THE TRADE-OFF THEORY AND THE PECKING ORDER THEORY: ARE THEY MUTUALLY EXCLUSIVE?

Carmen Cotei[1]
University of Hartford, USA
E-mail: cotei@hartford.edu

Joseph Farhat[2]
Central Connecticut State University, USA
E-mail: farhatjob@ccsu.edu

ABSTRACT
The main purpose of this study is to simultaneously examine the pecking order and trade-off theories of capital structure and determine which one performs better for a sample of US firms. Our empirical models, which allow the financing coefficient and the rate of adjustment to vary with the firms' characteristics, provide evidence that the trade-off theory factors play a significant role in determining the proportion of debt to be issued or repurchased under the pecking order assumptions. In addition, we find that the pecking order factors are major determinants of the rate of adjustment under the trade-off theory assumptions. These empirical results imply that the pecking order theory and the trade-off theory are not mutually exclusive.

Keywords: capital structure; pecking order theory; trade-off theory
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I. INTRODUCTION

The growing literature of evaluating the efficiency of the trade-off theory versus the pecking order theory has produced mixed evidence. Shyam-Sunder and Myers (1999) find more supportive evidence for the pecking order theory versus the trade-off

[1] Carmen Cotei, Department of Economics, Finance and Insurance, University of Hartford, 200 Bloomfield Ave., West Hartford, CT, 06117, USA

[2] Joseph Farhat, Department of Finance, Central Connecticut State University, 1615 Stanley St., New Britain, CT 06050, USA

theory. Hovakimian, Opler, and Titman (2001) examine the firms' debt-equity issuance (reduction) choice and find that deviation from the target leverage plays a more significant role in the repurchase decision than in the issuance decision of securities. Their results are consistent with the pecking order model in the short-run and reversion to the target leverage in the long-run. Byoun and Rhim (2002) find that both of the theories explain significant variations in the firms' total debt. Fama and French (2002) find evidence in favor and against both of the theories. Frank and Goyal (2003) find evidence inconsistent with the pecking order theory, especially for small firms. Lemmon and Zender (2002) find no supporting evidence for the trade-off theory, yet the costs of adverse selection were not able to explain the pecking order financing behavior that they documented. Korajczyk and Levy (2003) find that the deviation from the target capital structure has a significant role in the firm's choice of which type of security to issue or repurchase. In addition, their findings support the Hovakimian, Opler, and Titman's (2001) results that firms adjust toward the target leverage more actively than suggested by Shyam-Sunder and Myers (1999). Hovakimian (2003) examines the role of the target leverage in security issues and repurchases, and finds that debt reduction is initiated to reduce the deviation from target capital structure whereas debt issue, equity issue, and equity repurchase are not driven by this motivation.

This study complements the previous studies on the pecking order theory and the trade-off theory. The main purpose is to examine the validity of putting the pecking order and the trade-off theories in a horse race. Previous empirical works on the trade-off theory and the pecking order theory that use the partial adjustment model and the Shyam-Sunder and Myers' (1999) model (the pecking order model, hereafter) have the implicit assumption of homogeneous non-time-varying coefficient. The partial adjustment model employed to examine the trade-off theory assumes that firms within the same industry and across industries adjust toward their target capital structure with the same rate. Such an assumption ignores the fact that there are significant differences in the characteristics of firms within the same industry and across industries that affect the rate of adjustment. The non-time-varying coefficient assumption under the pecking order model assumes that firms within the same industry and across industries finance their external financing needs with the same proportion of debt over time, ignoring the degree of information asymmetry, firm's debt capacity, equity market condition and other firms' characteristics, which significantly affect the amount of debt that a firm can issue.

We investigate the possibility that firms do not view the pecking order and the trade-off theory as mutually exclusive. It is also important to understand the factors that affect both the rate of adjustment and the proportion of debt financing (reduction) relative to the financing deficit (surplus) in the context of both theories. Our model, which allows the financing coefficient and the rate of adjustment to vary with the firms' characteristics, provides empirical evidence that not only the pecking order theory's factors affect the financing deficit (surplus) coefficient, but also the trade-off theory factors play a significant role in determining the proportion of debt to be issued or

repurchased. In addition, the factors affecting the rate of adjustment indicate that the trade-off model and the pecking order model are not mutually exclusive.

II. THE PECKING ORDER THEORY

The pecking order theory (Myers and Majluf (1984) and Myers (1984)) and its extensions (Lucas and McDonald (1990)) are based on the idea of asymmetric information between managers and investors. Managers know more about the true value of the firm and the firm's riskiness than less informed outside investors. To avoid the underinvestment problem, managers will seek to finance the new project using a security that is not undervalued by the market, such as internal funds or riskless debt. Therefore, this affects the choice between internal and external financing. The pecking order theory is able to explain why firms tend to depend on internal sources of funds and prefer debt to equity if external financing is required. Thus, a firm's leverage is not driven by the trade-off theory, but it is simply the cumulative results of the firm's attempts to mitigate information asymmetry.

