# Determinants of Capital Structure of Firms in Pre-Post Financial Crisis: Evidence from China

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**Abstract:**
This paper examines the impact of the global financial crisis of 2007-08 on 897 Chinese listed non-financial firms by examining changes in their capital structure from 2003 to 2012. Panel data technique has been used and it is found that there is noticeable change on both firm level and macroeconomic level determinants of the capital structure after the financial crisis. Regression analysis has provided very significant results. In full period regression, liquidity has shown no change in both pre-post financial crisis time periods, while tax, non-debt tax shield, tangibility, economic development and inflation have shown a very significant and distinct change after crisis. But at the same time volatility has shown a very significant change in long term and in total leverage while profitability and size has shown significant change just in short term leverage after crisis. Growth potential has shown significant change only in total leverage after crisis. Analysis shows that pecking order theory has more explanations than static trade-off theory and market timing theory after the financial crisis for Chinese listed non-financial firms.
**KEY WORDS:** leverage; financial crisis; pecking order theory; capital structure; non-financial Chinese firms

## 1. Introduction

Every firm's main objective is firm's value maximization. In order to achieve this main objective, usually every firm has to make vital investment decisions and capital structure choices. Firms have to make very careful decision regarding their capital financing options, whether they should go public by issuing equity or seek loans from financial institutions. The firm's capital structure in turn determines the firm's confidence to pursue potential investment opportunities. For instance, debt is a more convenient and cheaper source of accumulating funds than equity because of ease of availability from established creditors and tax shields from the government.
A lot of research work has been done on attaining an optimal level of capital structure and on the basis of that various capital structure theories have been formulated. There are three main theories: trade-off theory, pecking order theory, and market timing theory. Researchers have tested these theories but have found ambiguous results. For example, in general, the trade-off theory claims that there is a positive correlation between profitability and leverage ratios Harrison & Widjaja (2013). However, some researchers, like Rajan and Zingales (1995), have found a negative correlation between profitability and leverage ratio. So, these theories are not reliable for different time periods or different economic conditions to validate it.

The global financial crisis of that became visible in August 2007 was caused by the sub-prime mortgage crisis in the USA, leading to the bankruptcy of several old and big financial and non-financial institutions. Because of globalization, the crisis quickly spread to other major developed and developing economies, triggering bankruptcy in many forms. Researchers are trying to find out the impact of the financial crisis on the capital structure of firms but they have mainly focused European and American economies. A study by Iqbal and Kume (2014) found that the recent financial crisis had an adverse impact on the capital structure decisions of UK, French and German firms. The findings show that both equity and debt levels changed significantly in the wake of financial crisis. Harrison & Widjaja (2013) conducted a study in the USA and found that the financial crisis of 2008 significantly impacted the capital structure decisions of firms. They found evidence that in the American economy - which is a mostly market based economy - post-crisis capital structure decisions of firms are more explainable by pecking order theory, which is was not the case prior to the crisis.

Researchers found that conservative firms were more likely to be ready for rare financial crisis like financial crisis of 2007-08 as these firms are significantly slow in adjusting the speed of capital structure in financial distress (Bhamra, Kuehn, and Strebulaev, 2011; Ariff, Taufiq, and Shamsher, 2008). But various studies have found, as mentioned earlier, that there is no well developed capital structure model that could comprehensively define all optimal capital structure options.

The financial crisis of 2007-08 affected the whole world in one way or another. Its impact on Asian countries

was quite enormous because most economies here are dependent economies, unlike the self-driven nature of the big economies of the world. So it was a very turbulent time for Asia. The intensity of the crisis was more than expected so it surprised every nation in this region. According to an ADB report of 2009, the overall GDP of Asia (excluding China and India) in 2008 showed a 15% decrease. The Asian countries were in a much worse condition than the countries from where the crisis originated.

The crisis did not spare the Chinese economy either. Following the global decline in economic growth, the Chinese economic growth rate fell from 13 percent to 6.8 percent in the fourth quarter of 2008 alone. The main reason was that the Chinese economy is mainly an export-oriented economy. The country's export declined sharply because of adverse economic conditions of other big economies, which ultimately shattered the Chinese economy. In response to this crisis, Chinese government took very impressive measures like a stimulus package of 4 trillion Yuan. The central bank of china, the People's Bank of China (PBOC), decreased their interest rates sharply which helped boost the growth rate of credit. As early as the first quarter of 2009, the stimulus package and the revised monetary policy began to show their positive impact on the Chinese economy. But it is still early to talk about the sustainability of the present growth rate of the Chinese economy as a number of big economies are still under the influence of the crisis, especially European economies. Till now, no 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 2003-2012.

## 2. Literature Review

Many studies have been done highlighting different aspects of the capital structure options for firms. But this quest started with Modigliani and Miller (1958) when they gave their theory of irrelevancy: capital structure is irrelevant to the firm's value in perfect market with symmetric information if there are no agency costs, bankruptcy costs and taxes. Authors claim that price of the equity would rise by taking debt as a substitute of equity in the capital structure of the firm even by reducing the overall proportion of equity by keeping the cost of capital constant. But this theory started a new round of counter theories and later it was found by many researchers that assumptions made by MM are too restrictive.

Till now, certain theories have been defined to explain various variables to determine the capital structure. Pecking order theory, trade off theory and market timing theory are the main capital structure theories which have identified variables like tangibility, profitability, size, liquidity and market to book ratio as the determinants of capital structure (Tong & Green, 2005). Several studies have shown quite ambiguous results after analyzing these theories. Pecking order theory claims that if investors have asymmetric information about the firm's value then the equity can be mispriced by the market. So, because of this asymmetric information firms will prefer retained earnings to debt, short-term debt over long-term debt and debt over equity (Chen & Chen, 2011). It can be risky for the firm if the market price of the equity is undervalued. So, in case of issuance of new stock by the firm to finance new project, it may create a situation of underinvestment. So, according to Myers (1984), to avoid this kind of situations, 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 convertibles and even over equity like issuance of common stock. But according to many researchers, there is no optimal debt-equity ratio in practice as every firm is independent to make any decision regarding their capital structure. Mostly firms prefer to have pecking order as it makes them finance their investments through internal sources (retained earnings) rather than looking for external financing and it also helps them to have lower level of leverage (Mayers and Majluf, 1984). Trade-off theory also talks about that the capital structure options for a firm but it mainly focuses on two options, debt and equity. This theory mainly discusses the benefits of debt and also talks about the agency costs and bankruptcy costs. But in all, this theory explains and tries to offset the costs with immediate access to the money in the form of debt and tax shield benefits provided by debt. 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 four variables of tangible assets, market to book ratio, size, and profitability in their study to determine its relationship with capital structure and they used economies of G7 countries. They got very ambiguous results. they found that size and tangible assets have positive relationship with the level of debt which is a supporting fact for trade-off theory but they also found that market to book ratio and profitability have negative relationship with level of debt which is a supporting fact for the pecking order theory. Myers (2001) explained this phenomenon as the absence of an optimal capital structure theory which can work better than its rival options in different circumstances. A study by Wald (1999) on the firms of USA, UK, Germany, France and Japan to check the correlation of size and leverage has shown that there is a positive relationship for the firms in USA, UK , France and Japan but a negative one for German firms.

But studies conducted on Chinese market have shown results as Strange and Chen (2006) has shown that there is a positive relationship between size and leverage (long term leverage) for the firms in China but studies by Tong and Green, (2005), Anwar, S., & Sun, S. (2013), Zou and Xiao, (2006) and Huang and Song (2006) have shown that leverage and size are negatively correlated.

## 2.2 Profitability

Researchers have shown contradictory results regarding profitability and leverage in their studies. Pecking order theory suggests that there is a negative relationship between profitability and leverage because when firms have large profits they prefer internal funds for financing their investments but trade-off theory claims as the firms are profitable so they would like to keep their internal funds and may access to external funds to finance their investments.

Several studies by Chinese researchers on China have shown a negative relationship between profitability and leverage (Chen, 2004; Tong and Green, 2005; Huang and Song, 2006; Anwar, S., & Sun, S. (2013); Zou and Xiao, 2006; DeJong et al., 2008), which supports the pecking order theory.

