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Ordering the Preference Hierarchies for Internal Finance, Bank Loans, Bond and Share Issues

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Ordering the preference hierarchies for internal finance, bank loans, bond and share issues: evidence from Dutch firms

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Abstract

We estimate the incremental financing decision for a sample of some 150 Dutch companies for the years 1984 through 1997, thereby distinguishing internal finance and three types of external finance: bank borrowing, bond issues and share issues. First, we estimate a multinomial logit model which confirms several predictions of both the static trade-off theory and the pecking-order theory as to the determinants of financing choices. Next, we use ordered probit models to determine which financing hierarchy fits the data best. The results suggest that Dutch firms have a most-preferred financing hierarchy: (i) internal finance, (ii) bank loans, (iii) share issues, (iv) bonds issues.

Key words: Corporate finance, discrete choice models.

JEL Classification: G32; C25.

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1 Introduction

Ever since the seminal contribution of Modigliani and Miller (1958), who show that under special circumstances (including the absence of frictions and taxes, and perfectly working capital markets) there is no optimal capital structure, one of the more intriguing challenges in corporate finance is to provide a satisfactory explanation as to why in practice some firms finance incremental investments with debt while others do so with equity. Over the years several explanations for this empirical fact have been given that, broadly speaking, can be grouped in two schools of thought. The first is the traditional *static trade-off theory*. This view holds that a firm chooses that debt-equity mixture that optimises its value. The resulting 'optimal capital structure' is determined by trading off the costs and benefits of equity and debt, including tax shields, financial distress and the disciplining of managers.

The second line of reasoning is that there is a *pecking order* as to the type of financing preferred by managers. When making their incremental financing decision, Donaldson (1961) observed that firms appear not to target specific capital structures. Rather they choose a type of capital according to a preference order: (i) internal finance, (ii) debt, and (iii) share issues. Myers and Majluf (1984) explain Donaldson's observation by referring to the inherent asymmetry of information associated with acquiring external finance. Insiders (owners and/or managers) know more about the firm's value than outsiders (investors) do. The former avoid issuing equity when they believe that shares are undervalued. The latter, realizing the former's reluctance to issue undervalued shares, would thus interpret a share issue as conveying unfavourable information as to the value of the firm. As a result, share issues are typically followed by a decrease in valuation of the issuing firm's assets. Insiders are therefore reluctant to raise equity capital and prefer to accumulate retained earnings in order to fund incremental investments.[1]

Which of the two hypotheses regarding the financing behaviour of firms is more relevant remains an empirical question. Most tests of the static trade-off theory consist of estimating models that relate firms' characteristics to their capital structure, measured by the ratio of debt over assets (or some transformation of this ratio, such as debt over equity). Depending on which exogenous variables are found to be statistically significant, the potential determinants of firms' target debt ratios are to be accepted or rejected (for an overview of this literature see Harris and Raviv, 1991).

There are however at least two drawbacks to this approach. First, debt

[1] Alternative explanations for the preference for internal finance over external finance include those refering to the higher transaction cost associated with acquiring external finance (e.g. Donaldson, 1961).

ratios represent the proportion that debt takes in all accumulated liabilities since the firm's birth. In some sense it is a snapshot of a firm's complete history of financing choices at a particular point in time. Information on the *timing* of acquiring debt or issuing equity is ignored. Second, internal equity (e.g. retained earnings) and external equity (obtained with share issues) are not distinguished in typical debt ratios. This distinction is essential however when considering the effect of asymmetry of information on incremental financing choices.

The second route of investigation, especially as to the validity of the static trade-off theory, involves estimating discrete choice models of firms' *incremental* financing decisions. The focus here is on establishing the relevant determinants for the *choice* of financing type. A pioneering example of this approach is the study of Marsh (1982). He finds that UK companies are heavily influenced by market conditions and the past history of security prices when choosing between issuing bonds and shares. He also finds that companies appear to make their choice of financing instrument as if they have target debt levels in mind.

The study of Marsh (1982) implicitly revealed the possibility of direct tests of the pecking-order theory. Helwege and Liang (1996) for instance, examining the financing choices of US firms that did an initial public offering (IPO), estimate first a binary logit model regarding the choice between internal and external finance, followed by a multinomial logit analysis for the choice of external finance type. Their results are inconsistent with pecking-order behaviour in that the probability of obtaining external funds is unrelated to the shortfall in internally generated funds.

De Jong and Veld (2001) estimate a binary logit model on a sample of Dutch quoted firms regarding the choice between bond and share issues. They find no confirmation of pecking order financing, notably as the influence of 'slack' (basically cash and liquid assets) on the probability of bond and share issuance is found to be insignificant.

Other empirical studies of the pecking order theory focus on the reaction of stock prices to the announcements of share and/or bonds issues (see e.g. Bayless and Chaplinski, 1990; de Jong and Veld, 2001). Empirical findings thus obtained suggest the existence of a lemon premium, particularly in case of new share issues, hence confirming the existence of asymmetric information between insiders and outsiders.

Shyam-Sunder and Myers (1999) explicitly compare the static trade-off theory with the pecking-order theory using a panel of US firms. Their results suggest greater confidence in the pecking-order theory than in the static trade-off theory. Although companies in their sample did have well-defined optimal debt ratios, it appears that their managers were not trying to ob-

tain these. However, as shown by Chirinko and Singha (2000), this test implicitly presumes that equity issues cover only a relatively small portion of firms' external financing needs. Accordingly, it can not be applied under all circumstances.

