國立屏東科技大學
National PingTung University of Science & Technology

出席國際學術研討會發表論文
出國報告書

報告人: 葉 憲 弘

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目　　錄

壹．出席國際學術研討會目的

1. 藉由出席參加 International Symposium on Finance and Accounting (ISFA) 2011 與 BAI 2011 國際學術研討會發表研究論文，吸收其他財務專家學者之意見與看法，作為改進研究論文之參考。
2. ISFA 2011 國際學術研討會邀請 SSCI 期刊 Emerging Markets Finance and Trade 主編 Professor Ali M. Kutan 出席研討會，並特別安排 Professor Kutan 於會前主持 workshop 和專家學者分享投稿至國際期刊之寶貴經驗。
3. 藉由出席參加國際學術研討會發表研究論文之機會，同時觀摩了解其他財務專家學者之最新研究主題與方向，作為自身研究論文方向之參考。
4. 透過在研討會中與專家學者面對面交談與對話，建立自身研究領域的 private network，可能為將來研究合作之對象以及未來在學術、研究上之相互支援與協助。

貳. 出席國際研討會過程

1. 此次出席國際學術研討會期間，仍有碩專班課程授課，因此只能在論文發表日前一天 7 月 5 日，從高雄搭華航班機出發至泰國曼谷。於隔日 7 月 6 日早上與下午各發表一篇研究論文後，因航班時間關係只能於 7 月 7 日搭機返國，繼續碩專班課程授課。
2. 由於行程只有三天時間限制，無法參訪本校在泰國之姐妹學校。
3. 研討會主辦單位與當地大學合辦此次國際學術研討會，在研討會餐會中有泰國文化藝術表演助興，此舉有助於國際學者對泰國文化與藝術之了解。
4. 在研討會中有相關論文探討 corporate governance 問題，應可考慮將公司治理問題納入後續資本結構之相關研究。

參. 出席國際研討會心得與建議

1. 在本校財務預算許可情況下，建議考慮與國外姐妹學校聯合舉辦國際學術研討會，藉以提高本校國際知名度，亦可藉機吸引國際學生來本校進修與研習。
2. 本次出席泰國國際研討會，碩專班課程尚未結束，因而無法參訪在泰國本校之姐妹學校。國內高等教育正值國際化轉型之際，爾後應利用出席國際學術研討會之機會，順道參訪國外之姐妹學校以增進雙方教學與研究之合作與情誼，以及雙方合作舉辦國際學術研討會之團隊默契。
3. 本次出席參加 ISFA 與 BAI 2011 國際學術研討會之餐會中，主辦單位也安排泰國文化藝術表演。國內大學舉辦國際學術研討會，亦可參考安排本國文化與藝術之表演，有助於參與研討會之國際學者對台灣之文化與藝術有之認識與了解，期能有助於本國觀光事業之發展。

肆. 出席 ISFA 2011 研討會發表論文全文

CAPITAL STRUCTURE BEFORE AND AFTER THE ASIAN FINANCIAL CRISIS OF 1997-1998: EVIDENCE FROM THE CONSTRUCTION INDUSTRY OF TAIWAN

Hsien-Hung H. Yeh
Department of Business Administration, College of Management,
National Pingtung University of Science and Technology,
1, Hseih-Fu Road, Nei-Pu, Pingtung 91201, Taiwan
hhyeh@mail.npust.edu.tw

ABSTRACT

The partial adjustment model is utilized in this study to examine how firms determined and adjusted their capital structure during periods before and after financial crisis of the Asian financial crisis of 1997-1998, respectively. Due to the presence of the lagged dependent variable in the model, the generalized method of moments (GMM) estimation is utilized in the study. The econometric software of Stata 11 is used to perform the GMM estimation. Empirical results show firstly that, controlling for economic and firm-specific effects, average debt ratio is 31.1% and 52.4% for the listed firms in the construction industry of Taiwan during periods before and after the Asian financial crisis of 1997-1998, respectively. Secondly, average debt ratio for firms with the financial constraint of under-leverage is 16.2% higher than that for firms with the financial constraint of over-leverage during the period before the Asian financial crisis. However, the difference in the average debt ratios between firms with the financial constraint of over-leverage and under-leverage became narrower and fell to 9.5% after the Asian financial crisis of 1997-1998. Finally, the rate of adjustment toward the target debt ratios of firms in the construction industry of Taiwan has slowed down after the Asian financial crisis of 1997-1998.

Keyword: Capital Structure, Financial Crisis, Partial Adjustment Model

Introduction

Some recent studies have documented that, due to the costs of adjustment, firms may deviate from the target capital structure over time but adjust toward the target in the long run (Byoun, 2008; Flannery and Rangan, 2006; Hovakimian et al., 2001). During the process of adjustment toward the target capital structure, the outbreak of financial crisis may raise the risk and cost of bankruptcy of firms. Consequently, the costs of adjustment toward the target capital structure may vary due to the outbreak of financial crisis. If so, how do firms determine their capital structure and adjust toward the target capital structure before and after the Asian financial crisis of 1997-1998, respectively? In addition, firms with above-target and below-target capital structure have different risk and cost of bankruptcy. Do firms with above-target and below-target capital structure determine their capital structure differently because of the risk and cost of bankruptcy? If so, did the impact of the Asian financial crisis of 1997-1998 affect the determination of capital structure for firms with below-target and above-target capital structure differently? These issues, however, thus far have remained neglected.

Further, Glen and Singh (2004) found that capital structure of firms in developed countries is different from that in developing countries. However, most prior studies addressed the issue in developed countries rather than in emerging markets or in developing countries. Moreover, rarely did prior studies examine the determination and adjustment of capital structure of firms in the construction industry except the work of Feidakis and Rovolis (2007) on the determinants of capital structure of European large construction firms. Therefore, this study is conducted within the construction industry of Taiwan to fill the gap. The rest of this paper is organized as follows. Section II provides literature review. Section III explains the data and method used in the study. Section IV presents the empirical results and analysis and, at last, Section V concludes the study.

