisis period.

**Subjects:** Econometrics; International Finance; Corporate Finance

**Keywords:** capital structure; financial crisis; Chinese non-financial firms

### 1. Introduction

Firms have to make vital investment decisions and capital structure choices to achieve their main objective through value maximization. Therefore, every firm has to make a very careful financial choice between issuing stock and getting debt. For instance, debt is more convenient and cheaper

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### PUBLIC INTEREST STATEMENT

The 2007 financial crisis period affected the corporations from different perspective especially the financing behavior of the firms. In this study, we investigate into how different factors affect the financing choice of the Chinese firms in normal and financial crisis period. Our results highlight that Chinese firms have decreased their dependence on acquiring debt in financial crisis period. In addition, the most important factors that affect the financing choice of the Chinese firms are liquid assets, profitability, and size of the firm. Our results provide valuable information to investors and policy-makers about the financing behavior of firms in different market conditions.

source of accumulating funds than equity because of ease of availability from established creditors and tax shields from the government.

Various capital structure theories like trade-off theory, pecking order theory, agency theory, market timing theory etc., have been formulated on attaining an optimal capital structure. It is still an ongoing debate that which theory has more explanatory power than the other. Researchers like (Booth, Aivazian, Demircuc, & Maksimovic, 2001; Chen, 2004; Harrison & Widjaja, 2014; Rajan & Zingales, 1995; Wald, 1999) and many others have tested these theories and have shown mixed results. However, these theories are not reliable for different time periods or different economic conditions to validate it with the real world.

The global financial crisis of 2007–2008 was caused by the sub-prime mortgage crisis in the USA which bankrupted several big financial and non-financial institutions. Globalization induced the crisis and triggered bankruptcy in many forms to other major developed and developing economies. An empirical study by Iqbal and Kume (2015) on UK, French, and German firms found that the financial crisis of 2007–2008 impacted the capital structure decisions adversely as both equity and debt levels changed significantly in the wake of financial crisis. Another study by Harrison and Widjaja (2014) on USA firms found that the financial crisis of 2007–2008 impacted the capital structure decisions of firms, significantly. They showed that post-crisis capital structure decisions by the firms are more explainable by pecking order theory than the pre-crisis period.

Asian countries were also affected by the financial crisis of 2007–2008 as most of the countries are not self-driven like developed economies of the world. The intensity of the crisis was more than expected which surprised every nation in the region. Asian Development Bank report (2009) showed that the overall GDP of Asia (excluding China and India) in 2008 was decreased by 15%. Because of the dependent nature of most of the Asian countries, it was a worse situation for Asian economies than the developed economies from where the crisis was originated.

Financial crisis of 2007–2008 also shattered Chinese economy adversely. Because of Chinese export-oriented economy, its growth rate fell from 13 to 6.8% in the fourth quarter of 2008. Chinese government took very impressive measures to cope up with this catastrophic economic condition. They bailed out a stimulus package of 4 trillion Yuan to support the financial institutions. They revised their monetary policy like decreasing the interest rates to boost the credit growth rate of credit. Even, after taking all these measures and initiatives, Chinese economy is still recovering from the shocks of financial crisis of 2007–08.

Till now, very less significant work has been done on determining the impact of financial crisis on capital structure of Chinese firms. This study aims to fill this gap in literature with respect to non-financial listed firms of China for the time period of 2002–2014 by splitting the time period into three sub-periods; pre-crisis (2002–2006), during-crisis (2007–2009), and post-crisis (2010–2014) period. Most of the studies have been conducted on the comparison of pre-post-financial crisis periods, but this study will also show the capital structure decisions of Chinese non-financial firms during financial crisis period (2007–2009) and then compare it with pre-post financial crisis periods.

The rest of the study is organized as follows. The second section reviews the literature and discusses the various factors that affect the financing choice of the firms. The third section presents the methodology. The fourth section presents the results. The last section concludes.

## 2. Literature review

Capital structure is a debt to equity ratio that shows how a company finances its operations. Researchers have given multiple theories to determine optimal capital structure choices for firms but still the knowledge is very limited. Till now, certain theories have been defined to explain various variables to determine the capital structure. Pecking order theory, trade-off theory, agency theory, and market timing theory are the main capital structure theories which suggest that variables like

tangibility, profitability, size, liquidity, and market to book ratio as the determinants of capital structure (Tong & Green, 2005).

Myers (1984) argues that it is risky for the firm, if the market price of the equity is undervalued. So, issuance of new stock may create a situation of underinvestment. To avoid this situation, firms prefer to adopt pecking order, that is, firms prefer internal finance (retained earnings) over external finance like debt, safe debt over risky debt and convertible bonds over equity like issuance of common stock. However, many researchers have shown that there is no optimal leverage ratio in practice as every firm is independent to make any decision about their capital structure choices.

Trade-off theory also provides information about the capital structure choices of firms but mainly focuses on two options, debt and equity. This theory discusses the benefits of debt and also provides information about the agency costs and bankruptcy costs and explains about offsetting the costs with immediate access to the debt and tax shield benefits provided by debt (Fischer, Heinkel, & Zechner, 1989).

Agency theory argues about the capital structure choices by explaining the difference between principals and agents (Jensen & Meckling, 1976). Managers (agents) have strong intentions to invest in high pay-off projects even if the probability of success is low. Good outcome brings high gain for managers but if it turns out badly then investors (principals) bear most of the costs. So, both managers and investors have their incentives to pursue (Jensen & Meckling, 1976).

Market timing theory explains capital structure as a function of market conditions. This theory argues that capital structure can be explained as a function of stock and bond market conditions and managers decide between issuance of debt and equity according to the market conditions (Baker & Wurgler, 2002).