In this paper we examine the incremental financing decision for a sample of some 150 Dutch firms for the years 1984 through 1997. To that end we first estimate a multinomial logit model that is quite standard in the recent literature. Our analysis stands out in the sense that we distinguish four financing types: internal finance, bank loans, bond issues and share issues. Including internal finance among the financing choices is highly relevant. Indeed, it is well documented that for firms in the Netherlands internal finance is very important, as it is for firms in other countries.[2] Our motivation for distinguishing bank debt from bonds is that the Dutch economy is bank-based in the sense that bank credit is the major source of external finance, while the corporate bond market is still relatively underdeveloped (see e.g. Saunders and Schmeits, 2002). This distinction also does justice to the differences in the asymmetry of information between private and public debt (Leland and Pyle, 1977). Accordingly, the pecking order theory predicts that firms prefer less risky, negiotable bank debt over non-negotiable public debt (Myers, 1984).

The relevance of including internal finance and bank loans as separate options into the set of possible financing types is confirmed by our estimates. The estimated bank loan equation and the internal financing equation are relatively strong in a statistical sense. The estimation results suggest that the static trade-off theory and the pecking order theory are both of empirical importance in explaining the financial choices of our sample of companies, which is in line with e.g. Bontempi (2002).

Our second contribution to the literature is to examine which ordering of financing types, so-called financing hierarchies, suits the data best. Note that the pecking order theory predicts one particular hierarchy to come out as most preferred by firms: financing internally is preferred over bank borrowing, bank borrowing is preferred over issuing bonds, and issuing bonds is preferred over issuing shares. We propose a new testing methodology using ordered probit analysis. In particular, we estimate separate ordered probit models for each possible financing hierarchy. We then test which one of these hierarchies suits best the data. According to this methodology Dutch firms prefer internal finance over bank loans, bank loans over share issues, and share issue over bonds issues. This hierarchy is very close to the pecking

[2] See for the Netherlands e.g. Cools, 1993, de Haan *et al.*, 1994, de Haan, 1997, Van Ees *et al.*, 1998, and for an international focus for example Corbett and Jenkinson, 1994.

order hierarchy except for the reversal of the last two financning types. The finding that in the Netherlands public debt is the least preferred form of finance could well be due to the fact that the Dutch corporate bond market is relatively underdeveloped (see e.g. Saunders and Schmeits, 2002). Indeed, as recently shown by Esho *et al.* (2001), firms that reside in a country with a well developed bonds market have a higher probability of tapping this market for their incremental financing needs.

We proceed as follows. In the next section our dataset is described followed by Section 3 in which we introduce the explanatory variables that are used in the discrete choice models throughout the paper. The estimation results for the multinomial logit model, explaining financing choices, are discussed in Section 4, while Section 5 presents the analysis of the ordered probit estimates and the resulting most preferred finance hierarchy. Section 6 concludes.

2 Data

Issuance data for *shares* and *bonds* are taken from the *Quarterly Bulletin* of the Nederlandsche Bank. We consider the years 1984 through 1997 and have selected those nonfinancial firms that have a stock quotation on the Amsterdam Exchanges (AEX) and for which annual account data are published in the *Jaarboek van Nederlandse Ondernemingen* for at least two years preceding an issue. This yields a sample of 153 companies distributed over eleven two-digit SIC industries (see Table 8 in Appendix A) that covers all major industries of the Dutch business sector with the metal industry somewhat overrepresented (comprising almost 20% of the sample). Considering both the length of the time-dimension and the broadness of the industry-dimension, we conjecture that the sample is representative for the financing behaviour of the Dutch industry.

Bank borrowing is a constructed observation and is defined according to the net increase in outstanding long-term debt plus short-term bank loans as stated on a firm's balance sheet. If this net increase exceeds 5% of total assets the particular firm is coded as having contracted new bank loans. In using a threshold value we follow Marsh (1982) and Hovakimian *et al.* (2001). It assures that the focus of analysis is on relatively substantial bank borrowings.

Internal finance, the fourth and final financing type we distinguish, is also a constructed variable. Both retaining profits and using up 'financial slack' are considered internal funding (see e.g. Myers, 1984). Accordingly, we code firms as using internal finance if (i) the amount of retained current earnings exceeds 5% of total assets, or (ii) if the net amount of cash withdrawn from

the accumulated stock of liquid assets exceeds 5% of total assets, again using a threshold value to create significant observations and to avoid constructing observations that are due to potential statistical noise in the raw data.

Our initial issuance data include firms that issue several times on the public capital market within one year. We follow Esho *et al.* (2001) in that if these issues are of the same type we combine these and code the specific firm according to the particular issuance type. Indeed, all constructed observations on internal finance and bank borrowing and all observations on the explanatory variables are on an annual basis, making it appropriate to align the issuance data to the same frequency. Moreover, firms with multiple issues on the public capital market within one year typically are large. In order to avoid price shocks on the capital market it is quite common for these firms to spread their issuances. Multiple issue within one year can thus be considered as one large issue.

This leaves us with 1,085 observations on financing needs. Within this sample there are 245 observations involving two or more financing types by the same firm in the same year; in 165 cases it is a combination of internal finance and some external financing type while in the remaining 80 cases it is a combination of external financing types only. Coding a combination of financing types as one particular form of financing is arbitrary to our opinion, although this procedure can be found in the literature.[3] Moreover, interpreting the sign and size of explanatory variables for these hybrid financing categories is difficult from an economic point of view. Alternatively these observations are removed from the sample, as we do. This has the advantage of estimating a model that relates to mutually exclusive financing choices only. Also, it still leaves us with a sample of considerable size, consisting of 840 financing choices.[4] In Table 9 of Appendix A the construction of the financing choice variables are summarized.

