Testing Static Tradeoff against Pecking Order Models of Capital Structure in Japanese Firms

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Abstract

The static tradeoff and pecking order models are tested on a sample data of 1325 non-financial Japanese firms for 2002-2006. Empirical results prove that both models can explain some part of the capital structure. The static tradeoff model shows that firm leverage is affected by several determinants, and the pecking order model displays similar movements between the change of long-term debt and financial deficit. However, both models have shortcomings. The static tradeoff model fails to explain the negative correlation between profitability and firm leverage, and the pecking order model fails to explain the low deficit coefficient.

Keywords: Static tradeoff theory; Pecking order theory; Capital structure

1. Introduction

The majority of researches on corporate capital structure focus on searching for an optimal capital structure, which derives from the tradeoff theory. In recent years, several empirical analyses have shifted their concentration to testing the competitive pecking order theory. Because of the inconsistent results of the prior studies, this paper aims at testing the two theories with the data of Japanese firms.

Shyam-Sunder and Myers (1999) test the static tradeoff against the pecking order models, using a sample of 157 U.S. firms that had traded continuously over the period 1971 to 1989. In the paper, they embody the pecking order theory in a basic model, indicating the external debt financing driven by the internal financial deficit, and adopt a target adjustment model as the proxy for the static tradeoff theory. They find that the pecking order model has greater time-series explanatory power than the tradeoff model. They furthermore investigate the statistical power of the two models on hypothetical data generated by Monte Carlo simulation. Their result is that the target-adjustment model can generate statistically significant results even when the financing is generated only by the pecking order, while on the contrary the pecking order model is correctly rejected when the data is generated following the target adjustment model.

Chirinko and Singha (2000) inquire into the validity of inferences based on Shyam-Sunder and Myers' basic pecking order model. They illustrate that in three situations, namely, i) when "equity issues constitute a more substantial percentage of overall external finance", though the firm prefers debt to equity financing; ii) when "equity issues are in the middle of the financial hierarchy", rather than at the end of the hierarchy; and iii) when "debt and equity are always issued in fixed proportions" (Chirinko and Singha, 2000, pp.422-24), the basic model proposed by Shyam-Sunder and Myers would generate misleading results. They claim that Shyam-Sunder and Myers' empirical evidence cannot evaluate the pecking order theory, and call for alternative models to test the competing theories.

Frank and Goyal (2003) adopt Shyam-Sunder and Myers' pecking order model with some modification, and test the theory on a broad cross-section of publicly traded U.S. firms over the period 1971 to 1998. They conclude that when it comes to a larger sample, firms of all sizes, and a longer period, the pecking order model cannot provide a satisfactory explanation, and net equity issues better track the financing deficit. They separate their results into two periods, the first 19 years (1971 to 1989) and the subsequent 9 years (1990-1998), each period with estimations on data with no gaps permitted in the reporting of flow of funds and data with gaps permitted, respectively. In order to compare with the test by Shyam-Sunder and Myers, they concentrate on the 19-year period and find that the estimated coefficient on the financing deficit declines sharply (from 0.75 to 0.28) when the sample shifts from the no-reporting-gap firms (768 firms) to the gap-permitted firms (over 2000 firms). Realizing that the no-reporting-gap firms tend to be large in size, they further test the sample by dividing firms into quartiles based on total assets, and the coefficient grows strictly and evidently along with firm sizes. As for the period 1990-1998, both coefficients on no-reporting-gap firms and gap-permitted firms decline greatly.

Fama and French (2002) test the tradeoff and pecking order predictions about debt and dividends with target-reverting models, different from models applied by Shyam-Sunder and Myers and Frank and Goyal. By testing on over 3000 firms covering the period of 1965-1999, they find that the tradeoff and pecking order models share many predictions about debt and dividends, but differ at two points, where each of the two suffers a failure, the tradeoff failing to explain why more profitable firms have lower book leverage, and the pecking order failing to explain why small low-leverage growth firms issue large equity. Furthermore, they point out that when the two theories share common predictions, it is difficult to tell which theory the empirical results follow.