There are several factors which can affect the capital structure decisions of firms. Literature about those variables can be discussed as follows:

### **2.1. Size**

Rajan and Zingales (1995) used economies of G7 countries and used tangible assets, market to book ratio, size, and profitability as variables in their study to determine its relationship with capital structure. They found that size and tangible assets have positive relationship with leverage supporting trade-off theory but they also found that market to book ratio and profitability have negative relationship with leverage supporting pecking order theory. Another study by Wald (1999) examined the association of size and leverage and reported positive relationship for the firms in USA, UK, France, and Japan but negative for German firms.

The empirical works on Chinese firms have shown mixed results. Jean Chen and Strange (2005) have shown a positive relationship between size and leverage (long-term leverage) for the firms in China but (Anwar & Sun, 2013; Huang & Song, 2006; Tong & Green, 2005; Zou & Xiao, 2006) have shown that leverage and size are negatively correlated.

### **2.2. Profitability**

Capital structure theories explain differently about the relationship between profitability and leverage. Pecking order theory supports a negative relationship between profitability and leverage because profitable firms prefer internal funds for financing their investments but trade-off theory suggests that profitable firms can have easy access to external financing, therefore firms prefer to utilize external funds to finance their investments.

The empirical studies on China (Anwar & Sun, 2013; Chen, 2004; de Jong, Kabir, & Nguyen, 2008; Huang & Song, 2006; Tong & Green, 2005; Zou & Xiao, 2006) have shown negative relationship between profitability and leverage, which supports the pecking order theory.

### **2.3. Growth opportunities**

Growing firms have more tendencies to expand their businesses when there is rapid growth in sales. Myers (1977) suggested that growing firms hold more choices for future investment projects than low growth firms. Trade-off theory and agency theory both support negative relationship between growth opportunities and leverage, because firms holding future growth opportunities are like intangible assets and it can't be collateralized (Chen, 2004). In contrast, pecking order theory posits that firms expecting high future growth should use equity financing.

The empirical evidences regarding association of growth and leverage are also mixed. Deesomsak, Paudyal, and Pescetto (2004) have shown a negative relationship between growth opportunities and leverage. Chinese researchers like (Anwar & Sun, 2013; Chen, 2004; Zou & Xiao, 2006) also have shown the same results while, Wald (1999) has shown negative relationship with USA firms.

### **2.4. Agency cost**

Agency conflict arises because of agency conflict between managers and creditors which may lead to the non-productive use of firm resources. Jensen and Meckling (1976) argued that firms with more free cash flows usually face this conflict and use of debt may solve this conflict as debt payments can reduce the available amount of free cash flows and it brings certainty and symmetry in the usage of available cash. Tian, Han, and Zhang (2015) have argued that firms in countries with established financial policies are more careful about creditors' rights, and have less agency cost. It is found that Chinese firms face a direct relationship between management-equity holders' agency conflict and leverage (Qureshi, Imdadullah, & Ahsan, 2012).

### **2.5. Non-debt tax shield**

Non-debt tax shield (NDTS) is applicable to those firms when their income is consistently becoming low. According to De Angelo and Masulis (1980), NDTS is an alternative to tax shield on debt financing. Researchers have shown different results. Bradley, Jarrell, and Kim (1984) have shown a positive relationship but Wald (1999) has shown a negative association between NDTS and leverage. Trade-off theory claims that firms will borrow more funds when the tax rates are higher so it may encourage firms for debt because of non-debt tax shields.

In context of China, different studies (Anwar & Sun, 2013; Huang & Song, 2006) have shown that there's a negative relationship between NDTS and leverage.

### **2.6. Tax**

Tax has great importance for determining the capital structure of firms. According to Modigliani and Miller (1963), companies should prefer debt financing for their projects because of tax deduction associated with it. Empirical studies in China have shown very abstruse results. Researchers like Huang and Song (2006) have shown a negative relationship between tax and leverage which supports pecking order theory. However, Jean Chen and Strange (2005) have shown that tax has no significant relationship with leverage in China.

### **2.7. Tangibility**

Tangibility is the firms' collateralizable assets which can be used to get loan. Myers and Majluf (1984) argued that firms can avoid associated costs by using tangible assets to get debt and it supports the trade-off theory. Studies have shown mix results for relationship between tangibility and leverage. Few of the studies (de Jong et al., 2008; Viviani, 2008; Wald, 1999) have shown a positive relationship between tangibility and leverage. While others studies (Booth et al., 2001; Karadeniz, Yilmaz Kadir, Balcilar, & Beyazit Onal, 2009; Mazur, 2007) have shown negative relationship between tangibility and leverage in their studies.

Studies on Chinese market have also shown that there is a positive relationship between tangibility and leverage (Chen, 2004; Huang & Song, 2006; Zou & Xiao, 2006).

### **2.8. Volatility**

Volatility or business risk measures the probability of financial distress. Modigliani–Miller theorem proposes that systematic increase in variance for the value of assets decreases firms' systematic risk of equity. Therefore, there would be a positive relationship between volatility and leverage. In contrast, many studies (Booth et al., 2001; Choi & Richardson, 2016; de Jong et al., 2008) have shown that volatility is negatively associated with leverage.

With reference to China, studies (Anwar & Sun, 2013; Huang & Song, 2006) found the same results with significant negative relationship between volatility and leverage.

### **2.9. Liquidity**

Liquidity has great importance for firms for the determination of capital structure for firms. Capital structure theories have argued differently for the relationship between liquidity and leverage. Trade-off theory claims that firms with higher liquidity ratios should prefer external financing while, on the other hand, pecking order theory argues that firms with higher liquidity ratios prefer internal funds (retained earnings) to finance their projects (Mazur, 2007; Viviani, 2008).

We have discussed firm level determinants of capital structure in the aforementioned section. The recent studies have shown that country-level factors also influence capital structure decisions of firms. Antoniou, Guney, and Paudyal (2008) studied five developed countries like UK, USA, France, Germany, and Japan and found that there are similarities for the determinants of capital structure but their importance varies among countries. They concluded that country-specific factors are of great importance while determining the capital structure of firms as only firm-specific factors cannot explain the capital structure at all. In considering the importance of country-level determinants, we considered two country-level determinants of capital structure i.e. economic development and inflation.