Table 1 gives the number of observations in our sample by financing type and year. It is quite clear that the majority of financing needs is taken care of internally: some 58% of all observations relate to internal finance. If anything this stresses the need to explicitly distinguish this type of financing when considering financing behaviour in the Netherlands. Bank loans con-

[3] See e.g. Helwege and Liang (1996). They code firms that use internal finance as such, even if these firms do not use any type of finance. Also, they code firms that issue bonds as issuing bonds, irrespective of whether they use bank credit and/or issue shares in the same year. Likewise, they code firms that issue shares as such, irrespective of whether these firms raise bank loans in the same year.

[4] We did a robustness check by including this category of 'combined financing choices' into our discrete choice models. This yielded qualitatively comparable estimates with those reported below. These estimates are avalaible upon request.

Year	Internal finance	Bank loans	Bonds	Shares	Total (number of firms)
1984	26	10	2	10	48
1985	34	13	6	6	59
1986	41	7	4	11	63
1987	36	14	3	7	60
1988	41	20	5	3	69
1989	42	14	3	12	71
1990	39	22	4	3	68
1991	36	26	2	3	67
1992	38	25	2	5	70
1993	28	14	2	5	49
1994	34	9	6	6	55
1995	34	17	4	5	60
1996	28	12	4	5	49
1997	28	18	1	5	52
Total	485	221	48	86	840

Table 1: Sample split according to financing type

stitute a major source of financing as well, accounting for some 26% of all observations. Issuing shares or, especially, bonds in the Netherlands is not the most common type of fulfilling firms' financing needs. Indeed, these two forms of financing together account for less than 16% of all observations.

The specific situation in the Netherlands makes it interesting to study incremental financing choices,[5] especially if bank borrowing is included. Indeed, the Dutch economy is bank-based and compares well with other continental European bank-based economies such as Germany. In both countries in 1997 (domestic) bank credit to the private sector is some 112 percent of GDP, compared to 121 percent in the UK and only 65 percent in the US (Saunders and Schmeits, 2002). Likewise, stock market capitalization in the Netherlands and Germany amounts to 51 and 40 percent of GDP respectively, fractions that are much higher in the US (104) and the UK (158). Among these four countries only in the US the corporate bonds market plays a significant role in debt financing. Non-financial corporate bonds outstanding in 1997 equalled 19.4 percent of GDP, a percentage that is much lower

[5] As is conventional in related studies, we address financing choices, conditional on the firms' need of finance. Hence, cases where the net use of funds is less than or equal to zero are not considered. The implicit assumption of this approach is that a decision to invest is independent from the choice as to the type of capital to attract. Incorporating both decisions into the empirical model would go beyond the scope of the present paper.

in the Netherlands (3.1), Germany (2.4) and the UK (0.1).

3 Empirical model

In this section the explanatory variables that are used in the discrete choice models are introduced. In the literature a variety of explanatory variables can be found for the type of empirical analyses presented here. Our chosen set of explanatory variables captures theoretical considerations as to the discrete financing choice. These considerations together with our choice of variables are summarized in Table 2. In Table 9 of Appendix A we summarize the construction of the variables.

According to the pecking-order theory firms have a preference for internal finance over external finance. Availability of internal funds is captured by the variables *liquidity* and *profitability*, defined as liquid assets over total assets and earnings over total assets, respectively. If the pecking-order theory holds, these proxies should be positively correlated with the incidence of internal finance and negatively correlated to all three external financing types (Table 2).

Alternatively, high profitability and ample liquidity can be interpreted as indicators of financial health. The risk of financial distress is likely to be relatively low for cash-rich profitable firms. Under the static trade-off theory this would increase the optimal debt ratio, i.e. these firms are more likely to choose debt than equity for incremental financing. Moreover, under the static trade-off theory a higher debt ratio would control any potential agency conflicts resulting from ample liquidity or cash flow within the firm (Jensen, 1986). As a result, under the static trade-off theory the expected signs of both liquidity and profitability as to the probability of using internal finance, bank loans or bonds are opposite to the expected signs under the pecking-order theory.

Firm *size* also has opposite interpretations under both theories. Large firms are expected to acquire external finance at lower cost. First, because larger firms are better known by market participants thus limiting the asymmetry of information between insiders and outsiders, and second, because flotation cost of public issues are relatively less burdensome for large firms. Accordingly, under the pecking-order theory, firm size is expected to be positively correlated with the probability that firms attract external finance and negatively correlated with the probability that firms use internal finance. The sign of the correlation for bank loans is at forehand uncertain, however, because larger firms may be less bank dependent and have easier access to public capital markets compared to smaller firms. Alternatively, firm size

Theory	Proxy	Expected sign			
Pecking order		Internal finance	Bank loans	Bonds	Shares
Preference for internal finance	Profitability	+	–	–	–
	Liquidity	+	–	–	–
Asymmetric information	Size	–	±	+	+
Flotation cost	Size	.	.	+	+
Issuance timing	Stock price run-up	.	.	.	+
Static trade-off					
Debt tax shields	Interest payments	+	–	–	+
Non-debt tax shields	Depreciation	+	–	–	+
Growth potential	Depreciation	.	–	+	.
Risk of financial distress	Profitability	–	+	+	–
	Liquidity	–	+	+	–
	Interest payments	+	–	±	+
Capital structure targeting	Deviation from target	+	–	–	+
	Stock price run-up	–	+	+	–
Business risk	Size	–	+	+	–
Issuance spreading	Previous financing	.	.	+	+

Table 2: Proxy variables and expected influence under alternative theories; -/+ indicates a negative/positive expected correlation of the proxy variable with the probability of choosing a particular financing source; a dot indicates that the particular theory yields no prediction.

can be a proxy for business risk since large firms have better diversification possibilities. It follows that larger firms are less risky and therefore can have higher optimal debt ratios. In that case firm size is expected to be positively correlated with the probabilities of both bank borrowing and bond issuance, while negatively correlated with internal finance and share issuance.

