Cahiers Economiques de Bruxelles, N° 158, 2ème trimestre 1998

Confronting Capital Structure Theories Empirically: Pecking Order versus Target Adjustment

E. DURINCK*, E. LAVEREN*, C. VAN HULLE**
AND J.VANDENBROUCKE* [1]

** Universiteit Antwerpen, UFSIA, Belgium*
*** Katholieke Universiteit Leuven, KUL, Belgium*

Abstract

We test for the empirical validity of Pecking Order, Target Adjustment and Free Cash Flow arguments in actual capital structure decisions, as reflected in Belgian accounting data. Tests that discriminate between the Pecking Order and the Target Adjustment hypothesis show that the current liquidity position of a firm is most relevant in explaining changes of financial debt levels, which is in line with Pecking Order Theory. Additional information can be extracted however, by measuring deviations from a "target" financial debt level which positions the firm in the Pecking Order.

Introduction

In business finance, the maximization of a firm's market value is widely accepted to be management's major objective. Policies to pursue this goal can be divided into three components: financing, investment and dividend decisions. Modigliani and Miller (1958) showed that, in a hypothetical framework with perfect capital markets and in the absence of taxes or transaction costs, these decisions are independent and the value of a firm is only influenced by the profitability of its investments. Ever since the publication of this "irrelevance theorem", several capital structure theories have been developed, see Harris and

[1] We would like to thank an anonymous referee for very useful and constructive comments on the originally submitted version. Please send correspondence to Eddy Laveren, Universiteit Antwerpen – UFSIA, B-115, Prinsstraat 13, 2000 Antwerpen,.

Raviv (1991) for an overview. A feature most of these theories share is the stress on the interdependence between the distinct decision processes and the relevance of financing and dividend decisions with respect to a firm's market value. Not all capital structure theories conclude to the existence of an optimal leverage ratio however. Some merely concentrate on the influence of a specific imperfection or exogenous variable on the debt/equity mix. Given the assumptions of the theory involved, one can even detect contradicting conclusions concerning changes of debt ratios in a certain situation. In this paper, we analyse these differences empirically.

The structure of the paper is as follows. First, we introduce the capital structure theories used in the analysis and show how each rationalizes departures from the Modigliani-Miller framework. Section I further formalizes some concepts used in the analysis and presents the test hypotheses. Section II presents a short decription of our data. We develop our test equations and discuss the regression results in section III. A summarizing conclusion ends the paper.

I. Theories and Hypotheses

In this section we briefly introduce the capital structure theories and the hypotheses that will be tested empirically.

1. Theories

This brief theoretical review mentions the basic ideas underlying the Static Trade-Off Theory, the Pecking Order Theory and the Free Cash Flow Theory, respectively. A more detailed discussion on capital structure theories is given in Cools (1993), Masulis (1989), Harris and Raviv (1991) or Voordeckers (1996).

a. Modigliani and Miller

Traditional capital structure theory, before Modigliani and Miller (1985), stated that the weighted average cost of capital is minimized at an optimal debt level. Since the cost of both debt and equity is related to leverage, "expensive" equity can initially be replaced by "cheap" debt. The value of the firm is maximized at the debt/equity combination that minimizes the weighted average cost of capi-

tal. Yet, in the hypothetical world of Modigliani and Miller (1958) financing decisions have no influence on the market value of a firm. This hypothetical world is characterized mainly by perfect capital markets, which causes only investment decisions to determine the value of a firm. In response to these conclusions, other capital structure theories explicitly consider the impact of imperfections such as asymmetric information, bankruptcy risk and costs, taxes and agency relations on the financing decision and the value of a firm. We next point out the basic features of the alternative capital structure theories our empirical analysis is based on.

b. Static Trade-Off Theory

The Static Trade-Off Theory was one of the first theoretical reactions to the 'irrelevance theorem' of Modigliani and Miller (1958). Static Trade-Off Theory concentrates on the benefits and costs of issuing additional debt (Myers, 1984). Major determinants of this trade-off are the deductibility of interest payments on the one hand and the expected cost of financial distress on the other. DeAngelo and Masulis (1980) point out the interdependence between the profitability of a firm, the existence of a non-interest tax shield and the benefits of the deductibility of interest payments. With respect to the expected cost of financial distress, Kale and Noe (1992) distinguish between direct and indirect costs. Taking these considerations into account, the optimal capital structure is the one where a marginal increase in debt is expected to provide an incremental tax subsidy that just offsets the resulting increase in expected bankruptcy costs.

In the empirical part of the paper, we do not measure the relative importance of the distinct trade-off determinants. We only try to detect whether firms exhibit a Static Trade-Off behaviour, by using a Target Adjustment Model. If financial debt in the previous period was situated below the target level, we should observe an increase in current financial debt. This would indicate that the increase in the interest deductibility exceeds the increase in the expected cost of financial distress. The opposite should prevail in case financial debt in the previous period exceeded the target level.

c. Pecking Order Theory

Pecking Order Theory is based on the assumption of asymmetric information. Insiders of a firm (managers as well as current shareholders) have better

and more information concerning e.g. the profitability of future investment projects than outsiders (potential shareholders and creditors) [2]. Potential creditors base the cost of their financial resources on information about the future solvency and growth opportunities of a company. Given the asymmetric information, this could lead to a higher interest cost than management anticipated. To the extent that this situation forces a change in the initial investment policy, the interaction between investment and financing decisions due to asymmetric information prevents the market value of the firm to be maximized.

Managers now may attempt to avoid or postpone a confrontation with the uninformed investors. According to Myers (1984) this will result in a "Pecking Order": When faced with a deficit, managers prefer internal funds, next financial debt and ultimately new equity. The cost of capital of these financing alternatives ranges from not to very sensitive with respect to asymmetric information. Within this framework, the current capital structure of a firm reflects the cumulated financing needs in the past. There does not exists an optimal or target level of financial debt.

