short commentary

Choices of capital structure

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This study intends to examine the choices of capital structure from Taiwanese electronic firms. Empirical results here provide the evidence that Taiwanese electronic firms follow the different financing behavior depending on the level of profitability. This study adopts two separated processes: First, we adopt Panel Unit Root Tests and find that under the different profitability the firms have different financing behaviors. Second, we adopt the model of Watson and Wilson (2002) to determine the order of the capital. We find out that the firms with a high level of profitability support the pecking order theory but the firms with a low profitability turn to support the static trade-off theory. However, the firms with the medium profitability cannot have any significant results.

Key words: Capital structure, Trade-off theory, pecking order theory.

INTRODUCTION

How to maximize firm value?

Managers intend to maximize firm value by lowering the weighted average cost of capital. In general, the source of capital can be separated into two kinds of funds: internal funds from retained earnings and external funds by issuing debt and equity. In general version of Modigliani and Miller (1958), they show that the cost of capital is independent of leverage when the costs of bankruptcy are included. However, the Modigliani and Miller (1958) proposition is with strong assumptions in a frictionless world of complete markets. Relaxing from the Modigliani and Miller (1958) assumptions (such as taxes, costs of financial distress, transaction costs, and asymmetric information) leads to heavy studies on discussing their impacts on the determinates of capital structure. For example relaxing the assumption of information asymmetry, a pecking order (PO) theory proposes that the firm prefers internal funds to external

funds under the situation of cash deficit due to signaling effects. When external financing is needed, the firm has a priority by issuing debts first and then equity (Myers and Majluf, 1984). However, a trade-off (TO) theory states that each firm has its optimal debt-to- equity ratio, determined by balancing the present value of expected marginal benefits against the tax present value of expected marginal bankruptcy cost of leverage (Harris and Raviv, 1991). Dang (2005) for British quoted companies, conclude that the capital structure decisions are closer to what is predicted by TO Theory. Surprisingly the results of studies focusing upon companies of other countries with similar financial systems are not convergent concerning the relative importance of the PO Theory and the TO Theory in the explanation of capital structure decisions.

By reviewing the literature, the financing behavior or capital structure theory might be followed by managers which cannot have consistent conclusions in the empirical studies. The brief summary of literature is as follows: Belt and Klein (1993) examine whether a firm's choice of capital structure follows the PO theory and they find out that the high-growth firms need more external funds, especially for the firms with lower asymmetric information and support the PO theory. Frank and Goyal (2003) test the PO theory on the publicly traded firms and did not find

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any evidence to support PO theory. Javier and Juan (2005) examine the determinants of capital structure in Spanish firms, and by dividing the firms into several sub-categories (small and medium- sized, high-growth, and highly leverage) they provide the evidence of PO theory. Kayhan and Titman (2007) examine the impact of cash flows, investment expenditures, and stock price histories on debt ratio which support the TO theory. Maria and Roberto (2001) use unit root tests to examine the Italian firms' financing behavior and they find out that more than 80% of firms can support the PO theory but the significant result in their study might not be robust, depending on the cultural heterogeneity. Fama and French (2002) use structural equation that regress leverage and dividend payout as dependent variables on several explanatory variables from the PO and TO theory. They find no conclusive evidence in support of one specific theory. Hovakimian et al. (2001) examine the determinants of capital structure and conclude that a firm's profitability and stock price changes make the difference. However, a dynamic approach of capital structure decisions involves the possibility that companies adjust their level of debt towards a target debt ratio (Frank and Goyal, 2007). The relationship between size and debt as well as the relationship between profitability and debt found in the current study corroborate the conclusions of several studies (Rajan and Zingales, 1995; Shyam-Sunder and Myers, 1999; Miguel and Pindado, 2001; Ozkan, 2001; Frank and Goyal, 2003; Panno, 2003; Bevan and Danbolt, 2004; Dang, 2005; Gaud et al., 2005; Ojah and Manrique, 2005; Tong and Green, 2005).

The main purpose in this study is to find out which capital structure (PO or TO theory) do the high-tech firms in Taiwan follow, first, by testing the stationarity of debt ratio series (panel unit root tests), the financing behavior of high-tech firms can be examined. A stationary debt ratio means that these high-tech firms follow the static TO theory; otherwise, it turns out to support the PO theory. Second, by adopting the PO model of Watson and Wilson (2002) , we can examine the priority of financing (internal funds, debt issuance, and equity issuance) for the firms under the different profitability level.

