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The Choice Between Equity and Debt: An Empirical Study

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ABSTRACT

This empirical study of security issues by UK companies between 1959 and 1974 focuses on how companies select between financing instruments at a given point in time. It throws light on a number of interesting questions. First, it demonstrates that companies are heavily influenced by market conditions and the past history of security prices in choosing between debt and equity. Second, it provides evidence that companies appear to make their choice of financing instrument as if they have target levels of debt in mind. Finally, the results are consistent with the notion that these target debt levels are themselves a function of company size, bankruptcy risk, and asset composition.

AN IMPORTANT QUESTION FACING companies in need of new finance is whether to raise debt or equity. In spite of the continuing theoretical debate on capital structure, there is relatively little empirical evidence on how companies actually select between financing instruments at a given point in time. Furthermore, almost none of the existing empirical evidence is based on British data. Sametz's [31] comment that "we know very little about how the great non-routine financial decisions are made" is still no understatement.

In this paper, we develop a descriptive model of the choice between equity and long term debt. The coefficients of the model are estimated using logit analysis applied to a sample of 748 issues of equity and debt made by UK companies over the period 1959–70. The predictive ability of the model is tested on a holdout sample of 110 equity and debt issues made between 1971 and 1974.

The study throws some light on a number of interesting questions such as whether companies behave as though they have target debt ratios; whether they have similar targets for the composition of their debt; whether market conditions or the company's historical share price performance affects their choice of instrument; and whether debt ratios or the choice of financing instrument are influenced by other factors such as operating risk, company size, the composition of the company's assets, and the rate at which retentions are generated. The study also provides a direct answer to the following question: given that we know that a company is in need of new long term or permanent capital, how accurately can we predict whether the company will issue equity or debt.

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I. Theoretical Background

In principal, companies needing new finance should issue equity if they are above their target debt level and debt if they are below. With no flotation costs, such adjustments could be made instantaneously and continuously. In practice however, the existence of significant flotation costs means that companies should plan issues to minimize both flotation costs and the costs of deviating from their target ratio. This gives rise to infrequent "lumpy" issues, with debt ratios over time fluctuating around their target.[1] Clearly, in any empirical work, it is important to identify what this target level is. However, since it is unobservable, we can do this only by looking at past behavior or by turning to the theory of capital structure for help.

Unfortunately the theory provides only limited guidance. More than twenty years after Modigliani and Miller's [26] original article, the theoretical debate is still centered on the most fundamental of issues. There are, nevertheless, two points of broad agreement. First, in spite of fundamental differences about the way in which it is important, virtually everyone stresses the importance of tax.[2] Second, most people would accept that managers are likely to set debt levels with due regard to the expected costs of bankruptcy and financial distress.[3] The implications for target debt levels and hence issue behavior are clear. First, any overall change in tax levels could cause issuing companies to shift their preferences towards either debt or equity. This will be true regardless of whether this is a temporary effect lasting only until equilibrium is restored (see Miller [25]), or whether it represents a permanent shift in companies' target ratios.[4] Second, target debt levels will be influenced by the probability of financial distress. Since the latter is a function of both operating and financial risk, it seems reasonable to expect companies with high operating risk to use less debt.

Given the incomplete and somewhat unsatisfactory state of the theory, little more can be said on the overall debt ratio. It is possible, however, to gain some insights into the split between long and short term debt. This is important since

[1] This also means that when planning their issues, companies should consider future as well as current debt ratios. For example, if companies are looking at book value debt ratios, these will change during the interissue period because of retentions and bank loans. Clearly such factors should be taken into consideration during the issue planning process.

[2] The traditional view is that there are tax advantages to debt, but that beyond a certain level, these are counterbalanced by costs associated with bankruptcy and financial distress (see Modigliani and Miller [26] and [27], Baxter [3] etc.). There has, however, been considerable debate over the size and nature of the tax advantage (see, for example, Farrar and Selwyn [15]), with Miller [25] arguing that it is zero. He claims that, in equilibrium, while there is an optimal debt level for the corporate sector as a whole, one debt level will be as good as another at the level of the individual firm.

[3] There has been considerable debate about the magnitude and importance of these costs (see Warner [46] and Miller [25]), and on whether it is managers or shareholders who "chicken out first" (see Myers and Pogue [29]). It is now clear, however, that the costs of financial distress embrace a whole range of agency costs associated with debt finance (see, for example, Jensen and Meckling [19]).

[4] The traditional view suggests that there would be a permanent shift. Miller [25], however, argues that if the change in tax rates alters the optimal debt ratio for the corporate sector as a whole, this will simply induce firms to alter their gearing until equilibrium is restored. Once this has taken place it will again be true that, ex ante, one debt ratio will be as good as another at the level of the individual firm.

the current study focuses on long term finance. First, we would expect to find small companies relying on bank loans rather than long term debt because of flotation costs and problems of access to capital markets. Second, it has been asserted that firms tend to match the maturity of their assets and liabilities (see Van Horne [45] for the traditional explanation and Myers [28] for a more satisfactory general view). We would therefore expect to find long term debt associated with fixed assets and short term debt with current assets.[5] Finally, Brealey and Schaefer [9] have argued that uncertainty about future inflation rates should make companies shun long term fixed interest rate debt, and rely instead on short term or variable rate debt.[6]

In summary, a company's choice of financing instrument will depend on the difference between its current and target debt ratios. Since target ratios are unobservable, we need to concern ourselves with their likely determinants. Theory predicts that the overall target will be a function of bankruptcy risk and tax, and that the composition of debt will depend on the company's size, asset composition, and on uncertainty about future inflation rates.