### **2.10. Economic development**

Gross Domestic product (GDP) or GDP growth is a gage to measure the health of a country. Researchers have found that GDP or GDP growth impacts significantly the capital structure decisions of firms. Numerous studies (Bandt, Camara, Pessarossi, & Rose, 2014; Dincergok & Yalciner, 2011; Gajurel, 2006; Jõeveer, 2013) have found that firms in countries with good economic conditions prefer internal financing, which is a supporting assumption for pecking order theory. But, contrary to this, de Jong et al. (2008) have shown that economic development has a positive relationship with leverage which supports trade-off theory. They further argued that firms in countries with stronger and sound legal systems prefer debt over equity corporate structure.

### **2.11. Inflation rate**

Inflation rate is measure of uncertainty in any economy. Inflation is a very important macroeconomic factor which significantly influences the capital structure. Researchers have shown mix results. Frank and Goyal (2009) found that there is no relationship between inflation and debt ratio of a firm, but however, Gajurel (2006) have shown that inflation is negatively correlated with leverage. Some studies (Bokpin, 2009; Hanousek & Shamshur, 2011; Sett & Sarkhel, 2010) reported that there is positive relationship between inflation rate and leverage.

#### **2.11.1. Financial crisis and capital structure preferences and China**

The financial crisis of 2007–2008 started off as a subprime mortgage crisis from the USA in August 2007 but it took most of the world under its shock within no time. It affected global financial and non-financial institutions severely. Financial giants like Bear Stearns, Lehman Brothers, Merrill Lynch, AIG, and Citigroup either totally collapsed or had to accept government support through large bailouts. This crisis hit every sector in the USA and the unemployment rate rose to 9.8 from 4.4% in 2009. It was considered as the worst recession since the Great Depression of the 1930s.

After financial crisis, many researchers tried to find out the impact of financial crisis on capital structure of firms in different economies. Akdal (2011) argued that UK firms were favoring pecking order theory for profitability, non-debt tax shields, volatility, and liquidity but favoring trade-off theory for tangibility and size. Harrison and Widjaja (2014) found that American non-financial firms behaved differently for their capital structure choices changed their behavior after financial crisis 2007–2008. They showed that results were in favor of pecking order theory.

Chinese capital market is still under-developed. That's why researchers were assuming that as China has closed economy and insulated banking system so it will not affect Chinese economy. However, the situation was different as it was expected, it hampered Chinese economic growth to a great extent because of Chinese export industry which in turn impacted the workforce adversely.

Mostly, research work has been done on developed economies regarding capital structure theories' validity but fewer studies have been conducted on developing or transitional economies especially on China. China economic features are different from other countries.

Scholars paid most of their attentions on western economies even after the inception of capital markets in China in 1990. After China's entry into a market-based economy, researchers started paying attention to the Chinese capital structure.

Studies prior to financial crisis have shown mix results in China as Huang and Song (2006) studied the leverage decisions of 799 Chinese listed companies and concluded that for Chinese non-financial firms trade-off model is more explainable than the pecking order hypothesis. Huang and Song (2006) found that Chinese listed firms are unlikely to follow the traditional pecking order as in western countries but they seem to follow a different method for financing their firms. They found that Chinese firms prefer external financing than internal sources. But Chen (2004) argued that Chinese firms don't follow any traditional capital structure model and suggested a new pecking order and claimed that retained profit is preferred over equity and equity is preferred over debt. Qian, Tian, and Wirjanto (2009) analyzed 650 Chinese listed companies and found that Chinese firms follow pecking order theory. Jian Chen, Jiang, and Lin (2014) argued that there's no theory that can explain the capital structure behaviors of Chinese firms. They showed that ownership has strong industrial effect on leverage. They also provided the evidence that Chinese firms rely more on short-term debt rather than long-term debt as in other developed countries.

### 3. Methodology

#### 3.1. Data

This study is designed to study the financing behavior of firms in tranquil and the recent global financial crisis period. We considered the non-financial firms of China for the period 2002–2014. For investigating the behavior of firms, we quantified the data into three sub-periods; pre-crisis period (2002–2006), during-crisis period (2007–2009), and post-crisis period (2010–2014). The selection of three different time periods will provide valuable information about the financing behavior of firms in tranquil, crisis, and in a recovery situation. We considered five years in pre- and post-financial crisis period to get robust results. We obtained the firm-level data-sets from the RESSET and CSMAR databases and the economic data have been obtained from EIU-Country Data. The final sample includes 1,554 firms in pre-crisis period, 2,445 firms in during-crisis period, and 4,210 firms in post-crisis period. These firms are listed on Shanghai and Shenzhen Stock Exchange.

In this study, we have considered the most widely used firm-level determinants of capital structure. Further, we have considered two country-level determinants of capital structure. The firm-level determinants of capital structure considered in this study include; agency cost, non-debt tax shield, tax shield, tangibility, liquidity, growth potential, profitability, volatility, and firm size. We have considered two country level-determinants of capital structure i.e. inflation and economic development. The inclusion of variables is based on various theories and empirical literature. The information



about the variables, their descriptions, the proxy used for the variables, and the effect of the variables on the leverage is reported in Table 1.

