Regional variation in the capital structure adjustment speed of listed firms: Evidence from China

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ABSTRACT

This paper investigates whether in China, a country large in size, geographically diverse and imbalanced in regional economic development, variation in firm capital structure[1] is systematically related to regional economic environment. In addition, we examine whether during macroeconomic recovery there is significant difference in the speed of adjustment in capital structure of firms located in different regions. The empirical analyses are based on 783 firms listed on Shanghai and Shenzhen Stock Exchanges during a sample period of year 2000 through 2014. Using GMM and Logit QMLE, we found strong evidence that the regional variation in the capital structure of listed firms is linked to growth indicator (the Market-to-Book value, MB), EBIT ratio, size of the firm and tangible assets (the value of Net Property, Plant and Equipment, PPE). In the process of economic recovery, there was apparent regional variation in the speed of adjustment in capital structure, i.e. the fastest adjustment in capital structure was found in East China while that of West China followed and that of Mid China the slowest, that is to say within a given period the leverage ratio of listed firms in East China rises or falls faster than in the other two regions.

1. Introduction

Beginning in the late 1950s Modigliani and Miller's (1958) capital structure irrelevance principle states that there is no relationship between a firm's value and its capital structure in a perfect market. However, in practice a firm's capital structure is influenced by firm specific internal factors as well as by external factors. In particular, under unexpected macroeconomic shocks, listed firms may be forced to adjust its capital structure, and consequently its capital structure could deviate from its optimal level. However, as economic recovery takes off a listed firm may redirect its capital structure toward its optimal level.

In China, vast differences are observed among regional economies; consequently regional economic development is imbalanced. For example, in 1979, the beginning of the economic reform, except for a few provinces in the eastern region such as Shanghai and Liaoning where GDP per capita reached RMB 5,000, GDP per capita in most provinces was around RMB 3000. However, in 2007, the gap between the eastern region and the western and the mid regions was further widened, e.g. GDP per capita of Shanghai, the richest in the eastern region, was ten times that of Guizhou, the poorest in the western region. According to Chen and Zheng (2008), GDP per capita of some eastern provinces such as Guangdong, Shandong, Fujian, Zhejiang,

Jiangsu, Shanghai, Liaoning and Tianjin exceeded RMB 10,000. This study proposes that the variation among regional economic development status is attributed to the variation in the growth of firms in the regions. We collect data on the average asset size of listed firms in each Chinese province in order to analyse the regional variation in the average size of firms' total assets. The regional distribution of listed firms shows that the average size of listed firms' total assets displays significant spatial variation across provinces. There are two remarkable patterns can be identified. First, the largest average size of listed firms' total assets is observed among provinces located in the Eastern coastal region, followed by the Middle region, where that of the Western region is the smallest. Second, the metropolises within each region, such as Beijing, Shanghai, Shenzhen etc., have much larger total asset size than other places in the region. These patterns provide clues for further analyses of regional variation in capital structure adjustment.

After the subprime crisis, the Chinese economy suffered the fallout. Therefore GDP growth, which indicates the economic recovery, displayed regional variation. For example, in the first half of 2009, among 31 Chinese provinces (including autonomous regions and municipalities), 14 provinces had a GDP growth of more than 10%, 8 provinces' GDP growth exceeded 8%, while the remaining 9 provinces had a slow growth of below 8%. The recovery of provinces with export-oriented

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economy lagged the other provinces. This phenomenon leads to the question of whether the speed of adjustment in firm capital structure also varies among provinces. The existing literature contains a wide range of discussion on this issue.

In China equity financing is at the national level while debt financing varies across different regions. Such regional variation in debt financing is closely related to the vertical banking system. We argue that the regional variation in the speed of adjustment in capital structure of listed firms is due to the divergent regional characteristics of debt financing. For the ease of empirical analyses, this paper categorises firms into east, mid and west according to the province of their incorporation. We investigate empirically the regional variation in capital structure adjustment speed of listed firms and its determinants.

Since the end of 2007 subprime crisis, much attention has been drawn to the dynamic adjustment in corporate capital structure following macroeconomic volatility. To the best of our knowledge, we are the first to examine the post-subprime crisis behavior of capital structure adjustment in the Chinese market by taking into consideration of regional macroeconomic environment. The contribution of this paper is the following. Analyzing the speed of adjustment in capital structure and the impact from economic stimulus policies sheds light on the resilience of economic entities. Such analyses also provide insight into the effectiveness of economic stimulus policies, and inform the efficient undertaking of such policies.

Three streams of literature are the most relevant to this study. First, the existence of an optimal capital structure. Through a survey of CFOs, Graham and Harvey (2001) found that 80% of the CFOs believed the existence of an optimal capital structure and continuously adapt firms' operational decisions to achieve the optimal level. Baker and Wurgler (2002) found that the effect market timing had on corporate leverage was weak; however the cost of adjustment was an important determinant of capital structure adjustment speed. Leary and Roberts (2005) found that firms' continuous optimization of their financial leverage ratio was due to the costs associated with the adjustment of capital structure. Flannery and Rangan (2006) and Qian et al. (2009) compared main stream theories on capital structure and found that there existed a long-term optimal capital structure for firms. These studies show that there is a trend that a firm's capital structure adjusts towards the optimal level.