Literature Review

After the classic work of capital structure by Modigliani and Miller (1958), much attention has been given to examine how firms determine their capital structure. These prior studies had documented a lot of evidence on how firms determine their optimal or target capital structure, as can be seen in the summarized report of Harris and Raviv (1991). However, Myers and Majluf (1984) argued that shareholders can be better off when firms reserve financial slack for investment opportunities. Narayanan (1988) claimed that it is better for firms to build up debt capacity for future investment opportunities. In a survey on the Fortune 500 Industrial companies, Pinegar and Wilbricht (1989) found that over 94% of the respondents indicate that it is important for firms to maintain financial flexibility in order to avoid passing up investment opportunities. Also, in an Australian survey, Allen (1991) undertook a series of field interviews with the company secretaries and senior financial personnel of 48 Australian listed companies. His respondents also contended that firms would reserve their borrowing capacity and maintain financial flexibility to avoid foregoing valuable investment opportunities. In an American survey Graham and Harvey (2001) found that financial flexibility is one of the important factors of capital structure considered by the management of firms. Graham and Harvey also found that 81% of firms in their survey consider a target debt ratio or range for their capital structure decisions. As a whole, these prior studies suggested that firms have a target capital structure when they make their capital structure decisions.

Further, several recent studies have concluded that firms may deviate from their target capital structure over time but adjust toward the target in the long run (Byoun, 2008;

Flannery and Rangan, 2006; Hovakimian et al., 2001). Adjustment of capital structure toward the target occurs when firms have above-target or below-target capital structure. When they have above-target (below-target) capital structure, firms are facing the financing constraint of over-leverage (under-leverage) relative to the target. Firms would gear down (up) their capital structure toward the target when they are facing the financing constraint of over-leverage (under-leverage) relative to the target. During the process of adjustment toward the target, firm might not be able to make a full adjustment of capital structure to the target due to the costs of adjustment. Thus, firms may deviate from the target capital structure in the short run.

The outbreak of financial crisis may raise the risk and cost of bankruptcy that affect the determination of capital structure. Consequently, the determination of capital structure of firms and their adjustment toward the target capital structure may be influenced by the impact of financial crisis. However, did the Asian financial crisis of 1997-1998 affect the determination of capital structure of firms in the construction industry and their adjustment toward the target? This issue thus far has remained neglected. To understand the impact of the Asian financial crisis of 1997-1998 on capital structure, it is necessary to compare how firms determined their capital structure and adjusted toward the target during periods before and after the Asian financial crisis of 1997-1998. In addition, Glen and Singh (2004) found that capital structure of firms in developed countries is different from that of firms in emerging markets. Most prior studies, however, had addressed the determination of capital structure in developed countries rather than in emerging markets or developing countries. Moreover, rarely did prior studies examine capital structure in the construction industry except the work of Feidakis and Rovolis (2007), which examined the determination of capital structure of European large construction firms. Therefore, it is necessary to provide evidence on how firms in the construction industry determined capital structure and adjusted toward the target during periods before and after the Asian financial crisis of 1997-1998 from emerging markets. This study is conducted within the construction industry of Taiwan to fill the research gap.

Data and Method

The Partial Adjustment Model of Capital Structure

Recent studies (Byoun, 2008; Flannery and Rangan, 2006; Hovakimian et al., 2001) suggested that firms may deviate away from their target capital structure over time but they adjust toward the target in the long run. The adjustment behavior of capital structure fits with the partial adjustment model and, thus, this econometric model is utilized in this study to examine the determination and adjustment of capital structure of firms during periods before and after the Asian financial crisis of 1997-1998, respectively. The partial adjustment model for the determination and adjustment of capital structure of firms in the construction industry can be expressed as follows:

$$Y_t - Y_{t-1} = \gamma(Y_t^* - Y_{t-1}) + \varepsilon_t \quad (1)$$

where, Y_t: the capital structure at year t, Y_{t-1}: the capital structure at year t-1, γ: the rate of adjustment toward the target capital structure and $0 < \gamma < 1$, Y_t^*: the target capital structure at year t and ε_t: the error term.

Given a positive rate of adjustment toward the target in the partial adjustment model, negative or positive adjustment of capital structure depends on whether firms have above-target or below-target previous capital structure relative to the target. When firms have

above-target capital structure, firms face the financing constraint of over-leverage relative to the target capital structure. The greater the rate of adjustment toward the target, the greater is the decrease in capital structure of firms. On the other hand, when firms have below-target debt, firms face the financing constraint of under-leverage relative to the target. The greater the rate of adjustment, the greater is the increase in capital structure of firms. In the short run, firms make an incomplete adjustment and thus firms deviate from their target capital structure. In the long run, however, the rate of adjustment equals to 1 and firms make a complete adjustment toward the target. Thus, the capital structure of firms is adjusted to be on target in the long run.

However, in the application of the partial adjustment model, the target capital structure is unobservable. It is assumed in this study that the target capital structure of firms in the construction industry is linearly determined by firm characteristics and economic factors, as suggested by main prior studies (Chu et al., 1992; Feidakis and Rovolis, 2007; Hackbarth et al., 2006; Harris and Raviv, 1991; Korajczyk and Levy, 2003; Kuo, 2006). By incorporating variables including economic growth, economic conditions, interaction between economic growth and economic conditions, and firm characteristics into Equation 1 and rearranging it, the partial adjustment model for the determination of capital structure of firms in the construction industry for each period before and after the Asian financial crisis of 1997-1998 can be written as follows:

$$\begin{aligned} Y_t = {} & (1-\gamma)Y_{t-1} + \gamma\beta_{EG}EG_t + \gamma\beta_{EC}EC_t + \gamma\beta_{EG\times EC}EG\times EC_t + \gamma\beta_1 SIZE_t \\ & + \gamma\beta_2 GROWTH_t + \gamma\beta_3 PROFIT_t + \gamma\beta_4 NDTS_t + \gamma\beta_5 ASSET_t + \varepsilon_t \end{aligned} \quad (2)$$

where, Y_t: the capital structure at year t, Y_{t-1}: the capital structure at year t-1, γ: the rate of adjustment toward the target capital structure, β: regression parameter, EG: economic growth, EC: economic conditions, EG$\times$EC: the interaction between economic growth and economic conditions, SIZE: firm size, GROWTH: growth opportunities, PROFIT: profitability, NDTS: non-debt tax shields, ASSET: asset tangibility, and ε_t: the error term.