Shyam-Sunder and Myers (1999) as well as the subsequent empirical work that use their model, define financing deficit (surplus) as[3]

$$Fin_t^{\pm} = Div_t + I_t + \Delta WC_t - C_t = \Delta LTD_t + \Delta E_t \quad (1)$$

Where *Fin* is financing deficit (surplus), *Div* is Cash dividends, *I* is net investment, Δ*WC* is Change in working capital, *C* is Cash flow after interest and taxes, Δ*LTD* is Net long-term debt issued, and Δ*E* is Net equity issued. A positive value of *Fin* indicates a financing deficit and a negative one indicates financing surplus.

The financing deficit (surplus) as it is defined in equation (1) models the long-term debt financing since the short-term debt is included in the working capital changes. Since the pecking order theory predicts that firms will issue securities in order of their sensitivity to the information asymmetry problem, firms expect to use short-term debt, long-term debt, and equity as a last resort. This implies that short-term debt should be exhausted before firms issue long-term debt. Thus, in this study we model both long-term and short-term debt financing. The sources and uses identity at time t is written as:

$$Fin_t^{\pm} = Div_t + I_t + \Delta WC_t - C_t = \Delta STD_t + \Delta LTD_t + \Delta E_t \quad (2)$$

$$\begin{aligned} LTD_t - LTD_{t-1} &= \pi_0 + \pi_1 Fin_t + \varepsilon_t \\ STD_t - STD_{t-1} &= \mu_0 + \mu_1 Fin_t + \varsigma_t \end{aligned} \quad (3)$$

Where Δ*STD* is Net short-term debt issued, π_1 is the proportion of long-term debt financing (reduction) relative to the financing deficit (surplus), μ_1 is the proportion of short-term debt financing (reduction) relative to the financing deficit (surplus).

The pecking order theory predicts that debt typically grows when investment exceeds internal funds and falls when investment is less than internal funds. Therefore,

[3] For example, Frank and Goyal (2003), Lemmon and Zender (2002), and Byoun and Rhim (2002).

the managers' problem in each period is to decide which changes they will make in each financing resources, given the size of their financing deficit (surplus) and the market conditions. The financing deficit (surplus) in equation (2) is equivalent to the one used in previous studies, except that we are modeling long-term and short-term financing, and therefore the changes in the short-term debt are excluded from the financing deficit (surplus) variable.

III. THE TRADE-OFF THEORY

The trade-off models have dominated the capital structure literature. The tax benefit-bankruptcy cost trade-off models (DeAngelo and Masulis (1980)) predict that firms will seek to maintain an optimal capital structure by balancing the benefits and the costs of debt. The benefits include the tax shield whereas the costs include expected financial distress costs. Under the agency theoretical models (Jensen and Meckling (1976), Myers (1977) and Jensen (1986)) firms use the benefits of reducing potential free cash flow problems and other potential conflicts between managers and shareholders, to offset costs associated with underinvestment and asset substitution problems. These theories predict that firms maintain an optimum capital structure where the marginal benefit of debt equals the marginal cost. The implication of these trade-off models is that firms have target leverage and they adjust their leverage toward the target over time.

The general form of the standard partial adjustment model used in the literature to examine the adjustment process toward a leverage target relies on the changes in debt that is partially absorbed by the difference between debt target, D_t^*, and lagged debt, D_{t-1}

$$D_t - D_{t-1} = \alpha_0 + \alpha_1 (D_t^* - D_{t-1}) + \varepsilon_t \quad (4)$$

Where D is Total debt, D* is Optimal debt, α1 is the adjustment rate coefficient and ε1 is the error term. Splitting the total debt to long-term debt and short-term debt yields:

$$LTD_t - LTD_{t-1} = \delta_0 + \delta_1 (D_t^* - D_{t-1}) + \nu_t \quad (5)$$

$$STD_t - STD_{t-1} = \lambda_0 + \lambda_1 (D_t^* - D_{t-1}) + \xi_t \quad (6)$$

$$\delta_0 + \lambda_0 = \alpha_0 \quad , \quad \delta_1 + \lambda_1 = \alpha_1 \quad (7)$$

D Total debt, D^* Optimal debt , LTD Long-Term debt , STD Short-Term debt , δ_1 The contribution of long-term debt in the total adjustment rate coefficient, λ_1 The contribution of short-term debt in the total adjustment rate coefficient and ν_t, ξ_t Error terms. Scaling all variables by the total assets yields a comparability of both the pecking order and the trade off model.