Second, the determinants and cyclicality of capital structure adjustment. Banjeree et al. (2004) and Lööf (2003) suggested that the speed of adjustment in capital structure was not only influenced by the cost of adjustment, but also by macroeconomic factors such as GDP growth and interest rates. The volatility of interest rates on a firm's credit reflects partly the firm's default risk. Usually default risk can be measured by credit spread. Due to the underdevelopment of corporate bond market, only selected large state-owned enterprises with high creditability issue bonds in the market. Therefore the market does not cover all the listed companies across the country. Consequently, we use only GDP growth as the macroeconomic factor. Hackbarth et al. (2006), Drobetz and Wanzenried (2006) and Huang and Song (2006) argued that the threshold for capital structure adjustment was lower in economic boom times while it was higher during economic recession. Leary and Roberts (2005) used a multi-period dynamic model and concluded that firms actively control their capital structure within a desirable range. Their finding is consistent with that of Fama and French (2002), i.e. firms' target capital structure was mean-reverting. The later also supports the pecking order hypothesis[2]. Fan et al. (2009) investigated whether firms' capital structure displayed geographic variation. Cook and Tang (2010) used a two-stage dynamic partial

adjustment model and found the speed of adjustment in listed firms' capital structure was faster during economic boom. Jiang and Huang (2011) argued the reform towards market was the most important institution that affected Chinese firms' capital structure. Their research showed that firms' capital structure adjusts faster in a more market-oriented environment. However, they did not discuss the regional variations in China. In comparison to their studies which focus on the impact of different state institutions on capital structure, we aim to address how under the same institutional environment in China different regional economic conditions influence listed firms' capital structure.

Third, the cost of capital structure adjustment. Tong (2004) used panel regression to analyse the time-varying capital structure of Chinese listed firms. He found that the leverage ratio had a positive relationship with firm size and growth prospect and it had a negative relationship with profitability. The sector variation in capital structure of listed firms in China also attracted wide attention from researchers. Guo and Sun (2003) argued that the adjustment in capital structure of Chinese listed firms was characterised by sector differences. Their study only compared the sectorial difference in capital structure. Since most regional economic growth is driven by the government, the industrial structure is quite homogenous across the country. Therefore, we do not consider the influence of industrial structure on capital structure. Wang et al. (2007) found that the costs from equity financing are much greater than that from bank financing. This led to lower speed of adjustment towards low debt/asset ratio in comparison with adjustment towards high debt/asset ratio. Their findings also reveal the motivation and the mechanism of adjustment in capital structure of Chinese listed firms.

In summary, literature on the adjustment of capital structure of Chinese listed firms focuses on firm specific factors and few extend the analysis to the macroeconomic level. In particular there is limited literature on the geographic variation in the speed of adjustment in capital structure. To summarise, the contribution of this paper is as follow. First, we explore the regional variation and the determinants of capital structure adjustment within one country. Second, we analyse the speed and the mechanism of regional capital structure adjustment during the recovery from macroeconomic shocks, and the corresponding policy implications.

2. Methodology

2.1. Model design

We use two-stage partial dynamic adjustment model for capital structure (Hovakimian et al., 2001). Assuming that it takes time and costs for a firm to adjust to a target leverage ratio and that the adjustment cannot be achieved instantaneously, this model sets the firm's target leverage ratio to be related to firm characteristics of the previous financial year. Combining Fama and French (2002) and Kayhan and Titman (2007), we incorporate macroeconomic variables into the two-stage partial dynamic adjustment model to better estimate firms' target leverage ratio. We then introduce speed of adjustment δ to arrive at an integrated dynamic adjustment model for capital structure. We use both models to empirically estimate the regional variation in the speed of adjustment in capital structure. We use the following two-stage partial dynamic adjustment model for capital structure. Assuming a firm's target debt/asset ratio ($D_{i,t}{}^*$) is a function of macroeconomic index ($Macro_{i,t-1}$) and a vector of firm characteristics ($X_{i,t-1}$).

The first stage:

$$D_{i,t}{}^* = \gamma Macro_{i,t-1} + \beta X_{i,t-1} \qquad (1)$$

In a perfect market with zero cost of adjustment, a firm can adjust to its target debt/asset ratio rapidly. However in practice where adjustment incurs costs, a firm cannot fully adjust to its target capital

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[2] The pecking order hypothesis posited by Myers and Majluf (1984) predicts that information asymmetry between managers and investors create a preference ranking over financing sources. Beginning with internal funds, followed by debt, and then equity, firms work their way up the pecking order to finance investment in an effort to minimize adverse selection costs.