Finally, our discussion of the theory has made no mention of short term timing considerations such as market conditions or the recent history of security prices. Indeed modern financial theory suggests that in an efficient market, such factors should be largely irrelevant to both issue timing and the choice of security[7] (see Marsh [22]). In spite of this, timing considerations are regarded as being extremely important by both companies and their financial advisers (see, for example, Bodenhammer [5]). In particular, equity issues seem to be favored after periods of strong share price and overall market performance. Whether this reflects a disbelief in market efficiency or a curious notion of the nature of the cost of equity on the part of managers, it is clear that such factors cannot be ignored if we are seeking to explain issue behavior.

II. Previous Studies

Three previous studies, all American, have looked directly at the debt/equity choice. Baxter and Cragg [4] analyzed 230 security issues[8] made in 1950–65 using logit and probit analysis. Martin and Scott [24] used multiple discriminant analysis (MDA) to examine 112 issues made in 1971. Finally, Taub [42] used logit

[5] Myers [28] argues that the fundamental problem is that bondholders experience difficulty in protecting themselves against the discretionary nature of investment opportunities which expire before the debt matures. We should therefore tend to find, for example, very little debt at all associated with future investment and growth opportunities.

[6] And presumably equity, although this was not included in their model.

[7] Changes in security prices will alter debt/equity ratios as measured in market value terms and might well, therefore, affect issue behavior. Unfortunately, however, this makes observed behavior even more puzzling, since equity is generally raised after share price rises, or precisely at those times when one would normally have expected debt capacity to have increased.

[8] Baxter and Cragg [4] did not restrict their study to the choice between debt and equity issues, but looked in addition at other types of security. Their sample consisted of 131 debt, 33 equity, 38 convertible, 5 preference, and 23 combined issues. In fact, the parts of their models dealing with convertibles, preferred and combined issues are far from conclusive, partly because of the small sample sizes, but also because each of the groups tended to exhibit characteristics which were intermediate between debt and equity.

analysis to examine 172 issues made in 1960–69. Of these studies, the framework used by Taub comes closest to the model of choice outlined in the previous section.

In all three studies, the explanatory variables were selected partly on prior grounds and partly by trial and error. Baxter and Cragg's final model, for example, contained 11 independent variables, but at least 79 others were examined. While "data-mining" is understandable, it makes the results difficult to interpret unless clear evidence is presented on the resultant model's stability and predictive power. None of the studies are very satisfactory in this respect. Taub presents no evidence at all, and Baxter and Cragg report only the "pseudo" R-squared for their fitted model. Martin and Scott, on the other hand, report more fully, claiming that their model correctly classified 75% of their original sample, and 77% of a holdout sample of 58 issues made in the following year.[9] In fact, however, their model was based on the six variables from the original 23 which displayed "the best predictive accuracy when applied to the holdout sample." Its high "predictive" ability is thus neither surprising nor, unfortunately, informative.[10] Finally, in all three studies many of the independent variables were highly collinear so that the results are often difficult to interpret.[11]

In spite of these problems the studies provide useful information. In particular, all three indicate that companies which are small, which have high P/E ratios, and which have high gearing[12] are more likely to issue equity. While the P/E effect may indicate that managers, like the authors of these three studies[13] equate earnings yield with the cost of equity, there could be other explanations. For example, managers may be timing issues to coincide with a high level of their share price either because of a disbelief in market efficiency, or because they feel it is easier to approach shareholders for new money when the company's shares are "in favor" (see Bodenhammer [5] and Marsh [22]). In any event, the P/E ratio is thus probably best regarded as a timing variable, picking up the tendency for equity issues to follow periods of strong share price performance. While all three studies also examined coverage ratios and risk,[14] the evidence was weak, conflicting, and nowhere significant.

[9] The Type I and Type II errors (incorrectly classifying debt issues as equity and vice versa respectively) were 21% and 30% of the original sample, and 24% and 20% for the holdout sample.

[10] It is tempting to relabel the original sample as the holdout sample and vice versa, and reinterpret the results accordingly. This would be valid, however, only if Martin and Scott [24] selected their model with no regard to its performance over what they label as the original sample.

[11] Baxter and Cragg [4], for example, employ four very closely related gearing variables, and two very similarly defined variables purporting to measure the relative costs of debt and equity. They found that five of their eleven variables had the "wrong" sign, that signs were inconsistent between models, and that pairs of related variables had conflicting signs.

[12] In fact, the evidence on gearing was surprisingly weak. The coefficient in Taub's [42] model had the correct sign but was never significant. Baxter and Cragg [4] found contradictory evidence when they defined gearing using market rather than book values for equity. Possibly this may be because the equity capitalization was acting as a proxy for the timing variable.

[13] While Martin and Scott [24] worked with the P/E ratio, both Baxter and Cragg [4] and Taub [42] defined the relevant variable as being the difference between the earnings yield (ie. the reciprocal of the P/E ratio) and the long term interest rate. This variable was intended to capture the difference between the company's cost of equity and its cost of debt at the time of the issue.