## 2.3 Growth Opportunities

Firms have to expand their business when there is rapid growth in sales. Myers (1977) suggests that firms with high growth may hold more choices for future investment projects than low growth firms. Trade-off theory suggests that there is negative relationship between growth opportunities and leverage because firms holding future growth opportunities are like intangible assets and it can't be collateralized. Agency theory also supports the trade-off theory. But pecking order theory suggests that when firms expect high future growth, then they should use equity financing. Deesomsak et al. (2004) have shown in their studies that there's a negative relationship between growth opportunities and leverage. Zou and Xiao (2006), Chen (2004) and Anwar, S., & Sun, S. (2013) also provide evidence consistent with the above mentioned negative correlation of growth opportunities with leverage. Wald (1999) has shown that the USA is the only country where high growth is associated with lower debt/equity ratio.

## 2.4 Non-debt Tax Shield (NDTS)

Non-debt tax shield is applicable for the firms when firm's income is consistently becoming low or it is negative. According to DeAngelo and Masulis (1980), NDTS is an alternative to tax shield on debt financing. Studies have shown quite mixed results regarding the relationship between NDTS and leverage. Bradley et al. (1984) have shown a positive relationship between the NDTS and leverage but Wald (1999) has shown a negative correlation between NDTS and leverage. Trade-off theory argues that firms would prefer debt for because of non-debt tax shields. Trade-off theory concludes that firms will borrow more funds when the tax rates are higher but usually bigger firms are following this theory than small ones.

In China, researchers have shown that there's a negative relationship between NDTS and leverage. Huang and Song (2006) provide evidence for determinants of capital structure in Chinese listed firms and find that leverage and firm size has a positive correlation but it has negative relationship with profitability, non-debt tax shields, growth opportunities and managerial shareholdings. They provide evidence that tax has very low significance as Chinese firms consider it only in long term debt financing. Anwar, S., & Sun, S. (2013) also support the results for NDTS and its relationship with leverage.

## 2.5 Tax

Tax is one of the more important factors for determining the capital structure for firms. Modigliani and Miller (1963) have suggested that companies should gain more debt financing for their on-going projects or for new investments because of tax deduction associated with it due to interest payments on debt. Empirical studies in China have shown very ambiguous results. Researchers like Huang and Song (2006) have confirmed the relationship and have showed that tax is negatively related to leverage which supports pecking order theory. But Strange and Chen (2006) have shown that there is no significant relationship of tax with leverage in China.

## 2.6 Tangibility

Tangibility is also one of the important determinants of capital structure for firms. It can be defined as the collatralizable asset which can be used to get loan. According to Myers and Majluf (1984) issuing debt by this way, helps a firm to avoid associated costs. So, this finding suggests that tangibility has a positive correlation with leverage which supports the Trade-off theory. Many researchers have shown in their studies that there is a positive relationship between tangibility and leverage (Wald, 1999; Viviani, 2008; DeJong et al., 2008). But

some researchers also have shown a negative relationship between these variables (Mazur, 2007; Karadeniz et al., 2009). Booth et al., (2001) have given evidence in their study on the firms of Pakistan, India, Brazil and Turkey that there's a negative relationship between tangibility and leverage.

A few studies on Chinese market have also shown the same findings consistent with their counterparts that there's a positive relationship between tangibility and leverage. Chen (2004); Huang and Song (2006); Zou and Xiao (2006) have concluded through their empirical findings that tangibility and leverage have a positive relationship in Chinese firms.

### 2.7 Liquidity

Liquidity is a very important determinant of capital structure for firms. Capital structure theories have different arguments about the relationship between liquidity and leverage. The trade-off theory argues that there is a positive relationship between liquidity and leverage as firms with higher liquidity ratios should go for debt or borrowings while, on the other hand, pecking order theory believes that there's a negative relationship between liquidity and leverage because firm with higher liquidity ratios prefer to use internal funds (retained earnings) to finance their new investment projects (Viviani, 2008). Some studies have shown their findings which are consistent with the pecking order theory (Mazure, 2007).

Some studies have shown that macroeconomic conditions, legal system and political environment might influence the capital structure of a firm. Antoniou, Guney, and Paudyal (2008) argue that UK and USA have common law and a market based governance structure some other countries like France and Germany their law is codified and bank based governance structures are the norm. Japan has a blended system. In their study of five different countries, they found that there are similarities for the determinants of capital structure but their importance varies among countries. So they suggested that country specific factors are also needed while determining the capital structure of firms as only firm specific factors cannot explain the capital structure at all.

### 2.8 Volatility

Volatility or business risk is the measurement of probability of financial distress. In studies, its relationship with leverage has been found negative. Modigliani–Miller theorem predicts that it would have a positive relationship with leverage as firm's systematic risk of equity decreases with the systematic increase of variance for the value of its assets. But Choi, J., & Richardson, M. (2012), DeJong et al. (2008) and Booth et al. (2001), have found that volatility has a negative relationship with leverage.

Huang and Song (2006) and Anwar, S., & Sun, S. (2013) have checked the relationship of volatility with leverage in Chinese firms and have found the same results. They provide evidence that there's a significantly negative relationship between volatility and leverage.

### 2.9 Economic Development

Some researchers have tried to find out the relationship between GDP or GDP growth and corporate capital structure. They have found that there is a negative correlation between GDP or GDP growth and capital structure (Dincergok & Yalciner, 2011; Camara et al., 2014). Researchers believe that a positive increase in the GDP or GDP growth rate will increase the profits of the companies so firms would prefer to use internal sources to finance their projects, which is a supporting assumption for pecking order theory (Gajurel, 2006). Rajan and Zingales (1995) have given evidence in their study that if GDP growth rate and leverage are negatively correlated then it would confirm the pecking order and if there's a positive relationship then it would support the trade-off theory.

Another study conducted by Dejong, Kabir and Nguyen (2008) in a sample of 42 countries from 1997-2001, find that firm specific factors like asset tangibility, firm size, profitability and growth opportunities are positively correlated with corporate structure of the firms in various countries. They also find that the importance of these factors varies among countries. They also give evidence that there is a positive relationship of ED with the corporate structure and they further argue that in countries with stronger legal and sound legal systems, firms prefer debt over equity. In short, country specific factors are important while deciding capital financing options for firms.

### 2.10 Inflation Rate

Another most important macroeconomic factor which can influence the capital structure is inflation rate. Inflation rate measures the uncertainty in economy. Many researchers have tried to find out the relationship between inflation rate and capital structure but their findings differ greatly. Frank & Goyal (2009) argue that

there is no relationship between inflation and capital structure of a firm. Gajurel (2006) argues that there is a negative relationship between inflation and capital structure. But some researchers like Sett & Sarkhel (2010) and Hanousek & Shamshur (2011) have found that there is a positive relationship between inflation rate and leverage. Camara et al. (2014) and Bokpin (2009) show that inflation rate and leverage have a significantly positive correlation.

### a. Financial Crisis and Capital Structure Preferences

After financial crisis, many economists provided their views about the impact of financial crisis on economies. Harrison & Widjaja (2013) checked the impact of financial crisis on American non-financial firms and found that size and tangibility have positive relationship with leverage but at the same time, market to book ratio, profitability and liquidity have negative correlation with leverage, which results are contrary to the situation that existed before the crisis. They also found that these results are in line with the assumptions of pecking order theory, which offers more explanations than trade-off theory and market timing theory during financial crisis. According to Sinan (2010) argues that profitability, non-debt tax shields, volatility, and liquidity are negatively correlated with leverage based on UK firms after the financial crisis. He also claims that the results are favoring pecking order theory. But at the same time he also finds that tangibility and size are positively correlated with the firm's leverage which is providing support for the trade-off theory.

Some researchers like Doukas et al., (2011) have shown that capital market conditions are more favorable after the crisis. They also believe that firms usually for debt financing when equity market is not favorable. They also find that firms usually go for long term debt financing for at least 5 years. They give evidence that trade-off theory has contradictions with capital structure of such kind of firms even prior to the financial crisis. After the financial crisis many researchers believed that China would not be affected because of its closed economy and insulated banking system but actually it hampered the face of Chinese economic growth to a very great extent. Chinese export industry was particularly affected by the crisis which in turn impacted the workforce adversely. Wearden & Stanway (2008) have shown in their study that China's GDP was fallen by 9% in the third quarter of 2008 by following 10.1% in the second quarter of 2008.