As discussed earlier in this section, firms with above-target and below-target capital structure have different risk and cost of bankruptcy that affect capital structure. During the process of adjustment toward the target capital structure, firms with above-target capital structure would gear down their capital structure toward the target, while firms with below-target capital structure would gear up their capital structure toward the target. Due to the risk and cost of bankruptcy, firms with the financial constraint of over-leverage relative to the target would finance less debt than do firms with the financial constraint of under-leverage. In order to examine the effect of financial constraint on the determination of capital structure in this study, the financial constraint (FC) of over-leverage and under-leverage relative to the target capital structure must be considered and included in Equation 2. Therefore, with the financial constraint of over-leverage and under-leverage relative to the target taken into account, the model for the determination of capital structure of firms for each period before and after the Asian financial crisis of 1997-1998 can be written as follows:

$$\begin{aligned} Y_t = {} & \beta_{FC}FC + (1-\gamma)Y_{t-1} + \gamma\beta_{EG}EG_t + \gamma\beta_{EC}EC_t + \gamma\beta_{EG\times EC}EG\times EC_t + \gamma\beta_1 SIZE_t \\ & + \gamma\beta_2 GROWTH_t + \gamma\beta_3 PROFIT_t + \gamma\beta_4 NDTS_t + \gamma\beta_5 ASSET_t + \varepsilon_t \end{aligned} \quad (3)$$

Data and Sample

In order to investigate the adjustment of capital structure for each period before and after the Asian financial crisis of 1997-1998, the sample includes the listed firms in the

construction industry of Taiwan during periods of 1982-1996 and 1999-2007. Annual financial data of firms in the construction industry within periods of 1982-1996 and 1999-2007 are collected from the data bank of the Taiwan Economic Journal. Unbalanced panel data collected within periods of 1982-1996 and 1999-2007 are used in this study to examine the determination and adjustment of capital structure of firms in the construction industry for periods of 1992-1996 and 1999-2007, i.e. before and after the Asian financial crisis of 1997-1998.

Based on the findings of prior studies on the negative effect of macroeconomic conditions on capital structure (Hackbarth et al., 2006; Korajczyk and Levy, 2003; Levy and Hennessy, 2007), the coefficient on the proxy for economic conditions (EC) in the equation is expected to be negative. Further, the generalized method of moments (GMM) estimation is utilized in the study due to the presence of the lagged dependent variable in the partial adjustment model. The econometric software of Stata 11 is used to perform the GMM estimation and detailed information can be found in the Stata User's Guide (StataCorp, 2009).

Variables and Measures

As suggested by most of the previous studies (Harris and Raviv, 1991), the ratio of total debts to total assets, i.e. debt ratio (DR), is used as the proxy for the capital structure of firms. Based on the partial adjustment model, firms with above-target debt ratios would gear down their debt ratios toward the target and make a negative adjustment of debt ratios. On the contrary, firms with below-target debt ratios would gear up their debt ratios toward the target and make a positive adjustment of debt ratios. Negative or positive adjustment reflects the financial constraint of over-leverage or under-leverage that firms are facing. Thus, the binary dummy variable (DUMdDR) with a value of 0 for negative adjustment and with a value of 1 for positive adjustment is used as the proxy for the financial constraint of over-leverage and under-leverage, respectively.

Further, the annual growth rate of gross domestic production (gGDP) is used to control for the effect of economic growth on debt rations in the study (Feidakis and Rovolis, 2007). The years during periods from economic trough to economic peak and during periods from economic peak to economic trough are selected to represent economic expansion and contraction, respectively. The classification of economic expansion and contraction is used in accordance with the reference dates of business cycles in Taiwan that are officially published by the Council for Economic Planning and Development. The binary dummy variable EC with a value of 1 for periods of economic expansion and with a value of 0 for periods of economic contraction is used as the proxy for economic conditions.

Furthermore, the natural logarithm of net sales (*ln*S) is used to measure firm size (Booth et al., 2001; Chu et al., 1992; Huang and Song, 2006; Rajan and Zingales, 1995; Titman and Wessels, 1988; Wiwattanakantang, 1999). The ratio of capital expenditure to total assets (CETA) is used as the proxy for growth opportunities (Titman and Wessels, 1988). The ratio of operating income to total assets (OITA) is used to measure profitability (Titman and Wessels, 1988). The ratio of total depreciation to total assets (DEPTA) is used as the proxy for non-debt tax shields (Chu et al., 1992; Kim and Sorensen, 1986; Titman and Wessels, 1988; Wald, 1999; Wiwattanakantang, 1999). The ratio of tangible fixed assets to total assets (FATA) is used to measure the tangibility of asset structure (Kim et al., 2006; Lee et al., 2000).

Empirical Results and Analysis

To investigate the determination and adjustment of debt ratios of firms in the construction industry for each period before and after the Asian financial crisis, the sample data collected within periods of 1992-1996 and 1999-2007 includes 693 observations of the listed firms in the construction industry of Taiwan. The summary of the main descriptive statistics for the two subsamples within periods of 1982-1996 and 1999-2007 is shown in Table 1. It is worth noting that no observation of 'zero' debt ratio adjustment is found in the sample. This shows that the sample data fits with the partial adjustment model and, thus, can be used to investigate the determination and adjustment of capital structure of firms in the construction industry of Taiwan for each period before and after the Asian financial crisis of 1997-1998.

The empirical results with the two-step GMM estimates performed by the econometric software of Stata 11 for the determination of debt ratios for firms in the subsamples before and after the Asian financial crisis are shown in columns (a) and (b) of Table 2, respectively. As can be seen in the table, the results of the first-order and second-order serial correlation test show that the m1 statistic is statistically significant but the m2 statistic is not statistically significant at the significance level of 5%. This suggests that it is appropriate to use the GMM estimation in this study. In addition, the J-statistic of the Sargan test is not statistically significant at the significance level of 10%. This shows that the instrumental variables are not correlated with the residuals and, thus, the instruments used in the model are valid. Moreover, the Chi-square statistic of the Wald test for the joint significance of the independent variables is statistically significant at the significance level of 1%. This results suggests that some coefficients on the independent variables in the model are significantly different from 0.

Further, the empirical results show that, firstly, the constant or intercept is 0.311 and 0.524 for the subsamples before and after the Asian financial crisis of 1997-1998, respectively, and statistically significant at the significance level of 10%. This indicates that, controlling for the effects of economic growth, economic conditions, interaction between economic growth and economic conditions and firm characteristics, the average debt ratio of firms in the construction industry of Taiwan has increased from 31.1% to 52.4% after the Asian financial crisis of 1997-1998.

Secondly, the regression coefficient on the lagged dependent variable is 0.626 and 0.862 for the subsamples before and after the Asian financial crisis of 1997-1998, respectively, and statistically significant at the significance level of 1%. The results show that the rate of adjustment toward the target debt ratios is 37.4% and 13.8% of the gap between the target debt ratios and the observed previous debt ratios. This finding suggests that firms in the construction industry adjusted at a slower rate after the Asian financial crisis than before the Asian financial crisis of 1997-1998.