[14] All three studies used different proxies for risk. Baxter and Cragg [4] took the variance of cash flow divided by the mean; Martin and Scott [24] looked at the variability of sales growth, but only on

Baxter and Cragg found that two other variables were important. First, companies raising large sums in relative terms favored debt. Possibly, this reflects concern over control. Second, companies with high ratios of market capitalization to total assets favored equity. This could reflect timing considerations, or the difficulties of funding future growth opportunities with long term debt (see Myers [28]). Martin and Scott found that high payout, low profitability, and a high proportion of fixed assets all tended to indicate a debt issue. The payout effect is consistent with the notion that companies attempt to minimize transactions costs in their joint financing and dividend policy decisions. Alternatively, high payout may indicate low risk. The profitability variable, on the other hand, may be proxying for the timing effect if profitable firms tend to be those whose share prices have risen the most. Finally, Taub included a tax rate variable in his model. Unfortunately, this yielded the "wrong" sign, and was never significant. This reflects the fact that there was virtually no variation in tax rates during his period.

Several other studies provide evidence on issue timing and whether companies try to maintain target debt ratios. Brealey, Hodges, and Capron [8] and Marsh [22] for the UK, and Bosworth [6] and Taggart [41] for the USA all indicate that equity issues tend to follow market rises. In addition, Scholes [33] and Smith [37] for the USA, Ball, Brown, and Finn [2] for Australia, and Marsh [23] for the UK all indicate that equity issues also tend to follow periods of unusually high residual returns on the company's shares. For debt issues, Bosworth [6], White [48], Taggart [41], and Solnik and Grall [39] all provide evidence that both the level and structure of interest rates are important determinants of the level of long term debt issues, although Marsh [22] found this effect to be much weaker in the UK. Finally, both Bosworth [6] and Taggart [41] offer evidence that companies in aggregate appear to attempt to keep to a target debt ratio. Ang's [1] results confirm this at the level of the individual firm, and consistent, but less direct evidence is provided by Gordon [17], Lev [20], Lev and Pekelman [21], and Brealey, Hodges, and Capron [8].[15]

Finally, there are a number of cross-sectional studies which provide direct evidence on the determinants of the debt ratio. These include American studies by Chudson [12], Bray [7], Gupta [18], Lev [20], Scott [34], Carleton and Silberman [11], and Ferri and Jones [16]; British studies by Brealey, Hodges, and Capron [8] and Briscoe and Hawke [10]; a German study by Schmidt [32]; and two international studies by Stonehill et al. [40] and Toy et al. [44].[16] The combined evidence broadly supports the view that at least three of the variables which theory suggests should be important—operating risk, company size, and asset composition— do indeed have the predicted effect. Thus higher operating

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a univariate basis; Taub [42] used the residual variance of operating profits divided by the mean, squared, as well as the variance of the earnings yield.

[15] Stonehill et al. [40] provide a snippet of possibly contradictory evidence. They found that executives, in describing the way in which they determined their debt ratios, attached considerable importance to the statement: 'We do not try to maintain any particular debt ratio on a year to year basis, but rather take advantage of favorable financing opportunities to issue either debt or equity as they occur."

[16] With the exception of the interview studies by Donaldson [14] and Stonehill et al. [40], all of these studies are based on published accounting information.

risk companies showed some tendency towards lower debt ratios;[17] smaller companies tended to rely on short term rather than long term debt;[18] and companies with a high proportion of fixed assets tended to use more long term debt.[19] Unfortunately, cross-sectional studies can provide us with no evidence on the importance of the remaining variable which theory suggests should be an important determinant of capital structure, namely tax.[20] Finally, it is also worth noting that numerous studies including Schwarz and Aronson [36], Gupta [18], Lev [20], Scott [34], Schmidt [32], Scott and Martin [35], and Ferri and Jones [16] have found significant industry effects in debt ratios.[21] It seems likely, however, that this is merely a reflection of systematic industry differences in asset composition, risk, and other variables.[22]

In summary, when choosing between financing instruments, companies appear

[17] Six studies looked at the relationship between operating risk and gearing. Gordon [17], Bray [7] and Carleton and Silberman [11] found that higher risk companies tended to have lower debt ratios; Toy et al. [44] found the reverse; Ferri and Jones [16] found no relationship; and Brealey, Hodges, and Capron [8] found that higher operating risk companies tended to avoid long term debt issues. In addition, Stonehill et al. [40] found that in their interviews with corporate executives, the latter at least paid lip service to the importance of risk analysis in establishing debt ratios. All of these studies used different proxies for risk, and in at least two cases (Bray and Toy et al.), the results are very difficult to interpret because of multicollinearity. On balance, therefore, the evidence confirms our expectations, but admittedly, it is weak and patchy.

[18] Most of the studies looked at whether debt ratios were a function of company size. Although Gordon [17] found that gearing increased with size, and Gupta [18] found the reverse, most studies, including those by Chudson [12], Bray [7], Toy et al. [44] and Ferri and Jones [16] found no simple linear relationship. However, all of these looked at total debt to total assets. Both Gupta [18] and Schmidt [32] who looked, in addition, at the composition of debt, found that large companies had more long term debt and small companies more short term debt. This is confirmed by Brealey, Hodges, and Capron [8] who found that larger UK companies had more long term debt. This is very much in line with expectations, and presumably reflects size related differences in terms of access to the capital markets, flotation costs and possibly asset composition.