Most of the work has been done in developed economies regarding theory testing and its validity but very fewer studies have been conducted to determine the applicability of capital structure theories in developing or transitional economies especially on china. China economic features are different from other countries. Till now, no study has been presented which is showing any change in the determination of CS for Chinese firms. but Studies prior to financial crisis has shown mix results in China as Huang and Song (2002) studied the leverage decisions of 799 Chinese listed companies and concluded that the trade-off model is more explainable than the pecking order hypothesis to determine the capital structure of Chinese listed companies. But after that various studies have shown that trade-off theory has found very limited evidence for Chinese listed companies and according to Huang and Song (2006) and Lim (2012) Chinese listed companies are unlikely to follow the traditional pecking order as in western countries but they are seem to follow a different method for financing their firms. They found that Chinese firms prefer external financing than internal sources. But Chen (2004) suggested a new pecking order and claimed that retained profit is preferred over equity and equity is preferred over debt. So, the order is retained profit then equity and lastly, debt.

### 2. Data and Methodology

In this research article, annual data has been used from the financial statements of non-financial firms of China for the time period of 2003-2012. This time period exactly show the impact of financial crisis on the capital structure of firms in china. 2003-2007 is the period before the financial crisis and 2008-2012 is the period after financial crisis. Both time periods equally divided into 5 years which is representing a very significant amount of time for pre-post financial crisis analysis of firms.

For this research, data has been taken from very reliable sources of database like RESSET, CSMAR and EIU-Country Data. Firm level data (Profitability, Size, Tangibility, Liquidity, Non-Debt Tax Shield and Volatility) has been accessed from RESSET and CSMAR while economic data (Economic Development, Tax Rate and Inflation) has been taken from EIU-Country Data. Table 1 shows the list of all variables and its proxies descriptions with expected relationships with leverage.

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

| Variable name | Model name | Proxy | Effect on leverage (+/-) |
|---|---|---|---|
| Tax rate | $TAX_{it}$ | Effective rate % | + |
| Non-debt tax shield | $NDTS_{it}$ | Depreciation expenses/total assets | - |
| Volatility | $VOL_{it}$ | Standard deviation of EBT/total equity | +/- |
| Profitability | $PROF_{it}$ | Profit before tax/total equity | +/- |
| Liquidity | $LIQ_{it}$ | Current assets/current liabilities | +/- |
| Growth Potential | $GP_{it}$ | Tobin's Q(ratio of market to book value of assets) | +/- |
| Tangibility | $TANG_{it}$ | Net fixed assets/total assets | + |
| Firm size | $SIZE_{it}$ | ln(total assets) | +/- |
| Economic Growth | $ED_t$ | % change of GDP | + |
| Inflation | $INF_t$ | average of consumer price index and producer price index | - |

Data has been carefully selected for the firms and have excluded firms on the basis of following criteria as mentioned by Harrison & Widjaja (2013):-
1.      Financial institutions such as banks, insurance, leasing, private equity and investment.
2.      Newly listed or delisted firms during the period of research 2003-2012.
3.   Non-availability of certain accounts to calculate variables (Profitability, Size, Tangibility, Liquidity, Non-Debt Tax Shield, Volatility, Economic Development, Tax Rate and Inflation)
4.      The leverage value is larger than the total asset value.
On the basis of that there are 897 firms in total following all the above mentioned criteria from various sectors of both Shenzhen and Shanghai stock exchanges.

### 3.1  Model Development

$STD_{it}= \alpha + \alpha_1 PROF_{it} + \alpha_2 SIZE_{it} + \alpha_3 TANG_{it} + \alpha_4 LIQ_{it} + \alpha_5 VOL_{it} + \alpha_6 GP_{it} + \alpha_7 NDTS_{it} + \alpha_8 TAX_{it} + \alpha_9 ED_{it} + \alpha_{10} INF_{it} + \lambda + e$**..................................... equ.1**

$LTD_{it} = \alpha + \alpha_1 PROF_{it} + \alpha_2 SIZE_{it} + \alpha_3 TANG_{it} + \alpha_4 LIQ_{it} + \alpha_5 VOL_{it} + \alpha_6 GP_{it} + \alpha_7 NDTS_{it} + \alpha_8 TAX_{it} + \alpha_9 ED_{it} + \alpha_{10} INF_{it} + \lambda + e$**..................................... equ.2**

$TD_{it} = \alpha + \alpha_1 PROF_{it} + \alpha_2 SIZE_{it} + \alpha_3 TANG_{it} + \alpha_4 LIQ_{it} + \alpha_5 VOL_{it} + \alpha_6 GP_{it} + \alpha_7 NDTS_{it} + \alpha_8 TAX_{it} + \alpha_9 ED_{it} + \alpha_{10} INF_{it} + \lambda + e$**..................................... equ.3**

Where,

$STD_{it}$: Short-term leverage, which can be calculated by shor-term debt ratio.

$LTD_{it}$: Long-term leverage, which can be calculated by long term debt ratio.

$TD_{it}$: Total leverage, which can be calculated by total debt ratio.

**$PROF_{it}$**: Profitability, calculated by earnings before interest and tax **(EBT)** scaled by total shareholder's equity as the index.

**$VOL_{it}$:**Volatility, which can be calculated by Standard deviation of EBT/total equity.

**$SIZE_{it}$**: Size, calculated through the logarithm of total asset as the index.

**$TANG_{it}$**: Tangibility, calculated by fixed assets divided by total assets.

**$LIQ_{it}$**: Liquidity, by using the Liquidity ratio as the index.

**$GP_{it}$:** Growth potential, calculated as market to book ratio of total assets.

**$TAX_{it}$**: Tax, calculated as the corporate tax rate of the economy.

**$NDTS_{it}$**: non debt tax shield ratio of yearly depreciation amount to total assets.

**$ED_{it}$:** Economic development, calculated as the average of annual real GDP growth rate.

**$INF_{it}$:** inflation, calculated as the average of consumer price index and producer price index.

$\lambda$ = parameter for time dummy variables

e**=** random error term

i= firms in the same cross-section (e.g., 1, 2, 3...n)

t= period of time (years)


Following Harrison & Widjaja (2013), data paneling methods and random effect model have been used in this model. The RE model applies a different intercept for each data unit in both cross-section and time series, thus maintaining the level of degrees of freedom. Data has been analyzed and run through Stata to examine the presence of significant correlation between the independent variables (Profitability, Size, Tangibility, Liquidity, Non-Debt Tax Shield, Volatility, GP, ED, Tax Rate and Inflation) and the dependent variable (short term leverage,

long term leverage and total leverage).

The first test which is been used prior to regression analysis is the Hausman Specification test. The purpose of this test is to identify that which specific test (fixed effect or random effect) will explain the regression analysis. The Hausman Specification test is conducted with SAS and table 2 shows that results below. It shows that fixed effect model will be followed to run other regression models and it rejects the null hypothesis.

**Table-2:** Hausman specification test for overall analysis

| Models | Chi-square statistic | Degrees of freedom | *p-value* |
|---|---|---|---|
| Short-term leverage ($STD_{it}$) | 93.28 | 10 | 0.000 |
| Long-term leverage ($LTD_{it}$) | 75.47 | 10 | 0.000 |
| Total leverage ($TD_{it}$) | 126.44 | 10 | 0.000 |

Notes: $STD_{it}$ is defined as current liabilities over total assets; $LTD_{it}$ is defined as non-current liabilities over total assets; $TD_{it}$ is defined as total liabilities over total assets.

Variance Inflation Factor (VIF) test is an important test to check the multicollinearity. If the value is higher it means, the presence of multicollinearity is stronger. The maximum tolerable value to determine the presence of multicollinearity is 5 (Harrison & Widjaja, 2013). The results can be seen (see Table 3) that in all 3 groups as per periods, the values are ranging from 1.04 to 1.63 and these results imply that multicollinearity among the variables is relatively weak.