### 3.2. Methodology

In this study, we applied panel data model for examining the determinants of capital structure in tranquil and in crisis situation. In the preliminary step, we applied the Hausman Specification test for identifying that which specific model, either fixed or random effect model will be best for the regression.<sup>1</sup> In the next step, we applied the following econometric model, which is represented in Equation (1). We applied the following equation for all sub-periods.

$$LEV_{it} = \beta_0 + \beta_1 TS_{it} + \beta_2 NDS_{it} + \beta_3 VOL_{it} + \beta_4 AC_{it} + \beta_5 GP_{it} + \beta_6 PROF_{it} + \beta_7 LIQ_{it} + \beta_8 TANG_{it} + \beta_9 SIZE_{it} + \beta_{10} INF_t + \beta_{11} ED_t + \varepsilon_t \quad (1)$$

In Equation (1),  $LEV_{it}$  represents leverage. We used three proxies of leverage, Short-term debt ( $STD_{it}$ ), which is defined as current liabilities over total assets; long-term debt ( $LTD_{it}$ ), which is defined as non-current liabilities over total assets; and total debt ( $TD_{it}$ ) which is defined as total liabilities over total assets;  $TAX_{it}$  is defined as % effective tax rate;  $NDS_{it}$  is defined as depreciation expense over total assets;  $PROF_{it}$  is defined EBT scaled by total assets;  $VOL_{it}$  is defined as standard deviation of EBT/total assets;  $AC_{it}$  is the operating exp/sales;  $LIQ_{it}$  is defined as current assets over current liabilities;  $TAN_{it}$  is defined as net fixed assets over total assets;  $SIZE_{it}$  is defined as natural logarithm of total assets;  $GP_{it}$  is defined as Tobin's Q (ratio of market to book value of assets);  $ED_{it}$  is defined as the yearly % change of GDP and  $INF_{it}$  is defined as annual inflation rate. For estimating the model, we have controlled the firm, time, and industry effect to get robust results.

## 4. Empirical results

### 4.1. Descriptive statistics

The results of descriptive statistics of dependent and explanatory variables in pre-, during-, and post-crisis period are reported in Table 2. The final sample in pre-, during-, and post-crisis period yields a total of 6,350, 6,348, and 16,824 firm-year observations, respectively. The results show some noteworthy findings. We find that more than 50 percent of the total assets are financed with debt. Further, we observed that firms in China rely more on short-term debt as compared to long-term debt. This result is consistent with Huang and Song (2006). We observed significant decrease in the mean short-term debt in during-crisis period, and further significant decrease in post-crisis period. Such results suggest that firms have decreased their dependence on short-term leverage in financial crisis period and they further reduced in post-crisis period. The other possible explanation would be the fact that Chinese firms were not able to acquire more debt in financial crisis period. However, we

**Table 1. Independent variables, their description and expected relationship with leverage**

Variable name	Model name	Proxy	Effect on leverage (+/-)
Agency cost	$AC_{it}$	Operating Exp./Sales	+
Non-debt tax shield	$NDS_{it}$	Depreciation expenses/total assets	-
Tax shield	$TAX_{it}$	Tax Payments/gross profit	+
Tangibility	$TANG_{it}$	Net fixed assets/total assets	+
Liquidity	$LIQ_{it}$	Current assets/current liabilities	+/-
Growth potential	$GP_{it}$	% Change in total assets	+/-
Profitability	$PROF_{it}$	Profit before tax/total assets	+/-
Volatility	$VOL_{it}$	% Change in (EBT/total assets)	+/-
Firm size	$SIZE_{it}$	ln (total assets)	+/-
Inflation	$INF_t$	Annual inflation rate	-
Economic growth	$ED_t$	Annual per capita GDP growth rate	+/-

**Table 2. Descriptive statistics**

Variable	Pre-crisis (2002–2006)				During-crisis (2007–2009)				Post-crisis (2010–2014)			
	Obs.	Mean	Std.	Median	Obs.	Mean	Std.	Median	Obs.	Mean	Std.	Median
STD <sub>it</sub>	6,350	0.4421	0.2169	0.4252	6,348	0.4282	0.2170	0.4119	16,824	0.3677	0.2065	0.3501
LTD <sub>it</sub>	6,350	0.1060	0.1091	0.0740	6,348	0.1115	0.1231	0.0699	16,824	0.0853	0.1131	0.0369
TD <sub>it</sub>	6,350	0.5505	0.2373	0.5452	6,348	0.5393	0.2450	0.5314	16,824	0.4534	0.2384	0.4469
TAX <sub>it</sub>	6,350	0.0563	0.0595	0.0412	6,348	0.0637	0.0672	0.0527	16,824	0.0584	0.0580	0.0506
NDTS <sub>it</sub>	6,350	0.0282	0.0192	0.0248	6,348	0.0291	0.0208	0.0248	16,824	0.0245	0.0194	0.0201
VOL <sub>it</sub>	6,350	-0.5824	3.6295	-0.1084	6,348	-0.3010	3.1206	-0.0611	16,824	-0.3203	2.7282	-0.1170
AC <sub>it</sub>	6,350	0.2047	0.2304	0.1389	6,348	0.1917	0.1958	0.1409	16,824	0.2225	0.1989	0.1678
GP <sub>it</sub>	6,350	0.1748	0.3431	0.1045	6,348	0.3109	0.4910	0.1886	16,824	0.3044	0.5111	0.1621
PROF <sub>it</sub>	6,350	0.0313	0.0857	0.0354	6,348	0.0721	0.0989	0.0616	16,824	0.0664	0.0824	0.0561
LIQ <sub>it</sub>	6,350	1.5484	1.4845	1.2065	6,348	1.8374	1.9985	1.3148	16,824	2.7651	3.1894	1.6785
TANG <sub>it</sub>	6,350	0.4738	0.2033	0.4646	6,348	0.4362	0.2220	0.4196	16,824	0.3784	0.2232	0.3576
SIZE <sub>it</sub>	6,350	12.1494	1.1305	12.0794	6,348	12.2719	1.4683	12.2155	16,824	12.2082	1.9745	12.4031
ED <sub>t</sub>	6,350	1.6005	1.4130	1.4632	6,348	3.0594	2.9757	4.7503	16,824	3.0269	1.1238	2.6271
INF <sub>t</sub>	6,350	10.8090	1.2659	10.0756	6,348	10.7544	2.1509	9.6234	16,824	8.3377	1.2135	7.7503