To study the Pecking Order empirically, we test the relation between changes in the financial debt level and the availability of internal funds. If the firm indeed wants to be financially independent, financial debt should decrease in a situation of excess cash flows and should increase when the firm is short of internal funds.

d. Free Cash Flow Theory

Free Cash Flow Theory studies capital structure decisions within the framework of agency relations. Managers (agents) are expected to behave in shareholder's interest (principal) through the maximization of the market value of the firm. Without incentives or monitoring by the shareholders however, there always exists the possibility that managers' investment and financing policy does not serve this purpose completely. Especially in the presence of 'free cash' which Jensen (1986) defined as the excess of funds when all investment projects with a positive net present value have been financed.

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[2] Healy and Palepu (1996) describe the case of CUC International, where a situation of asymmetric information between managers and investors lead to a decline in available financial resources. They also indicate that capital structure decisions can contribute to solving these information asymmetries.

According to Stulz (1990), the resulting under- or overinvestment can be remedied by issuing more debt. On the one hand, overinvestment declines because of the periodic interest payments and capital expenditures that reduce the amount of "free cash". On the other hand, the additional funds obtained through debt financing can be used to set up profitable investment projects that would not have been exercised because of the opportunistic behaviour shareholders anticipated. The latter reduces underinvestment.

Empirically, the relevance of the Free Cash Flow Theory should be confirmed by an increase in financial debt whenever internal funds differ from zero, hence both in case of a surplus and in case of a deficit.

2. Hypotheses

The empirical part of the paper focusses on hypotheses that confront the Pecking Order Theory with two competing alternatives: the Target Adjustment and the Free Cash Flow Models. We will refer to these hypotheses as *Target Adjustment versus Pecking Order* and *Free Cash versus Pecking Order*. The regression equations used are based on Shyam-Sunder and Myers (1993), but dummy-variables are added in order to concentrate on a specific selection of observations and to accentuate the differences in theoretical predictions.

In presenting the hypotheses, we make use of the variables $DEF_{i,t}$ (=the surplus (<0) or deficit (>0) of internal funds of firm i in period t), $B_{i,t}$ (= total assets of firm i in period t) and $D_{i,t}$ (= the financial debt level of firm i in period t). We refer to the Appendix for a formal definition of these variables and proceed with a formalization of our test hypotheses instead.

a. Free cash versus Pecking Order

Jensen (1986) defined "free cash" as the excess of funds when all investment projects with a positive net present value have been financed. Using accounting data, it is difficult to confirm whether the reported investment expenditures satisfy this theoretical condition. However, for the purpose of our paper we may assume that the *DEF*-variable (see Appendix) is a good proxy for what causes the agency relationship Jensen (1986) described.

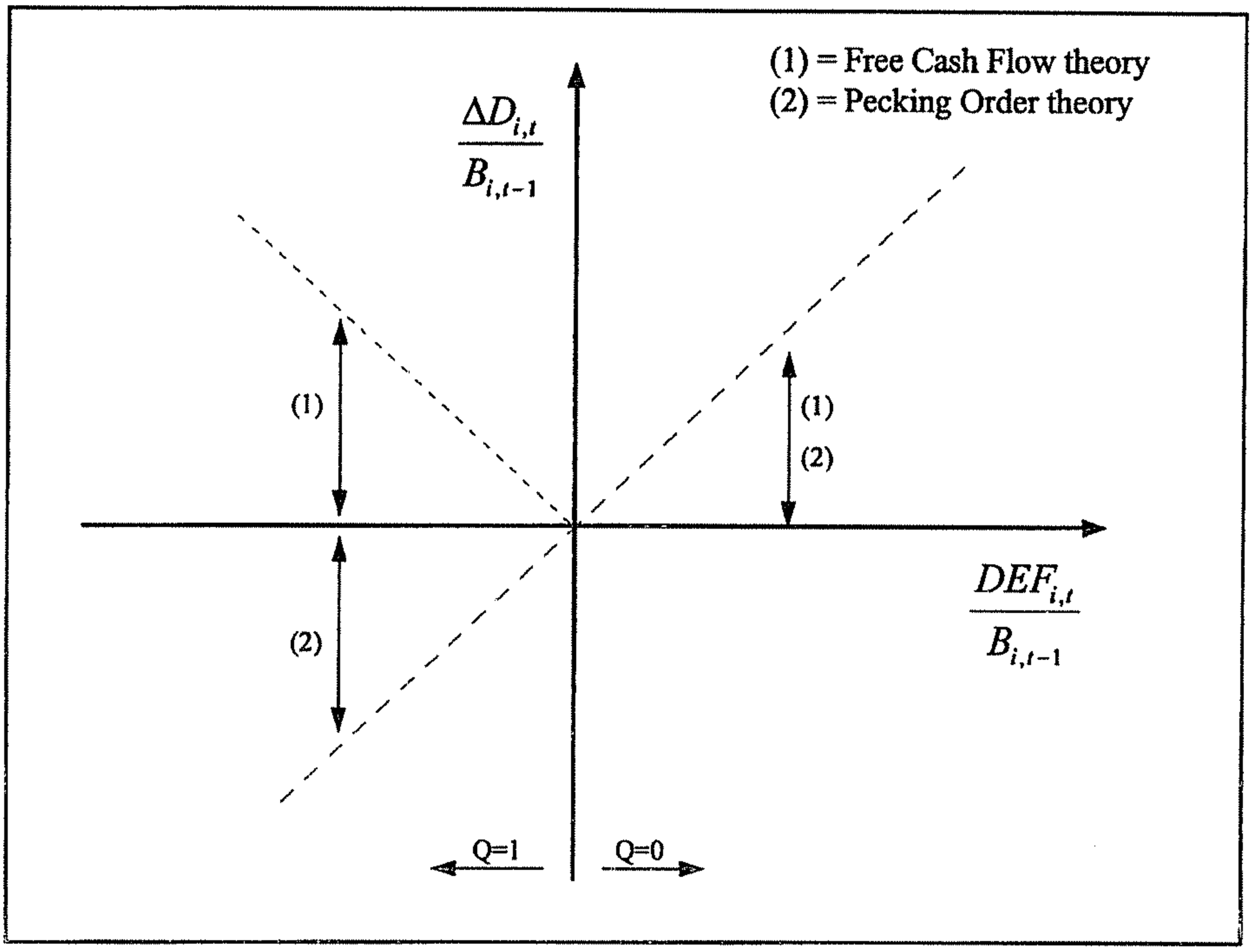
According to Free Cash Flow Theory, a surplus of 'free cash' ($DEF_{i,t} < 0$) gives rise to a suboptimal investment policy because of the agency relation between managers and shareholders. This suboptimality can be avoided or reduced by issuing more debt (($D_{i,t} > 0$). As such, both under- and overinvestment are remedied. Yet, Pecking Order Theory predicts the opposite. When confronted with a surplus of internal funds, a firm should reduce its financial debt in order to pursue further financial independence. This way, the consequences of asymmetric information are avoided. In case of a deficit ($DEF_{i,t} > 0$), both the Free Cash Flow and the Pecking Order Theory predict an increase of financial debt. Since the contradiction concerning the influence of 'free cash' on the level of financial debt occurs only when a surplus is measured, we isolate these observations using a dummy-variable Q:

$$(1) \qquad Q_{i,t} = \begin{matrix} 1 \text{ if } DEF_{i,t} < 0 \\ 0 \text{ if } DEF_{i,t} \geq 0 \end{matrix}$$

The hypothesis to be tested is shown graphically in figure 1. Assuming Pecking Order relevance, we expect to find a positive relationship between the 'free cash' determinant and the dependent variable. As pointed out in figure 1, the regression coefficient should be between zero and one. When distinguishing between periods with cash surpluses and deficits, Free Cash Flow Theory predicts a negative regression coefficient for observations where Q=1. Theoretically, this coefficient should be between zero and minus one, but a regression coefficient not significantly different from zero would suffice to reject the Pecking Order hypothesis.

FIGURE 1

Free Cash versus Pecking Order



b. Target Adjustment versus Pecking Order

According to the Static Trade-Off Theory, financial debt is adjusted by comparing the actual level of financial debt in the previous period with a target level. We write this target level of financial debt as $D^*_{i,t}$ – and again refer to the Appendix for its definition.

Now, the Static Trade-Off Theory states that the firm could increase its market value by issuing more debt ($\Delta D_{i,t} > 0$) if the actual level of financial debt was below the target ($D^*_{i,t} - D_{i,t-1} > 0$). The benefits of the increase in deductable interest payments outweigh the increase of the expected cost of financial distress. When the firm operated above the target ($D^*_{i,t} - D_{i,t-1} < 0$) financial debt should be reduced, but the speed of adjustment could be different. To allow for

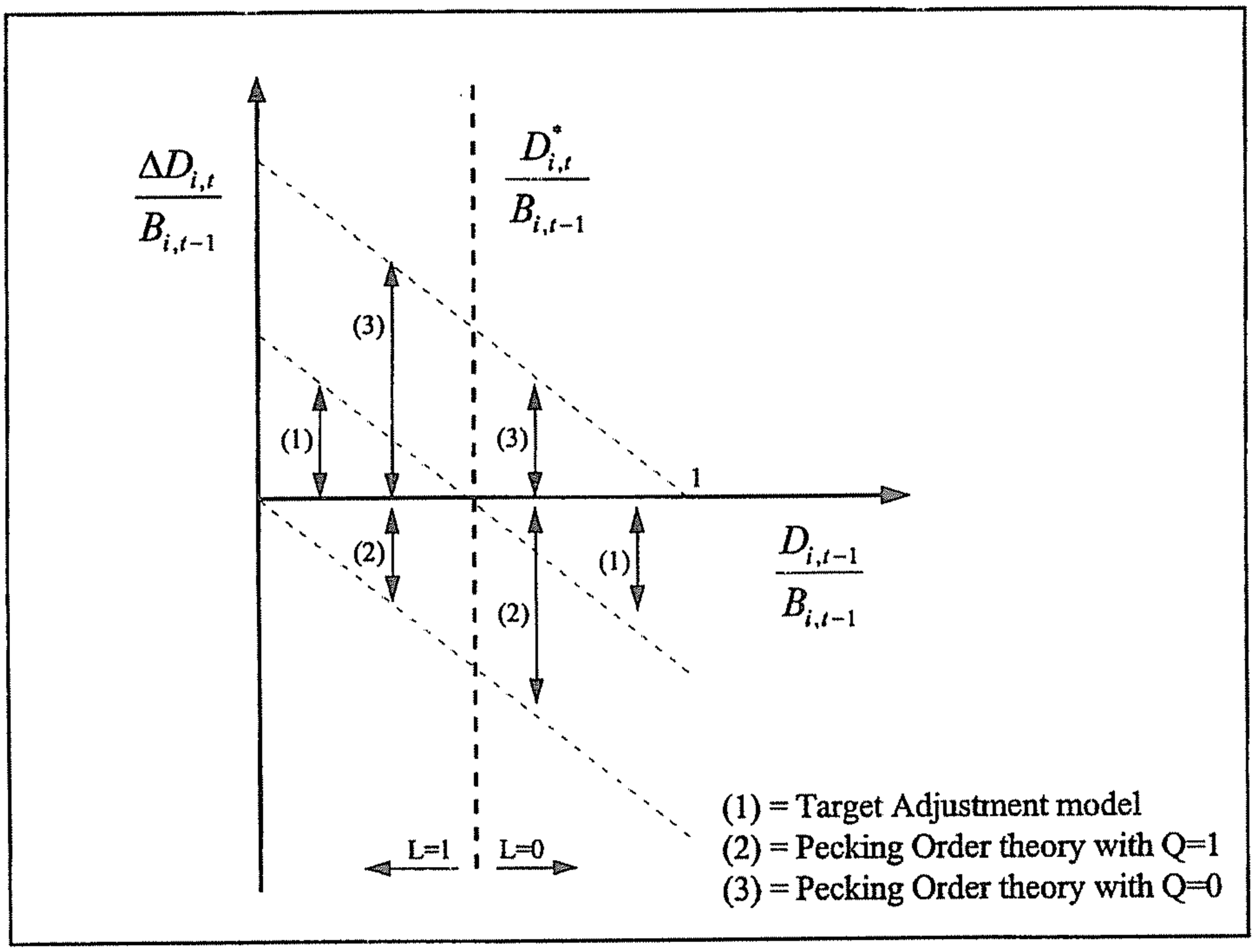
an asymmetric adjustment towards the target, we define a dummy-variable L as follows:

$$L_{i,t} = \begin{cases} 1 \text{ if } D^{*}_{i,t} - D_{i,t-1} > 0 \\ 0 \text{ if } D^{*}_{i,t} - D_{i,t-1} \leq 0 \end{cases} \quad (2)$$

Within the framework of the Target Adjustment Model, predictions about the evolution of financial debt are solely based on the deviation from the target (L). Pecking Order Theory explicitely states, however, that there does not exist a target or optimal level of financial debt. According to the latter, changes in financial debt are determined by the surplus or deficit of internal funds (Q) instead. Figure 2 gives a graphical presentation of both theories.

FIGURE 2

Target Adjustment versus Pecking Order



In figure 2, the Target Adjustment Model is indicated as (1). Since the evolution towards the target evolves gradually, the adjustment only equals a fraction of the deviation in the previous period. Consequently, these fractions have to lie between zero and the 45°-line drawn through the point where the actual level of financial debt equals the target level.

The changes in financial debt indicated by (2) and (3) are independent of the situation relative to the target. The firm uses the surplus of 'free cash' (Q=1) to decrease financial debt and financial debt increases whenever the firm lacks internal funds (Q=0). Should Q=1, the decrease in financial debt is limited to the actual amount held in the previous period. This is shown in figure 2 by the 45°-line throught the point where no financial debt was used. In the case of Q=0, the maximum increase of financial debt equals one minus the financial debt ratio in the previous period. Hence, the 45°-line intersects the X-axes at the point where the financial debt ratio of the previous period is equal to one.

II. Data Description

The data used in the analysis are accounting data of 354 Belgian firms over the period 1978-1993. All companies are industrial or commercial enterprises, legally held to publish their accounts according to the 'full scheme' during the entire 16-year period[3].

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[3] Belgian firms are legally held to publish their accounts according to the 'full scheme' whenever one of the folowing conditions is satisfied: a) year-average of 100 employees or b) at least two of the following criteria apply: 1) year-average of 50 employees, 2) turnover of 170 million BEF, 3) total liabilities are 85 million BEF.

TABLE 1

Sample data

	mean	median	standard deviation
debt ratio	0.681	0.701	0.1681
financial debt ratio	0.261	0.244	0.1698
return on total assets	0.173	0.158	0.1366
coverage ratio	0.154	0.123	0.1638
growth	0.114	0.073	0.5802

Debt ratio = (debt / total liabilities); financial debt ratio = (financial debt / total liabilities); return on total assets = (cash flow after taxes / total assets); coverage ratio = (cash flow after taxes / debt); growth = $(\text{turnover}_t - \text{turnover}_{t-1}) / \text{turnover}_{t-1}$.

The average debt ratio in our sample amounts to 68%, of which 26% is financial debt (long term and short term). Consequently, a major proportion of the debt component contains accounts payable, taxes and other non-financial debt. Yet, a relative measure of changes in financial debt is used as dependent variable in the econometric analysis. Specifically, we focus on differences related to this issue of financing behaviour across four distinct classes in our sample. The selection of the observations into these classes is based on the four possible combinations of the dummy-variables Q and L. Since parts of the discussion that follow depend on a full understanding of these classes of observations, recall that:

L=1 and Q=1 means below the target with a cash surplus
L=1 and Q=0 means below the target with a cash deficit
L=0 and Q=1 means above the target with a cash surplus
L=0 and Q=0 means above the target with a cash deficit

Table 2 gives an impression of the differences in terms of financing patterns that these classes reveal. Our aim is to explain these differences in terms of either one of the competing capital structure theories.

TABLE 2

Some characteristics of the distinct classes based on Q and L

	L=1 and Q=1	L=1 and Q=0	L=0 and Q=1	L=0 and Q=0
	15.2% (*)	38.7%	19.6%	26.5%
return on total assets $_{(t-1)}$	0.199 (**)	0.185	0.166	0.151
coverage ratio $_{(t-1)}$	0.223	0.176	0.124	0.105
$\Delta D_{i,t} > 0$	27.6% (***)	78.8%	8.3%	58.7%
$\Delta D_{i,t} = 0$	1.2%	0.5%	0.2%	0%
$\Delta D_{i,t} < 0$	71.2%	20.7%	91.5%	41.3%
$\Delta K_{i,t} > 0$	6.1%	14.9%	12.2%	19.8%
$\Delta K_{i,t} = 0$	91.8%	83.4%	85.2%	77.5%
$\Delta K_{i,t} < 0$	2.1%	1.7%	2.6%	2.7%

NOTES – (*) Percentage of the sample in the column-class. (**) Mean per class of the row-determinant. (***) Percentage per class that satisfies the row-change.
SYMBOLS: L: below (=1) or above (=0) the target in the previous period. Q: surplus (=1) or deficit (=0) of internal funds. (D = change in financial debt. (K = change in equity capital.