This paper aims at testing which of the two, the static tradeoff model or the pecking order model, can better explain the capital structure of Japanese firms for the past five years. Unbalanced panel data of 1325 non-financial firms listed on the First

Section of Tokyo Stock Exchange is analyzed by panel data analysis. The empirical results show that the static tradeoff model does predict the financial structure of these firms being affected by several factors, yet fails to explain the negative correlation between leverage and profitability, the same as pointed out by Fama and French. On the other hand, the pecking order model cannot offer a satisfactory explanation as expected, though it can make sense in tracking the variation of the capital structure to some extent.

The remainder of the paper is divided into five parts: Section 2 summarizes the theoretical framework on the subject; Section 3 describes the two models and the related variables; Section 4 describes the data and presents the empirical results; Section 5 discusses the empirical results; and Section 6 concludes.

2. Theoretical Framework

2.1 The Tradeoff Theory

Firms are considered to trade off between the benefits and the costs of debt, and based on such tradeoff there will be an optimal capital structure for the firm. Tax shields of debt and control of free cash flow problem push firms to absorb more debt in their capital structure, while bankruptcy costs and other agency problems make firms to use less. According to the subjects on which costs and benefits are balanced, the tradeoff theory can be divided into two fields, the tax-based and the agency-cost-based.

2.1.1 The Tax-Based

Corporate tax and bankruptcy costs are the central market frictions on which the tax-based tradeoff theory is established. On the one hand, the interest charges on debt are tax deductible and this advantage of debt pushes firms to use more debt in their corporate financing; on the other hand, bankruptcy costs deriving from high-level debt will make firms to use less debt. Quite a few papers discuss about the optimal capital structure from the viewpoint of tax-based tradeoff, such as Kraus and Litzenberger (1973), Scott (1976), Kim (1978) and DeAngelo and Masulis (1980).

Scott (1976) confirms the existence of an optimal capital structure based on a multi-period model of debt, equity and valuation. He concludes that in an imperfect market, the market value of a non-bankrupt firm depends on both the expected future earnings and the liquidating value of its assets. He further predicts that the optimal level of debt increases with the liquidation value of the firm’s assets, the corporate tax rate, and the size of the firm.

Kim (1978) discusses about debt capacity and the existence of optimal capital structure of firms. He states that in a perfect capital market with frictions of bankruptcy costs and corporate income taxes, the firm has a debt capacity, which should be less than 100-percent, and the debt level of the optimal capital structure

should be less than its debt capacity. He also points out that for low levels of debt the market value of the firm increases with debt level, while when financial leverage becomes extreme the firm's market value will decrease with debt level.

DeAngelo and Masulis (1980) show a model of corporate tax and differential personal tax, introducing the factor of "non-debt corporate tax shields", referring to "depreciation deductions or investment tax credits" and "depletion allowances" (DeAngelo and Masulis, 1980, p.4). They argue that non-debt corporate tax shields suggest a unique interior optimum leverage decision for each firm in market equilibrium, no matter whether leverage-related costs are present or not. Based on their model, they predict that leverage of the firm is i) negatively related to the non-debt tax shields; ii) negatively related to marginal bankruptcy costs; and iii) positively related to corporate tax rates.

2.1.2 The Agency-Cost-Based

Debt of the firm will generate agency costs because of conflicts of interest between parties of contracts on the firm. On the other side, by controlling the problem of free cash flow, debt can also generate benefits of motivating efficiency of the firm. Jensen (1986) argues that by trading off the benefits and costs of debt, the firm can get an optimal capital structure, "the optimal debt-equity ratio is the point at which firm value is maximized, the point where the marginal costs of debt just offset the marginal benefits" (Jensen, 1986, p.324).