[19] Perhaps surprisingly, only Chudson [12] provides direct evidence here. Bray [7], Schmidt [32], and Ferri and Jones [16] all found a negative correlation between total debt and the proportion of fixed assets. This is precisely what one would expect if current assets tend to be financed with short term debt and current liabilities, while fixed assets tend to be financed with long term debt and equity. Finally, some further evidence is provided by the interview study by Stonehill et al. [40] which found that executives ranked "liquidity of assets" quite highly as a debt ratio determinant.

[20] With the possible exception of companies which are not in a tax paying position, the tax advantage of debt will be common across all companies at a particular point in time. The same applies to the effects of inflation uncertainty which anyway would probably not have been very marked during the periods covered by these studies. Cross-sectional studies, therefore, can provide no information on either variable. This is not true of the interview studies, however, and it is worth noting that Stonehill et al. [40] found that executives regarded tax as a very important debt ratio determinant.

[21] With some dissenting evidence from Toy et al. [44] and Remmers et al. [30].

[22] Apart from the factors mentioned, several other variables were identified as debt ratio determinants. Several studies (Bray [7], Gordon [17], Toy et al. [44], Schmidt [32], and Carleton and Silberman [11]) found return on investment to be negatively correlated with the debt ratio. There are several possible explanations. First, high profitability will automatically tend to reduce the book debt ratio through retentions. Second, equity issues tend to be made following periods of abnormally good performance. Finally, high return on investment may be associated with high operating risk. Bray [7], Gupta [18], and Toy et al. [44] all found that total debt ratios were positively related to growth, typically measured as sales growth. This almost certainly reflects the relationship between asset mix and debt composition, since firms experiencing high sales growth will tend to expand current assets

to try to maintain long term target debt levels, although they may deviate from these in the short run in response to timing considerations and capital market conditions. Furthermore, the evidence is consistent with the notion that these long term targets are functions of the variables which "theory" suggests should be important such as operating risk, company size, and asset composition. In reaching these conclusions, however, we had to piece together scattered, weak, and sometimes conflicting evidence, and take a certain amount of license in interpreting results. Given the nature and quality of previous studies, and the dearth of evidence for the UK, there is an obvious need for further research in this area.

III. Model and Methodology

Firms requiring new finance can meet their needs in a number of ways. These include raising short term debt and drawing down liquids funds in addition to selling new long term securities. Our focus here (following Baxter and Cragg [4], Martin and Scott [24], and Taub [42]) is simply on modelling the choice between equity and debt on those occasions when firms resort to the long term capital market. Decisions in this area are distinguished by the fact that sales of bonds and stock tend to occur at discrete intervals and in relatively large amounts. The choice of instrument on such occasions is thus an interesting and important problem.

In this study, we therefore examine a sample of UK companies making debt or equity issues in an attempt to explain their issue behavior. In doing this, we assume that companies adopt the general model of choice outlined in Section I above. More precisely, we assume that a company's choice of financing instrument is a function of the difference between its current and target debt ratios in the following way:

$$Pr(Z_{jt} = 1) = Pr(D^*_{jt} - D_{jt} < 0) \tag{1}$$

where $Pr(Z_{jt} = 1)$ is the probability that company j will issue equity at time t given that it will make an issue of either equity or bonds, and D^*_{jt} and D_{jt} are the company's target and actual debt ratios respectively.

Since D^*_{jt} is unobservable, we need to concern ourselves with its determinants. We therefore assume a model of the following form:

$$D^*_{jt} - D_{jt} = \underline{B}'\underline{x}_{jt} + u_{jt} \tag{2}$$

where $\underline{x}_{jt}$ is a vector of explanatory variables, $\underline{B}'$ is the corresponding vector of coefficients, and u_{jt} is a stochastic error term. Our model then becomes:

$$Pr(Z_{jt} = 1) = Pr(\underline{B}'\underline{x}_{jt} + u_{jt} < 0) \tag{3}$$

Consider a random sample of n companies at time t and suppose that the first r issue equity while the remaining $n - r$ issue debt. The logarithmic likelihood

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faster than fixed assets. Other findings that debt ratios are positively related to asset turnover (Bray [7] and Gupta [18]) and negatively related to payout (Bray [7]) seem merely to reflect the correlations between these two variables and growth and risk respectively.

function can then be written as:

$$\sum_{j=1}^{r} \log_e[Pr(\underline{B}'\underline{x}_{jt} + u_{jt} < 0)] + \sum_{j=r+1}^{n} \log_e[1 - Pr(\underline{B}'\underline{x}_{jt} + u_{jt} < 0)] \quad (4)$$

Since the value of the likelihood function depends on the vector of parameters $\underline{B}$, we can estimate these using logit analysis to obtain the vector of maximum likelihood estimators $\hat{\underline{B}}'$. Alternatively, by using a different transformation, we can use probit analysis to obtain our maximum likelihood estimates.[23] Since there is little to choose between probit and logit analysis,[24] we decided, for good measure, to use both. In the following sections, we describe our sample of issues and our choice of explanatory variables.