Thirdly, the dummy proxy (DUMdDR) for the financing constraint of over-leverage and under-leverage faced by firms with above-target debt ratios and below-target debt ratios is statistically significant and positively related to the debt ratios both before and after the Asian financial crisis of 1997-1998 at the significance level of 1%. This shows that the average level of debt ratios for firms that had below-target debt ratios is 16.2% higher than that for firms that had above-target debt rations during the period of 1982-1996 before the Asian financial crisis of 1997-1998. This suggests that, due to higher risk and cost of bankruptcy, firms with the above-target debt ratios financed with less debt than did firms with the below-target debt ratios. However, the difference in average debt ratios between firms with the above-target and below-target debt ratios became narrower and fell to 9.5% during the period of 1999-2007 after the Asian financial crisis of 1997-1998.

Table 1 Summary of the main descriptive statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
Panel A: Subsample for the period before the Asian financial crisis of 1997-1998					
DR	409	0.62570	0.20653	0	1.02086
DUMdDR	409	0.46455	0.49935	0	1.00000
gGDP	409	7.67379	1.87743	3.47462	12.65895
EC	409	0.68949	0.46327	0	1.00000
*ln*S	409	19.86197	4.30423	0	23.66120
CETA	409	0.02007	0.05545	-0.05368	0.54357
OITA	409	0.03889	0.09631	-1.01512	0.26824
DEPTA	409	0.00484	0.00833	0	0.06170
FATA	409	0.11906	0.13872	0	0.98031
Panel B: Subsample for the period after Asian financial crisis of 1997-1998					
DR	284	0.57337	0.18793	0.02502	1.15187
DUMdDR	284	0.48592	0.50068	0	1.00000
gGDP	284	4.38472	2.35699	-2.17116	6.15318
EC	284	0.65141	0.47737	0	1.00000
*ln*S	284	21.38593	1.63375	14.76520	23.98730
CETA	284	0.00135	0.05620	-0.73406	0.45069
OITA	284	0.00232	0.09505	-1.24708	0.14186
DEPTA	284	0.00349	0.00627	0	0.04724
FATA	284	0.11324	0.10289	0.00018	0.66737

Notes:

1. The subsamples before and after the Asian financial crisis includes the unbalanced panel data of the listed firms in the construction industry of Taiwan during the periods of 1982-1996 and 1999- 2007, respectively.
2. No observations of zero adjustment ($DR_t - DR_{t-1} = 0$) are found in the sample. Therefore, the sample data fits with the partial adjustment model in the study. Given a positive adjustment rate, firms in the sample that made negative adjustment ($DR_t - DR_{t-1} < 0$) and positive adjustment ($DR_t - DR_{t-1} > 0$) face the financing constraint of over-leverage and under-leverage relative to the target debt raitos, respectively.
3. DR = total debt ratios; DUMdDR = 0 and 1 for the financing constraint of over-leverage and under-leverage, respectively; gGDP = annual growth rate of real GDP; EC = 1 for economic expansion and 0 for economic contraction; *ln*S = natural logarithm of net sales; CETA = capital expenditure/total assets; OITA = net operating income/total assets; DEPTA = depreciation/total assets; FATA = tangible fixed assets/total assets.

Table 2 Results with GMM estimates for subsamples before and after the Asian financial crisis

Independent Variables	Dependent Variable: DR_t			
	(a) before the Asian financial crisis of 1997-1998		(b) after the Asian financial crisis of 1997-1998	
	coefficients	Robust standard errors	coefficients	Robust standard errors
Constant	0.311[c]	0.161	0.524[a]	0.182
DR_{t-1}	0.626[a]	0.113	0.862[a]	0.124
DUMdDR	0.162[a]	0.022	0.095[a]	0.013
gGDP	0.006	0.007	0.001	0.002
EC	-0.014	0.064	0.072[b]	0.033
gGDP×EC	0.000	0.009	-0.016[b]	0.007
*ln*S	-0.010	0.006	-0.022[b]	0.009
CETA	0.117	0.172	0.873[a]	0.089
OITA	0.167	0.260	0.074[c]	0.041
DEPTA	-3.832[b]	1.912	-0.711	1.873
FATA	0.159	0.218	-0.147[b]	0.067
No. of observations	327		200	
Serial correlation test:				
m1 (p-value)	-1.997 (0.046)		-3.337 (0.001)	
m2 (p-value)	0.522 (0.602)		-0.907 (0.365)	
Sargan test: J-statistic (d.f.)	28.475 (21)		18.256 (15)	
p-value	0.127		0.249	
Wald test: χ^2 (d.f.)	221.25 (10)		835.70 (10)	
Probability	0.000		0.000	

Notes:

1. Two-step GMM estimation is used in the study. In addition, [a], [b] and [c] indicate the significance level of 1%, 5% and 10%, respectively.
2. DR_t = debt ratio at year t; DR_{t-1} = debt ratio at year t-1; DUMdDR = 0 and 1 for the financing constraint of over-leverage ($DR_t - DR_{t-1} < 0$) and under-leverage ($DR_t - DR_{t-1} > 0$), respectively; gGDP = annual growth rate of real GDP; EC = 1 for economic expansion and 0 for economic contraction; gGDP×EC = the effect of interaction between economic growth and macroeconomic conditions; *ln*S = natural logarithm of net sales; CETA = capital expenditure/total assets; OITA = net operating income/total assets; DEPTA = depreciation/total assets; FATA = tangible fixed assets/total assets.
3. The m1 and m2 statistics are used to test the first-order and second-order serial correlation in the first-differenced residuals, respectively, under the null hypothesis of no serial correlation. Instrument specification includes DR_{t-1}, DUMdDR, gGDP, EC, gGDP×EC, *ln*S, CETA, OITA, DEPTA, and FATA.
4. The Sargan test that is a test of over-identifying restrictions examines the validity of instrumental variables. The Wald test is a test of the joint significance of the independent variables asymptotically distributed as χ^2_k under the null of no relationship, where k is the number of coefficients estimated.

Fourthly, the proxy for economic growth (gGDP) is not significantly related to the debt ratios for both before and after the Asian financial crisis of 1997-1998. Further, the proxies for economic conditions and the interaction between economic growth and economic conditions (gGDP×EC) are not significantly related to the debt ratios before the Asian financial crisis but significantly related to the debt ratios after the Asian financial crisis of 1997-1998. It is worth noting that debt ratios are negatively related to economic conditions for the subsample before the Asian financial crisis but positively related to economic conditions for the subsample after the Asian financial crisis. This finding suggests that capital structure of firms in the construction industry of Taiwan becomes pro-cyclical after the Asian financial crisis of 1997-1998.