Jensen and Meckling (1976) define two types of agency costs in the "modern diffuse ownership corporation" (Jensen and Meckling, 1976, p.309), agency costs of equity and that of debt. Agency costs of equity derive from the conflicts of interest between outside stockholders and managers. Along with the separation of ownership and control in the ownership of corporation, managers will tend to make less effort in maximizing the firm's value, because they do not have 100 percent of the residual claims on the firm; on the other hand, they also have incentive to pursue more non-pecuniary benefits, because they do not bear the full cost of the non-pecuniary

benefits they consume. In order to eliminate such activities by the managers, the outside stockholders will cost “monitoring expenditure” to resort to methods such as “auditing, formal control systems, budget restrictions, the establishment of incentive compensation systems” (Jensen and Meckling, 1976, p.323).

Agency costs of debt derive from the conflicts of interest between debtholders and equityholders, because “by promising to take the low variance project, selling bonds and then taking the high variance project he can transfer wealth from the (naive) bondholders to himself as equity holder” (Jensen and Meckling, 1976, p.335). Due to the property of debt contract, if an investment can yield high returns, equityholders will take most of the gain; however, if the investment fails, debtholders will bear the loss. As a result, equityholders have the incentive to sell bonds, and carry out high risky investments. To limit such activities by equityholders, debtholders will cost “monitoring expenditure” to write bond covenants as detailed as possible, and to carry them through.

Jensen (1986) discusses about the benefits of debt, defined as “control hypothesis” (Jensen, 1986, p.324). Because managers possess the control over free cash flows, they have the incentive to shrink payouts to shareholders, and invest in low-return projects in order to enlarge the firm in size. Shrunk payouts on stocks will lead to the falling of stock prices, and investment in low-return projects is also a waste of firm resources. Because of stock being substituted by debt, managers are forced to pay for the compulsory future cash flows on bond, instead of the optional dividends on stocks. Thus debt can reduce the agency costs along with free cash flow.

2.2 The Pecking Order Theory

Against the tradeoff theory, the pecking order theory claims that there is no well-defined target optimal debt ratio for the firms. The pecking order theory is first advanced by Myers and Majluf (1984), based on asymmetric information and signalling problems with external financing. According to Myers and Majluf (1984) and Myers (1984), there is a hierarchy in firm’s financing activities, namely, a

preference for internal financing over external financing, and for debt financing over equity financing when it comes to external financing. Because the attraction of debt-related benefits and the threat of financial distress and other debt-related agency costs are assumed second-order, firms are not pursuing an optimal structure, and the debt ratio is the cumulative result of hierarchical financing decisions.

Prior to Myers and Majluf (1984) and Myers (1984), some others also discuss about the asymmetric information and signalling problems about corporate capital structure, such as Leland and Pyle (1977) and Ross (1977).

Leland and Pyle (1977) formulate a model in which managers' willingness to invest in their own project is taken as the signal of the project – more investment in the project by the managers signals better quality of the project. They reason that i) firm value increases with managers' share-proportion of the firm; ii) managers have to invest more in their own projects than they would if the information can be costlessly and correctly transferred to investors; and iii) for any given level of firm value, greater project risk indicates lower optimal debt.

3. The Models

3.1 The Static Tradeoff Model

3.1.1 The Conventional Regression Model

Static tradeoff theory is mostly tested by two types of models, the target-adjustment model and the conventional regression model. The target-adjustment model argues that the firm has a target optimal capital structure. Random events drive current debt ratio to deviate from the target, while the firm will try to stick to its target, therefore shows a reverting movement toward the target. However, in empirical analysis, the target debt ratio is not attainable, and then the historical average level of debt ratio is often taken as a substitute.

The conventional regression model is based on the idea that capital structure of the firm is determined by many factors, and by trading off among those factors, the firm can reach an optimal capital structure. In empirical analysis, the conventional regression model is more often applied than the target-adjustment model. One reason is that the latter requires data covering a much longer span, which is not always attainable. In this paper, the conventional regression model is applied to test the static tradeoff theory. The model is as below with the variables of firm *i* measured at the end of period *t*. The dependent variable and the five independent variables will be explained in the later sessions.

$$Leverage_{it} = \alpha + \beta_1 Profitability_{it} + \beta_2 Tangibility_{it} + \beta_3 Size_{it} + \beta_4 NDTS_{it} + \beta_5 GO_{it} + \varepsilon_{it} \quad (1)$$

3.1.2 Determinants of Capital Structure and Their Theoretical Implications

In the above model, the dependent variable is the leverage of the firm, and the five independent variables, also the five determinants of capital structure, are profitability, tangibility, firm size, non-debt tax shields (NDTS), and growth opportunity (GO), respectively. Theoretical studies of the static tradeoff theory have

done much on defining determinants of the capital structure and predicting their signs on the capital structure. I would like here to summarize theoretical discussion and implication about the above five independent variables.