Notes: This table provide information about the descriptive statistics of the three sub-periods; pre, during and post-crisis period. STD is defined as current liabilities over total assets; LTD is defined as non-current liabilities over total assets; TD is defined as total liabilities over total assets; TAX is defined as % effective tax rate; NDTs is defined as depreciation expense over total assets; PROF is defined EBT scaled by total assets; VOL is defined as standard deviation of EBT/total assets; AC is the operating exp/sales; LIQ is defined as current assets over current liabilities; TAN is defined as net fixed assets over total assets; SIZE is defined as natural logarithm of total assets; GP is defined as Tobin's Q (ratio of market to book value of assets); ED is defined as the yearly % change of GDP and INF is defined as annual inflation rate.



find that firms have increased their long-term debt during-crisis period, but decrease their long-term debt in post-crisis period. The notable findings suggest that firms decreased their reliance on total leverage in post-crisis period (0.45), as compared to pre-crisis (0.55) and during-crisis (0.53) period. Moreover, we observed that few of the factors decrease in during-crisis period (volatility, agency cost, tangibility), while most of the factors increased in during-crisis and post-crisis period.

#### **4.2. Correlation matrix**

The Tables 3–5 represents the pair-wise correlation and variance inflation factor for pre-, during-, and post-crisis period, respectively. The results show some key findings. The results show that the correlation among few of the variables varies across periods. We observed that NDTs has significant negative association with short-term debt in pre-crisis period; however, the stated relationship is positive in during and post-crisis period. In addition, the notable finding suggests that the association of NDTs and long-term debt is positive in all sub-periods. The obtained results are not consistent with theoretical and empirical literature which suggests that NDTs and leverage are negatively associated. This result suggests that financial crisis affected the stated relationship.

In this study, we used three proxies of leverage as dependent variables and eleven explanatory variables. By considering many variables and for a large sample, the multicollinearity might be an issue which might exist among variables. For robustness of our estimated results, we tested the multicollinearity between the variables by using Variance Inflation Factor. The results of Variance Inflation Factor of pre-, during-, and post-crisis period are reported in Tables 3–5, respectively. The results show that there are no problems of multicollinearity among the variables.

#### **4.3. Determinants of capital structure in pre-, during-, and post-crisis period**

The results of short-term, long-term, and total leverage in the three selected sub-periods are reported in Table 6. The results yield some noteworthy findings. The notable findings suggest that tax has significant relationship with all leverage measures in post-crisis period. Further, the association is significant positive with total debt only in during-crisis period. Such results suggest that Chinese firms enjoyed tax shield benefits in the post-crisis period only. However, the association of long-term debt and tax is significant negative in post-crisis period. The results are consistent with Huang and Song (2006) which confirmed the same relationship and showed that tax is negatively related to leverage for Chinese firms.

The NDTs has significant positive association with short-term and total-debt in all sub-periods. Such results suggest that firms in China rely more on NDTs to increase their leverage. This result is inconsistent with the studies like Huang and Song (2006), which reported significant negative association of debt with NDTs. Furthermore, the notable findings suggest the absence of association of NDTs with total-debt in all sub-periods.

The volatility or business risk has significant positive association with all leverage measures in pre and post-crisis period. However, the relationship is only significant with short-term debt in during-crisis period. Such results suggest that financial crisis affected the relationship of volatility and leverage. The significant positive relationship is consistent with Modigliani–Miller theorem which predicts that firm's systematic risk of equity decreases with the systematic increase of variance for the value of its assets. However, the results are inconsistent with studies that predicted negative leverage and volatility association (Booth et al., 2001; Choi & Richardson, 2016; de Jong et al., 2008).

The agency cost has significant positive association with total debt while insignificant with long-term debt in all sub-periods. Furthermore, the association of agency cost is significant positive with short-term debt in pre and during-crisis period. Such results suggest that Chinese firms rely more on debt to mitigate the effects of agency cost. The significant positive association is consistent with agency cost theory and empirical literature.

**Table 3. Pair-wise correlation and variation inflation factor in pre-crisis period**

Variables	STD <sub>it</sub>	LTD <sub>it</sub>	TD <sub>it</sub>	TAX <sub>it</sub>	NDTS <sub>it</sub>	VOL <sub>it</sub>	AC <sub>it</sub>	GP <sub>it</sub>	PROF <sub>it</sub>	LIQ <sub>it</sub>	TANG <sub>it</sub>	SIZE <sub>it</sub>	INF <sub>it</sub>	ED <sub>it</sub>	VIF
STD <sub>it</sub>	1.0000														
LTD <sub>it</sub>	-0.1342	1.0000													
TD <sub>it</sub>	0.8872	0.3178	1.0000												
TAX <sub>it</sub>	-0.2123	0.0686	-0.1687	1.0000											1.25
NDTS <sub>it</sub>	-0.0674	0.1409	0.0063	-0.1228	1.0000										1.35
VOL <sub>it</sub>	-0.0719	0.0260	-0.0508	0.1526	-0.0130	1.0000									1.14
AC <sub>it</sub>	0.2467	-0.0768	0.2219	-0.2680	0.0399	-0.1641	1.0000								1.50
GP <sub>it</sub>	-0.0868	0.1379	-0.0274	0.2095	-0.1703	0.1026	-0.2272	1.0000							1.18
PROF <sub>it</sub>	-0.4811	0.0284	-0.4547	0.4107	-0.0831	0.3393	-0.5248	0.3341	1.0000						1.86
LIQ <sub>it</sub>	-0.5009	-0.1398	-0.5293	0.1206	-0.1108	0.0339	0.0005	0.0295	0.1950	1.0000					1.17
TANG <sub>it</sub>	-0.2440	0.3703	-0.0529	-0.0359	0.4782	-0.0145	0.0159	-0.1003	-0.0118	-0.2690	1.0000				1.43
SIZE <sub>it</sub>	-0.1070	0.3176	0.0315	0.1775	0.0963	0.0583	-0.2919	0.1376	0.1609	-0.1442	0.1786	1.0000			1.18
INF <sub>it</sub>	0.0560	0.0335	0.0694	0.0075	0.0328	-0.0274	-0.0298	-0.0007	0.0035	-0.0224	-0.0037	0.0371	1.0000		1.05
ED <sub>it</sub>	0.0957	0.0782	0.1218	0.0287	0.0646	0.0283	-0.0358	0.0553	0.0454	-0.0561	0.0162	0.0613	0.2041	1.0000	1.06