Finally, the results show that the proxy for non-debt tax shields (DEPTA) has a significant, negative effect on the debt ratios during the period before the Asian financial crisis. However, during the period of 1999-2007 after the Asian financial crisis of 1997-1998, the proxies for firm size (*ln*S), growth opportunities (CETA), profitability (OITA) and asset tangibility (FATA) are significantly related to the debt ratios of firms in the construction industry of Taiwan. This finding suggests that the effects of firm characteristics on debt ratios in the construction industry of Taiwan vary across periods before and after the Asian financial crisis of 1997-1998.

Conclusion

Prior studies have documented that firms may deviate from the target capital structure over time but adjust toward the target in the long run. During the process of adjustment toward the target capital structure, financial crisis raises the probability of getting into financial distress as well as the risk and cost of bankruptcy and, in turn, have impact on the capital structure of firms as well as their adjustment behavior. How do firms adjust their capital structure in response to financial crisis? This issue, however, has remained neglected. In addition, much attention has been given to address the issue in developed countries instead of developing countries or emerging markets, in particular within the construction industry. This study is conducted in the construction industry of Taiwan to fill the gap.

Further, as suggested by prior studies, firms deviate from the target capital structure over time but adjust toward the target in the long run. The adjustment behavior of capital structure fits well with the partial adjustment model and, thus, this econometric model is utilized to examine the adjustment behavior of capital structure of firms in the construction industry of Taiwan before and after the Asian financial crisis of 1997-1998. Unbalanced panel data collected form the listed firms in the construction industry of Taiwan within the period of 1982 to 2007, excluding the years of 1997 and 1998 during the Asian financial crisis, is used in the study to investigate the adjustment of capital structure before and after the Asian financial crisis of 1997-1998. The generalized method of moments (GMM) estimation is utilized in the study due to the presence of the lagged dependent variable in the partial adjustment model and the econometric software of Stata 11 is used to perform the GMM estimation.

The empirical results show that, controlling for the economic and firm-specific effects, the average level of debt ratios of the listed firms in the construction industry of Taiwan is lower during the period before the Asian financial crisis than after the Asian financial crisis. Further, other things being constant, firms with above-target debt ratios tend to finance less debt than do firms with below-target debt ratios due to higher risk and cost of bankruptcy.

In addition, the findings show that the difference in average debt ratios between firms with above-target debt ratios and below-target debt ratios has become smaller after the Asian financial crisis of 1997-1998. Furthermore, the effect of macroeconomic conditions on debt ratios varied across periods before and after the Asian financial crisis of 1997-1998. In particular, debt ratios of firms in the construction industry of Taiwan are pro-cyclical after the Asian financial crisis. Finally, the rate of adjustment toward the target debt ratios has become slower after the Asian financial crisis for firms in the construction industry of Taiwan. This suggests that the cost of adjustment toward the target has increased due to the Asian financial crisis.

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THE ADJUSTMENT OF CAPITAL STRUCTURE ACROSS THE SHIFTS IN MACROECONOMIC CONDITIONS: EVIDENCE FROM THE ELECTRONICS INDUSTRY OF TAIWAN

Hsien-Hung H. Yeh
Department of Business Administration, College of Management,
National Pingtung University of Science and Technology,
1, Hseih-Fu Road, Nei-Pu, Pingtung 91201, Taiwan
hhyeh@mail.npust.edu.tw

ABSTRACT

Prior studies have found the counter-cyclical effect of macroeconomic conditions on capital structure. The adjustment of capital structure across macroeconomic conditions, however, has been neglected until now, in particular the evidence from emerging markets. Controlling for the effect of financial crisis, this study is conducted within the electronics industry of Taiwan during the period of 1999 to 2007. Firstly, the empirical results show that the average rate of adjustment toward the target debt ratios is only 7% of the gap between the target and the previous debt ratios. Secondly, firms with the above-target debt ratios have lower debt ratios than do firms with the below-target debt ratios. Third, the negative effect of macroeconomic conditions on debt ratios is not statistically significant. Finally, macroeconomic conditions may have the effect of interaction with firm characteristics on the determination of debt ratios of firms in the electronics industry of Taiwan during the period of 1999-2007.

Keyword: Capital Structure, Macroeconomic Conditions, Partial Adjustment Model

INTRODUCTION

After the pioneering study of capital structure by Modigliani and Miller (1958), researchers in finance have documented evidence on the determination of capital structure. Prior studies thus far had reached some conclusions about the determinants of capital structure, in particular factors related to firm and industry characteristics (Harris & Raviv, 1991). However, some of firm characteristics such as growth opportunities and profitability may vary with macroeconomic conditions over time. Some recent studies have concluded that the determination of capital structure is counter-cyclical (Hackbarth, Miao, & Morellec, 2006; Korajczyk & Levy, 2003; Levy & Hennessy, 2007). These recent studies suggest that macroeconomic conditions have a negative effect on capital structure.

Further, some recent studies have documented that firms may deviate away from their target capital structure over time but adjust toward the target capital structure in the long run (Byoun, 2008; Flannery & Rangan, 2006; Hovakimian, Opler, & Titman, 2001). As suggested by prior studies, the determination of capital structure is negatively influenced by macroeconomic conditions. Thus, it is necessary for us to know how firms adjust toward the target capital structure over time, in particular across the shifts in macroeconomic conditions.

Moreover, Glen and Singh (2004) found that the determination of capital structure in developed countries is different from that in emerging markets. Little attention has been given to address the issue for evidence from developing countries or emerging markets. Taiwan had a successful, natural experiment on economic development in the last century (Ghosh, 1994). In addition, the electronics industry plays an important role in the process of economic development in Taiwan and in the global computer market now as well. Therefore, this study is conducted within the electronics industry of Taiwan to provide evidence of how firms adjust toward the target capital structure across the shifts in macroeconomic conditions.

As a whole, the purpose of this study is to provide evidence from a perspective of emerging markets on the followings: (1) How do firms in the electronics industry of Taiwan adjust toward the target capital structure across the shifts in macroeconomic conditions? (2) Does capital structure vary across firms with the financial constraint of above-target and below-target capital structure relative to the target in the electronics industry of Taiwan? (3) Do macroeconomic conditions have a negative effect on the determination of capital structure of firms in the electronics industry over the business cycle? (4) Is the determination of capital structure of firms in the electronics industry of Taiwan affected by the interaction between firm characteristics and macroeconomic conditions? Finally, the remainder of the paper is organized as follows. The main, important literature is reviewed in Section 2. Methods and data used in the study are explained in Section 3. Section 4 presents the empirical results and analysis. At last, Section 5 concludes this study.