IV. FACTORS AFFECTING THE RATE OF ADJUSTMENT AND THE PROPORTION OF DEBT FINANCING

We modify the pecking order model to allow the financing coefficient to be a function of firm's characteristics. This will enable us to examine the factors affecting the proportion of debt financing (reduction) relative to the financing deficit (surplus) and to evaluate the consistency of those factors with the predictions of the pecking order and

the trade-off theories. Such a model relaxes the assumption of the pecking order model (the non-varying time coefficients). In addition, it accommodates the determinants of the use of debt suggested by both theories and controls for the factors other than the adverse selection costs (e.g. debt capacity, equity market conditions and growth options).

To investigate the factors that characterize the financing behavior patterns at the firm's level, we classify firms into two main groups: the financing deficit group ($Fin_t > 0$) and financing surplus group ($Fin_t < 0$). For each financing deficit (surplus) group the modified model is:

$$LTD_t - LTD_{t-1} = \pi_0 + \pi_i Fin_t + \varepsilon_t \tag{8}$$

Where

$$\pi_i = \beta_0 (M/B)_i + \beta_1 Tang_i + \beta_2 Info_i + \beta_3 MTR_{t-1,i} + \beta_4 MTR_{t-1}, i * D_1 + \beta_5 RDAD_i + \beta_6 NDTS_i + \beta_7 NDTS_i * D_2 + \beta_8 AbDev_{t-1,i} + \beta_9 AbDev_{t-1,i} * D_3 + \beta_{10} Size_i + \beta_{11} St_i$$

$$STD_t - STD_{t-1} = \mu_0 + \mu_i Fin_t + \varsigma_t \tag{9}$$

Where

$$\mu_i = \rho_0 (M/B)_i + \rho_1 Tang_i + \rho_2 Info_i + \rho_3 MTR_{t-1,i} + \rho_4 MTR_{t-1}, i * D_1 + \rho_5 RDAD_i + \rho_6 NDTS_i + \rho_7 NDTS_i * D_2 + \rho_8 AbDev_{t-1,i} + \rho_9 AbDev_{t-1,i} * D_3 + \rho_{10} Size_i + \rho_{11} St_i$$

M/B is the market to book ratio. *Tang* is the ratio of tangible assets to total assets. *Info* is a metric proxy of information asymmetry computed as the standard deviation of the value weighted market adjusted return residuals, calculated on the daily base for each firm-year. *MTR* is the marginal tax rate at time *t-1*. D_1 is an indicator variable that takes the value of one if the firm has net loss carry forward at time *t-1* and zero otherwise. *RDAD* is the summation of R&D and the advertising expenses relative to total assets. *NDTS* is the non-debt tax shield, the sum of depreciation and investment tax credits relative to total assets. D_2 is an indicator variable that takes the value of one if the Altman's (1968) *Z* > three and zero otherwise. *AbDev* is the absolute value of the deviation from the target leverage at time *t-1*. D_3 is an indicator variable that takes the value of one if the firm is above its target leverage and zero otherwise. *Size* is the logarithm of the total assets. *St* is a proxy for stock price run up (decline) calculated as the ratio of the stock price at time t relative to the price at time *t-1*. Below we explain the rationale for including the explanatory variables.

Investment inefficiencies are caused by the conflicts of interest between managers, shareholders, and bondholders. Myers (1977, 1984) suggests that due to the underinvestment problem, firms with high growth options may use less debt to preserve their debt capacity (to avoid either foregoing future investment opportunity or financing them with more risky securities). In addition, as suggested by Myers (1977) firms with high growth options may employ short-term debt to overcome the underinvestment problem. Thus, we expect to find firms with higher growth options, as measured by the market to book ratio (*M/B*), to use less debt financing as proportion of their financing deficit. Thus, a negative relation between the proportion of long-term debt financing and the growth options, and a positive relation between the proportion

of short-term debt financing and the growth options is predicted. The opposite relation is predicted for firms having a financing surplus. Yet, the trade-off theory implies that such a relation is predicted if lenders are not willing to accept the growth options as collateral for long-term debt. Because exercising these options are optional and lenders have no control over the managers after they received the loan, the potential moral hazard problem increases the lender's incentive not to finance high growth options firms that lack high tangible collateral.

The pecking order theory predicts that firms will issue equity as a last resort. Specifically, they issue equity when firms exhaust their debt capacity and the degree of underpricing is not too high. Thus, firms' debt capacity plays a significant role in the choice and the size of debt financing. To control for the firms' debt capacity, we use the ratio of plant and equipment to total assets as a measure of tangible assets (*Tang*). Firms with higher tangible assets are expected to have higher debt capacity and lower costs of financial distress. MacKie-Mason (1990) uses tangible assets as control variable for the moral hazard problem, in which managers make their investment decisions after the debt has been issued. His argument is that debt should be cheaper when firms' value depends heavily on investments already in place. The trade-off theory predicts that tangible assets can be viewed as debt collateral. Thus, firms with greater tangible assets have the ability to issue more debt. These competing hypotheses agree on the fact that the higher the tangible assets, the most likely firms use more debt financing as proportion of their financing deficit. In addition to the tangible assets, firms' size (*Size*) is also used as control variable for the debt capacity. Since large firms are well diversified and more profitable relative to small firms, Frank and Goyal (2003) find that the pecking order model fits better for large firms.