3.1.2.1 Profitability

The static tradeoff theory generally predicts a positive correlation between profitability and firm leverage. According to tax-based models, an important benefit of debt is the corporate tax shields of debt. More profitable firms with higher returns will, *ceteris paribus*, have the incentive to borrow more, in order to acquire more income tax shields. Agency-cost-based models also suggest that firms with higher profitability will tend to have higher debt ratio. According to Jensen (1986), debt can serve to control the free cash flow problem. Large amount of free cash flow under the control of the managers will lead to their investment in low-return projects and a waste of firm resources. Substituting debt for stock can limit the managers' control over free cash flow and reduce the consequent agency costs. Therefore, firms with higher profitability will tend to have more debt in their capital structure.

3.1.2.2 Tangibility

The static tradeoff theory predicts a positive correlation between capital structure and firm tangibility. Jensen and Meckling (1976) point out that agency costs of debt happen because managers have the incentive to transfer wealth from debt holders to themselves (as equity holders) by investing in high risky projects after selling bonds. Lenders would be more willing to offer loans to firms with higher proportion of tangible assets. Large proportion of tangible assets can serve as collateral, reducing lenders' risk of suffering from wealth transferring; tangible assets are also suggested to have higher liquidation value than intangible assets. Therefore leverage of a firm will increase with its tangibility.

3.1.2.3 Size

Leverage and firm size are theoretically predicted to have a positive correlation. First, large firms are generally considered to be able to borrow at a cheaper cost of

capital, because of their advantages in economic scale. Second, large firms are more likely to have diversified financing resources, and therefore have less possibility of going bankruptcy. Third, large firms are supposed to be sounder in their economic activities with less volatility. Therefore leverage and firm size are positively correlated.

3.1.2.4 Non-Debt Tax Shields

DeAngelo and Masulis (1980) first introduce the concept of "non-debt corporate tax shields," referring to depreciation deductions, depletion allowances and investment tax credits. They argue that non-debt corporate tax shields can substitute for debt in shielding from corporate tax. More tax benefits from non-debt tax shields, *ceteris paribus*, will lead to less need for debt, and therefore leverage of the firm is negatively correlated to the non-debt tax shields.

3.1.2.5 Growth Opportunity

The static tradeoff theory suggests a negative correlation between growth opportunity and firm leverage. One reason is that high growth is mostly considered to be accompanied by high bankruptcy risk, and consequently lowers down debt ratio. Also according to the agency costs of debt pointed out by Myers (1977), highly levered firms are more likely to pass up profitable investment opportunities. The reason is that when debt ratio is very high, equityholders bear the risk and cost of investments, while debtholders might gain most of the returns.

3.1.3 Prior Empirical Results on Determinants of Capital Structure

Many empirical researches also have been done to find out how determinants affect firm leverage. Harris and Raviv (1991) present a comprehensive summary of prior empirical studies. Their Table IV is quoted as below[1].

[1] See Harris and Raviv, 1991, p.336.

Table IV

Determinants of Leverage

The sign of the change in leverage as a result of an increase in the given characteristic is shown for each of six studies. Blank entry indicates that the specific study did not include the given characteristic. The studies are Bradley, et al. (1984) [denoted BJK], Chaplinsky and Niehaus (1990) [CN], Friend and Hasbrouck (1988), and Friend and Lang (1988) [FH/L], Gonedes, et al. (1988) [GLC], Long and Malitz (1985) [LM], Kester (1986) [Kest.], Kim and Sorensen (1986) [KS], Marsh (1982) [Mar.], and Titman and Wessels (1988) [TW]. Comparisons suffer from the fact that these studies used different measures of the firm characteristics, different time periods, different leverage measures, and different methodologies.