**Table-3: Variance Inflation Factor Test**

| Variables | 2003-2012 | | 2003-2007 | | 2008-2012 | |
|---|---|---|---|---|---|---|
| | VIF | 1/VIF | VIF | 1/VIF | VIF | 1/VIF |
| $TAX_{it}$ | 1.04 | 0.96 | 1.04 | 0.97 | 1.03 | 0.97 |
| $NDTS_{it}$ | 1.32 | 0.76 | 1.32 | 0.76 | 1.32 | 0.76 |
| $VOL_{it}$ | 1.09 | 0.91 | 1.11 | 0.90 | 1.12 | 0.89 |
| $PROF_{it}$ | 1.05 | 0.95 | 1.05 | 0.95 | 1.07 | 0.93 |
| $LIQ_{it}$ | 1.25 | 0.80 | 1.26 | 0.79 | 1.27 | 0.79 |
| $TANG_{it}$ | 1.43 | 0.70 | 1.44 | 0.69 | 1.45 | 0.69 |
| $SIZE_{it}$ | 1.31 | 0.77 | 1.35 | 0.74 | 1.52 | 0.66 |
| $GP_{it}$ | 1.33 | 0.75 | 1.55 | 0.65 | 1.60 | 0.62 |
| $ED_t$ | 1.33 | 0.76 | 1.45 | 0.69 | 1.63 | 0.62 |
| $INF_t$ | 1.26 | 0.80 | 1.33 | 0.75 | 1.61 | 0.62 |

### 3.2 Descriptive Statistics

Descriptive statistics has been shown in Table 4, for the dependent and independent variables that provide some insights about the variables. 8790 observations have recorded in the sample of Chinese listed non-financial firms. The mean *STDit* of 0.614 and a standard deviation (SD) of 0.598 suggests that total debt is a dominant mode of financing in China. Whereas minimum value zero of *LTDit* (mean 0.170 and SD 0.236) suggests that some of the firms do not borrow long-term debt. For firm level variables, we observe low $NDTS_{it}$ with a mean of 0.016 and SD of 0.027. We observe highest variation of SD 2.095 and 1.765in *INFt* and *EDt* respectively suggesting that Chinese firms are facing quite a volatile business environment.

**Table-4: Descriptive statistics**

| Variable | Obs. | Mean | Std. Dev. | Min. | Max. |
|---|---|---|---|---|---|
| $STD_{it}$ | 8790 | 0.494 | 0.291 | -0.882 | 2.089 |
| $LTD_{it}$ | 8790 | 0.170 | 0.236 | -1.092 | 0.833 |
| $TD_{it}$ | 8790 | 0.614 | 0.598 | 0.118 | 6.522 |
| $TAX_{it}$ | 8790 | 0.226 | 0.077 | 0.001 | 0.330 |
| $NDTS_{it}$ | 8790 | 0.016 | 0.027 | -0.115 | 0.097 |
| $VOL_{it}$ | 8790 | 0.173 | 0.487 | 0.005 | 3.756 |
| $PROF_{it}$ | 8790 | 0.086 | 0.233 | -1.221 | 1.074 |
| $LIQ_{it}$ | 8790 | 1.343 | 0.966 | 0.063 | 6.170 |
| $TANG_{it}$ | 8790 | 0.298 | 0.188 | 0.003 | 0.795 |
| $SIZE_{it}$ | 8790 | 21.783 | 1.283 | 18.609 | 25.404 |
| $GP_{it}$ | 8790 | 1.428 | 1.269 | 0.183 | 7.535 |
| $ED_t$ | 8790 | 10.447 | 1.765 | 7.652 | 14.166 |
| $INF_t$ | 8790 | 3.079 | 2.095 | -1.746 | 5.071 |

In order to test the autocorrelation, pairwise correlations methods have been used. The maximum coefficient of the pairwise correlation which can be tolerated is 0.8 (Harrison & Widjaja, 2013). Results are showing (see tables 5-7) that there is no evidence of autocorrelation in our data as there are no coefficients of pairwise correlation which are larger than 0.

**Table-5: Pairwise Correlation Test for all Data (2003-2012)**

| | $STD_{it}$ | $LTD_{it}$ | $TD_{it}$ | $TAX_{it}$ | $NDTS_{it}$ | $VOL_{it}$ | $PROF_{it}$ | $LIQ_{it}$ | $TANG_{it}$ | $SIZE_{it}$ | $GP_{it}$ | $ED_t$ | $INF_t$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $STD_{it}$ | 1.000 | | | | | | | | | | | | |
| $LTD_{it}$ | 0.120 | 1.000 | | | | | | | | | | | |
| $TD_{it}$ | 0.121 | -0.288 | 1.000 | | | | | | | | | | |
| $TAX_{it}$ | 0.054 | 0.031 | 0.040 | 1.000 | | | | | | | | | |
| $NDTS_{it}$ | -0.065 | 0.101 | -0.135 | 0.052 | 1.000 | | | | | | | | |
| $VOL_{it}$ | 0.279 | -0.010 | 0.227 | 0.062 | -0.138 | 1.000 | | | | | | | |
| $PROF_{it}$ | -0.047 | -0.081 | -0.003 | 0.019 | 0.013 | 0.015 | 1.000 | | | | | | |
| $LIQ_{it}$ | -0.415 | -0.115 | -0.334 | -0.123 | -0.088 | -0.145 | 0.069 | 1.000 | | | | | |
| $TANG_{it}$ | -0.041 | 0.224 | -0.030 | 0.123 | 0.449 | 0.006 | -0.036 | -0.343 | 1.000 | | | | |
| $SIZE_{it}$ | 0.035 | 0.391 | -0.189 | -0.035 | 0.182 | -0.191 | 0.099 | -0.119 | 0.108 | 1.000 | | | |
| $GP_{it}$ | -0.197 | -0.260 | 0.055 | -0.054 | -0.122 | 0.098 | 0.124 | 0.229 | -0.106 | -0.403 | 1.000 | | |
| $ED_t$ | 0.024 | -0.082 | 0.008 | 0.100 | 0.051 | 0.014 | 0.028 | -0.054 | 0.058 | -0.137 | 0.163 | 1.000 | |
| $INF_t$ | 0.003 | -0.037 | -0.007 | 0.036 | 0.026 | -0.002 | 0.023 | -0.004 | 0.008 | -0.042 | -0.015 | 0.440 | 1.000 |

Notes: $STD_{it}$ is defined as current liabilities over total assets; $LTD_{it}$ is defined as non-current liabilities over total assets; $TD_{it}$ is defined as total liabilities over total assets; $TAX_{it}$ is defined as % effective tax rate; $NDTS_{it}$ is defined as depreciation expense over total assets; $PROF_{it}$ is defined EBT scaled by total equity; $VOL_{it}$ is defined as standard deviation of EBT/total equity;, $LIQ_{it}$ 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 average of consumer price index and producer price index.

**Table-6: Pairwise Correlation Test of all Data (2003-2007)**

| | $STD_{it}$ | $LTD_{it}$ | $TD_{it}$ | $TAX_{it}$ | $NDTS_{it}$ | $VOL_{it}$ | $PROF_{it}$ | $LIQ_{it}$ | $TANG_{it}$ | $SIZE_{it}$ | $GP_{it}$ | $ED_t$ | $INF_t$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $STD_{it}$ | 1.000 | | | | | | | | | | | | |
| $LTD_{it}$ | 0.103 | 1.000 | | | | | | | | | | | |
| $TD_{it}$ | 0.165 | 0.335 | 1.000 | | | | | | | | | | |
| $TAX_{it}$ | 0.052 | 0.055 | 0.049 | 1.000 | | | | | | | | | |
| $NDTS_{it}$ | -0.079 | -0.140 | -0.113 | 0.054 | 1.000 | | | | | | | | |
| $VOL_{it}$ | 0.282 | -0.063 | 0.361 | 0.064 | -0.114 | 1.000 | | | | | | | |
| $PROF_{it}$ | -0.029 | -0.107 | 0.029 | 0.039 | 0.061 | -0.029 | 1.000 | | | | | | |
| $LIQ_{it}$ | -0.409 | -0.099 | 0.342 | 0.127 | -0.075 | 0.157 | 0.046 | 1.000 | | | | | |
| $TANG_{it}$ | -0.087 | 0.246 | -0.047 | 0.137 | 0.463 | 0.064 | 0.042 | -0.309 | 1.000 | | | | |
| $SIZE_{it}$ | -0.010 | 0.308 | -0.194 | -0.008 | 0.222 | 0.225 | 0.084 | -0.131 | 0.184 | 1.000 | | | |
| $GP_{it}$ | -0.188 | -0.192 | 0.046 | -0.037 | -0.101 | 0.048 | 0.156 | 0.220 | -0.096 | -0.283 | 1.000 | | |
| $ED_t$ | 0.066 | 0.003 | 0.064 | 0.029 | -0.039 | 0.043 | 0.067 | -0.087 | -0.035 | 0.147 | 0.359 | 1.000 | |
| $INF_t$ | 0.021 | 0.004 | 0.019 | 0.009 | -0.027 | 0.019 | 0.032 | -0.026 | -0.032 | 0.090 | 0.335 | 0.444 | 1.000 |

Notes: $STD_{it}$ is defined as current liabilities over total assets; $LTD_{it}$ is defined as non-current liabilities over total assets; $TD_{it}$ is defined as total liabilities over total assets; $TAX_{it}$ is defined as % effective tax rate; $NDTS_{it}$ is defined as depreciation expense over total assets; $PROF_{it}$ is defined EBT scaled by total equity; $VOL_{it}$ is defined as standard deviation of EBT/total equity;, $LIQ_{it}$ 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 average of consumer price index and producer price index.