The main prediction of the pecking order theory is that firms with high information asymmetry rely more on issuing debt to finance their external financing needs, given that the financial distress cost is low. Short–term debt, which is less sensitive to the information asymmetry problem relative to long-term debt (Flannery (1986)), should constitute a higher proportion of the debt financing if the information asymmetry is uniformly distributed over time. Under such assumption, we expect to find a higher impact of information asymmetry on the proportion of short-term debt financing. Following Bhagat and Thompson (1985), Blackwell and Spivey (1990), Krishnaswami, Spindt, Subramaniam (1999), and Krishnaswami and Subramaniam (1999), we use the residual volatility in daily stock returns as a metric of information asymmetry. The residual volatility in daily stock returns is the standard deviation of the value weighted market adjusted return residuals, calculated on the daily base for each firm-year (*Info*). The pecking order theory predicts that the coefficient on the Info variable to be positive for the financing deficit group.

The pecking order theory states that firms do not have a well-defined target leverage. In addition, Myers (1984) suggests that the adverse selection costs overwhelm the forces that determine the optimal leverage in the trade-off theory. The trade-off theory predicts that in addition to the internal fund deficit (surplus) other factors such as the deviation from the target leverage (industry median), marginal tax rates, net loss

carry forward, financial distress and non-debt tax shields sources may affect the proportion of debt financing (reduction).

If the proportion of debt financing (reduction) is chosen to minimize the deviation from target leverage, we expect to find that the firms' deviation from the target leverage has a significant impact on the proportion of debt financing (reduction). To examine this hypothesis, we use the absolute value of the actual leverage deviation from the target leverage in the previous year. In addition, the trade-off theory predicts that firms below the target are most likely to use more debt financing and firms above the target to use less debt financing. To test this prediction, we add the interaction of the deviation from the target leverage (*AbDev*) with indicator variable D_3 that equals 1 if the firms are above their target leverage and 0 otherwise. Thus, for the financing deficit (surplus) group, a positive (negative) coefficient for *AbDev* variable and a negative (positive) coefficient for $AbDev + AbDev*D_3$ is predicted.

The trade-off theory predicts that firms with high marginal tax rate (MTR_{t-1}) have greater incentive to issue debt due to the tax-deductibility of interest payments. DeAngelo and Masulis (1980) argue that non-debt tax shields, depreciation and investment tax credit (*NDTS*), can substitute for the interest deductibility. MacKie-Mason (1990) argues that non-debt tax shields do not always crowd out interest deductibility. Specifically, profitable firms could have large non-debt tax shields, high marginal tax rate, and issue more debt. Highly distressed firms, close to tax exhaustion, are most likely to avoid debt financing since non-debt tax shields crowd out the associated debt tax shields. Thus, DeAngelo and Masulis (1980) model predicts that the relation between the debt financing and the non-debt tax shields is negative, whereas MacKie-Mason (1990) argument indicates that this relation is positive for profitable firms and negative for highly distressed firms. On the other hand, the ability of the firms to carry forward their net operating losses can affect the amount of debt financing. Firms that have a net loss carry forward (*NLCF*) have a disincentive to use more debt financing as proportion of their deficit relative to firms that do not experience a loss.

Like Graham (1996), we use the marginal tax rate (MTR_{t-1}) and the marginal tax rate interaction with an indicator variable D_1 that takes the value of 1 if the firm has net loss carry forward at time *t-1* and 0 otherwise. The trade-off theory predicts a positive relation between the MTR_{t-1} and the proportion of debt financing. Firms with net loss carry forward are expected to use debt less aggressively than firms without net loss carry forward, thus a negative sign of $MTR_{t-1} * D_1$ is predicted. To test MacKie-Mason's (1990) prediction that non-debt tax shields does not crowd out interest deductibility for profitable firms, we interact the non-debt tax shields (*NDTS*) with indicator variable D_2 that takes the value 1 if the firm's Altman's *Z* (1968) is greater than three and zero otherwise. Altman's *Z* equals the sum of 3.3 times earnings before interest and taxes plus sales plus 1.4 times retained earnings plus 1.2 times working capital divided by total assets. This interacted term allows separating the profitability and debt substitution aspects of non-debt tax shields. If MacKie-Mason's (1990) argument holds, we expect a negative sign for *NDTS* and a positive one for $NDTS * D_2$.