Characteristic	BJK	CN	FH/L	GLC	LM	Kest.	KS	Mar.[a]	TW
Volatility	−		−			−*	+		−*
Bankruptcy Probability								−	
Fixed Assets			+	+	+			+	+*
Non-Debt Tax Shields	+	+					−		−*
Advertising	−[b]				−				
R & D Expenditures	−				−				
Profitability			−	−*	+*	−			−
Growth Opportunities		−*				+	−		−*
Size		−*	+*			−*	−*	+	−*
Free Cash Flow		−							
Uniqueness[c]									−

[a] Marsh measures the probability of issuing debt conditional on issuing securities and on firm characteristics. The sign indicates the direction of change of this probability given a change in the indicated characteristic.

[b] Advertising and R & D expenditures are combined.

[c] This refers to the uniqueness of the product and is included specifically to test the model of Titman (1984).

* Indicates that the result was either not statistically significantly different from zero at conventional significance levels or that the result was weak in a nonstatistical sense.

More recent studies also give some hint about the signs of determinants of capital structure, such as Rajan and Zingales (1995) and Booth et al. (2001). Summary of their studies is given in the table 1 below.

Table 1.

Determinants	Rajan & Zingales	Booth et al.
Profitability	−	−
Tangibility	+	+
Size	+	+
Growth Opportunity	−	−
Tax Rate		−
Business Risk		−

3.1.4 Definitions of the Variables in Static Tradeoff Model

Definitions of the variables of static tradeoff model are summarized in Table 2 below. In prior empirical studies, there is always more than one definition for these variables; in this paper, the most often used or the feasible ones based on the data will be applied.

Table 2.

Variables	**Definitions**
Leverage	long-term debt scaled by total assets
Profitability	earnings before interest and tax (EBIT) scaled by total assets
Tangibility	fixed assets scaled by total assets
Size	the natural logarithm of market value
Non-debt tax shields	depreciation scaled by total assets
Growth opportunities	Tobin's q (market-to-book ratio of total assets)

3.2 The Pecking Order Model

In this paper the simple pecking order model originally developed by Shyam-Sunder and Myers (1999) and modified by Frank and Goyal (2003) will be applied to test the pecking order theory[2].

Define:

DIV_{it} = dividend payments;

X_{it} = capital expenditure;

ΔW_{it} = net increase in working capital;

C_{it} = operating cash flows after interest and taxes;

D_{it} = long-term debt outstanding;

with the variables of firm *i* measured at the end of period *t*. The funds flow deficit is defined as:

$$DEF_{it} = DIV_{it} + X_{it} + \Delta W_{it} - C_{it} \qquad (2)$$

The basic equation to be tested is:

$$\Delta D_{it} = \alpha + \beta_{PO} DEF_{it} + e_{it} \qquad (3)$$

where ΔD_{it} is the amount of long-term debt issued - or retired, if DEF_{it} is negative.

According to Shyam-Sunder and Myers (1999), this simple model of the pecking order theory indicates that when a firm has need of external cash flows for its real investment and dividend payment commitments, the firm issues debt.

The strict form of the pecking order hypothesis expects α =0 and β_{PO} =1, predicting that all funds flow deficit is made up by issuing debt. But they also point

[2] See Shyam-sunder and Myers, 1999, p.224; Frank and Goyal, 2003, p.221.

out that, “if costs of financial distress are serious, the firm will consider issuing equity to finance real investment or pay down debt…. Thus a broader pecking order hypothesis would accommodate some equity issues” (Shyam-Sunder and Myers, 1999, p.225). Therefore, the broader form of the model will expect β_{PO} <1, but close to 1 (e.g. β_{PO} =0.8), and α close to 0.