**Table-7: Pairwise Correlation of all Data (2008-2012)**

| | $STD_{it}$ | $LTD_{it}$ | $TD_{it}$ | $TAX_{it}$ | $NDTS_{it}$ | $VOL_{it}$ | $PROF_{it}$ | $LIQ_{it}$ | $TANG_{it}$ | $SIZE_{it}$ | $GP_{it}$ | $ED_{t}$ | $INF_{t}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| $STD_{it}$ | 1.000 | | | | | | | | | | | | |
| $LTD_{it}$ | 0.136 | 1.000 | | | | | | | | | | | |
| $TD_{it}$ | 0.086 | 0.260 | 1.000 | | | | | | | | | | |
| $TAX_{it}$ | 0.067 | 0.038 | 0.045 | 1.000 | | | | | | | | | |
| $NDTS_{it}$ | -0.049 | 0.085 | 0.149 | 0.019 | 1.000 | | | | | | | | |
| $VOL_{it}$ | 0.275 | 0.040 | 0.117 | 0.070 | -0.161 | 1.000 | | | | | | | |
| $PROF_{it}$ | -0.066 | -0.059 | -0.031 | -0.006 | -0.034 | 0.062 | 1.000 | | | | | | |
| $LIQ_{it}$ | -0.421 | -0.135 | -0.331 | -0.123 | -0.097 | 0.133 | 0.094 | 1.000 | | | | | |
| $TANG_{it}$ | 0.006 | 0.229 | -0.012 | 0.076 | 0.426 | 0.075 | -0.114 | -0.374 | 1.000 | | | | |
| $SIZE_{it}$ | 0.069 | 0.439 | -0.210 | 0.016 | 0.209 | -0.181 | 0.111 | -0.125 | 0.102 | 1.000 | | | |
| $GP_{it}$ | -0.206 | -0.329 | -0.060 | 0.072 | -0.136 | 0.141 | 0.093 | 0.236 | -0.109 | -0.533 | 1.000 | | |
| $ED_{t}$ | 0.009 | -0.047 | -0.010 | 0.076 | 0.015 | 0.012 | 0.032 | 0.014 | 0.022 | -0.084 | 0.132 | 1.000 | |
| $INF_{t}$ | 0.003 | -0.018 | -0.004 | -0.004 | 0.011 | -0.004 | 0.033 | 0.008 | -0.016 | -0.008 | 0.095 | 0.582 | 1.000 |

Notes: $STD_{it}$ is defined as current liabilities over total assets; $LTD_{it}$ is defined as non-current liabilities over total assets; $TD_{it}$ is defined as total liabilities over total assets; $TAX_{it}$ is defined as % effective tax rate; $NDTS_{it}$ is defined as depreciation expense over total assets; $PROF_{it}$ is defined EBT scaled by total equity; $VOL_{it}$ is defined as standard deviation of EBT/total equity;, $LIQ_{it}$ 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 average of consumer price index and producer price index.

## 4    Results and Discussion

In this section, regression results will be discussed. Mainly data from 2003-2012, has been broken into 2 categories, before financial crisis (2003-2007) and after financial crisis (2008-2012). Regression results are very profound. It can be seen (table-8-9-10-11) that variables are showing their relationships differently in three set of leverages. All results are within 95% confidence interval.

| **Table-8: 2003-2012** | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | **$STD_{it}$** | | **$LTD_{it}$** | | **$TD_{it}$** | |
| | **Coef.** | **P>|t|** | **Coef.** | **P>|t|** | **Coef.** | **P>|t|** |
| **$TAX_{it}$** | -0.145 | 0.000 *** | 0.011 | 0.760 | -0.062 | 0.340 |
| **$NDTS_{it}$** | 0.049 | 0.592 | -0.351 | 0.000 *** | -0.737 | 0.000*** |
| **$VOL_{it}$** | 0.082 | 0.000 *** | 0.020 | 0.000*** | 0.023 | 0.013*** |
| **$PROF_{it}$** | -0.007 | 0.464 | -0.092 | 0.000*** | 0.011 | 0.465 |
| **$LIQ_{it}$** | -0.112 | 0.000 *** | 0.006 | 0.048** | -0.153 | 0.000 *** |
| **$TANG_{it}$** | -0.129 | 0.000 *** | 0.072 | 0.000*** | 0.084 | 0.024 ** |
| **$SIZE_{it}$** | 0.012 | 0.001 *** | 0.076 | 0.000*** | -0.067 | 0.000 *** |
| **$GP_{it}$** | -0.027 | 0.000 *** | -0.009 | 0.000*** | 0.029 | 0.000 *** |
| **$ED_t$** | 0.007 | 0.000 *** | -0.001 | 0.289 | -0.012 | 0.000 *** |
| **$INF_t$** | -0.002 | 0.045 ** | -0.002 | 0.097 * | 0.001 | 0.550 |
| **Constant** | 0.413 | 0.000 *** | -1.473 | 0.000 *** | 2.369 | 0.000 *** |
| **R-Sq** | 0.2494 | | 0.1896 | | 0.1743 | |
| **No. of obs.** | 8790 | | 8790 | | 8790 | |
| **No. of firms** | 879 | | 879 | | 879 | |

Notes: $STD_{it}$ is defined as current liabilities over total assets; $LTD_{it}$ is defined as non-current liabilities over total assets; $TD_{it}$ is defined as total liabilities over total assets; $TAX_{it}$ is defined as % effective tax rate; $NDTS_{it}$ is defined as depreciation expense over total assets; $PROF_{it}$ is defined EBT scaled by total equity; $VOL_{it}$ is defined as standard deviation of EBT/total equity;, $LIQ_{it}$ 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 average of consumer price index and producer price index.

*** Variable significant at 1%, ** variable significant at 5%,  * variable significant at 10%

### 4.1  Over all period 2003-2012

Tax is considered to be an important determinant of capital structure in Chinese firms. Strange and Chen (2006) have provided evidence but they have shown that there is no significant relationship of tax rate with leverage in Chinese firms. According to trade-off theory there's a positive relationship between tax savings and leverage but if tax rate is higher and tax savings are less then firms will prefer to other sources of financing like internal financing or equity financing. In this study the coefficient of tax is -0.145 which is only significant in short term leverage while in long term and total debt, it has no significance. It implies that Chinese firms don't consider tax effect in their long term and total leverage but in short term, it has inverse relationship with leverage. So, these results are contrary to the trade-off theory.

Non-debt tax shield (NDTS) is significant in only significant in long term leverage and total and their coefficients are -0.351and -0.737, respectively. NDTS is a main determinant of capital structure in trade-off theory and it suggests that when NDTS is higher, firms depends less on debts as their will be less advantages for firms to use debt and then tax shields on it. So, this study confirms the pecking order theory for Chinese firms.

The coefficients of volatility (VOL) are 0.082, 0.020 and 0.023 which are very significant results. Previous studies have shown very ambiguous results in case of volatility. Huang and Song (2006) have shown that there is negative relationship between total leverage and volatility but Strange and Chen (2006), have given evidence that there's a significant positive relationship between volatility and leverage. But this study also confirms Strange and Chen (2006) results of and support the pecking order theory as Chinese listed firms are supported by the government so it is not easy for banks or other financial institutions to close down the operations of any

listed company in China. So, in case of any financial distress, Chinese listed firms can have access to external funds or debts.

The coefficient of profitability is -0.007, -0.092 and 0.011 in STD, LTD and TD, respectively. But profitability is only significant in long term leverage. It means profitability has inverse relationship with leverage with Chinese firms but in only in long term in the period of 2003-2012. So, it implies that more profitable a firm, the lower its leverage and it supports to pecking order theory which suggests that firms prefer their internal funds to finance their projects or investments. So, pecking order theory claims that firms with higher profitability will have lower level of leverage in their capital structure.