IV. Sample and Data

A sample of 748 issues was selected from the population of all cash issues[25] of equity and quoted debt[26] made by UK quoted companies between 1959 and 1970. Issues were included in our sample if:

(1) the net proceeds exceeded £10,000 and represented at least 2% of the company's capital employed;[27]
(2) they were simple cash issues of debt or equity. Preferred, convertible and multiple issues were excluded, since these share some of the characteristics of both debt and equity, and would thus only cloud our analysis; and
(3) a complete history of accounting data for the ten year period prior to the

[23] Probit and logit analysis are maximum likelihood techniques which are suitable for use when the dependent variable is in the form of a probability conditional on the values of the explanatory variables. One way of overcoming the estimation problems introduced by the fact that a probability is confined to the finite interval zero to one is to transform the dependent variable so that the transform of the probability lies in the range $-\infty$ to $+\infty$. In particular, two such transformations have been suggested, namely the probit and logit transformations, giving rise to probit and logit analysis respectively. The transformation used in probit analysis is the inverse function for the cumulative standard normal distribution. Logit analysis uses a slightly more direct transformation whereby the transformed dependent variable is simply the logarithm of the odds in favor of the event in question occurring. See Theil [43] for an introductory discussion of logit and probit analysis, and Baxter and Cragg [4], Cragg and Baxter [13], Taub [42], and White and Turnbull [47] for applications in the finance area.

[24] It is, however, sometimes easier to interpret the vector $\underline{B}$ in logit analysis, and the theoretical background of probit analysis is rather complicated. Baxter and Cragg [4], however, point out that, in practice, both techniques give very similar results, and this is confirmed by the other studies which have used both approaches.

[25] Noncash issues such as scrips, conversion issues, exchange issues, and securities issued as consideration for acquisitions were excluded. There is a potential inconsistency, however, in the case of the latter. There is little difference between issuing securities in consideration for acquisitions and acquiring for cash obtained from the sale of a security issue. While we exclude the former, we have no way of identifying the latter, and hence such cases are included in our sample.

[26] Our initial intention was to include all issues of long term debt. Unfortunately, however, data for unquoted debt issues were very difficult to obtain, and in particular, it proved almost impossible to establish issue dates. Since timing variables appear to be important, and since we could not, therefore, compute these for unquoted debt issues, we reluctantly decided to limit our study to quoted debt issues where the issue date could be more readily established.

[27] This condition also served to exclude debt refunding issues except in cases where there was a net addition to the company's debt of at least this magnitude. We also excluded all but the first tranche in the case of partly paid issues.

Table I

Sample of Debt and Equity Issues by Year

Sample	Calendar Year	Equity Issues	Debt Issues	Total Issues
Main Sample	1959	10	8	18
	1960	63	17	80
	1961	57	18	75
	1962	44	22	66
	1963	32	40	72
	1964	59	40	99
	1965	9	86	95
	1966	10	81	91
	1967	6	31	37
	1968	32	19	51
	1969	19	14	33
	1970	8	23	31
	All Years	349	399	748
Holdout Sample (1971–74)	1971	10	24	34
	1972	37	14	51
	1973	16	3	19
	1974	5	1	6
	All Years	68	42	110

issue was available on the "Computer File of UK Quoted Companies' Accounts" (hereafter referred to as the DTI data).[28]

In addition, we set aside an independent holdout sample of 110 issues made over the subsequent period 1971–1974 for testing the predictive ability of our model (see Table I).

Most of the data we required were available from the DTI file of accounting data. In addition, however, share price data were taken from the London Share Price Database (LSPD)[29] and from the Stock Exchange Daily Official List, and issue dates were collected from a variety of sources including the Stock Exchange Year Book and the Extel Capital Changes Book.

V. The Explanatory Variables

The explanatory variables used in our model fall into three groups. The first consists of variables which measure deviations from target debt levels. Since we have little direct information on what these targets are, we are forced here to use crude estimates such as historical averages. Because of this, we incorporate a second group of variables in our model whose sole function is to act as proxies for the target ratios. These variables, which include company size, risk, and asset

[28] This databank comprises annual financial accounts, including balance sheets, income appropriation accounts, and sources and uses of funds statements for some 2,000–2,500 UK industrial companies (the precise number varies from year to year) from 1948 until the present day. Details of this file and of the conditions under which companies are included are available in Whittington and Meeks [49].

[29] For a description of this database, see Smithers [38].

composition were selected either on theoretical grounds, or because previous empirical studies claim they are important determinants of debt ratios. Finally, the model has also been expanded to embrace a third group of variables reflecting short term timing considerations such as market conditions, on the grounds that such variables are persistently claimed to be important determinants of the choice of financing instrument.

A. Deviations from Target Ratios

Two variables are used to measure deviations from target debt ratios, the first focusing on long term debt[30] and the second on short term debt as a percentage of total borrowings.[31] While these could be combined into a single variable, there are good reasons for keeping them separate. First, since this study is concerned with long term debt issues, it seems appropriate to include a variable which looks exclusively at the ratio of long term debt to total capital. Second, the ratio of short term to total debt will vary between companies because of differences in both asset composition and company size. The aggregation of long and short term debt into a single variable would, therefore, lead to a loss of information.