Table 2 points out some major trends. First, increases in both financial debt and equity capital are most frequent in situations where the firm has a deficit of internal funds[4]. Yet, the debt/equity combination used to finance this deficit is influenced by the deviation from the target level of financial debt in the previous period. Second, a decrease in financial debt is largely determined by the liquidity position of the firm rather than by the deviation from the target. For example, firms with a surplus of internal funds (Q=1) that operated below the target in the previous period (L=1) are, as a percentage, more likely to decrease financial debt than to move towards the target. Finally, unchanged capital is much more frequent than unchanged financial debt. Although based on a preliminary analysis, these conclusions are all in line with the Pecking Order Theory.

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[4] Within each class, the proportions (not percentages) of an increase and decrease in both financial debt and capital are significantly different with a confidence interval of 99%. The proportions of a specific change are also significanly different between all possible classes, except for a decrease in equity capital. The latter proportion is statistically the same in each class.

Figures 3a and 3b offer an additional representation of the hypotheses to be tested. In both graphs, the Y-axis divides off decreases (<0) and increases (>0) in financial debt as a percentage of total liabilities in the beginning period. The X-axis in figure 3a corresponds with internal funds surpluses (<0) and deficits (>0), similar to figure 1. In figure 3b, the X-axis indicates deviations from the respective target levels, as a percentage of total liabilities in the beginning period. Negative X-values indicate that the level of financial debt in the beginning period exceeds the target level. Positive X-values show that the target level of financial debt is higher than the actual level in the previous period.

FIGURE 3A

Free Cash versus Pecking Order

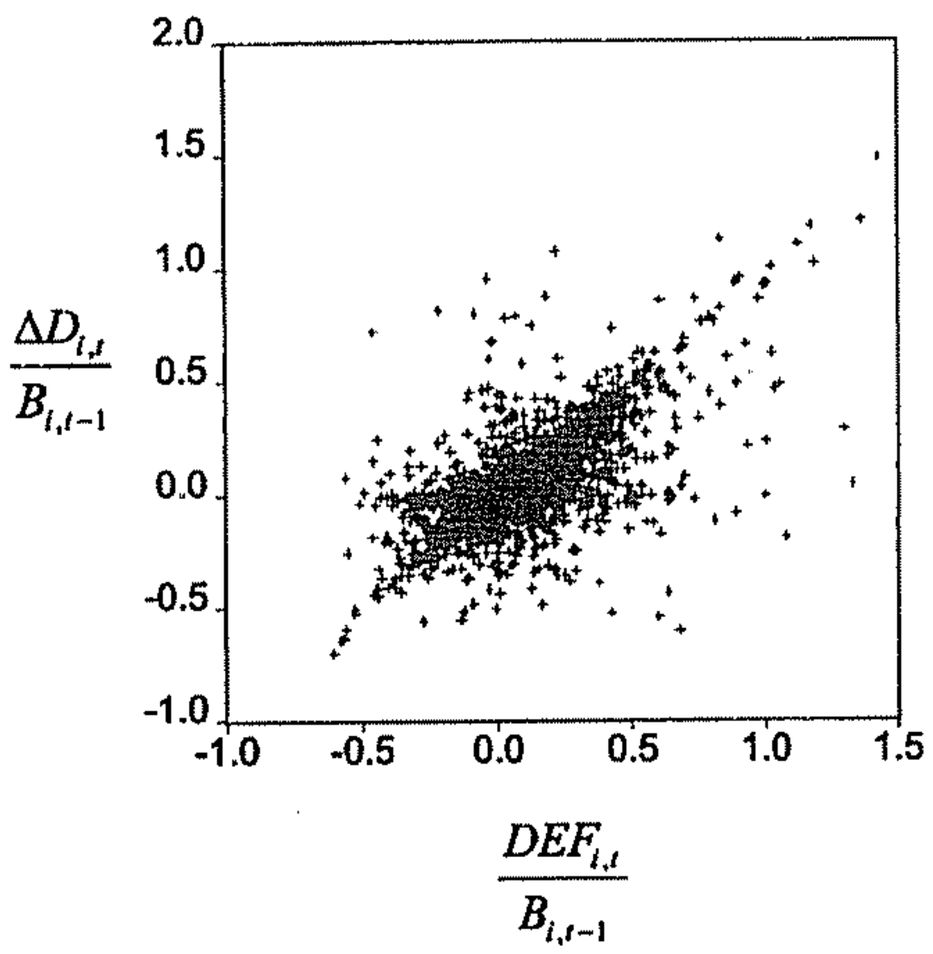
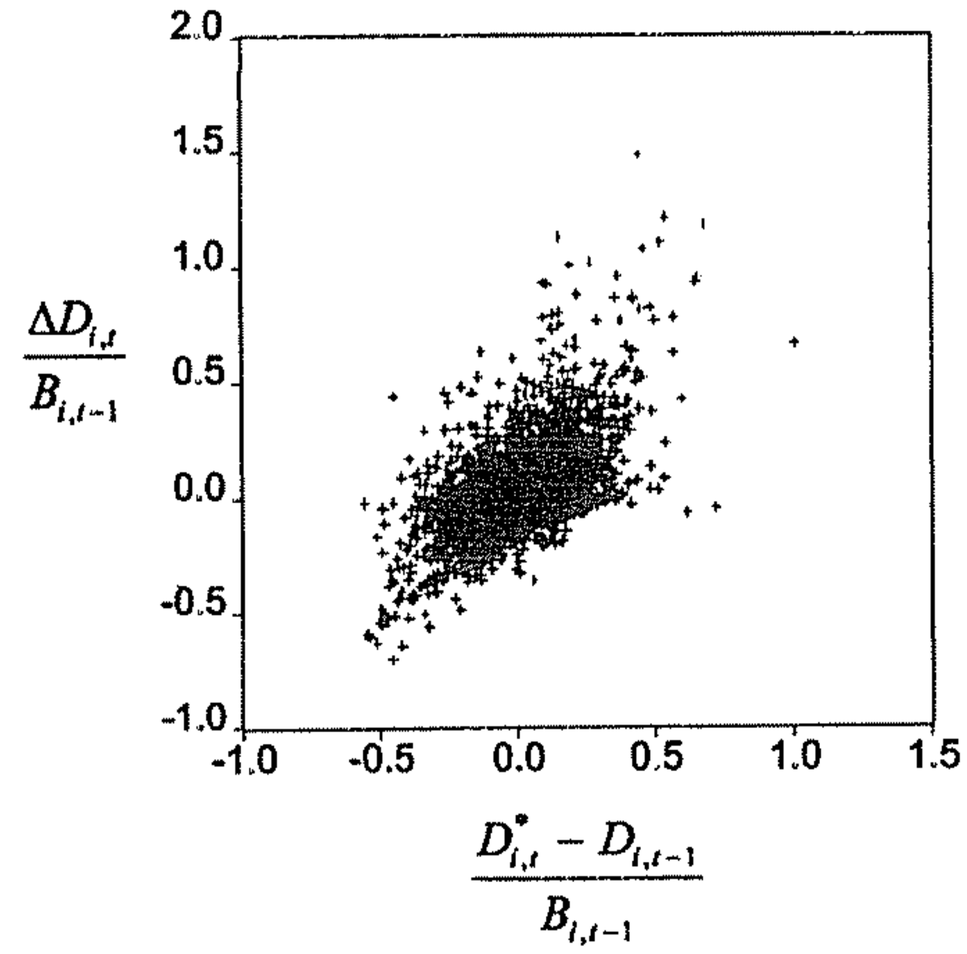