LITERATURE REVIEW

After the irrelevance proposition of capital structure by Modigliani and Miller (1958), much attention has been given to the determination of capital structure of firms. As summarized by Harris and Raviv (1991), previous studies thus far have concluded some common determinants of capital structure of firms, in particular the factors related to firm and industry characteristics. These determinants related to firm characteristics include firm size, growth opportunities, profitability, non-debt tax shields and asset tangibility. However, firm characteristics such as growth opportunities and profitability may vary with macroeconomic conditions over time.

Some recent studies have concluded that the determination of capital structure is counter-cyclical (Hackbarth et al., 2006; Korajczyk & Levy, 2003; Levy & Hennessy, 2007). Korajczyk and Levy (2003) investigated the impact of macroeconomic conditions on capital structure. They split their sample into financially constrained and financially unconstrained sub-samples to test whether the tradeoff theory and the pecking order theory can explain the effects of financial constraints and macroeconomic conditions on capital structure decisions. Korajczyk and Levy found that capital structure is counter-cyclical for the financially unconstrained firms that have sufficient funds for growth opportunities. Furthermore, Hackbarth et al. (2006) analyzed credit risk and capital structure with their contingency-claims model. They argued that shareholders' value-maximization default policy is characterized by a different threshold for each state and, in addition, default thresholds are countercyclical. They concluded that corporate leverage should be countercyclical. Moreover, Levy and Hennessy (2007) also concluded that market leverage should be counter-cyclical. In short, as suggested these recent studies, macroeconomic conditions have a negative effect on capital structure.

However, little attention has been given to address the issue for evidence from developing countries or emerging markets. Glen and Singh (2004) found that the determination of capital structure in developed countries is different from that in emerging markets. However, most of prior studies addressed the issue on the effect of macroeconomic conditions on capital structure in developed countries rather than in developing countries or emerging markets. Thus, it is necessary to provide evidence on the effect of macroeconomic conditions on capital structure from developing countries or emerging markets. Taiwan had a natural experiment in economic development and a successful experience from being a less developed country to becoming a newly industrialized country within few decades in the last century (Ghosh, 1994). In addition, the electronics industry of Taiwan plays an important role of Taiwanese economy since 1980s. Therefore, this study is conducted within the electronics industry of Taiwan to provide evidence of how firms adjust toward the target capital structure across shifts in macroeconomic conditions and to fill the gap as well.

METHODS

The Partial Adjustment Model of Capital Structure

Firms may deviate from the target capital structure in the short run but adjust toward the target in the long run, as suggested by recent prior studies (Byoun, 2008; Flannery & Rangan, 2006; Hovakimian et al., 2001). In addition, the adjustment of capital structure of firms over time fits well with the econometric model, i.e. the partial adjustment model. Therefore, this model is used to investigate the adjustment of capital structure of firms in the electronics industry across the shifts in macroeconomic conditions over the business cycle. Based on the standard partial adjustment model, the partial adjustment model applied to examine the adjustment of capital structure in the study can be expressed as follows:

$$Y_t - Y_{t-1} = \gamma(Y_t^* - Y_{t-1}) + \varepsilon_t \quad (1)$$

where, Y_t: capital structure at year t, Y_{t-1}: capital structure at year t-1, γ: the rate of adjustment toward the target capital structure, Y_t^*: the target capital structure at year t and ε_t: the error term.

During the process of adjustment toward the target capital structure, the greater the rate of adjustment toward the target, the more the after-adjustment capital structure is close to the

target capital structure. In the long run, the rate of adjustment toward the target is equal to 1 and the after-adjustment capital structure is on target.

However, the target capital structure is unobservable in the application of the partial adjustment model. As suggested by prior studies (Chu, Wu, & Chiou, 1992; Feidakis & Rovolis, 2007; Flannery & Rangan, 2006; Harris & Raviv, 1991; Hovakimian et al., 2001; Korajczyk & Levy, 2003; Levy & Hennessy, 2007), it is assumed in the study that the target capital structure is determined by macroeconomic conditions, economic growth, firm characteristics and the interaction between firm characteristics and macroeconomic conditions for firms in the electronics industry of Taiwan. Thus, based on Equation 1, the model for the determination of capital structure of firms in the electronics industry can be expressed written as follows:

$$\begin{aligned} Y_t = {} & (1-\gamma)Y_{t-1} + \gamma\beta_{EC}EC_t + \gamma\beta_{EG}EG_t + \gamma\beta_1 SIZE_t + \gamma\beta_2 GROWTH_t \\ & + \gamma\beta_3 PROFIT_t + \gamma\beta_4 NDTS_t + \gamma\beta_5 ASSET_t + \gamma\beta_1 SIZE \times EC_t \\ & + \gamma\beta_2 GROWTH \times EC_t + \gamma\beta_3 PROFIT \times EC_t + \gamma\beta_4 NDTS \times EC_t \\ & + \gamma\beta_5 ASSET \times EC_t + \varepsilon_t \end{aligned} \tag{2}$$

where, Y_t: capital structure at year *t*; Y_{t-1}: capital structure at year *t*-1; γ: the rate of adjustment toward the target capital structure; EC: macroeconomic conditions; EG: economic growth; SIZE: firm size; GROWTH: growth opportunities; PROFIT: profitability; NDTS: non-debt tax shields; ASSET: asset tangibility; SIZE×EC, GROWTH×EC, PROFIT×EC, NDTS×EC and ASSET×EC: interaction between firm characteristics and macroeconomic conditions; and ε_t: the error term.

Given a positive rate of adjustment toward the target (i.e., $0 < \gamma < 1$), the adjustment of capital structure toward the target depends on the financial constraint of above-target and below-target that firms are facing. Firms with the above-target (below-target) capital structure are facing the financial constraint of over-leverage (under-leverage) relative to the target. Firms with above-target capital structure would gear down their capital structure toward the target, while firms with the below-target capital structure would gear up their capital structure toward the target.

However, firms with above-target capital structure face higher risk and cost of bankruptcy than do firms with below-target capital structure. Due to higher risk and cost of bankruptcy, firms with above-target capital structure would finance less debt than do firms with below-target capital structure. One of the important purposes in this study is to provide the evidence how firms with the financial constraint of over-leverage and under-leverage relative to the target determine their capital structure. Taking the financial constraint of over-leverage and under-leverage relative to the target in the application of the partial adjustment model, it allows us to investigate whether firms with above-target and below-target capital structure determine their capital structure differently or not.