In addition to depreciation and investment tax credit, research, development, and advertising expenses (*RDAD*) provide other sources of non-debt tax shields to firms. Myers (1977) argues that these sources create assets that can be viewed as options, which are subject to managerial discretion and higher agency cost. Whether these sources reflect the agency cost of discretionary assets or non-debt tax shields, the relation between this variable and the proportion of debt financing should be negative for the financing deficit group and positive for the financing surplus group.

If firms time their equity issue (reduction) with favorable market conditions, we expect to find that such a behavior to affect the proportion of debt financing (reduction) relative to the financing deficit (surplus). Lucas and MacDonald (1990) model predicts that managers with superior private information will delay equity issue until their stock prices rise. Korajczyk, Lucas, and MacDonald (1990) find evidence supporting this prediction, as firms' equity issuance clusters following stock prices run up. Hovakimian, Opler, and Titman (2001) find evidence that stock prices run up (decline) play a significant role in the firms' choice of equity issuance and repurchase decision. Baker and Wurgler (2002) also find supporting evidence for the market-timing hypothesis. We use the ratio of stock price (*St*) in the current period relative to the previous one to test the market-timing hypothesis. If firms time their equity issue (reduction) with favorable market conditions, we expect to find a negative sign of St for the financing deficit group and a positive sign for the financing surplus group.

The partial adjustment model assumes that the adjustment rate is the same across industries, firms and over time. To allow the adjustment rate to vary across firms and to capture the pecking order and the trade-off theory factors' that affect the rate of adjustment, we allow the rate of adjustment to be a function of the factors suggested by both theories:

$$\begin{aligned} LTD_t - LTD_{t-1} &= \alpha_0 + \alpha_i\left(D_t^* - D_{t-1}\right) + \varepsilon_t \\ STD_t - STD_{t-1} &= \lambda_0 + \lambda_i\left(D_t^* - D_{t-1}\right) + \varepsilon_t \end{aligned} \tag{9}$$

$$\alpha_i\{\lambda_i\} = \beta_0(M/B)_i + \beta_1 Tang_i + \beta_2 Info_i + \beta_3 St_i + \beta_4 MTR_{t-1,i} + \beta_5 MTR_{t-1,i} * D_1 + \beta_6 NDTS_i + \beta_7 RDAD_i + \beta_8 Dis_{t-1,i} + \beta_9 Fin_i * D_2 + \beta_{10} Fin_i * D_3 + \beta_{11} Size_i \tag{9a}$$

M/B is Market to book ratio of i^{th} firm, *Tang* is Tangible assets to total assets of i^{th} firm, *Info* is Information asymmetry proxy of i^{th} firm, *St* is the ratio of stock prices at time *t* relative to time *t-1* of ith firm, *MTR* is Marginal tax rate at time *t-1* of i^{th} firm, D_1 is an indicator variable that takes the value of 1 if the firm has net loss carry forward at time *t-1* of i^{th} firm, *NDTS* is Non-Debt tax shields (the sum of depreciation and investment tax credits relative to total assets) of i^{th} firm, *RDAD* is the sum of R&D and the advertising expenses relative to total assets of i^{th} firm, *Dis* is absolute value of the distance from the target leverage at time *t-1* of i^{th} firm, *Fin* is the financing deficit (surplus) of i^{th} firm, D_2 is an indicator variable that takes the value of 1 if *Fin*>0 (firms are in financing deficit) and 0 otherwise, D_3 is an indicator variable that takes the value of 1 if *Fin*<0 (financing surplus) and 0 otherwise and *Size* is the logarithm of the total assets of i^{th} firm.

The trade-off theory predicts that firms' profitability, tangible assets, size, financing deficit size and the distance from the target leverage are positively related to the rate of adjustment for firms that adjust from below. At the same time, non-debt tax shields, expected bankruptcy cost, growth options, financing surplus size and the net loss carry forward are negatively related to the rate of adjustment for this group of firms. Accordingly, firms' profitability, tangible assets, size, and financing deficit size are negatively related to the rate of adjustment for firms that adjust from above, whereas non-debt tax shields, expected bankruptcy cost, growth options, financing surplus size, and the net loss carry forward are positively related to the rate of adjustment for this group of firms.

The agency cost models predict that *M/B* has a negative impact on the rate of adjustment for firms that operate below the target leverage and a positive one for firms above the target leverage. Firms' size and tangible assets serve as proxy for the firms' debt capacity and financial distress, thus a positive sign for the coefficients are expected. For firms below their target, the *MTR* is predicted to have a positive impact on the rate of adjustment, whereas firms with a net loss carry forward (*NLCF*) have fewer incentives to adjust. On the other hand, for firms above their target leverage, the opposite effect is supposed to be observed. Non-debt tax shields sources (*NDTS* and *RDAD*) are expected to reduce the rate of adjustment for firms below their target, since they already enjoy a high non-debt tax shields, and to accelerate it for firms above their target. The finance deficit (surplus) variables are introduced to capture the contribution of external financing needs (surplus) to the adjustment process.