FIGURE 3B

Target Adjustment versus Pecking Order[5]



The Free Cash versus Pecking Order hypothesis is plotted in figure 3a. As is suggested graphically, the correlationcoefficient between the cash position and changes in financial debt is positive and equals 0.68 in our sample. We should note however that the correlation is larger in case of a deficit compared to peri-

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5 Note that the calculation of the independent variable in the Target Adjustment versus the Pecking Order hypothesis implies that the graphical representation in figure 3b is the reverse of figure 2 and that the axes cross at the target level. Figure 2 is intuitive in order to explain the hypothesis to be tested, but by defining the variables as shown in figure 3b we can test for adjustment coefficients between zero and one, similar to the Free Cash versus Pecking Order hypothesis.

ods of cash surpluses. Figure 3b in turn shows the changes in financial debt as a function of the deviations from the target level, both divided by total assets in the beginning period. In order to detect Pecking Order relevance when using deviations from the target level as explanatory variable, we are interested in the numerical value of the estimated coefficients, not just their sign (see equation 3 and table 3 below).

III. EMPIRICAL RESULTS

This section presents our empirical results. First we discuss the Target Adjustment versus Pecking Order hypothesis and next we turn to the Free Cash versus Pecking Order hypothesis.

1. Target Adjustment versus Pecking Order

The Target Adjustment versus Pecking Order hypothesis is tested for by using the deviation from the target as the independent variable, as shown in equation (3).

$$\frac{\Delta D_{i,t}}{B_{i,t-1}} = a + c_1 LQ\frac{D^*_{i,t} - D_{i,t-1}}{B_{i,t-1}} + c_2 L(1-Q)\frac{D^*_{i,t} - D_{i,t-1}}{B_{i,t-1}} +$$

$$c_3(1-L)Q\frac{D^*_{i,t} - D_{i,t-1}}{B_{i,t-1}} + c_4(1-L)(1-Q)\frac{D^*_{i,t} - D_{i,t-1}}{B_{i,t-1}} \quad (3)$$

The predictions of both the Static Trade-Off and the Pecking Order Theory concerning changes in financial debt can now be translated into expectations about the coefficients c_i where i = 1,2,3,4. These express the current change in financial debt as a portion of the deviation from the target in the previous period.

According to the Target Adjustment Model, each coefficient has to be strictly positive and smaller than or equal to one. This would mean that, regardless of the firm's liquidity position, the level of financial debt gradually ($c_i < 1$) moves towards the target ($c_i > 0$). Pecking Order Theory predicts rather the opposite, namely that only the liquidity position of a firm determines the issuance of new

financial debt. Financial debt should increase whenever Q=0 and decrease if Q=1. Taking the numerical values of the independent variable into account, we can write the expected coefficients as given in table 3.

TABLE 3

Expected coefficients in equation (3)

Target Adjustment	Pecking Order
$0 < c_1 < 1$	$c_1 < 0$
$0 < c_2 < 1$	$0 < c_2$ (possibly $c_2 > 1$)
$0 < c_3 < 1$	$0 < c_3$ (possibly $c_3 > 1$)
$0 < c_4 < 1$	$c_4 < 0$

Most important to our analysis are c_1 and c_4. According to the Pecking Order Theory, firms reduce financial debt when there is a surplus of internal funds (Q=1) eventhough they operated below the target in the previous period (L=1). Similarly, financial debt increases when the firm is confronted with a deficit (Q=0), regardless of the high financial debt ratio relative to the target (L=0). The regression results are shown in table 4.

TABLE 4

Regression results of equation (3)

coefficient	estimated value	t-statistic
a	-0.0006	-0.24
c_1	0.1476	3.66*
c_2	1.0191	68*
c_3	0.6958	25*
c_4	0.0357	1.22

°: $0.01 < p < 0.05$ - *: $p < 0.01$

$R^2 = \overline{R}^2 = 0.54$
F-statistic = 1583*
Number of observations = 5310

As was expected within the Target Adjustment framework, the intercept term proves not to be statistically different from zero. There is no incentive to change financial debt if the firm reached its target level in the previous period. The adjustment coefficients whenever a deviation from the target did occur prove to be less in favour of Target Adjustment arguments.