In both cases, the deviation from target is defined as the difference between the target and the ratio's current value.[32] The latter is taken as the ratio which the company would have immediately after the issue if it chose to raise debt. This presumably is the figure the company would be concerned with since it takes full account of the effect of the size of the proposed issue on the debt ratio.[33] With the target ratios on the other hand, we have no way of identifying the figures the company has in mind other than by looking at past behavior. For both ratios, therefore, we took the historical average over the past ten years as our estimate of the target.[34]

[30] Defined as the ratio of long term debt plus preference to capital employed, since it is assumed that companies view preferred stock as similar to debt. We also experimented with the ratios of long term debt plus preference to both total assets and fixed assets, and in all essential respects, our results were identical.

[31] We also experimented with the ratio of bank loans to capital employed by analogy with the long term debt ratio. Redefining the ratio in this way made little difference to our results, although the *t*-values of the coefficient estimates were much lower.

[32] We could have included the current and target ratios as separate variables in our model. However, it would have been difficult to disentangle their separate effects since the two are highly correlated. The obvious solution is to combine them as we have done, in a single deviation-from-target variable. We did, however, test the logit model using both variables defined separately, and although the correlation between the two was 0.8, it is encouraging to note that both variables had the predicted sign and appeared to be significant.

[33] It in fact made no difference to our results whether we defined the variable in this way or whether we defined the current debt ratio in the conventional way and included a separate issue size variable.

[34] This will be appropriate only if the target ratio is relatively stable over time and the actual ratio fluctuates around it. It will be a poor estimate, however, if there is some time trend in the target. To overcome this problem, an alternative proxy for the target is the forecast debt ratio obtained from fitting a simple autoregressive function to the past history of debt ratios. Yet another possibility is to assume that companies attempt to raise as much debt as possible subject to some upper limit. In this case, the company's maximum debt ratio in the past might be a good proxy for the target. We in fact experimented with all three measures. While all three had the predicted effect, only the mean and maximum measures appeared statistically significant, with the mean providing the greatest explana-

Since we are trying to explain corporate decisions, it is important to use ratios which accord as closely as possible with those which managements use. This presents us with a dilemma since the theory of capital structure suggests that debt ratios should be measured in market value terms. On the other hand, virtually all traditional textbooks on accounting and managerial finance prescribe the use of book value ratios. Indeed, the survey evidence from Stonehill et al. [40] strongly indicates that corporate treasurers tend to think in terms of book rather than market value ratios. Furthermore, debt limits in trust deeds and articles of association are nearly always expressed in terms of book values. Finally, as Myers [28] has pointed out, there may be some theoretical justification for the use of book values, since these are related to the value of assets in place and do not normally include the capitalized value of future growth opportunities.

For all these reasons, we measured both debt ratios in book value terms. For the 50 percent of our sample for which share price data were readily available, however, we did experiment with quasi-market value ratios, where we took market values for the company's equity, but book values for its debt.[35] In fact, the results obtained with these market value ratios were very similar to those obtained using book values,[36] although the market value ratios provided slightly less explanatory power.

Both of our target deviation measures focus on the difference between target and current debt ratios, without looking ahead at the way in which the debt ratio is likely to change over time. However, a company's stream of retentions will lead to a steady, semi-automatic reduction in the book debt ratio over time. We might therefore expect that companies with a high expected level of retentions will be more likely to issue debt. Because of this, we included a retentions variable in our model. Since we have no simple means of identifying the expected level of retentions, we used the current level expressed as a percentage of capital employed as our proxy.

B. Proxies for the Target Ratios

Clearly, ten year averages can provide only very crude estimates of actual target levels. First, the sporadic nature and "lumpiness" of new issues coupled with the semi-automatic effect of retentions on the debt ratio may make even ten-year averages misleading. Second, past issues may have given rise to significant temporary departures from the long term targets in order to take advantage of short term conditions. Finally, the targets themselves may have changed over time. Because of this, we have included in the model three determinants of the debt ratios: company size, operating risk, and asset composition in order to act as proxies for the true but unobservable target ratios.

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tory power. The poor performance of the final measure was probably due to the considerable amount of noise involved in fitting the autoregressive function.

[35] This procedure was adopted largely because of the problems involved in trying to establish the market value of a company's debt. However, it should provide a good proxy for the true market value debt ratio, since the market value of a company's equity is far more variable than that of its debt.

[36] This is consistent with Taggart's [41] findings that there is very little to choose between the book and market value formulations.

Because of company size related differences in long term debt flotation costs and possibly also in asset composition, we would expect smaller companies to have a lower long term debt ratio target and a higher short term to total debt target. We therefore included a size variable defined as the logarithm of capital employed.[37]

We experimented with four different measures of risk. The first was the "bankruptcy risk" measure used by White and Turnbull [47],[38] namely

$$\frac{\text{fixed charges–earnings before income and tax}}{\text{estimated standard deviation (past ten years) of earnings}}$$

This variable is appealing since it is allied to the conventional coverage ratio and is also related to the types of measures which businessmen are urged to consider in their risk analysis of the debt/equity decision (see Donaldson [14] and Stonehill et al. [40]). Following Brealey, Hodges, and Capron [8], our second measure of risk was taken as the standard deviation of scaled earnings (EBIT) changes, where the scaling factor was taken as total assets. Our final two measures were the beta or systematic risk of the company's equity, and the standard deviation of the returns on the company's shares. Unfortunately, however, these two measures could be estimated for only about half of the companies in our sample.[39] Of the four risk measures, only the standard deviation of scaled earnings changes measures operating risk per se. All of the others measure total risk, since they are influenced by the level of gearing.