Lucas and McDonald (1990) find that firms with undervalued stock tend to delay issuing equity until their stock prices have risen to 'fair' values. This stylized fact contrasts sharply with the static trade-off theory. Indeed, if firms keep to their optimal capital structures they should off-set stock price effects on capital structures by issuing equity after share price declines, and issuing debt or repurchase equity after share price increases. The finding of Lucas and McDonald (1990) is in line with the pecking-order theory though, since increases in the stock price reduces the relative cost of issuing public equity. We thus include the variable *stock price run-up*, defined as the percentage change of a firm's stock price during the previous year, to control for these stock price effects.

Under the static trade-off theory tax shields affect the choice of financing type (see e.g. DeAngelo and Masulis, 1980). We include in our empirical model both a debt tax shield, *interest payments*, and a non-debt tax shield, *depreciation*, both scaled with total assets. If a firm has a large debt service due to previously accumulated private debt, it is less likely to attract additional debt (see e.g. MacKie-Mason, 1990). Interest payments are thus expected to enter the bank loan and bond equation with a negative sign, and with a positive sign in the internal finance and share equation. Interpreting a high debt service as a proxy for the risk of financial distress leads to almost the same prediction. In that case the effect on the probability of issuing bonds is at forehand undetermined. On the one hand firms are less likely to issue additional bonds the higher are current interest payments, suggesting a negative coefficient for the debt tax shield variable in the bond equation. On the other hand, firms that have used up most or all of their bank debt capacity might move on towards the bond market. In that case the coefficient is expected to be positive rather than negative.

The non-debt tax shield variable depreciation is expected to enter the shares equation with a positive coefficient, and with a negative coefficient in both the bonds and bank debt equations. Indeed, the larger is the non-debt tax shield, the lower is the probability that additional debt could enlarge the tax shield much further.

Depreciation is also used in the literature as a proxy for growth opportunities (Barclay and Smith, 1995). In particular, firms with higher depreciation ratios have relatively more tangible assets and thus relatively fewer growth options in their investment opportunity set. Indeed, according to Krish-

naswami et al. (1999) there is an inverse relation between the depreciation ratio and the proportion of debt that is privately placed. Hence, under this interpretation the depreciation rate may enter the bond equation with a positive sign (and the bank loan equation with a negative sign). As for internal finance and share issues the theory yields no prediction.

As mentioned in the Introduction, the static trade-off theory holds that firms have target debt ratios that they constantly try to reach and/or maintain. These targets depend on tax structures, bankruptcy risks and agency costs. If some shock drives a firm away from its target capital structure, it will adapt its issuance behaviour so as to return to its target again. We thus need to include *deviations from target capital structures* into our empirical model.

Since we only observe actual capital structures, target capital structures have to be approximated. In the literature two groups of approximations have been put forward. The first considers long-term average debt ratios, either at the firm level or at the industry level (see e.g. Marsh, 1982). In the latter case firms within the same industry are assumed to have identical target capital structures. Differences between actual debt ratios and target debt ratios are then considered as deviations from target capital structures. The second approach assumes that target debt ratios can be approximated by regressing the debt ratio on a set of observable firm-level variables (see Hovakimian, Titman and Opler, 2001). According to this methodology the residuals from such a regression can be interpreted as deviations from the target capital structure.

We have constructed deviations from target capital structures using both methods (Appendix B). Although market values of capital structures are theoretically considered to be more relevant than book values, the latter are often used (see e.g. de Jong and Veld, 2001). We consider both market and book values for firm's debt ratios. Further, we include either firm or industry dummies in the Hovakimian-Titman-Opler type regression. Hence, we construct eight different measures for the deviation from the target capital structure. It appears however that using any of these measures yields quite comparable results, as shown in Table 11 of Appendix B. Appendix B gives our reasons for using the residuals from the Hovakimian-Titman-Opler regression with industry dummies and market values for the debt-equity ratio as our preferred deviation measure.

The deviation from the target capital structure is defined as the actual debt ratio minus the target debt ratio. If it is positive and firms adjust their incremental financing decisions so as to return to their target capital structures, as the static trade-off theory predicts, it is to be expected that firms will sooner issue shares and/or retain earnings than that they will take

	Internal finance	Bank loans	Shares	Bonds
Liquidity	0.16	0.05	0.06	0.07
	(0.13)	(0.03)	(0.03)	(0.05)
Profitability	0.13	0.09	0.07	0.09
	(0.14)	(0.09)	(0.08)	(0.10)
Size	12.40	12.25	13.31	15.65
	(12.49)	(12.15)	(13.13)	(15.82)
Previous financing	0.23	0.40	0.39	0.67
	(0)	(0)	(0)	(1)
Depreciation	0.05	0.04	0.06	0.06
	(0.05)	(0.04)	(0.05)	(0.06)
Interest payments	0.02	0.02	0.03	0.03
	(0.01)	(0.02)	(0.03)	(0.03)
Deviations from target	-0.01	0.02	0.00	-0.00
	(-0.02)	(0.02)	(0.00)	(-0.01)
Stock price run-up	0.25	0.12	0.31	0.22
	(0.19)	(0.06)	(0.24)	(0.13)

Table 3: Firm characteristics by financing type; mean values of proxies with median values within parentheses.

on more bank or public debt.