Liquidity (LIQ) is overall significant but has shown positive relationship in LTD and negative in both STD and TD. Pecking order theory suggests that as firms with more liquidity ratio are more able to finance their projects so firms will not go for external financing or debts. So, pecking order theory claims that there is negative relationship between liquidity and leverage. So, it in this study, Chinese firms follows pecking order theory for their long term leverage (-0.112) and total leverage (-0.153). But contrary to this, trade-off theory shows a direct relationship between liquidity and leverage as firms have more liquidity ratio, they will hold it and can use it in the time of distress and they will prefer to use debt. So,   trade-off theory suggests that a highly liquidate firm will go for more leverage. So, this study shows that Chinese firms follow trade off theory in case of long term leverage (0.006).

Tangibility (TANG) is a very important variable to determine the capital structure of Chinese firms as it serve as the collateral for debts and it helps to moderate the conflicts between shareholder and bond holder. In this study, tangibility has significant coefficients in all leverages. But tangibility has shown negative relationship in short term leverage (-0.129) which supports the pecking order theory. But trade-off theory claims that tangibility and leverage have positive relationship as firms can utilize their tangible assets to their advantage and can get more external financing (debt) against their tangible assets. So, results show that Chinese firms from 2003-2012, follow trade-off theory for long term leverage (0.072) and total leverage (0.084).

The coefficient of size (SIZE) is 0.012, 0.076 and -0.067 in short term leverage, long term leverage and total leverage, respectively. Size is significant in all leverages but it has shown very contradictory results. In this study results have shown that Chinese firms have positive relationship between size and leverage in short term leverage and long term leverage. It means bigger firms will prefer to have more debt. It follows the trade-off theory. While contrary to this, pecking order theory claims that firms with bigger size will prefer their internal resources to finance their operations. So, size will have a negative relationship with leverage. So, in this study, Chinese firms have shown a negative relationship between total leverage and size.

Growth potential (GP) has -0.027, -0.009 and 0.029 significant coefficient values for short term leverage, long term leverage and total leverage, respectively. It shows that Chinese firms are tend to have inverse relationship with leverage as they have abundance of funds to invest their operations smoothly but in short term and long term. It means Chinese-listed firms with good growth opportunities in the future prefer to be less dependent on external financing in the form of debt. But after analyzing the results of SIZE and GP, it can be stated that smaller firms tend to use their own funds to growth but bigger firms prefer to use debt for their growth. It is contrary to pecking order theory in case of short term and long term leverage. But for total leverage, Chinese firms prefer to use external sources of funds to run their operations. Possible explanation can be that as growth opportunity is an intangible asset for a firm which is likely to be smashed up in case of any crisis (Huang and Song, 2006).

Researchers have tried to find out the relationship between macroeconomic variables and leverage. Rajan and Zingales (1995), Booth et al. (2001), Chen (2004) have found that there's a positive relationship between growth and leverage. Joeveer (2013) have showed that GDP growth is very important factor to determine the capital structures of firms in those countries where the economic conditions are very stable and progressive. He suggests that GDP growth rate may affect the leverage as it is indirectly related to growth opportunities.  If GDP growth is good then firms would be having more growth opportunities to expand their business so for that purpose they need more finances to support their operations and companies will prefer to have debt to have extra funds to meet their requirements for expansion. This explanation favors the pecking order theory. POT suggests that there's a positive relationship between GDP growth and leverage. The pecking order hypothesis predicts that firms with higher growth opportunities indicate the greater demand of capital, thus external fund is preferred through debt financing (Lim, 2012). But Jong., Kabir, and Nguyen, (2008) in their study of 42 countries have evident that there's negative relationship between growth and leverage in those countries where economic

conditions like capital formation and GDP growth rate along with legal enforcement and creditor/shareholder right protection are better. This study has found that coefficients of economic development (ED) are 0.007 and -0.012 and significant for short term leverage and total leverage for the period of 2003-2012 for Chinese listed non-financial firms. These results show that capital structure of Chinese firms is positively affected by GDP growth in short term which supports that argument of pecking order theory but in case of total leverage, GDP growth has negative relationship with leverage which is contrary to pecking order theory and supports the trade-off theory (Joeveer, 2013).

Inflation is a very important factor to determine country's stable growth. If there's any increase in inflation rate, it may brings uncertainty in the economy which ultimately affect the firm's capital structure. High inflation may lessen the importance of leverage because of higher bankruptcy costs associated with debt for firms (Baltacı & Ayaydın, 2014). Higher inflation increases the cost of debt so firms reduce their debt ratios. So inflation has a negative relationship with leverage. Joeveer (2013) has provided the evidence that there is a negative relationship between inflation and leverage. This study shows that Chinese firms have significant negative relationship with leverage in short term (-0.002) and long term (-0.002) which is contrary to other studies. The possible explanation can be as mentioned by Strange and Chen (2006) Chinese listed firms are supported by Chinese government. So debt financing is easy for them to finance their projects and macro-economic variables are very much under control so it's not creating any uncertain situations for Chinese firms.

| | STD$_{it}$ | | LTD$_{it}$ | | TD$_{it}$ | |
|---|---|---|---|---|---|---|
| **Variables** | **Coef.** | **P>|t|** | **Coef.** | **P>|t|** | **Coef.** | **P>|t|** |
| **TAX$_{it}$** | -0.056 | 0.445 | -0.021 | 0.743 | -0.156 | 0.144 |
| **NDTS$_{it}$** | 0.120 | 0.391 | -0.113 | 0.349 | -0.084 | 0.680 |
| **VOL$_{it}$** | 0.051 | 0.000*** | 0.014 | 0.110 | -0.004 | 0.796 |
| **PROF$_{it}$** | 0.050 | 0.000*** | -0.119 | 0.000*** | 0.015 | 0.438 |
| **LIQ$_{it}$** | -0.094 | 0.000*** | 0.008 | 0.077* | -0.121 | 0.000*** |
| **TANG$_{it}$** | -0.025 | 0.496 | 0.081 | 0.010*** | 0.147 | 0.005*** |
| **SIZE$_{it}$** | -0.003 | 0.765 | 0.115 | 0.000*** | -0.251 | 0.000*** |
| **GP$_{it}$** | -0.038 | 0.000*** | -0.012 | 0.000*** | -0.004 | 0.448 |
| **ED$_t$** | 0.014 | 0.000*** | -0.007 | 0.001*** | 0.042 | 0.000*** |
| **INF$_t$** | 0.010 | 0.011*** | 0.000 | 0.957 | 0.007 | 0.196 |
| **Constant** | 0.533 | 0.000 *** | -2.241 | 0.000 *** | 5.630 | 0.000 *** |
| **R-Sq** | 0.2244 | | 0.1235 | | 0.1098 | |
| **No. of obs.** | 8790 | | 8790 | | 8790 | |
| **No. of firms** | 879 | | 879 | | 879 | |

Table caption: **Table-9: 2003-2007**

Notes: STD$_{it}$ is defined as current liabilities over total assets; LTD$_{it}$ is defined as non-current liabilities over total assets; TD$_{it}$ is defined as total liabilities over total assets; TAX$_{it}$ is defined as % effective tax rate; NDTS$_{it}$ is defined as depreciation expense over total assets; PROF$_{it}$ is defined EBT scaled by total equity; VOL$_{it}$ is defined as standard deviation of EBT/total equity;, 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 average of consumer price index and producer price index.
*** variable significant at 1% ** variable significant at 5% * variable significant at 10%

## 4.2 Pre-Financial Crisis (2003-2007)

After analyzing the data (see table-9) for 2003-2007(pre-financial crisis), it is showing Tax, NDTS, Tangibility and size are insignificant in short term while volatility, profitability, liquidity growth potential, economic

development and inflation significant before financial crisis. In case of long term many variables like tax, NDTS, volatility and inflation are insignificant but profitability, liquidity, tangibility, size, growth potential and economic development are significant. Tax, NDTS, volatility, profitability, growth potential and inflation are insignificant in total leverage but liquidity, tangibility size and economic development are significant.

Tax and NDTS has shown no significance for all kinds of leverages. This may explain the fact that during the time of economic expansion Chinese firms didn't consider much about tax and tax shields for their capital structure. As shown in table. 9, from 2003-2012, tax is only significant in short term leverage but in the period of 2003-2007, it's not significant at all. This proves the evidence provided by Strange and Chen (2006).

Volatility is only significant positively in short term. It means Chinese firms are dependent on external source of financing to meet their short term needs in case of any distress but for long term and total leverage there's no significant relationship has been found between leverage and volatility.

Profitability has given ambiguous results in this study prior to financial crisis. Profitability is significant in both STD and LTD but its relationship with leverage is positive and negative, respectively. It shows that Chinese firms prefer for debts or loans in their short term to finance their operations but for short term they depend on themselves. So, in case of profitability, Chinese firms follow trade-off theory in their short term but contrary to this, they follow pecking order theory to meet their long term financial obligations.