4. Empirical Analysis

4.1 The Data

In this paper, data of 1325 non-financial firms listed on the First Section of Tokyo Stock Exchange (TSE) are used for analysis. In order to include the dynamics of capital structure during the past several years, data of five consecutive years from 2002 to 2006 will be analyzed.

The annual data of consolidated financial statements are collected from Nikkei Economic Electronic Databank System (NEEDS), with some supplementary references to Electronic Disclosure for Investors' NETwork（EDINET）of the Financial Services Agency. The data of stock prices from 2002 to 2006 are from the webpage of Yahoo! Finance, with some references to the Stock Price CD-ROM 2006 of TOYO KEIZAI INC..

Descriptive statistics of the sample data are summarized in Table 3 below.

Table 3. Descriptive statistics of the sample data

Variable	Observations	Mean	Maximum	Minimum	Standard Deviation
Long term debt	6625	78616.4	7391487.0	0.0	367487.3
Book value of total assets	6625	390424.1	28731595.0	1182.0	1290803.0
Market value of total assets	6594	459634.0	40793850.0	1953.5	1509067.0
Change in long-term debt	6625	-2069.7	1258789.0	-873658.0	41938.3
Dividends	6625	1342.4	178296.0	0.0	4925.3
Capital expenditure	6616	18753.6	2776676.0	0.0	95412.2
Change in working capital	6625	3947.3	1444193.0	-2211604.0	54093.8
Operating cash flow after interest and taxes	6625	26941.6	3480591.0	-83829.0	127269.1
Leverage	6625	0.108	0.927	0.000	0.117
Profitability	6187	0.041	0.946	-1.241	0.063
Tangibility	6625	0.487	0.987	0.033	0.178
Size	6594	11.720	17.524	7.577	1.416
Non-debt tax shields	6625	0.032	0.238	0.000	0.022
Growth opportunity	6594	1.185	15.081	0.302	0.578

4.2 Empirical Results

In this paper, parameters of interest are estimated with panel data analysis. First, both the static tradeoff model and the pecking order model are estimated with the fixed effects model and the random effects model, respectively. In the following Hausman-test done on either random effects model, p-value of the null hypothesis is equal to 0.0000, indicating the random effects model rejected. Therefore the fixed effects model can be applied[3]. However, taking N=1325 into consideration, the fixed effects model suffers a great loss of degrees of freedom. So instead of the fixed effects model, cross-sectional heteroskedasticity among firms is presumed and both static tradeoff and pecking order models are estimated with feasible GLS. All estimations in this paper are undertaken by statistics package, *Eviews*. Estimation results of the two models are presented in Table 4 and 5, respectively.

Table 4. GLS result of the static tradeoff model

The static tradeoff model is estimated using feasible GLS with cross-sectional heteroskedasticity. The estimated model is as below,

$$Leverage_{it} = \alpha + \beta_1 Profitability_{it} + \beta_2 Tangibility_{it} + \beta_3 Size_{it} + \beta_4 NDTS_{it} + \beta_5 GO_{it} + \varepsilon_{it}.$$

The dependent variable is firm leverage, and the independent variable is leverage determinants, i.e., profitability, tangibility, size, non-debt tax shields and growth opportunity. The unbalanced panel data contain data of 1325 non-financial firms for 2002 to 2006, among which 6159 observations of 1272 cross-sections are actually analyzed. Standard errors of coefficients are in parentheses.

[3] The estimation results of fixed effects model, random effects model and Hausman-test are not presented here.

	Static tradeoff model
Constant	-0.261** (0.0043)
Profitability	-0.274** (0.0105)
Tangibility	0.257** (0.0031)
Size	0.022** (0.0004)
NDTS	0.122** (0.0308)
GO	-0.002 (0.0013)
R^2	0.770

** indicates significance at the 1% confidence level.

Table 5. GLS result of the simple pecking order model

The pecking order model is estimated using feasible GLS with cross-sectional heteroskedasticity. The estimated model is $\Delta D_{it} = \alpha + \beta_{PO} DEF_{it} + e_{it}$, with $DEF_{it} = DIV_{it} + X_{it} + \Delta W_{it} - C_{it}$. The dependent variable is the change of firm long-term debt, and the independent variable is financial deficit. The unbalanced panel data contain data of 1325 non-financial firms for 2002 to 2006, among which 6616 observations of 1325 cross-sections are analyzed. Standard errors of coefficients are in parentheses.