Observations showing a surplus of internal funds (Q=1) and a financial debt level below the target (L=1) seem to increase financial debt since $c_1 > 0$. However, the statistics presented in table 2 already indicated that firms belonging to the class where Q=L=1 are, as a percentage, more likely to reduce than to increase financial debt. The magnitude of these reductions apparently is not of enough importance to push the positive coefficient c_1 to an insignificant level.

Positive coefficients c_2 and c_3 are in line with both the Static Trade-off and the Pecking Order Theory. The former theory explains the increase (c_2) and decrease (c_3) of financial debt on the basis of the deviation from the target (L=1 and L=0 respectively). According to the Pecking Order, changes in financial debt levels are a function of the liquidity position of a firm (Q=0 and Q=1 respectively). Since $c_2>1$,[6] the latter seems to explain why firms overshoot their target when confronted with a deficit of internal funds. A majority prefers debt over equity (see table 2). Given the rather low financial debt ratio in the previous period (L=1), firms still move down the Pecking Order. The trade-off between interest deductibility and expected cost of financial distress is of less guidance.

Even when already operating above the target level of financial debt, a deficit of internal funds forces a firm to issue new debt ($c_4>0$). Yet, the debt/equity mix used to finance the deficit is clearly influenced by the cumulated financial debt ratio in the past. Although positive, the estimated adjustment coefficient is not statistically different from zero. As shown in table 2, there are still significantly more increases of financial debt than there are decreases. Note that 18.5% of the observations also increase capital because of the cumulated financing needs in the past (L=0).

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6 We also tested whether c_2 significantly differs from 1 by using the equation (Y-X) = (+(X where Y and X are the dependent and indepent variable of equation (3). The (-coefficient was found to be significantly different from zero for the class where Q=0 and L=1.

2. Free Cash versus Pecking Order

To test for the Free Cash versus Pecking Order hypothesis, it suffices to distinguish between the classes Q=1 and Q=0 (see figure 1). Nevertheless, we will expand these classes with the dummy-variable L like in the previous section. We do this for the following reasons. First, introducing the deviation from the target as a criterion to classify the observations should not alter the results if the firm does finance according to the Pecking Order Theory. Second, like in table 4, this expansion could give us more detailed information since L approximates the relative position of the firm in the Pecking Order. The equation to be tested only differs from equation (3) by the independent variable. In equation (4) the deviation from the target is replaced by the deficit or surplus of internal funds, expressed as a percentage of total assets in the beginning period.

$$\frac{\Delta D_{i,t}}{B_{i,t-1}} = a + c_1 LQ\frac{DEF_{i,t}}{B_{i,t-1}} + c_2 L(1-Q)\frac{DEF_{i,t}}{B_{i,t-1}} + \tag{4}$$
$$c_3(1-L)Q\frac{DEF_{i,t}}{B_{i,t-1}} + c_4(1-L)(1-Q)\frac{DEF_{i,t}}{B_{i,t-1}}$$

The dummy-variable L does not influence the expectations based on the Free Cash Flow or the Pecking Order Theory. The relevance of the classification using L should only be reflected in the magnitude of the coefficients, not their sign. Knowing that Q=1 in the case of a surplus ($DEF_{i,t}<0$) and Q=0 when faced with a deficit of internal funds ($DEF_{i,t}>0$) the expected values of c_i (i = 1,2,3,4) are as given in table 5.

TABLE 5

Expected coefficients in equation (4).

Free Cash Flow	Pecking Order
$-1 < c_1 < 0$	$0 < c_1 < 1$
$0 < c_2 < 1$	$0 < c_2 < 1$
$-1 < c_3 < 0$	$0 < c_3 < 1$
$0 < c_4 < 1$	$0 < c_4 < 1$

Expectations based on the Pecking Order Theory are motivated as follows. Financial debt will increase or decrease with a fraction[7] of respectively the reported deficit (Q=0) or surplus (Q=1) of internal funds. According to the theory, and in line with table 2, the magnitude of these changes depends on the relative position of the firm in the Pecking Order. In terms of coefficients, we expect that $c_2>c_4>0$, pointing out the cumulating financial debt ratio and $0<c_1<c_3$, expressing the tendency to move towards financial independence.

Free Cash Flow Theory stresses the agency relation between managers and shareholders. In order to avoid or reduce the resulting divergence of interests, the data should reveal an increase in financial debt when we report a surplus of internal funds (Q=1). We therefore expect c_1 and c_3 to be negative. However, there could be a trade-off between the agency constraint induced by additional financial debt and the increasing financial debt ratio. As a result of this trade-off, we may assume that $c_1<c_3<0$. Given a certain excess of 'free cash', the portion used to increase financial debt is inversely related to the financial debt already cumulated in the past. With respect to the implications of a deficit (Q=0), the Free Cash Flow Theory predicts an increase in financial debt aswell. The relation between the magnitude of this increase and the financial debt ratio (L) is similar to the one assumed by the Pecking Order Theory. Table 6 shows the regression results of equation (4).

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7 Shyam-Sunder and Myers (1993) go a step further an test whether the coefficients of equation (4) are equal to one. In the case of a deficit for example, this implies that only debt will be used as a means of finance. The decision to issue new equity is excluded by definition. Our model allows more flexibility on the one hand and gives more detailed information on the other. We only test whether the coefficients are positive but explicitly model the position of the firm in the Pecking Order through the dummy variable L.

TABLE 6

Regression results of equation (4).

coefficient	estimated value	t-statistic
a	0.0069	3.54*
c_1	0.0820	2.06°
c_2	0.5121	81*
c_3	0.8515	30*
c_4	0.2147	10*

°: 0.01 < p < 0.05 - *: p < 0.01

$R^2 = \overline{R}^2 = 0.54$
F-statistic = 2053*
Number of observations = 5310

Except for the positive intercept term, all estimated values confirm the Pecking Order. A deficit of internal funds (Q=0) gives rise to an increase in financial debt. The amount of debt in the financing mix decreases as the firm moves down the Pecking Order (L=0). When confronted with a surplus, the existing financial debt is repaid. Especially when the financial debt ratio has cumulated substantially in the past (L=0). The estimated value of c_1 (L=Q=1) is significant only at the 5% level.