Firms below the target and in need for external funds are supposed to issue debt. This will positively affect their rate of adjustment (a positive sign for $Fin*D_2$). If these firms have a financing surplus then, this will reduce their rate of adjustment (a negative sign for $Fin*D_3$), unless they use their financing surplus to repurchase equity.

If fixed costs constitute a major portion of the total costs of changing capital structure, firms with optimal leverage will alter their capital structure only if they are sufficiently far away from the optimal capital structure. Thus, the likelihood of adjustment is a positive function of the distance between optimal and actual leverage. To test this hypothesis, we use the distance from the target leverage (*Dis*); the expected sign of this variable is positive for the firms above or below their target leverage.

If firms follow the trade-off theory in the long-run, they may deviate from the target in the short-run due to the pecking order theory factors. In other words, firms view the trade-off and the pecking order theory as not mutually exclusive. We expect to find that these factors contribute positively or negatively in the rate of adjustment. For example, firms below the target with high information asymmetry (*Info*) are expected to use debt financing under the pecking order theory and such behavior will contribute positively in the rate of adjustment toward the target. In addition, if firms time their equity issue with favorable market conditions, the stock price run-up (*St*) will contribute positively in the rate of adjustment if they are above their target leverage and negatively if they are below their target leverage.

V. DATA AND SAMPLE SELECTION

The initial sample consists of all firms on the Compustat database for the period 1980-2001. As in previous studies, financial firms (SIC 6000-6999), regulated utilities (SIC 4900-4999) and non-classifiable establishments (9900-9999) are excluded. To enter in the sample, financial data must be available for all the of following variables: total assets, long-term debt, short-term debt, retained earnings, book value of equity, market value of equity, depreciation, investments tax credits, net loss carry forward, R&D, advertising expenses, working capital items, net sales, tangible assets, earnings before interest and taxes, daily stock prices on the CRSP data base, and the marginal tax rates4. Firms that have negative debt or zero total assets in any given year are excluded from the analysis. Table 1 shows the sample distribution, financing deficit firms (*Fin* >0) and financing surplus firms (*Fin* <0), firms below their target leverage and firms above their target leverage. The firms' target leverage is measured by the industry leverage median.

Table 1: Sample distribution

Group	Number of Observations	% of Observations
Financing Deficit Firms	60,333	67.34%
Financing Surplus Firms	29,258	32.66%
Below the Target Firms	48,220	53.82%
Above the Target Firms	41,371	46.18%
Total	89,591	100.00%

VI. EMPIRICAL RESULTS- MULTIVARIATE ANALYSIS

Table 2 presents the estimation results of the model for the financing deficit group and the financing surplus group. In support for Myers (1977, 1984), Jensen and Meckling (1986) and Lang, Ofek and Stulz (1996) models, firms with higher growth options use less long-term debt financing as proportion of their financing deficit. In addition, the growth options coefficient has a positive sign for short-term debt financing, which supports Myers' (1977) solution of the underinvestment problem, in which high growth options firms may roll over short-term debt to overcome this problem. On the other hand, the financing surplus group confirms these results. Higher growth options firms tend to reduce their long-term debt by a higher proportion of their financing surplus relative to short-term debt. The firms' debt capacity proxy (tangible assets or size) is positively related to the proportion of long-term debt financing. However, the size variable is negatively related to the proportion of short-term debt financing. These results are in the line with Barclay and Smith (1995) findings of positive relation between debt maturity and firm size. This also can be explained by the limited ability of small firms to access the capital markets due to the high flotation cost of long-term debt.

[4] The marginal tax rates are the simulated marginal tax rates (Graham (1996)) for the 1980-2001 period. John Graham kindly made this data available for academic uses.

However, the tangible assets have no significant role in affecting the proportion of long-term or short–term debt reduction, but size is positively related to the proportion of long-term or short–term debt reduction.

Table 2: Factors Affecting the Proportion of Debt Financing

The dependent variables are the changes in long-term debt and short–term debt scaled by total assets. The Fama-MacBeth (1973) regressions are run for each year of the 1980-2001 period. ** and * indicate that the coefficient is statistically different from zero at 0.01 and 0.05 levels.