	Pecking order model
Constant	-300.522** (20.5241)
DEF	0.261** (0.0049)
R^2	0.302

** indicates significance at the 1% confidence level.

5. Discussion

5.1 The Static Tradeoff Theory

5.1.1 Profitability

According to Table 4, profitability is negatively correlated with firm leverage. This result confirms with prior empirical studies. According to Harris and Raviv's Table IV and Table 1 of the current paper, most of the prior empirical studies show a negative correlation between profitability and leverage, and the only positive correlation is either not statistically significant or weak in a non-statistical sense.

The static tradeoff theory predicts a positive correlation between firm leverage and profitability, because firms with higher profitability will, *ceteris paribus*, tend to borrow more in order to realize corporate tax shields. On the other hand, the pecking order theory predicts a negative correlation between firm leverage and profitability, because firms with higher profitability will have more internal retained earnings and therefore have less need to borrow. The negative correlation between leverage and profitability becomes an Achilles' heel of the static tradeoff theory, often criticized by the proponents of the pecking order theory.

5.1.2 Non-debt tax shields

NDTS coefficient is 0.122, indicating a positive correlation between NDTS and leverage. This result confirms with some of the prior studies, such as Bradley, et al. (1984) and Chaplinsky and Niehaus (1990). In fact, prior studies do predict opposite signs on NDTS coefficient. According to DeAngelo and Masulis (1980), NDTS can be regarded as a substitute for debt to realize tax shields, and therefore NDTS shall be negatively related with leverage. However, NDTS, often defined as depreciation, has high positive correlation with tangibility (defined as fixed assets/total assets), and consequently also has the potential to be positively correlated with leverage.

5.2 The Pecking Order Theory

5.2.1 Small deficit coefficient

The simple pecking order model expects α =0, meaning if there is no financial deficit, there shall be no change to the debt (ΔD_{it} =0 when DEF_t =0). However, here $\alpha = -300.522$ indicates when DEF_{it} =0, ΔD will equal -300.522, i.e., if there is no funds flow deficit, the firm will pay debt down by 300.522 (million yen) per year on average. The pecking order theory states that the drive of change in debt or debt ratio is the need of external funding; however it has not given us the hint: what the drive of this paying-down-debt behavior is.

Figure 1 demonstrates the average movement of DEF_t and ΔD from the year 2002 to 2006. From the figure, we can see that during the five years both DEF_t and ΔD are negative for most of the time, suggesting that there is funds flow surplus in the firms and the long-term debt is being paid down. Second, DEF_t and ΔD display similar movements, especially during 2002-2003 and 2005-2006.