We have already seen that the higher the proportion of assets in place, the higher we would expect a company's long term debt ratio to be. We therefore included a measure of asset composition in our model. This was taken as the ratio of fixed to total assets (both figures net of depreciation).

Finally, we might also expect tax to be an important determinant of debt ratios. However, at least for companies in a tax paying position, the tax deductibility of interest affects all companies in the same way at a given point in time, and cannot therefore explain cross-sectional differences between companies. Since our sample spans eleven years, during which time there were several changes in tax rates and at least one major change in the tax system, we could have introduced a variable which reflected the tax incentive of debt at the time each issue was made. However, since to a large extent, we shall pick up any such year to year effects through the two market condition variables described below, we have not included a separate tax variable.

[37] We also experimented with the logarithms of both total assets and equity market capitalization, although data for the latter was available for only half of the sample. All three size measures were highly correlated, and gave virtually identical results.

[38] White and Turnbull [47] defined this variable in terms of expected fixed charges and expected future income. In their empirical work, however, they used the previous year's fixed charges, the standard deviation of historical income, and an earnings forecast taken from a simple model of earnings regressed against time. Although we experimented with a simple autoregressive function fitted to the past ten years' earnings data, this was dominated by noise so that we eventually used historical average earnings as our proxy for expected income. In all other respects, our measure is the same as that used by White and Turnbull.

[39] Data for the remaining companies in the sample were not available from the LSPD. Betas and standard deviations of return were calculated using trade-to-trade observations (see Marsh [23]) based on a quarterly differencing interval.

C. Timing and Market Condition Variables

Three market condition and timing variables were included in our predictive model since timing considerations are persistently claimed to be an important determinant of the debt/equity choice. Two variables were included to reflect equity and bond market conditions respectively, and thus to indicate whether companies in general are more likely to issue equity or debt at a particular point in time. The third variable was selected to capture company specific timing considerations.

The equity and bond market variables used were forecasts of the total amount of equity and debt which would be raised by all UK companies during the quarter in question. These were derived from a simple forecasting model using only data and forecasting coefficients which would have been available prior to the quarter in question.[40] The basic form of the model was that the level of equity and debt issues is related to the recent performance of the stock and bond markets respectively. This is essentially a behavioral model reflecting the preferences expressed by managements and their advisers for issuing equity after periods of strong stock market performance, and issuing debt when interest rates are low and/or are expected to rise (see Bodenhammer [5], Solnik and Grall [39], Van Horne [45], and White [48]). An important part of the reasoning here seems to be that managers interpret past performance as an indicator of future performance and time their issues accordingly. Such behavior would be irrelevant in an efficient market, and it is interesting to note that there is no evidence whatsoever to suggest that managers enjoy any success in their timing endeavors.[41] Nevertheless, we saw in Section II above that previous empirical work indicates that modeling issue behavior in this way provides a reasonable description of reality.

More formally, we defined the equity issue forecasting model as:

$$E_t = \gamma_{0t} + \gamma_{1t}E_{t-1} + \gamma_{2t}M_{t-1} + \gamma_{3t}M_{t-2} + u_t \tag{5}$$

where E_{t-1} and E_t are the level of new equity issues (in £1975) in quarters $t-1$ and t, M_{t-1} and M_{t-2} are the returns on the equity market in quarters $t-1$ and $t-2$ and γ_{0t}, γ_{1t}, γ_{2t}, and γ_{3t} are the parameters of the model when it is estimated using all available data[42] up to and including data for quarter $t-1$. Our equity market timing variable is simply the forecast, based on this model for the quarter during which the issue in question takes place. The bond market timing variable is defined analogously, although here, the variables in the forecasting model are

[40] It is important to avoid ex post selection bias in the definition and selection of variables used in this forecasting model. Strictly speaking, not only should the model be estimated using only ex ante data, but the general form of any model should also be known ex ante. This means that at the start of our sample period in 1959, it would have been reasonable to propose a general model of the form given in Equation (5) below. On the basis of the rather limited historical data which we have available prior to 1959, this seems more than reasonable.

[41] If success is judged by the *subsequent* performance of the stock and bond markets, then both Brealey, Hodges, and Capron [8] and Marsh [22] found no evidence that UK companies had been successful in issue timing. Thus, while the level of equity issues can, to some extent, be predicted from past stock market returns, future market returns cannot be predicted from the previous history of new issues. The capital markets appear to be efficient with respect to information on the overall level of new issues.

[42] Quarterly data for new equity issues by seasoned companies was available back to 1955, and for debt issues, back to 1958.

the level of new corporate bond issues and the yield on medium term Government securities.