Liquidity is overall significant but negatively correlated in STD and TD. These results show that Chinese listed firms have no or less tendency to go for external sources of finances if the liquidity is high. Even liquidity is positively correlated to long term debt ratio but it is very less significant. These results are in-line with the total sample (2003-2012) analysis. So, these results suggest that Chinese firms follow the pecking order theory for their capital structure.

Tangibility is significant in LTD and TD but negatively correlated only to STD. unlike to total sample (2003-2012) where, it is significant in all leverages, but prior to financial crisis it is not significant in short term leverage. These results confirm the previous studies especially by Huang and Song (2006) in which they have shown that tangibility has significant positive relationship with long-term debt ratio and total debt ratio.

Size is also significant in LTD and TD but only has negative relationship with STD. these results show that in the period of economic growth, Chinese-listed firms prefer to rely on their own resources to cope up with their financial needs. As interpreted by Huang and Song (2006), size can be considered as the proxy of bankruptcy cost as for Chinese listed firms it has less or no affect on their leverage because state is mostly, the main shareholder so there are very rare chances to go bankrupt.

Prior to financial crisis period (2003-2012), growth potential (GP) is significant negatively correlated to leverage in short term and long term leverages. It shows that firms with more growth opportunities are less likely to depend on external financing. These results are contrary to pecking order theory.

Economic development (ED) is significant in all kinds of leverages but it is negatively correlated only in LTD which explains that GDP growth development is very important for Chinese firms in economic development period (2003-2007). Results have shown that Chinese firms have less dependence on long term debt ratio which also confirms the previous studies (Jong et al., 2007). But it is positively correlated with short term leverage and total leverage. These results confirm the pecking order theory.

Inflation is only significant in STD but positively correlated to all kinds of leverages which show that any increase in inflation is positively correlated with short term leverage. Inflation is a very important measure of economic stability in any country. For Chinese listed firms, if there is any change in inflation, it can affect the financial decisions of capital structure. But for long term and total leverage, inflation has no affect on Chinese listed firm's capacity to meet their financial obligation as mostly firms are supported by the state (Huang and Song, 2006).

### 4.3. Post Financial Crisis Analysis and Its Comparison with Pre-Financial Crisis Period

From table 10-11, it can be seen that there is a significant amount of change in data after financial crisis.
Tax is significant and negatively correlated to all kinds of leverages. Table 11, is showing a very clear picture of the impact on the determinants of capital structure for Chinese listed firms before and after crisis. Before

financial crisis, tax was insignificant to all leverages but after crisis, it can be seen that it is significant negatively correlated to leverage. Tax has already shown a negative relationship with leverage prior to financial crisis but it was not significant. These results are contrary to trade-off theory.

| Table-10: 2008-2012 | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | $STD_{it}$ | | $LTD_{it}$ | | $TD_{it}$ | |
| | **Coef.** | **P>|t|** | **Coef.** | **P>|t|** | **Coef.** | **P>|t|** |
| $TAX_{it}$ | -0.128 | 0.044** | -0.109 | 0.056* | -0.219 | 0.026*** |
| $NDTS_{it}$ | 0.348 | 0.004*** | -0.322 | 0.003*** | 0.166 | 0.369 |
| $VOL_{it}$ | 0.083 | 0.000*** | 0.021 | 0.013*** | 0.037 | 0.009*** |
| $PROF_{it}$ | -0.069 | 0.000*** | -0.070 | 0.000*** | -0.032 | 0.104 |
| $LIQ_{it}$ | -0.107 | 0.000*** | 0.015 | 0.002*** | -0.124 | 0.000*** |
| $TANG_{it}$ | -0.144 | 0.000*** | 0.026 | 0.464 | -0.004 | 0.944 |
| $SIZE_{it}$ | -0.037 | 0.000*** | 0.103 | 0.000*** | -0.100 | 0.000*** |
| $GP_{it}$ | -0.013 | 0.001*** | -0.006 | 0.070* | 0.018 | 0.001*** |
| $ED_t$ | -0.002 | 0.587 | 0.008 | 0.014*** | -0.020 | 0.001*** |
| $INF_t$ | 0.001 | 0.593 | -0.004 | 0.001*** | 0.004 | 0.012*** |
| $Constant$ | 1.563 | 0.000*** | -2.147 | 0.000*** | 3.201 | 0.000*** |
| **R-Sq** | 0.2096 | | 0.2086 | | 0.1527 | |
| **No. of obs.** | 8790 | | 8790 | | 8790 | |
| **No. of firms** | 879 | | 879 | | 879 | |

Notes: $STD_{it}$ is defined as current liabilities over total assets; $LTD_{it}$ is defined as non-current liabilities over total assets; $TD_{it}$ is defined as total liabilities over total assets; $TAX_{it}$ is defined as % effective tax rate; $NDTS_{it}$ is defined as depreciation expense over total assets; $PROF_{it}$ is defined EBT scaled by total equity; $VOL_{it}$ is defined as standard deviation of EBT/total equity;, $LIQ_{it}$ 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 average of consumer price index and producer price index.
*** variable significant at 1%  ** variable significant at 5%  * variable significant at 10%

Non-debt tax shield has also shown very different results. NDTS which is totally insignificant before the crisis, has become significant in STD and LTD but it is positively correlated to short term leverage and negatively correlated only to long term leverage. It shows that Chinese firms have no intentions to prevail tax shields before the crisis, but after the crisis and because of tightening of financial policies, firms have started to use tax shields but for their short term debts ratios but for their long term leverage Chinese firms have very strong tendency to not rely on using tax shields for their long term debt ratios. It shows that Chinese firms follow the trade-off theory to deal with their long term debt ratios and it confirms the previous studies.

Volatility is significant and positively correlated to all kinds of leverages. Volatility is a measure of business risk. Regressions analysis (table-9-10-11) has shown that Chinese firms have to depend on external sources of finances in case of any financial distress. Before the crisis, it is just in short term leverage but after the crisis, there's a significant change in Chinese firms for availing their finances. Moreover, these results are contrary to pecking order theory which suggests that firms are less likely to go for debt when they are going to be bankrupt or any other kinds of financial distress. These results have contradiction with previous studies on Chinese firms.

Profitability is significant in STD and LTD but negatively correlated to all kinds of leverages. Prior to financial crisis, it is positively correlated to STD but negatively correlated to LTD. It shows that profitable firms have less or no tendency to go for debt or other sources of funds for their investments but on their own resources to meet their financial needs. These results support the pecking order theory for Chinese firms after the financial crisis.

| Table-11: 2003-2012 Overall Sig-Ins Analysis | | | | | | |
|---|---|---|---|---|---|---|
| **Variables** | *2003-2007* | | | *2008-2012* | | |
| | $STD_{it}$ | $LTD_{it}$ | $TD_{it}$ | $STD_{it}$ | $LTD_{it}$ | $TD_{it}$ |
| $TAX_{it}$ | **Ins. (-)** | **Ins. (-)** | **Ins. (-)** | Sig. (-) | Sig. (-) | Sig. (-) |
| $NDTS_{it}$ | **Ins. (+)** | **Ins. (-)** | Ins. (-) | Sig. (+) | Sig. (-) | Ins. (+) |
| $VOL_{it}$ | Sig. (+) | **Ins. (+)** | **Ins. (-)** | Sig. (+) | Sig. (+) | Sig. (+) |
| $PROF_{it}$ | **Sig. (+)** | Sig. (-) | **Ins. (+)** | Sig. (-) | Sig. (-) | Ins. (-) |
| $LIQ_{it}$ | Sig. (-) | Sig. (+) | Sig. (-) | Sig. (-) | Sig. (+) | Sig. (-) |
| $TANG_{it}$ | **Ins. (-)** | **Sig. (+)** | **Sig. (+)** | Sig. (-) | Ins. (+) | Ins. (-) |
| $SIZE_{it}$ | **Ins. (-)** | Sig. (+) | Sig. (-) | Sig. (-) | Sig. (+) | Sig. (-) |
| $GP_{it}$ | Sig. (-) | Sig. (-) | **Ins. (-)** | Sig. (-) | Sig. (-) | Sig. (+) |
| $ED_t$ | **Sig. (+)** | **Sig. (-)** | **Sig. (+)** | Ins. (-) | Sig. (+) | Sig. (-) |
| $INF_t$ | **Sig. (+)** | **Ins. (+)** | **Ins. (+)** | Ins. (+) | Sig. (-) | Sig. (+) |
| *Constant* | Sig. (+) | Sig. (-) | Sig. (+) | Sig. (+) | Sig. (-) | Sig. (+) |

**Notes:** Sig= significant, Ins= insignificant

Liquidity is also significant but only positively correlated in LTD. These results are as same as before the financial crisis but the level of significance is high is case of long term leverage and it is positively correlated to LTD. It shows that Chinese firms prefer to debt for their long term leverages but for short term and total leverage, they are negatively correlated to liquidity. These results show that Chinese firms follow the pecking order theory for their STD and TD.