Based on Equation 2, the model with the financial constraint (FC) of over-leverage and under-leverage relative to the target taken into account for the determination of capital structure of firms in the electronics industry can be written as follows:

$$\begin{aligned} Y_t = {} & \beta_{FC}FC + (1-\gamma)Y_{t-1} + \gamma\beta_{EC}EC_t + \gamma\beta_{EG}EG_t + \gamma\beta_1 SIZE_t \\ & + \gamma\beta_2 GROWTH_t + \gamma\beta_3 PROFIT_t + \gamma\beta_4 NDTS_t + \gamma\beta_5 ASSET_t \\ & + \gamma\beta_1 SIZE \times EC_t + \gamma\beta_2 GROWTH \times EC_t + \gamma\beta_3 PROFIT \times EC_t \\ & + \gamma\beta_4 NDTS \times EC_t + \gamma\beta_5 ASSET \times EC_t + \varepsilon_t \end{aligned} \tag{3}$$

According to Equation 3, when the coefficient on the financial constraint (FC) of over-leverage and under-leverage relative to the target capital structure is not equal to 0, firms with above-target and below-target determine their capital structure differently.
Moreover, due to the presence of the lagged dependent variable in the model, the generalized method of moments estimation is used in the study. The econometric software of Stata 11 is used to perform the estimation. Further, the Wald test is used to examine the joint significance of the independent variables in the model under the null hypothesis of no relationship. Furthermore, the dynamic panel model is valid if the estimators are consistent and the instrumental variables used in the model are valid. The Sargan test examines the validity of instruments for over-identifying restrictions under the null hypothesis that the instrumental variables are not correlated with a set of residuals (Arellano & Bond, 1991). The m1 and m2 statistics are used to test the first-order and second-order serial correlation in the first-differenced residuals under the null hypothesis of no serial correlation, respectively (Arellano & Bond, 1991). Detailed information for the GMM estimation can be found in the Stata User's Guide (StataCorp, 2009).

Data and Sample

Annual financial data of the listed firms in the electronics industry are collected from the financial database of the Taiwan Economic Journal. Controlling for the effect of the Asian financial crisis of 1997-1998 and the global financial crisis of 2008-2009, 707 observations in the sample is collected within the period of 1999 to 2007 from the listed firms in the electronics industry of Taiwan. Thus, unbalanced panel data is used in this study to examine the adjustment of capital structure across the shifts in macroeconomic conditions.

Measures of Variables

As suggested by most prior studies on capital structure, capital structure is measured by the ratio of total debts to total assets (DR) for firms in the electronics industry of Taiwan. As discussed in the section of Methods, firms with above-target debt ratios face the financial constraint of over-leverage (under-leverage) relative to the target and, thus, they would adjust their debt ratios toward the target, i.e. negative (positive) adjustment of debt ratios. Negative and positive adjustment of debt ratios made by firms reflects the financial constraint of over-leverage and under-leverage faced by firms with above-target and below-target debt ratios, respectively. Thus, the binary dummy variable (FC) with a value of 0 and 1 is used as the proxy for the financial constraint of over-leverage and under-leverage, respectively.
Further, to investigate the adjustment of capital structure of firms in the electronics industry across the shifts in macroeconomic conditions, the years during periods from economic trough to peak and during periods from economic peak to trough of each business cycle are selected to represent economic expansion and contraction, respectively. The classification for economic troughs and peaks is based on the reference dates of business cycles that are officially published by the Council for Economic Planning and Development of Taiwan. The dummy variable with a value of 1 for economic expansion and with a value of 0 for economic contraction is used as the proxy for the shifts in macroeconomic conditions. To control for the effect of economic growth in the study, the annual growth rate of gross domestic production (gGDP) is used as the proxy for economic growth (Feidakis & Rovolis, 2007).
Furthermore, the natural logarithm of net sales (*ln*S) is used as the proxy for firm size (Booth, Aivazian, Demirguc-Kunt, & Maksimovic, 2001; Huang & Song, 2006). Growth opportunity is measured by the ratio of capital expenditure to total assets (CETA) (Titman

& Wessels, 1988). The ratio of operating income to total assets (OITA) is used as the proxy for profitability (Titman & Wessels, 1988). Non-debt tax shields are measured by the ratio of total depreciation to total assets (DEPTA) (Wald, 1999; Wiwattanakantang, 1999). The ratio of inventory plus fixed assets to total assets (INVFATA) is used to measure asset tangibility (Downs, 1993; Wald, 1999).

Empirical Model

Incorporating the proxies for macroeconomic conditions, economic growth, firm characteristics and the interaction between firm characteristics and macroeconomic conditions into Equation 3, the empirical model for the determination of capital structure of firms in the electronics of Taiwan can be written as follows:

$$\begin{aligned} Y_t = {} & \beta_{FC}FC + (1-\gamma)Y_{t-1} + \gamma\beta_{EC}EC_t + \gamma\beta_{EG}gGDP_t + \gamma\beta_1 \ln S_t \\ & + \gamma\beta_2 CETA_t + \gamma\beta_3 OITA_t + \gamma\beta_4 DEPTA_t + \gamma\beta_5 INVFATA_t \\ & + \gamma\beta_1 \ln S \times EC_t + \gamma\beta_2 CETA \times EC_t + \gamma\beta_3 OITA \times EC_t \\ & + \gamma\beta_4 DEPTA \times EC_t + \gamma\beta_5 INVFATA \times EC_t + \varepsilon_t \end{aligned} \quad (4)$$

Based on Equation 4, it is expected that, first, the coefficient on FC is positive because of higher risk and cost of bankruptcy for firms with above-target debt ratios that are facing the financial constraint of over-leverage relative to the target debt ratios. Second, the coefficient on EC is expected to be negative, as suggested by recent prior studies (Hackbarth et al., 2006; Korajczyk & Levy, 2003; Levy & Hennessy, 2007). Empirical results and analysis are presented in the next section.

EMPIRICAL RESULTS AND ANALYSIS

Controlling for the potential impact of financial crisis such as the Asian financial crisis of 1997-1998 and the global financial crisis of 2008-2009, the sample in the study includes 707 observations of the listed firms in the electronics industry during the period of 1999-2007. In addition, no firm in the sample is found to make zero adjustment of debt ratios. This shows that the sample data fits with the partial adjustment model of capital structure used in the study. The summary of the main statistic statistics is presented in Table 1.
Further, the regression results with the GMM estimates are reported in Table 2. As can be seen in the table, the results of the Wald test reject the null hypothesis of no relationship between all the independent variables and the dependent variable in the model. In addition, the result of the Sargan test accepts the null hypothesis that the instrumental variables used in the study are not correlated with a set of residuals. Moreover, based on the values of the m1 and m2 statistic shown in Table 2, the first-order serial correlation in the first-differenced residuals is found but no second-order serial correlation in the first-differenced residuals is found in the study. These findings show that it is appropriate to use the GMM estimation in the study. Finally, due to the use of the GMM estimation, the sample size shown in Table 2 includes only 517 observations instead of 707 observations reported in Table 1.