	Financing deficit group		**Financing surplus group**	
	Δ Long Term Debt	**Δ Short Term Debt**	**Δ Long Term Debt**	**Δ Short Term Debt**
Constant	-0.005**	0.009**	-0.004**	-0.005**
M/B	-0.021**	0.001*	0.064**	0.005
Tang	0.341**	0.030	0.042	0.001
Info	0.010**	0.029**	0.009	0.031**
MTR_{t-1}	0.709*	0.131**	1.278*	1.541
$MTR_{t-1}* D_1$	-0.207*	0.059*	-0.132*	-0.143
RDAD	-0.211**	-0.045	-0.591*	0.506
NDTS	-0.119*	0.049*	1.044**	-0.687**
$NDTS* D_2$	0.149*	-0.130*	-0.435**	0.221**
AbDev	0.016*	0.006	-0.191*	0.233
$AbDev* D_3$	-0.062**	-0.009*	0.311**	-0.031
Size	0.050**	-0.007*	0.072**	0.031**
St	-0.004*	-0.015**	0.011*	0.005
$Adj\text{-}R^2$	0.371	0.111	0.770	0.266

Consistent with the pecking order model, after controlling for the debt capacity, the information asymmetry is positively related to the proportion of long-term debt financing. In addition, the information asymmetry effect on the proportion of short-term debt financing is positive and slightly higher in magnitude relative to the proportion of long-term debt financing. On the other hand, the information asymmetry shows no significant role in affecting the proportion of long-term debt reduction, while it has a significant positive effect on the proportion of short-term debt reduction. One possible explanation is the degree of sensitivity of the short-term debt to information asymmetry, which could lead to less mispricing of the short-term debt relative to long-term debt and this is why firms will tend to reduce short-term debt rather the long-term-debt.

We find a significant support for the hypothesis that higher marginal tax rate lead firms to use more debt financing. In addition, firms that have net loss carry forward use long-term debt less aggressively relative to firms without net loss carry forward, while firms with net loss carry forward use more aggressively short-term debt financing. This could occur because firms with net loss carry forward are not able to access the long-term debt market as easy as they might take a bank loan. On the other hand, the

marginal tax rate has a positive impact on the proportion of long-term debt reduction. Firms that are more profitable tend to reduce their long-term debt by a higher proportion relative to less profitable firms (those that have net loss carry forward). On the other hand, neither the marginal tax rate nor the interaction between marginal tax rate and net loss carry forward has a significant effect on the proportion of short-term debt reduction.

The sign and the magnitude of the non-debt tax shields coefficient support MacKie-Mason's (1990) argument, a positive sign for $NDTS*D_2$, where non-debt tax shields do not crowd out interest deductibility for profitable firms and but it does for highly distressed firms. This is consistent with the notion that highly distressed firms utilize the non-debt tax shields more than less distressed firms. In addition, for highly distressed firms the non-debt tax shields variable is positively related to the proportion of short-term debt financing. This suggests that these firms have low ability to access the long-term debt market. When firms have financing surplus, highly distressed firms tend to reduce their long-term debt by a higher proportion relative to healthy firms.

The other source of the non-debt tax shield, the sum of R&D and the advertising expenses relative to total assets (*RDAD*), negatively affects the proportion of long–term debt financing or reduction and has no significant effect on the short-term debt financing or reduction.

In support of the trade-off theory, firms below their target leverage that have financing deficit tend to issue more debt as proportion of their financing deficit and reduce less debt when they have financing surplus. Firms above their target leverage tend to issue less debt as proportion of their financing deficit and reduce more debt when they have financing surplus.

Finally, to investigate the market-timing hypothesis, firms with high stock price tend to issue less debt when they have financing deficit and to reduce more debt when they have financing surplus. This implies that firms in financing deficit issue more equity when their stock prices run-up, whereas firms that have a financing surplus tend to repurchase more equity when their stock prices decline. Korajczyk, Lucas, and MacDonald (1990), Hovakimian, Opler, and Titman (2001) and Baker and Wurgler (2002) find evidence supporting this prediction.

In general, the multivariate analysis indicates that after controlling for the debt capacity, the information asymmetry problem is not the only determinant of the proportion of debt financing or debt reductions. The factors suggested by the trade-off models play a significant role in the firms' decisions of how much debt to use to fill their financing deficit or how much debt to reduce in allocating their financing surplus. Finally, the deviation from the target leverage plays a significant role in determining the proportion of debt financing or reduction.

Table 3 reports the estimation results of the factors affecting the rate of adjustment model using the Fama-MacBeth method. The model is estimated for firms above and below their target leverage. For the long-term debt contribution in the total rate of adjustments, high growth options tend to reduce the rate of adjustment for firms below their target leverage and to accelerate it for firms above their target leverage.

Table 3- The Factors Affecting the Rate of Adjustment

Firms are classified in two main groups: firms below their target leverage and firms above their target leverage. The dependent variables are the changes in long-term debt and short–term debt scaled by total assets. ** and * indicate that the coefficient is statistically different from zero at 0.01 and 0.05 levels.