Tangibility has shown different results for post financial period. It is only significant negatively correlated only in STD. in the period of economic expansion (2003-2007), it is significant positive in LTD and TD but after crisis period, it is showing totally different results. It shows that Chinese firms with more tangible assets have less dependence on debt ratios for their short term but for their long term and total debt ratios, they have no significant relationship with tangibility and it supports the pecking order theory.

Size is thoroughly significant to all leverages but size is positively correlated to long term debt ratio while negatively correlated to short term debt ratio and total debt ratio. Prior to financial crisis, size has same relationships with all leverages same like after financial crisis but the level of significance is different in both scenarios. It is not significant to short term debt in pre-crisis period but in long term and total debt ratios. But after crisis it is significant in all leverages. It shows that after the crisis, Chinese firms with the change of size have fewer tendencies to go for debt but for long term, they prefer to go for external sources to meet their financial needs. So, for post crisis period, Chinese firms are showing very mixed association with capital structure theories. Chinese firms support to pecking order theory for STD and TD but for LTD they seem to follow trade-off theory.

Growth potential (GP) has also shown very significant results for all leverages after financial crisis. Prior to crisis, it is negatively correlated to all but not significant relationship with TD leverages but after the crisis GP is negatively correlated to STD and LTD but positively correlated to TD. It shows that Chinese firms with high growth potential as less likely to prefer debt to finance their new investments or business expansion but in case of total leverage, they have the tendency to look for financial support from external sources, which is the only change been observed after the crisis.

Economic development (ED) is significant in LTD and TD but ED is positively correlated to LTD and negatively correlated to TD. But, prior to financial crisis period it is significant to all leverages but negatively correlated to LTD but positively correlate to STD and TD. It shows that financial crisis has affected the Chinese firm's financial decisions at every kind of leverage. It shows that with positive growth of GDP, Chinese firms are less likely to approach external financing in their total leverage but for long term debt leverage, Chinese firms are more likely to avail the excessive funds from external sources to finance their projects. These results are different prior to financial crisis. But Chinese firms follow the pecking order theory for their long term leverage.

Inflation is significant in LTD and TD but negatively correlated in LTD and positively in TD. These results are totally different as it is observed in pre-financial crisis period. It shows that financial crisis has changed the affect of inflation on Chinese firm's ability to make decisions for their capital structure as pre-financial crisis period, inflations has significant relationship only with STD but after crisis it is significant in LTD and LD. Results shows that with any increase in inflation rate, Chinese firms are less likely to go for debt but in case of TD, there are more tendencies to look for external sources of finances to meet their financial needs. These results are contrary to fact that Chinese firms are supported by the state (Huang and Song, 2006).

## 5.  Conclusion and Limitations

This study has tried to combine the possible firm level and macroeconomic level determinants of capital structure and then an attempt has been made to find out the impact of financial crisis of 2007-08 on all these set determinants. Leverage has been categorized in three parts as short term debt ratio (STD), long term debt ratio (LTD) and total debt ratio (TD) pursuant to the definitions by Rajan and Zingales (1995). Capital structure is analyzed by keeping in view three main theories of capital structure: trade-off theory, pecking order theory, and market timing theory. All these theories show different relationships with various variables. Ten variables (Profitability, Size, Tangibility, Liquidity, Non-Debt Tax Shield, Volatility, Economic Development, Tax Rate and Inflation) have been used in this paper, which are commonly used by various researchers in their studies on China or other parts of the world. This study has used data of 897 Chinese non-financial firms listed on both Shanghai and Shenzhen stock exchanges for the period of 2003-2012. Data paneling technique has been used to analyze the data. Entire sample period of 2003-2012, has been divided into two sub-periods which are 2003-2007 (representing pre-financial crisis period) and 2008-2012 (representing post-financial crisis period).

Regression analysis has provided very significant results. In full period regression, liquidity (LIQ) has shown no change in both pre-post financial crisis time periods, while tax (TAX), non-debt tax shield (NDTS), tangibility (TANG), economic development (ED) and inflation (INF) have shown a very significant and distinct change after crisis.  But at the same time volatility has shown a very significant change in long term and in total leverage. While profitability (PROF) and size (SIZE) has shown significant change just in STD. Growth potential (GP) has shown significant change only in total leverage after crisis. Tax is only significant negatively to STD while NDTS is significant negatively to LTD and TD. Volatility is significant positively to all leverages. But profitability is only significant negatively to LTD. Liquidity is also significant to all leverages but the relationships are different as it is negative in both STD and TD but positive in LTD. Tangibility, size and growth potential are significant to all leverages but TANG is only negatively correlated to STD. Size is only negatively correlated to TD while GP is only positively correlated to TD. Economic development which is measured through GDP growth rate has significant positive and negative relationships with STD and TD, respectively. Inflation is negatively correlated to STD and LTD but the level of significance is very low. On the basis of this analysis, it can be inferred that one theory cannot explain the behavior of these determinants of capital structure for Chinese listed non-financial firms. These results are quite similar to previous studies like Huang & Song (2006), Strange & Chen (2006), Chen (2004), Chen & Chen (2011) and Anwar & Sun (2013).

The regression analysis for pre-financial crisis period of 2003-2007 provides very interesting results as compared to post-financial crisis period of 2008-2012. Table-11 shows a very clear picture of both periods. It shows that various variables have different level of significance and relationship with leverages. For instance, tax and NDTS is insignificant to all leverages for pre-crisis period but it is significant to all leverages for post-financial crisis. While tax has a negative relationship in both periods, NDTS shows different relationships to all leverages in both periods. Volatility is insignificant to LTD and TD in per-crisis period but it shows a significant positive relationship to all leverages in post-crisis period. It can be inferred that Chinese firms rely more on external financing in times financial crisis or financial. Profitability shows a considerable negative relationship to STD and LTD. It suggests, in line with the pecking order theory, that profitable Chinese firms are more likely to use their own funds rather than relying on external sources of finance. Liquidity saw no change in significance or relationship to all leverages in both periods. Tangibility shows very different results in both periods. It is insignificant to STD but significant positive to LTD and STD but after crisis, it is significant negative to STD but insignificant to LTD and STD. The possible explanation to this is that Chinese firms with more tangible assets are less likely to rely on debt. Size is insignificant in STD in pre-financial crisis period but in post-financial crisis period it has a significant negative relationship with STD. For LTD and TD, size has similar significant relationships. In theory it supports, if larger firms have low leverage in their capital structure but it is not usual for smaller firms to have higher leverage. For Chinese firms, results similarly support higher leverage in the long term. The reason can be some institutional factors that propel firms to have more long term leverage to finance their operations after the crisis, along with excessive asymmetric information during the financial crisis 2007-08

that allowed the firms to raise their long term leverage to meet any upcoming financial need. Researchers (Campello et al, 2010) have shown that mostly small firms were affected by financial crisis of 2007-08 and this fact supports the pecking order theory. Growth potential has insignificant relationship with TD in pre-crisis period but after crisis it has a significantly positive relationship with TD while for STD and LTD, results are similar for both periods. It shows that firms with higher growth opportunities are more likely to avail external sources of finance as their total leverage but for long term leverage and short term leverage, this tendency is less likely and they prefer to rely on their own financial resources. Economic Development is significant to all leverages before crisis but after crisis it is insignificant to STD but significant to LTD and TD. Inflations has shown very different results in both cases as it is only significant positive to STD in pre-crisis period but after crisis, it shows that inflation has effected LTD and TD significantly.

After analyzing all the factors, it can be inferred that there is no theory which can explain the behaviors of the factors which determine the capital structure of Chinese listed non-financial firms. As explained by Chinese researchers like Huang & Song (2006), Strange & Chen (2006) and Chen (2004), there is no one theory which can explain all the determinants of capital structure of Chinese firms. However, pecking order theory has more explanatory power than other theories of capital structure.

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