Finally, firms may spread their financing issues over a period of more than one year. This behaviour is captured by a *previous financing* dummy that equals 1 if a firm raised funds externally in the previous year, and 0 otherwise. If firms raise excess funds to avoid future issuing cost the previous financing dummy would be negatively correlated with all external funding measures. On the other hand, a positive sign could indicate a 'learning effect'; firms that have a positive experience as to attracting external funds may be more inclined to acquire external finance. A positive coefficient could also indicate that external financing needs are correlated from one year to the next, as suggested by Helwege and Liang (1996).

Table 3 gives the mean and median values of the proxy variables for our sample, split up according to the choice of financing. From these summary statistics some tentative inferences can be made. Bank loans are used by smaller firms while bond issuers are typically large. Firms financing internally are relatively profitable and have substantial financial slack at their disposal. Bond issuers have a recent track record on the issuance market, while internal funders visit the capital market less often. Finally, firms issuing shares often

experienced a recent rise of their stock prices.

4 What drives incremental financing choices?

Table 4 presents the estimation results for a multinomial logit model explaining financing choices. For ease of interpretation, the marginal effects are given, being the partial derivatives of the probabilities evaluated at the respective means of the explanatory variables. From an econometric point of view these estimates are quite satisfactory, considering in particular the percentage of correct predictions and the goodness-of-fit measure. Generally speaking the estimates confirm the pecking order theory as well as some aspects of the static trade-off theory.[6]

Both liquidity and profitability are strongly and positively correlated with the probability of using internal finance, while they are negatively correlated with the probability of attracting any type of external finance. Although the latter correlations are weaker in a statistical sense, notably for bonds, these findings are in line with the pecking-order theory. Indeed, the greater is the availability of internal funds, the higher is the probability that these funds are used and the lower is the probability that external funds are needed. The outcomes contradict the static trade-off theory, which predicts that a lot of free cash should increase the probability of taking on more debt. In contrast to De Jong and Veld (2001) we find a significantly negative effect of liquidity and cash flow on the probability of issuing shares.

At the same time the effects of the two tax shield variables, when statistically significant, confirm the static-trade-off theory. Indeed, the more these shields are already used, the less likely it is that additional bank loans are attracted, and the more likely it is that shares are issued and/or internal finance is used. On the other hand, the bonds equation suggests that firms use up first their bank debt capacity before they move on to the bond market. The empirical relations between the tax shield variables and the probability that firms issue bonds are not statistically significant however.

The same applies to the previous financing dummy. Although the positive sign of all estimated marginal effects suggests that there is some learning effect, the correlations are never statistically significant.

The marginal effects of firm size indicate that larger firms issue more on the public capital market, whereas smaller firms borrow more from banks.

[6] We also experimented with a model for the choice between internal and external finance, and another model for the choice between external financing types only. These results were broadly consistent with those presented here (see de Haan and Hinloopen, 1999).

	Marginal effects			
	Internal finance	Bank loans	Bonds	Shares
Intercept	-0.20	0.75**	-0.22*	-0.33**
	(1.07)	(3.61)	(1.86)	(2.54)
Liquidity_{t-1}	3.17**	-2.76**	-0.06	-0.35*
	(8.13)	(4.00)	(0.94)	(1.76)
$\text{Profitability}_{t-1}$	1.13*	-0.27	-0.11	-0.75**
	(2.14)	(0.64)	(1.23)	(2.66)
Previous financing	-0.06	0.03	0.01	0.01
	(1.18)	(0.81)	(1.54)	(0.58)
Size_{t-1}	-0.01	-0.02*	0.01*	0.02**
	(0.99)	(1.85)	(1.85)	(2.50)
$\text{Depreciation}_{t-1}$	1.89*	-2.82**	0.25	0.68*
	(2.04)	(2.88)	(1.59)	(1.92)
$\text{Interest payments}_{t-1}$	4.32**	-4.97**	0.05	0.60
	(2.36)	(2.69)	(0.19)	(0.88)
Stockprice run-up	0.04	-0.10*	0.01	0.06*
	(0.77)	(2.19)	(1.01)	(2.29)
$\text{Deviation from target}_{t-1}$	-1.70**	1.45**	0.06	0.19*
	(5.45)	(4.14)	(1.16)	(1.75)
% correct	84.42%	67.38%	52.38%	32.14%
Log likelihood	-437.87			
Pseudo-R^2	0.36			
% correct (total)	72.73%			
Number of observations	638			

Table 4: Multinomial logit regression results with categories defined as: 0 = internal finance, 1 = bank loans, 2 = bonds, and 3 = shares; Absolute t-statistic values within parentheses; * indicates statistical significance at five percent; ** indicates statistical significance at one percent; Marginal effects are based on the mean values of the explanatory variables.

The signs of the effects of size are in accordance with the pecking order theory, although the effect on internal finance is not statistically significant. Only the entry of the size variable in the bond equation is in line with the static trade-off theory.

Recent stock price run-ups add to the probability that shares are issued to finance incremental investments. At the same time it lowers the probability that additional bank loans are contracted. These findings are in accordance with the pecking order theory but contradict the static trade-off theory. Stock price run-ups appear not to significantly influence the probability that either internal financing or bonds are used to attract funds.

A direct test for the static trade-off theory is the inclusion of the deviation from target variable. In Table 4 the residuals from the Hovakimian-Titman-Opler type regression with industry dummies and market values for debt ratios are used as the deviation measure (see Appendix B). The signs of the estimated marginal probabilities suggests that the static trade-off theory holds partially. A positive deviation from the target debt ratio indeed enhances the probability that firms issue shares. However, it is even more likely that in this case firms contract bank loans, as implied by the larger marginal effect (1.45 versus 0.19), a result at odds with the static trade-off theory since it would increase the debt ratio even more (and hence the deviation from the target). Moreover, a positive deviation from target decreases instead of increases the probability of internal finance. Note that these findings do not hinge heavily on the choice as to which of the eight different measures for the deviation from target is being used (see Table 11 in Appendix B).