	Below the target leverage group		**Above the target leverage group**	
Independent variable	**ΔLong Term Debt**	**ΔShort Term Debt**	**ΔLong Term Debt**	**ΔShort Term Debt**
Constant	0.015**	0.007**	0.019**	0.003*
M/B	-0.053**	0.007*	0.051*	0.031*
Tang	0.232**	0.069**	-0.057**	-0.022
Info	0.060**	0.043	-0.016*	0.005
St	-0.010**	-0.007**	0.080**	0.010*
MTR_{t-1}	0.314*	0.257**	-0.303*	-0.009
$MTR_{t-1}* D_1$	-0.231*	0.773	0.464**	-0.371
NDTS	-0.112*	0.236	0.267*	-0.509
RDAD	-0.494**	0.027	0.074*	0.216
Dis	0.073**	-0.051	0.112*	-0.014
$Fin* D_2$	1.621**	0.197**	-0.921**	-0.189*
$Fin* D_3$	-1.002*	-0.561*	0.328**	0.106*
Size	0.029**	-0.002*	0.022**	0.004
$Adj\text{-}R^2$	0.484	0.150	0.587	0.186

However, high growth options increase the total rate of adjustment through the short-term debt contribution in the total rate of adjustments for firms below the target leverage. For firms above their target level, the sign of the growth options on the rate of adjustment for the short-term debt is the opposite of the expected one. The tangible assets have a positive impact on the rate of adjustment in both long-term debt model and short-term debt model for firms that adjust from below. For these firms, size has a positive impact on the contribution of long-term debt in the total rate of adjustments and a negative impact on the contribution of short-term debt in the total rate of adjustments. For firms that adjust from above, the tangible assets have insignificant impact on the short-term debt contribution in the total rate of adjustments, and a negative and significant impact on the contribution of the long-term debt in the total rate of adjustments. In the same time, size shows a positive significant effect on the long-term debt contribution in the total rate of adjustment.

Higher information asymmetry contributes positively in the rate of adjustment for firms below their target and negatively for firms above their target. This is consistent with the effect of the pecking order behavior within the context of the trade-off theory. Yet, the information asymmetry has no significant impact on the short-term debt contribution in the total rate of adjustments. The market equity conditions play a significant role in the rate of adjustments. Stock prices run up reduce the rate of adjustments for firms below the target and increase the rate of adjustments for firms above the target.

As predicted, the non-debt tax shields sources are negatively (positively) affecting the long-term debt contribution in the total rate of adjustments rate for firms below (above) their target, but these factors have no effect in the short-term debt contribution in the total rate of adjustments rate.

Firms with high marginal tax rate adjust faster toward the target relative to firms that have a net loss carry forward when they are below their target leverage; for firms above their target leverage, high marginal tax rate decreases the rate of adjustment toward the target relative to those which have a net loss carry forward. Yet, marginal tax rate has no significant effect on the short-term debt model except for firms that operate below their target leverage.

Firms farther away from the target have tendency to adjust faster toward the target using long-term debt regardless if they are above or below their target. However, the distance from the target leverage has no significant effect on the rate of adjustment of the short-term debt. Finally, the financing deficit plays a significant role in increasing the rate of adjustment for firms below the target and reducing it for firms above the target. In addition, the financing surplus plays a significant role in increasing the rate of adjustment for firms above the target and reducing it for firms below the target.

Overall, the factors affecting the proportion of debt financing and those affecting the rate of adjustment indicate that the trade-off model and the pecking order model are not mutually exclusive. Managers tend to adjust toward target leverage but this does not prevent them from deviating from this target to take advantage of the market equity conditions and the information asymmetry problem. Consistent with this conclusion, the trade-off theory factors are significant determinants of the proportion of debt financing (reduction) relative to the financing deficit (surplus).

VII. CONCLUSION

The empirical results of the factors affecting the proportion of debt financing (reduction) and factors affecting the rate of adjustment imply that the pecking order theory and the trade-off theory are not mutually exclusive. Firms may strive for a target debt ratio range and within this range, the pecking order behavior may describe incremental decisions or, over time, firms may switch between target adjustment and pecking order behavior. Consistent with Fischer, Heinkel, and Zechner (1989) and Leland (1994, 1998) market frictions can lead firms to deviate from their target leverage. Hovakimian, Opler and Titman (2001) conclude that the different effect of profitability on the debt ratio and the debt-equity issue choice appear to be consistent with a pecking order behavior in the short-run and revision to the target in the long-run. This leads to the possibility that firms do not view the pecking order and trade-off theories as mutually exclusive (Fama and French (2002)). For example, firms below their target leverage with high information asymmetry are most likely to issue debt, given that they have a high debt capacity, thus, accelerating their rate of adjustment. If these firms have stock price run up, managers find themselves better off issuing equity, even though this decision leads to a temporary deviation from the target leverage.

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