MODELS AND METHODOLOGY

Trade-off model

The static trade-off (TO) theory stated that each firm has its own optimal or target debt-ratio which can maximize firm value. Therefore, we can formulate the changes of debt ratio as target adjustment mechanism. The model developed by Maria and Roberto (2001) in the following is adopted here to examine firm's financing behavior:

$$\Delta D_{it} = \alpha_i \left(D_{it}^* - D_{it-1} \right) + v_{it} \tag{1}$$

where D_{it-1} is actual debt-ratio, D_{it}^* is target debt-ratio, v_{it} is stochastic error. α_i is larger than zero, indicating that a firm's debt usage adjustment is toward the target ratio, although they might deviate from the optimal one in the short run. The target debt-ratio is defined as follows:

$$D_{it}^* = D_i^* + \Omega_{it} \tag{2}$$

where D_i^* is the optimal debt-ratio, constant over time and determined by trading off between the cost and benefits of borrowing; Ω_{it} is zero mean stochastic component of optimal leverage, which is stationary when the target is stable over time. By substituting (2) to (1), we can obtain:

$$\Delta D_{it} = \gamma_i + \beta_i D_{it-1} + \mu_{it} \tag{3}$$

where $\gamma_i = \alpha D_{i}^{\cdot}{}_{t}$, representing a constant term, and $\mu_{it} = \Omega_{it} + v_{it}$, depending on both the error of equation (1) and the stochastic component of equation (2). The general formulation of equation (3) is as follows:

$$\Delta D_{it} = \gamma_i + \vartheta D_{it-1} + a_{ij} \sum_{j=1}^{b} \Delta D_{it-j} + \varepsilon_{it} \tag{4}$$

If we assume that both v_{it} and Ω_{it} are under the white noise processes, then $b = 0$ and equation (4) can be reduced to DF unit root test model for i^{th} firm shown on equation (3). However, in the case with more complex dynamic processes of v_{it} and Ω_{it} , we have to set $b > 0$ until ε_{it} is a white noise process.

Here we adopt panel unit root tests to examine the financing behavior in the different types of firms. If the empirical results provide the evidence of stationarity, a mean-reversed relationship, it demonstrates that the firms follow the TO theory, adjusting toward the target debt-ratio. Otherwise, if the result is not a mean-reversed one, it can imply that firm's financial behavior based on the PO theory.

In this study, we use the panel unit root test to examine the firm's financial behavior. If the result has mean-reversion, it means that the firm has a target debt-ratio and the firm's financial behavior according with the TO theory. On the contrary, if the result does not have mean-reversion, it implies that the firm's financial behavior accord with the PO theory.

Watson and Wilson model

Watson and Wilson (2002) examine how firms obtain the funds for the required growth in business operations or firm's assets. The definition of total assets as follows:

$$Total\ Asset\ (TA_{it}) = Equity\ (E_{it}) + Debt\ (D_{it}) + Other\ Liabilities\ (OL_{it}) \tag{5}$$

If the changes in other liabilities (OL_{it}) for each firm over the period of time are assumed to fluctuate randomly with its average growth

Table 1. Empirical panel unit root test.

	All firms	High profits	Medium profits	Low profits
Levin, Lin and Chu	-14.710	-7.737	-11.760	-15.700***
Im, Pesaran and Shin	0.877	0.336	1.430	15.272***
Maddla and Wu	231.814	59.329	116.885	241.784***
Hadri (homoscedasticity)	15.034***	5.959***	8.076***	-2.66
Hadri (heteroscedasticity)	11.454***	5.526***	6.801***	-2.812

Note: 1. *** indicates significance at the 0.01 levels. 2. Critical values are based on Monte Carlo Simulations using 20,000 replications.

Table 2. Results from Watson and Wilson model.

Panel A Watson and Wilson model

Variable	High profits		Medium profits		Low profits	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Constant	-0.073***	-8.866	-0.001	-0.826	0.001	0.712
RP	2.405***	13.529	0.989***	44.734	0.903***	46.396
EI	1.138***	10.162	0.983***	99.88	1.003***	77.387
D	1.718***	40.515	0.977***	88.75	1.001***	85.366
Adjusted R^2	0.733		0.928		0.953	

Panel B   Wald test

$\beta_1 = \beta_2$	34.979***	0.054	17.547***
$\beta_2 = \beta_3$	24.995***	0.179	0.028
$\beta_1 = \beta_3$	12.769***	0.23	18.142***

Note: 1. The Watson and Wilson model i

$$\left(TA_{it} - TA_{it-1}\right) TA_{it-1} = \beta + \beta_1 \left(P_{it} - Div_{it}\right) TA_{it-1} + \beta_2 \left(EI_{it}\right) TA_{it-1} + \beta_3 \left(D_{it} - D_{it-1}\right) TA_{it-1} + \upsilon_{it}$$

This is for the different subsamples based on the profitability. 2. *** indicates significance at the 0.01 levels.

Titman and Wessels (1988) and Wald (1999) state that after financing with the external funds, if the funds are still not enough, the debt ratio should be negative correlation with profitability.

Conclusions

This study examines the financing behavior of high- tech firms in Taiwan. We adopted Panel Unit Root tests and the Watson and Wilson (2002) model and found out that the firms with the different levels of profitability have the different choices of capital structure (the PO theory versus the static TO theory). Therefore, a firm's financing behavior depends on its profitability. We provide the evidence that the low-profits firms follow the TO theory but the high- profits firms can support the PO theory. However, the empirical results of medium- profits firms can neither support the TO theory nor the PO theory, which means they do not have any specific financing

preferences. The medium-profits firms can choose to issue new equities or debts depending on their current market values, which can reduce the cost of external financing. In brief, the empirical results here find out the evidence that Taiwanese electronic firms follow the different financial behavior depending on the condition of profitability.

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