Summarizing, our findings confirm the importance of including internal finance and bank loans into the set of possible financing types. Marginal effects appear to be relative large in both the bank loan equation and the internal financing equation. Our results are also in line with a number of related contributions (e.g. Hovakimiam *et al.*, 2001, Bontempi, 2002) in that empirical support is found for both the static trade-off theory and the pecking order theory. However, the latter gives a specific prediction as to the preference hierarchy of financing types. It is to the further examination of this financing hierarchy issue we turn in the next section.

5 Is there a financing hierarchy?

Although the multinomial logit estimate presented in Section 4 provides valuable information as to the determinants of firms' incremental financing choices, it does not capture all information potentially present in the data. In particular it does not test for the presence of a most preferred hierarchy

Hierarchy	Internal finance	Bank loans	Bonds	Shares	ln(likelihood)	Rank at 1%	Rank at 5%
h_1	0	1	2	3	-541.36	2	2
h_2	0	1	3	2	-534.12	1	1
h_3	0	2	1	3	-555.00	3	5
h_4	0	2	3	1	-552.72	3	4
h_5	0	3	1	2	-540.79	2	2
h_6	0	3	2	1	-543.43	2	3
h_7	1	0	2	3	-603.18	5	7
h_8	1	2	3	0	-649.51	8	10
h_9	1	3	2	0	-627.58	7	9
h_{10}	1	0	3	2	-586.63	4	6
h_{11}	1	2	0	3	-621.87	6	8
h_{12}	1	3	0	2	-585.11	4	6

Table 5: Hierarchies and their ranking according to their likelihood. Significance levels for the rankings are for the Likelihood Ratio test.

of financing types as suggested by the pecking order theory. In this section we test whether or not there is such a hierarchy.

To that end an ordered probit model is estimated using the same set of variables as in the multinomial logit regression. The main feature of the *ordered* probit model is that the coding of the financing choices imposes a specific ordering for the respective choices. For example, coding the different financing types $\{\mathsf{internal\ finance}, \mathsf{bank\ loans}, \mathsf{bonds}, \mathsf{shares}\}$ with the ordinal discretes $\{0, 1, 2, 3\}$ actually *imposes* the pecking order hierarchy when estimating the model. Our research strategy is to estimate ordered probit models for all conceivable hierarchies. These can then be compared by means of a likelihood-ratio test (LR) thus revealing the hierarchy that fits best the data. In principle this leaves us with $4! = 24$ different ordered probit estimates and $\mathsf{bd} \times 24 \times 23 = 276$ bilateral likelihood comparisons. However, every potential ordering has a twin ordering that yields coefficient estimates of equal magnitude but with opposite sign. Yet, the likelihood values are identical. This twin ordering is the unique ordering that has a perfect inverse correlation with the original ordering. For example, the ordering $\{0, 1, 2, 3\}$ has a correlation of -1 with, and only with, ordering $\{3, 2, 1, 0\}$. Accordingly, we only have to consider 12 ordered probit estimates and $\mathsf{bd} \times 12 \times 11 = 66$ bilateral likelihood comparisons to determine which hierarchy fits the data

	h_2	h_5	h_1	h_6	h_4	h_3
h_2	0.00					
h_5	13.34	0.00				
h_1	14.49	1.15	0.00			
h_6	18.63	5.29	4.14	0.00		
h_4	37.21	23.87	22.72	18.58	0.00	
h_3	41.76	28.41	27.27	23.13	4.54	0.00
h_{12}	101.98	88.64	87.49	83.35	64.77	60.22
h_{10}	105.02	91.68	90.53	86.39	67.81	63.26
h_7	138.13	124.79	123.64	119.50	100.92	96.38
h_{11}	175.51	162.17	161.02	156.88	138.30	133.76
h_9	186.93	173.59	172.44	168.30	149.72	145.17
h_8	230.79	217.45	216.30	212.16	193.58	189.03
	h_{12}	h_{10}	h_7	h_{11}	h_9	h_8
h_{12}	0.00					
h_{10}	3.04	0.00				
h_7	36.15	33.11	0.00			
h_{11}	73.53	70.49	37.38	0.00		
h_9	84.95	81.91	48.80	11.42	0.00	
h_8	128.81	125.77	92.66	55.28	43.86	0.00

Table 6: Likelihood ratio test results; Signifance values at the 5 and 1 percent level respectively are 3.84 and 6.63.

best.[7]

In Table 6 the outcomes of all 66 pairwise LR-tests are reported. The hierarchies in the colums and rows are sorted by their likelihood values, from lowest to highest. The LR-tests are computed as $-2[\ln(\text{likelihood}_{\text{col}}) - \ln(\text{likelihood}_{\text{row}})]$. Significance values at the five and one percent level are 3.84 and 6.63, respectively. For both significance levels the resulting rankings of the twelve hierarchies are included in the last two colums of Table 5.

The results of the ordered probit analysis prompts two observations. First, firms appear to have an ordered preference for financing types. If not, all hierarchies would not differ from each other in a statistical sense.

[7]The number of comparisons could be limited further if likelihood comparisons were transitory. In that case we would only have to sort the 12 preference hierarchies by their concomitant likelihood value and make 11 bilateral comparisons. However, if according to the LR test hierarchy 1 does not differ from hierarchy 2 in a statistical sense, and hierarchy 2 does not differ from hierarchy 3 according to the same test, this does *not* imply that hierarchy 1 does not differ from hierarchy 3. Hence, the 11 bilateral comparisons between sorted hierarchies are not conclusive.