As mentioned before, the L-classification proves to be relevant even when testing Free Cash versus Pecking Order and using the cash position as dependent variable. The sum of squared residuals of the restricted model where $c_1 = c_3$ and $c_2 = c_4$ proves to drop considerable. Performing an F-test clearly confirmed the added value of elaborating the Pecking Order Model with the L dummy.

Conclusion

We confront capital structure theories dealing with Target Adjustment, Pecking Order and Free Cash empirically. Our objective is to concentrate on some contradicting theoretical predictions relating to changes in financial debt levels. We looked at these contradictions in isolation by dividing our sample in four different classes of observations.

The analysis provides strong evidence in favour of the Pecking Order Theory. Both the Free Cash versus Pecking Order and the Target Adjustment versus Pecking Order hypothesis indicate that an increase or decrease in financial debt is determined by the liquidity position of the firm. Due to our original classification of observations, using well-defined dummy variables, we were able to refine the regression equation previously used in literature and to be more specific on the financing behaviour as related to the relative position in the Pecking Order. Specifically, we were able to confirm the conjecture derived from Pecking Order Theory that the portion of additional debt to finance a cash deficit or the decrease of financial debt in the case of a surplus is strongly influenced by the cumulated financial debt ratio in the past.

We hence conclude that, in addition to its intuitive appeal, the Pecking Order hypothesis is well able to explain the financing behaviour of Belgian firms.

Appendix
Definition of variables used in the analysis

1. Definition of variables

In the regression equations we use changes in financial debt as dependent variable. To avoid heteroskedasticity, the difference between the financial debt levels of two successive periods is related to the total assets (=equity+liabilities) of the beginning period. This should enable us to measure the full increase or decrease of financial debt. Relating to total assets in the ending period could result in measurement errors because of the possible parallel evolution of total liabilities and financial debt. With the financial debt level of firm i in year t and the total liabilities of firm i in year t, we can write the dependent variable as

$$\frac{D_{i,t} - D_{i,t-1}}{B_{i,t-1}} \equiv \frac{\Delta D_{i,t}}{B_{i,t-1}} \tag{A1}$$

The dependent variable shows a mean of 12.3% (standard deviation = 0.20) when the firm increases financial debt. When financial debt is reduced, the percentage change is only 6.7% (standard deviation = 0.08). Taken over the entire sample, we find that the average change in financial debt as a percentage of total assets in the previous period equals +3% with standard deviation 0.182.

In the Target Adjustment Model we will use an independent variable that measures the deviation of the financial debt level in the previous period relative to the target. For each company, we calculate the target as the average of the ratio (financial debt) / (total assets) over the 16-year period. The target level of financial debt ( ) that a firm should realize by the end of the observed period is found by multiplying the average ratio by the total assets of the period involved:

$$D^{*}_{i,t} = \frac{\sum_{t=1}^{T} \frac{D_{i,t}}{B_{i,t}}}{T} B_{i,t} \tag{A2}$$

The independent variable used in the Target Adjustment Model is now calculated as

(A3) $$\frac{D^{*}_{i,t} - D_{i,t-1}}{B_{i,t-1}}$$

The variable defined in (A3) has a positive value if the firm was operating below the target level in the previous period. The mean deviation above and below the target equals 0.1 with standard deviation 0.09 and 0.15 respectively. In the sample as a whole we find a mean of 0.01 (standard deviation = 0.16), indicating a level of financial debt beneath the target.

In a second model, we will use the amount of 'free cash' as the independent variable. Analogous to Shyam-Sunder and Myers (1993) we define 'free cash' as the deficit or surplus of internal funds of firm i in period t:

$DEF_{i,t}$ = dividend payments + portion of long term debt to be repaid during period t

+ investment in fixed assets + net increase in working capital[8]

- operating cash flow after taxes[9]

A surplus of internal funds is indicated by a negative $DEFi_{,t}$. The average surplus in our sample, as a percentage of total liabilities in the previous period, equals 8.3% (standard deviation = 0.09). The average deficit amounts to 14.8% of total liabilities in the previous period (standard deviation = 0.30). Over the entire sample we find a mean of 0.067 (standard deviation = 0.27), indicating a deficit of 6.7%.

2. Accounting data used [10]

a) Financial debt = financial debt payable after one year
+ financial debt payable within one year
+ current portion of debts after one year

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8 The net change in working capital is calculated as the difference in working capital between two successive periods. See the appendix for more details about the definition of certain variables.

9 Shyam-Sunder and Myers (1993) only use long term debt as dependent variable. They include short term debt in the calculation of the net change in working capital.

10 The names of the balance accounts are the ones used on the CD-rom of the National Bank of Belgium.

b) Operating cash flow after taxes = profit or loss for the period
+ depreciation and other amounts written off formation expenses, intangible and tangible fixed assets
- adjustments to depreciation of and to other amounts written off intangible and tangible fixed assets
+ extra depreciation of and extra amounts written off formation expenses, intangible and tangible fixed assets

c) Net working capital = amounts receivable after one year
+ amounts receivable within one year
+ stocks and contracts in progress
+ deferred charges and accrued income (assets)
- provisions and postponed taxes
- trade debts payable after one year
- advances receipts on contracts in progress, payable after one year
- other amounts payable after one year
- trade debts payable within one year
- advances receipts on contracts in progress, payable within one year
- taxes, remuneration and social security
- other amounts payable within one year
- accrued charges and deferred income (liabilities)

d) Investment in fixed assets.
The investment in fixed assets is calculated as the sum of investments in tangible, intangible and financial assets. For each component we define the amount invested as follows:
Investment = account in current period
- account in the previous period
+ recorded depreciations and amounts written down
- depreciations and amounts written down taken back
- revaluation surpluses

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