Table 1 Summary for the main descriptive statistics

Variable	Observations	Mean	Standard Deviation	Minimum	Maximum
DR	707	0.387	0.143	0.057	0.867

FC	707	0.535	0.499	0	1.000
gGDP	707	0.043	0.024	-0.022	0.062
EC	707	0.658	0.475	0	1.000
*ln*S	707	23.229	1.374	19.496	27.534
CETA	707	0.037	0.063	-0.434	0.505
OITA	707	0.041	0.071	-0.270	0.294
DEPTA	707	0.030	0.033	0.001	0.156
INVFATA	707	0.289	0.172	0.000	0.777

Notes:

1. The sample includes the unbalanced panel data of the listed firms in the construction industry during the period between 1999 and 2007 over about seven business cycles of Taiwan.
2. DR = total debt/total assets; FC = 0 and 1 for the financial constraint of over-leverage and under-leverage, respectively; gGDP = annual growth rate of real GDP; EC = 1 for the periods during economic expansion and 0 for periods during economic contraction; *ln*S = natural logarithm of net sales; CETA = capital expenditure/total assets; OITA = net operating income/total assets; DEPTA = depreciation/total assets; INVFATA = inventory plus fixed assets/total assets.

Table 2 Regression results with the GMM estimates

Dependent variable (DR)

Independent Variables	Coefficients	Robust standard errors
DR_{t-1}	0.930[a]	0.065
FC	0.107[a]	0.007
gGDP	-0.017	0.104
EC	-0.044	0.091
*ln*S	0.012	0.012
CETA	0.292[a]	0.098
OITA	-0.303[a]	0.086
DEPTA	-0.956[a]	0.335
INVFATA	0.049	0.071
*ln*S×EC	0.001	0.004
CETA×EC	-0.160	0.111
OITA×EC	0.034	0.084
DEPTA×EC	-0.015	0.179
INVFATA×EC	0.115[c]	0.060
Number of observations	517	
The Wald test: χ^2 (d.f.) ; Probability	552.83 (14) ; 0.000	
The Sargan test: J-statistic (d.f.) ; Probability	20.211 (19) ; 0.382	
The first-order and second-order serial correlation test: m1 (p-value) ; m2 (p-value)	-4.060 (0.00) ; 0.161 (0.872)	

Notes:

1. DR_t = debt ratio at year t; DR_{t-1} = debt ratio at year t-1; FC = 0 and 1 for the financial constraint of over-leverage and under-leverage, respectively; gGDP = annual growth rate of real GDP; EC = 1 for economic expansion and 0 for economic contraction; *ln*S = natural logarithm of net sales; CETA = capital expenditure/total assets; OITA = net operating income/total assets; DEPTA = depreciation/total assets; INVFATA = inventory plus net fixed assets/total assets.
2. The GMM estimates reported are all two-step.
3. [a], [b] and [c] indicate the significance level of 1%, 5% and 10%, respectively.
4. The Wald test is a test of the joint significance of the independent variables asymptotically distributed as χ^2_k under the null of no relationship, where k is the number of coefficients estimated. The Sargan test that is a test of over-identifying restrictions is used for testing the validity of instrumental variables. Instrument specification includes DR_{t-1}, FC, EC, gGDP, *ln*S, CETA, OITA, DEPTA, and INVFATA. The m1 and m2 statistic tests examine the first-order and second-order serial correlation in the first-differenced residuals, respectively, under the null hypothesis of no serial correlation.

Furthermore, as can be seen in Table 2, empirical results show that, first, the average rate of adjustment toward the target debt ratios is only 7% of the gap between the target debt ratios and the previous debt ratios. This finding suggests that firms in the electronics industry of Taiwan adjust their debt ratios at a very slow rate toward the target during the period of 1999-2007. Second, the proxy (FC) for the financial constraint of over-leverage and under-leverage relative to the target debt ratios is statistically significant and positively related to the debt ratios. This indicates that firms with the above-target debt ratios have lower debt ratios than do firms with the below-target debt ratios. The higher risk and cost of bankruptcy for firms with the financial constraint of over-leverage results in their lower level of debt ratios, compared to firms with the financial constraint of under-leverage relative to the target debt ratios. Third, controlling for the effects of economic growth and firm characteristics, the negative effect of macroeconomic conditions is not significantly related to the debt ratios of firms. However, the coefficient on the proxy for the interaction between asset tangibility and macroeconomic conditions (INVFATA×EC) is statistically significant and positively related to the debt ratios at the significance level of 10%. This result shows that the interaction between firm characteristics and macroeconomic conditions may affect the determination of debt ratios for firms in the electronics industry of Taiwan during the sample period of 1999-2007.

CONCLUSION

Firms may deviate away from their target capital structure over time but adjust toward the target in the long run, as suggested by recent studies. In addition, as suggested by some recent studies, capital structure decisions of firms are counter-cyclical and negatively influenced by macroeconomic conditions. During the process of adjustment toward the target capital structure, firms with above-target capital structure would gear down toward the target but firms with below-target capital structure would gear up toward the target. Besides, firms with above-target capital structure face higher risk and cost of bankruptcy than firms with below-target capital structure. Thus, it is necessary to know how firms with above-target and below-target capital structure adjust toward the target across the shifts in macroeconomic conditions over time. However, the determination of capital structure of firms across the shifts in macroeconomic conditions has thus far remained neglected, in particular from the emerging markets. This study is conducted within the electronics industry of Taiwan to provide evidence on how firms adjust their capital structure toward the target across the shifts in macroeconomic conditions.

Controlling for the possible impact of financial crisis, the annual financial data of the listed firms in the electronics industry of Taiwan during the period of 1999-2007 collected from the financial database of the Taiwan Economic Journal is used in the study to examine the adjustment of capital structure of firms across the shifts in macroeconomic conditions. In addition, the adjustment of capital structure fits with the partial adjustment model and thus this econometric model is used in the study. Empirical results of this study show that, first, firms in the electronics industry of Taiwan adjust very slowly toward the target debt ratios during the period of 1999-2007. Second, due to the risk and cost of bankruptcy, firms with above-target debt ratios have lower debt ratios than do firms with below-target debt ratios. Third, controlling for the effects of economic growth and firm characteristics, macroeconomic conditions do not have a significant, negative effect on debt ratios. However, empirical results in this study suggest that macroeconomic conditions may have the effect of interaction with firm characteristics on debt ratios of firms in the electronics industry of Taiwan during the period of 1999-2007.

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