According to Table 6 this only holds for two pairs of hierarchies at the five percent significance level, being $\{h_1, h_5\}$ and $\{h_{10}, h_{12}\}$, and for an additional three pairs of hierarchies at the one percent significance level, being $\{h_1, h_6\}$, $\{h_3, h_4\}$ and $\{h_5, h_6\}$.

Second, firms have a *unique most preferred* hierarchy that is very close to the pecking order hierarchy. In particular, when deciding on the incremental financing type, firms prefer internal finance over bank loans, bank loans over shares, and shares over bonds (i.e. h_2). The only difference with the pecking order hierarchy (h_1), which shares the second place in the hierarchies ranking, is that the order of preference for shares and bonds is reversed. This could well be attributable to the fact that the bond market in the Netherlands is relatively underdeveloped. Indeed, as documented by Esho *et al.* (2001), firms that are located in countries with highly developed bond markets have a higher probability of issuing bonds to fulfill their financing needs.

We conclude this section with the ordered probit regression that yields the most preferred hierarchy (h_2). The estimation results are given in Table 7. Note that all coefficients are significant in a statistical sense except for the tax shield variables and the stock price run-up. The three threshold parameters are also highly significant.[8]

6 Conclusion

We analyse the determinants of the incremental financing choice for some 150 Dutch nonfinancial companies that are quoted on the Amsterdam Exchanges, for the years 1984 through 1997. We thereby distinguish a broader range of financing types than is usual in the literature: internal finance, bank borrowing, bond and share issues. The inclusion of both internal finance and bank borrowing is especially relevant for the case of the Netherlands where bank loans are the most important source of external finance and where internal finance is the most important source of finance in general. This is confirmed by our estimation results in the sense that the internal finance and bank loan equations perform quite well from an econometric point of view. The estimation results indicate that the static trade-off theory and the pecking order theory are both of empirical importance in explaining the financial choices of our sample of companies, although not all aspects of both theories are confirmed.

[8] To the best of our knowledge there does not exist a procedure to test directly a multinomial logit model versus an ordered probit model. We therefore refrain from an in-depth comparison of the results in Table 7 and Table 4.

	Coefficient estimates
Intercept	-2.19**
	(6.11)
Liquidity_{t-1}	-5.67**
	(8.88)
$\text{Profitability}_{t-1}$	-3.99**
	(4.27)
Previous financing	0.33**
	(2.95)
Size_{t-1}	0.22**
	(8.82)
$\text{Depreciation}_{t-1}$	1.89
	(1.12)
$\text{Interest payments}_{t-1}$	-0.49
	(0.10)
Stock price run-up	0.14
	(1.38)
$\text{Deviation from target}_{t-1}$	2.79**
	(5.11)
Threshold value 1	2.19**
	(6.06)
Threshold value 2	3.44**
	(9.21)
Threshold value 3	4.10**
	(10.39)
% correct (total)	63.64%
Log likelihood	-534.12
Pseudo-R^2	0.22
Number of observations	638

Table 7: Ordered probit regression results for the most preferred hierarchy (number 2); categories are defined as: 0 = internal finance, 1 = bank loans, 2 = shares, and 3 = bonds; Absolute values t-statistic within parentheses; * indicates statistical significance at five percent; ** indicates statistical significance at one percent.

We then introduce a new methodology to specifically test whether a preferred hierarchy as to the type of incremental financing exists. In particular we estimate ordered probit models for all possible financing hierarchies and compare these by means of a likelihood ratio test. This procedure yields a ranking of financing hierarchies in terms of the best fit to the data. The resulting ranking shows that the most preferred hierarchy is very close to that predicted by the pecking-order theory: Dutch firms prefer internal finance over external finance, and among the external financing types they prefer bank loans over shares, and shares over bonds. Indeed, the only difference with the pecking-order hierarchy is that the preference order for shares and bonds is reversed. This low preference of Dutch firms for bonds could well be attributable to the relatively low level of development of the Dutch bond market.

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7 Appendix A Sample and variable construction

The industry composition of the sample is given in Table 8.

The model variables are defined in Table 9.

8 Appendix B Deviations from target capital structures

We consider two types of proxies for deviations from target capital structures. The first is the difference between actual debt ratios and the historical average

Industry	**Number of firms**	**Fraction**
Metal	30	19.6
Wholesale trade	25	16.3
Other manufacturing	20	13.1
Construction	18	11.8
Services	16	10.5
Chemicals	12	7.8
Transport	9	5.9
Food	8	5.2
Retail trade	7	4.6
Multinationals	5	3.3
Other trade	3	2.0
Total	153	100.0

Table 8: Sample classified according to SIC 2-digit industry codes

Variable	**Definition**
Discrete choice variables	(coded 0, 1, 2, or 3)
Internal finance	If retention of current earnings > 5% total assets, and/or net depletion of cash holdings > 5% of total assets
Bank borrowing	If net increase outstanding Financial Debt > 5% of total assets
Bond issue	If any bonds were issued during the year
Share issue	If any shares were issued during the year
Explanatory variables	
Liquidity	Liquid Assets / Total Assets
Previous financing	= 1 if external funds were acquired in previous year, 0 otherwise
Size	Logarithm of Total Assets
Profitability	Earnings / Total Assets
Depreciation	Depreciation / Total Assets
Interest payments	Interest payments / Total Assets
Deviations from target	Residuals from auxiliary regression (see Appendix B)
Stock price run up	Percentage change stock price during previous year

Table 9: Variable definitions

debt ratio, where the latter is computed either at the firm or the industry level. This procedure yields four different approximations for the deviation from target capital structures, since we compute debt ratios both in book values and market values.