Notes: This table presents the results of correlation and variance inflation factor in pre-crisis period (2002–2006). STD is defined as current liabilities over total assets; LTD is defined as non-current liabilities over total assets; TD is defined as total liabilities over total assets; TAX is defined as % effective tax rate; NDTS is defined as depreciation expense over total assets; PROF is defined EBT scaled by total assets; VOL is defined as standard deviation of EBT/total assets; AC is the operating exp/sales; LIQ is defined as current assets over current liabilities; TAN is defined as net fixed assets over total assets; SIZE is defined as natural logarithm of total assets; GP is defined as Tobin's Q (ratio of market to book value of assets); ED is defined as the yearly % change of GDP and INF is defined as annual inflation rate, VIF is variance inflation factor.

**Table 4. Pair-wise correlation and variation inflation factor in during-crisis period**

Variables	STD <sub>it</sub>	LTD <sub>it</sub>	TD <sub>it</sub>	TAX <sub>it</sub>	NDTS <sub>it</sub>	VOL <sub>it</sub>	AC <sub>it</sub>	GP <sub>it</sub>	PROF <sub>it</sub>	LIQ <sub>it</sub>	TANG <sub>it</sub>	SIZE <sub>it</sub>	INF <sub>it</sub>	ED <sub>t</sub>	VIF
STD <sub>it</sub>	1.0000														
LTD <sub>it</sub>	-0.0018	1.0000													
TD <sub>it</sub>	0.8743	0.4690	1.0000												
TAX <sub>it</sub>	-0.0728	0.0476	-0.0398	1.0000											1.21
NDTS <sub>it</sub>	0.0589	0.1150	0.1125	-0.2222	1.0000										1.50
VOL <sub>it</sub>	-0.0740	-0.0165	-0.0765	0.1501	-0.1418	1.0000									1.13
AC <sub>it</sub>	0.0818	0.0047	0.0694	-0.1621	0.0962	-0.0826	1.0000								1.18
GP <sub>it</sub>	-0.1502	-0.0440	-0.1532	0.1546	-0.3041	0.0900	-0.1143	1.0000							1.24
PROF <sub>it</sub>	-0.3054	-0.2225	-0.3805	0.3167	-0.2256	0.3116	-0.1357	0.2501	1.0000						1.44
LIQ <sub>it</sub>	-0.5200	-0.1886	-0.5524	0.0658	-0.1983	0.0265	0.0873	0.2722	0.2247	1.0000					1.26
TANG <sub>it</sub>	-0.1038	0.3897	0.1013	-0.1546	0.5231	-0.0812	0.0399	-0.2512	-0.2643	-0.3491	1.0000				1.62
SIZE <sub>it</sub>	0.0111	0.3487	0.1905	0.1008	0.0203	0.0053	-0.2967	0.0351	-0.2207	-0.2235	0.2436	1.0000			1.33
INF <sub>it</sub>	0.0747	-0.0166	0.0551	-0.0266	0.0193	-0.0172	-0.0081	0.0290	-0.0505	-0.0956	0.0557	-0.0037	1.0000		1.24
ED <sub>t</sub>	0.0554	0.0139	0.0540	0.1111	-0.0003	0.0781	-0.0262	0.0947	-0.0070	-0.0776	0.0527	0.0209	0.4250	1.0000	1.27

Notes: This table presents the results of correlation and variance inflation factor in during-crisis period (2007–2009). STD is defined as current liabilities over total assets; LTD is defined as non-current liabilities over total assets; TD is defined as total liabilities over total assets; TAX is defined as % effective tax rate; NDTS is defined as depreciation expense over total assets; PROF is defined EBT scaled by total assets; VOL is defined as standard deviation of EBT/total assets; AC is the operating exp/sales. LIQ is defined as current assets over current liabilities; TAN is defined as net fixed assets over total assets; SIZE is defined as natural logarithm of total assets; GP is defined as Tobin's Q (ratio of market to book value of assets); ED is defined as the yearly % change of GDP and INF is defined as annual inflation rate, VIF is variance inflation factor.

**Table 5. Pair-wise correlation and variation inflation factor in post-crisis period**

Variables	STD <sub>it</sub>	LTD <sub>it</sub>	TD <sub>it</sub>	TAX <sub>it</sub>	NDS <sub>it</sub>	VOL <sub>it</sub>	AC <sub>it</sub>	GP <sub>it</sub>	PROF <sub>it</sub>	LIQ <sub>it</sub>	TANG <sub>it</sub>	SIZE <sub>it</sub>	INF <sub>it</sub>	ED <sub>it</sub>	VIF
STD <sub>it</sub>	1														
LTD <sub>it</sub>	0.0244	1													
TD <sub>it</sub>	0.8798	0.4906	1												
TAX <sub>it</sub>	-0.0685	0.1010	-0.0111	1											1.28
NDS <sub>it</sub>	0.0229	0.1328	0.0864	-0.2317	1										1.53
VOL <sub>it</sub>	-0.0700	-0.0211	-0.0737	0.1397	-0.0933	1									1.07
AC <sub>it</sub>	-0.1228	-0.1268	-0.1635	-0.2327	0.0678	-0.0710	1								1.28
GP <sub>it</sub>	-0.1140	-0.0687	-0.1317	0.1131	-0.2200	0.0190	-0.0317	1							1.17
PROF <sub>it</sub>	-0.2806	-0.2126	-0.3481	0.3447	-0.2027	0.2475	-0.1183	0.2082	1						1.35
LIQ <sub>it</sub>	-0.6042	-0.2439	-0.6386	0.0642	-0.1876	0.0284	0.1985	0.2311	0.1828	1					1.24
TANG <sub>it</sub>	-0.0650	0.4481	0.1575	-0.1098	0.5269	-0.0577	-0.0510	-0.2016	-0.2221	-0.3437	1				1.74
SIZE <sub>it</sub>	0.0949	0.4456	0.2932	0.1916	-0.0024	-0.0109	-0.3812	-0.0696	-0.1584	-0.2244	0.3273	1			1.49
INF <sub>it</sub>	-0.0109	0.0929	0.0347	0.0786	-0.0159	0.0135	-0.0832	0.1363	0.0534	0.0467	-0.0038	0.1082	1		1.86
ED <sub>it</sub>	0.0109	0.1168	0.0655	0.0915	-0.0001	0.0279	-0.1057	0.2071	0.0829	0.0309	0.0072	0.1104	0.6775	1	1.92