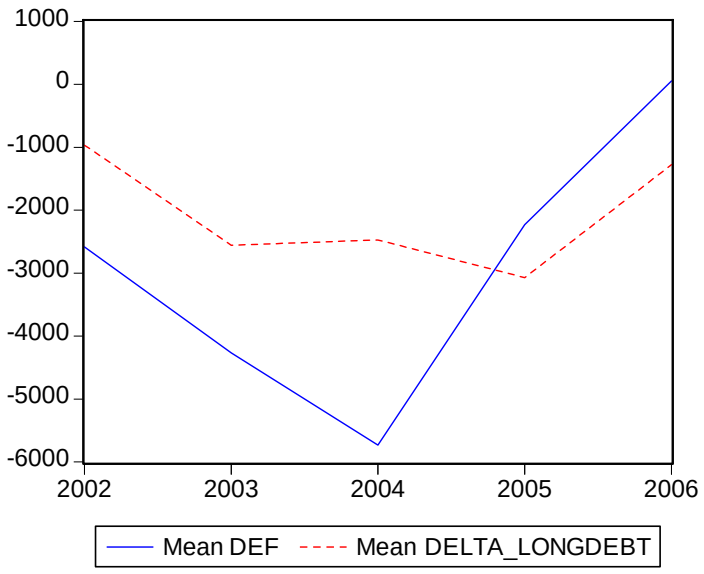

Figure 1

β_{PO} =0.261 proves that financial deficit (surplus) is part of the drive of the change of long-term debt, but it is far less than the model's expectation of equal to 1. It is natural for firms to pay down debt when there are internal surplus. However, except occasions when the bankruptcy cost is extremely high, it is unreasonable for firms to spend 100% (or in a broader sense, 80%) of their surplus on paying down debt. Shyam-Sunder and Myers state that the simple pecking order's predictions do not depend on the sign of DEF_t (Shyam-Sunder and Myers, 1999, p.225). Here β_{PO} = 0.261 indicates that firms will spend only around one fourth of their internal surplus on paying down long-term debt. So, even if the simple pecking order model can offer a satisfactory explanation for capital structure with financial deficit, it does not make sense of asserting that the simple pecking order's predictions do not depend on the sign of DEF_t. At least, it cannot explain the small deficit coefficient in this paper.

5.2.2 Hierarchy under Internal Surplus

Shyam-Sunder and Myers reason that firm's decision to repurchase shares will be a signal of "favorable operation" to the market, and consequently force up stock prices. Because of the too high cost of share repurchase, managers will end up with paying down debt (Shyam-Sunder and Myers, 1999, p.225). Therefore, they state that the simple pecking order's predictions do not depend on the sign of DEF_t, i.e., when there is internal surplus, firms prefer paying down debt to repurchasing shares.

However, while the cost of repurchasing shares increases along with the forced up stock prices, firm value will also increase. In other words, the existing shareholders will benefit. On the other hand, debt (bank loans or corporate bonds) usually have contract period, and therefore cannot be repaid freely. When the advantage of the increase of firm value exceeds the disadvantage of the cost of share repurchase, firms will prefer repurchasing shares to paying down debt.

5.2.3 Ideal vs. Reality

The ideal of the pecking order theory is that small firms have more problems of

asymmetric information and adverse selection, and therefore will finance deficits with debt instead of equity; large firms with fewer asymmetric information and adverse selection problems will finance with equity. However, the reality is: that small firms bear more bankruptcy risks and other agency problems leads to the difficulties in borrowing, and large firms, conventionally regarded as having sounder management and fewer bankruptcy risks, can borrow more easily and less costly. Small firms, against the theoretical inference, rely heavily on equity issues instead of the debt issues, while large firms issue debt to finance deficits. Frank and Goyal (2003) prove this through testing the pecking order model for sub-samples by sorting firms into quartiles based on total assets. In their tests for period 1971-1989, the deficit coefficient β_{PO} is 0.164 for smallest firms against 0.753 for largest firms. In the tests for period 1990-1998, β_{PO} is 0.087 for smallest firms against 0.675 for largest firms.

This inherent weak point results in the difficulty of embodying the pecking order theory in concrete models, since firms act against what the theory expects them to do. Firm may have the hierarchy in financing activities, but their real possibility or capability to realize the hierarchy is questionable.

6. Conclusion

This paper tests the static tradeoff model and the simple pecking order model using panel data estimation on a sample data of 1325 non-financial Japanese firms for 2002-2006. The main results can be summarized as follows.

Regression results show that in the static tradeoff model, firm leverage is affected by the four determinants. Three determinants out of four are proved to have signs consistent with the theoretical predictions, and R^2 is relatively high. However, profitability is shown to be negatively correlated with firm leverage. This result is consistent with most prior empirical studies, but inconsistent with the prediction of static tradeoff theory.

The test of pecking order model displays similar movements between the change of long-term debt and financial deficit, indicating that financial deficit (surplus) is part of the drive for the change of long-term debt. However, rather than the model's expectation of a financial deficit coefficient equal to or close to 1, the deficit coefficient in this paper is only 0.263. This result indicates that funds flow deficit (or surplus) is not the only drive for the change of long-term debt.

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