The second type of proxy is the residual from a linear regression explaining firms' debt ratios, measured either in book value or market value,[9] and including either firm or industry dummies. In addition to these dummies we have included typical static trade-off theoretical proxy variables for the riskiness of firms (see e.g. Cools, 1993, or Hovakimian *et al.* 2001): (i) unlevered beta, a stock market measure of business risk,[10] (ii) the log of total assets, inversely related to business risk, and (iii) the share of tangible assets in total assets, again inversely related to business risk.[11] Both the log of assets and the share of tangible assets are expected to be positively correlated with the debt ratio while a negative correlation is expected for the unlevered beta. The residuals from these regressions are used as proxy variables for the deviations from target debt ratios. This second procedure also yields four proxies for the deviation from target capital structures.

In Table 10 the regression results are reported, based on a panel of 153 firms spanning the years 1984 through 1997. All variables have the expected sign and are statistically significant at the one percent level. Indeed, based on these results we are confident enough to treat the concomitant residuals as deviations from the target capital structure and to include these in our model of firm's choice of financing type.

Having constructed eight different approximations for the deviation from the target capital structure, the final step involves the choice as to the proxy to be included in our model. It appears that all deviations are of comparable magnitude and for most sample years the majority of the median deviations is of equal sign. One would thus expect that econometrically it will not make much of a difference which proxy for the deviation from target is used. This expectation is confirmed in Table 11, where the marginal effects for all eight deviation variables are singled out from the corresponding multinomial logit regressions, in which the other (not reported) explanatory variables are

[9] The market value of assets equals the market value of debt plus the market value of equity. The latter equals the number of shares times the share price. We assume the market value and book value of debt to be identical.

[10] The unlevered beta is based on monthly return rates of firms' individual shares and of the AEX index, averaged over a 5-year period.

[11] Initially we included the depreciation ratio and the market-to-book ratio as well (see de Haan and Hinloopen, 1999). The former appeared not to be statistically significant while the latter is suspicious to yield spurious correlations. Accordingly these variables are left out.

	Market values		Book values	
Intercept	0.39**	-0.21**	0.48**	0.20**
	(5.8)	(6.7)	(6.7)	(6.1)
Unlevered beta	-1.56**	-0.19**	-0.56**	-0.13**
	(12.8)	(12.6)	(4.4)	(8.7)
Log of assets	0.03**	0.03**	0.03**	0.03**
	(7.0)	(14.5)	(6.1)	(14.2)
Tangible assets/assets	0.45**	0.43**	0.11**	0.06**
	(26.6)	(30.4)	(4.2)	(8.4)
Year dummy[a]	18.0**	13.3**	6.6**	3.3**
Industry dummy[a]		70.6**		28.0**
Firm dummy[a]	31.8**		21.6**	
$\overline{R}^2$	0.86	0.61	0.66	0.19
# obs.	1,772	1,772	1,888	1,888

Table 10: Regression results static trade-off model; absolute value t-statistics in parentheses; * statistically significant at 5 percent; ** statistically significant at 1 percent; [a] F-values for joint significance of all dummies are reported.

identical to those used in Section 4.

Our choice of proxy is thus to be determined by economic considerations. First, there is no reason to assume that a capital structure target is constant over time. It is therefore that in most recent related empirical contributions the residual from a Hovakimian-Titman-Opler type of regression is used rather than deviations from long-term averages of debt ratios (see, e.g. de Jong and Veld, 2001). Second, according to the static trade-off theory, capital structures should be measured in market values rather than book values (Modigliani and Miller, 1958). Finally, including industry dummies in the regression (like Hovakimian-Titman-Opler, 2001) allow for structural deviations from industry-wide capital structure targets to be captured in the residual, while firm dummies would swallow these up. This could mean that if a firm moves towards its target this will be interpreted as a move from its target.[12] Accordingly, in the empirical part of Section 4 and 5 we use as proxy for the deviation from target capital structures the residuals from the Hovakimian-Titman-Opler regression with industry dummies and where the debt ratio is measured in market values.

[12]This problem with firm dummies was brought to our attention by an anonymous referee.

	Marginal effects			
Deviations	Internal finance	Bank loans	Bonds	Shares
Residuals debt ratio equation, market values, firm dummies	-1.64** (3.96)	1.75** (4.02)	-0.04 (0.69)	-0.07 (0.55)
Residuals debt ratio equation, market values, industry dummies	-1.70** (5.45)	1.45** (4.14)	0.06 (1.16)	0.19 (1.75)
Residuals debt ratio equation, book values, firm dummies	-1.86** (4.64)	1.97** (4.28)	-0.06 (1.00)	-0.06 (0.49)
Residuals debt ratio equation, book values, industry dummies	-1.28** (4.82)	1.35** (3.92)	-0.05 (1.15)	-0.01 (0.09)
Deviations from historical average debt ratio, market values, per firm	-1.31** (4.47)	1.36** (4.13)	-0.08 (0.21)	-0.05 (0.51)
Deviations from historical average debt ratio, book values, per firm	-2.09** (5.04)	2.02** (4.47)	-0.06 (0.93)	0.14 (1.09)
Deviations from industry average debt ratio, market values, per year	-1.86** (5.99)	1.58** (4.81)	0.08 (1.67)	0.19* (2.10)
Deviations from industry average debt ratio, book values, per year	-1.32** (4.99)	1.28** (4.13)	-0.06 (1.18)	0.10 (1.05)

Table 11: Multinomial logit regression results for alternative measures for deviations from target debt ratios, with categories defined as: 0 = internal finance, 1 = bank loans, 2 = bonds, and 3 = shares; Absolute values t-statistic within parentheses; * indicates statistical significance at five percent; ** indicates statistical significance at one percent; Marginal effects are based on the mean values of the explanatory variables.