Notes: This table presents the results of correlation and variance inflation factor in during-crisis period (2010–2014). STD is defined as current liabilities over total assets; LTD is defined as non-current liabilities over total assets; TD is defined as total liabilities over total assets; TAX is defined as % effective tax rate; NDS is defined as depreciation expense over total assets; PROF is defined EBT scaled by total assets; VOL is defined as standard deviation of EBT/total assets; AC is the operating exp/sales; LIQ is defined as current assets over current liabilities; TAN is defined as net fixed assets over total assets; SIZE is defined as natural logarithm of total assets; GP is defined as Tobin's Q (ratio of market to book value of assets); ED is defined as the yearly % change of GDP; and INF is defined as annual inflation rate, VIF is variance inflation factor.

**Table 6. Determinants of capital structure in China in pre-, during-, and post-crisis period**

Variables	Pre-crisis (2002–2006)			During-crisis (2007–2009)			Post-crisis (2010–2014)		
	STD <sub>it</sub>	LTD <sub>it</sub>	TD <sub>it</sub>	STD <sub>it</sub>	LTD <sub>it</sub>	TD <sub>it</sub>	STD <sub>it</sub>	LTD <sub>it</sub>	TD <sub>it</sub>
TAX <sub>it</sub>	-0.0217 (-0.6600)	-0.0054 (-0.2200)	0.0138 (0.3700)	0.0417 (1.6200)	0.0206 (1.0900)	0.0588** (2.1700)	0.0925*** (4.6800)	-0.0310** (-2.4200)	0.0844*** (3.9100)
NDTS <sub>it</sub>	0.5619*** (5.2700)	0.0721 (0.8800)	0.6614*** (5.4900)	0.4955*** (4.2400)	-0.0217 (-0.2500)	0.5657*** (4.6100)	0.7968*** (10.3100)	0.0558 (1.1200)	0.8108*** (9.6000)
VOL <sub>it</sub>	0.0028*** (8.2100)	0.0005* (1.7700)	0.0036*** (9.4400)	0.0008** (2.0200)	0.00001 (-0.0500)	0.0007 (1.5600)	0.0006* (1.9200)	0.0006*** (3.1100)	0.0009*** (2.7700)
AC <sub>it</sub>	0.0325*** (3.6100)	-0.0037 (-0.5400)	0.0393*** (3.8600)	0.0472*** (3.8900)	-0.0134 (-1.5100)	0.0352*** (2.7600)	0.0130 (1.6900)	0.0003 (0.0700)	0.0180** (2.1400)
GP <sub>it</sub>	0.0139*** (3.3200)	0.0285*** (8.9000)	0.0426*** (9.0100)	0.0072** (2.2100)	0.0003(0.1200)	0.0092*** (2.7100)	0.0042** (2.4600)	0.0007(0.6800)	0.0044** (2.3600)
PROF <sub>it</sub>	-0.5998*** (-23.5000)	-0.0435** (-2.2200)	-0.6712*** (-23.2500)	-0.2931*** (-13.3600)	-0.0669*** (-4.1600)	-0.3534*** (-15.3300)	-0.2770*** (-18.1200)	-0.0411*** (-4.1500)	-0.3394*** (-20.3300)
LIQ <sub>it</sub>	-0.0478*** (-33.2600)	0.0084*** (7.6400)	-0.0392*** (-24.1000)	-0.0364*** (-33.2700)	0.0011 (1.3800)	-0.0352*** (-30.5400)	-0.0284*** (-65.1200)	0.0009*** (3.0700)	-0.0276*** (-58.0800)
TANG <sub>it</sub>	-0.2408*** (-15.9200)	0.1592*** (13.7200)	-0.0753*** (-4.4000)	-0.1313*** (-7.4400)	0.1200*** (9.2700)	-0.0148 (-0.8000)	-0.1889*** (-18.7100)	0.1269*** (19.4100)	-0.0675*** (-6.1200)
SIZE <sub>it</sub>	-0.0037 (-0.7500)	0.0323*** (8.5700)	0.0267*** (4.8000)	-0.0360*** (-6.8200)	0.0147*** (3.8100)	-0.0258*** (-4.6600)	-0.0209*** (-8.0500)	0.0195*** (11.6400)	-0.0044 (-1.5600)
ED <sub>it</sub>	0.0056*** (7.4000)	0.0014*** (2.3600)	0.0076*** (8.7700)	0.0017*** (4.4200)	-0.0020*** (-6.8700)	-0.0004 (-0.9400)	-0.0009 (-1.1200)	0.0011** (2.2600)	0.0001 (0.1600)
INF <sub>it</sub>	0.0151*** (14.4700)	0.0033** (4.0600)	0.0184*** (15.5700)	0.0008 (1.4200)	-0.0001 (-0.2500)	0.0003 (0.5600)	0.0053*** (5.6700)	0.0085*** (13.9900)	0.0137*** (13.3700)
Constant	0.4997*** (8.8200)	-0.4167*** (-9.5900)	0.1006 (1.5700)	0.9724*** (13.9300)	-0.1098** (-2.1400)	0.9206*** (12.5500)	0.7204*** (19.5400)	-0.2747*** (-11.5100)	0.4877*** (12.1100)
R <sup>2</sup>	0.5561	0.2016	0.4209	0.3346	0.2247	0.2909	0.3925	0.2998	0.4462
No. of obs.	6,350	6,350	6,350	6,348	6,348	6,348	16,824	16,824	16,824
No. of firms	1,554	1,554	1,554	2,445	2,445	2,445	4,210	4,210	4,210

Notes: This table presents the results of panel data model for the three leverage measures; STD, LTD, STD for the period, pre-crisis (2002–2006), during-crisis (2007–2009), and post-crisis (2010–2014). STD is defined as current liabilities over total assets; LTD is defined as non-current liabilities over total assets; TD is defined as total liabilities over total assets; TAX is defined as % effective tax rate; NDTS is defined as depreciation expense over total assets; PROF is defined EBT scaled by total assets; VOL is defined as standard deviation of EBT/total assets; AC is the operating exp/sales; LIQ is defined as current assets over current liabilities; TAN is defined as net fixed assets over total assets; SIZE is defined as natural logarithm of total assets; GP is defined as Tobin's Q (ratio of market to book value of assets); ED is defined as the yearly % change of GDP; and INF is defined as annual inflation rate. The figures in parenthesis are t-statistics.

\*Significance at 10%.

\*\*Significance at 5%.

\*\*\*Significance at 1%.

The growth has significant positive association with short-term and total debt in all sub-periods. However, the relationship of growth and long-term debt is significant only in pre-crisis period, suggesting growth an important measure of explaining the capital structure of the firm in pre-crisis period. The significant positive association is consistent with pecking order theory. However, the agency theory and trade-off theory predicts negative association between growth and leverage.

The profitability has significant negative association with all leverage proxies and in all sub periods. The obtained results reveal that the profitability plays an important role in determining capital structure of firms regardless of market conditions. The significant negative association of profitability and leverage is consistent with pecking order theory and with empirical literature (Chen, 2004; Huang & Song, 2006; Tong & Green, 2005).

The relationship of liquidity with short-term and total debt is significant negative in all sub-periods. The notable findings suggest that the association of liquidity and long-term leverage is significant positive in pre and post-crisis period. The aforementioned results suggest that the relationship between leverage and liquidity differs across periods and across leverage measures. The significant negative association of liquidity and leverage is consistent with hypothesis of pecking order theory, while the positive association is consistent with theoretical predictions of trade-off theory.

The tangibility has significant association with all leverage measures in all sub-periods (except with total leverage in during-crisis period). The noteworthy findings suggest that the association of tangibility is significant negative with short-term and total debt, while positive with long-term debt. These results suggest that the relationship of tangibility differs across leverage measure. The significant positive association supports the predictions of trade-off theory, while negative association supports the hypothesis of pecking order theory.

We find significant association of size and all leverage measures in all sub-periods. However, the association of size and short-term debt is significant negative in during and post-crisis period. Furthermore, we find that the association between size and total-leverage is significant positive in pre-crisis period, while significant negative in during-crisis period. Such results suggest that financial crisis affected the relationship between the size and leverage. In addition, the association of size and leverage also depends upon the leverage measure i.e. short-term or long-term. The significant negative association confirms the hypothesis of pecking order theory, while the significant positive association confirms the predictions of trade-off theory.

The economic development has significant positive association with all leverage measures in pre-crisis period. However, the stated relationship is significant only with short-term debt in post-crisis period. Such results suggest that economic development doesn't play an important role in determining capital structure of the firm in post-crisis period. The notable finding indicates the negative association between economic development and long-term debt in during-crisis period. This result indicates that financial crisis affected the association of economic development and leverage. Rajan and Zingales (1995) have given evidence in their study that negative correlation of GDP growth rate and leverage would confirm the pecking order theory and the positive relationship would support the trade-off theory.

The association of inflation is significant positive with all leverage indicators in pre-post-crisis periods. The absence of significant relationship between inflation and leverage in during-crisis period would indicate that financial crisis significantly affected the association between leverage and inflation. The significant positive association is consistent with (Hanousek & Shamshur, 2011; Sett & Sarkhel, 2010) and theoretical predictions of trade-off theory.

## 5. Conclusion

This study investigated the financing behavior of firms in tranquil and crisis situation. We considered non-financial firms listed on Shanghai and Shenzhen Stock Exchange of China for the period



2002–2014. We divided the sample into three sub-periods; pre-crisis (2002–2006), during-crisis (2007–2009), and post-crisis period (2010–2014). We considered nine firm-level determinants named; agency cost, non-debt tax shield, tax shield, tangibility, liquidity, growth potential, profitability, volatility, firm size; and two country-level determinants; inflation and economic development.

The results show some noteworthy findings. We find that Chinese firms were depending more on leverage in pre-crisis period, however, they decrease their debt level in during-crisis and post-crisis period. In addition, we observed that few of the factors decreased in during-crisis period like volatility, agency cost, and tangibility. We observed that financial crisis affected the relationship of various explanatory variables and leverage. The notable findings suggest the absence of association between tax shield in pre-crisis and during-crisis period. Further, we observed insignificant association of agency cost with long-term debt in all sub-periods. The noteworthy findings suggest that the association of tangibility is significant negative with short-term and total debt, while positive with long-term debt. The role of economic development in explaining capital structure also disappeared after the occurrence of financial crisis. Finally, we find the absence of association in leverage and inflation during financial crisis period.

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#### Note

1. The results of Hausman Specification test are available upon request.

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