Note that in addition to the prior market condition variables our forecasting models also include a lagged new issue term. Since the quarterly new issue series are serially correlated, the inclusion of these terms leads to slightly better forecasts. This serial correlation may simply arise from lags and differences in response times. For example, even if companies raised equity entirely in response to equity market returns, there would still be differences in the time taken to reach a decision, to handle the administrative and legal requirements, and to wait in the "queue" which the Bank of England controls to smooth the requirements for new money over time. Similarly, if market conditions change, issues which have reached an advanced stage of planning will typically go ahead rather than being cancelled. In addition, of course, we would also expect the level of new issues to be serially correlated if there is serial correlation in companies' requirements for new money, or if external events such as changes in tax rates cause shifts in preference for debt or equity, and if there are differential lagged responses to these events.

Our third timing variable was a measure of the issuing company's share price performance, adjusted for the market, over the year preceding the issue. This variable was introduced since we know from Marsh [22] that there is a substantial difference between the pre-issue share price performance of debt and equity issuers, with equity issues tending to follow unusually good share price performance.[43] In calculating this variable, we simply took the difference between the share return and the return on the market.

D. Other Variables

We experimented with two other variables, the payout ratio and return on investment. These were included largely because Martin and Scott [24] found them to be useful discriminators rather than because of any very strong prior grounds. Return on investment was defined as profits after tax divided by shareholders' funds while the payout ratio was defined as current ordinary dividends divided by profit after tax. Since companies may continue to pay dividends when they are in a loss making position, this ratio is not statistically well-behaved, and can be very misleading. To avoid problems, we set the payout ratio to zero when no dividends were paid and 100% when dividends exceeded earnings.

Summary statistics on all of the variables are given in Table II. As can be seen, the majority were well-behaved with roughly symmetric distributions, and with few outlying observations of the sort likely to cause estimation problems.[44] The

[43] We took the residual return rather than the total return since our equity forecast variable already includes the market return component of the company's pre-issue share price performance. It is useful to separate the total return into its two component parts in this way, since the market return component indicates whether companies in general are more likely to issue equity or debt at a particular point in time, while the residual return variable captures company specific timing considerations.

[44] We have, of course, pre-empted this problem in the case of dividend payout. It is also worth noting that although the distributions appear symmetric, they will not always be normal since in several cases, the values of the variables are restricted to a finite range, eg. fixed assets must fall between 0 and 100%.

Table II

Means and Distributions of Explanatory Variables and Univariate Tests of Significance

				Fractiles			Extreme Values		Equity Issues		Debt Issues		
Type of Variable	Variable	Mean	Std. Dev.	.1	.5	.9	Min	Max	Mean	Std. Dev.	Mean	Std. Dev.	F Ratio[a]
Measures of Deviations from Targets	Long Term Debt	−12.3	10.6	−0.3	−11.7	−26.2	−63.9	40.5	−14.4	11.1	−10.6	9.8	24.6
	Short Term Debt	−13.0	23.8	−42.4	−7.8	8.2	−90.0	86.4	−11.4	24.9	−14.3	22.7	2.8
	Retentions	4.3	3.1	1.5	4.0	7.5	−19.4	23.8	4.7	3.1	4.0	3.0	9.8
Proxies for the Targets	Size ($\log_e$)	1.74	1.58	−.06	1.44	3.98	−1.24	5.59	1.22	1.39	2.19	1.60	77
	Asset Composition	45.8	19.5	22.7	43.7	75.0	1.2	92.8	42.0	18.8	49.0	19.6	24.5
	Bankruptcy Risk	−2.96	1.85	−5.20	−2.50	−1.10	−15.7	0.6	−2.79	1.76	−3.12	1.91	6.0
	Std. Dev. EBIT	.03	.02	.01	.02	.06	.00	.21	.04	.03	.03	.02	1.5
	Beta[b]	1.03	.32	.69	1.04	1.42	0.07	2.03	1.06	.33	1.01	.32	.5
	Std. Dev. Returns[b]	.35	.10	.24	.34	.45	0.18	.80	.35	.09	.35	.10	0
Timing and Market Conditions	Equity Issue Forecast	138	61	61	137	221	11	287	162	53	117	60	119
	Debt Issue Forecast	131	54	61	129	225	18	250	119	47	142	57	34
	Residual Return	.16	.50	−.28	.08	.55	−.97	8.20	.28	.62	.05	.35	40
Other	Return on Investment	10.0	4.6	5.4	9.3	15.3	−30.0	39.4	10.5	4.4	9.6	4.8	7.0
	Payout Ratio	46.8	18.1	28.0	44.3	70.1	0.0	100.0	44.6	18.8	48.7	17.2	9.6

[a] F-Ratio derived from one way analysis of variance between group means.

[b] Based on 362 observations only.

only exceptions appear to be the size and residual returns variables which are positively skewed, and the short term debt target which is slightly negatively skewed.

VI. Analytical Results and the Predictive Model

Before carrying out any multivariate analysis, it is interesting to examine the differences between the debt and equity issuers on a univariate basis. Table II gives the means and standard deviations for each variable for both the debt and equity issuing groups. In addition, the F-ratio derived from the one-way analysis of variance between group means is presented for each variable.

Clearly, there are highly significant differences (above the 99.9% level) between debt and equity issuers on the basis of all of the timing and market condition variables, the deviation from the long term debt target, company size, and the proportion of fixed assets. Significant differences also exist in terms of the retentions variable, return on investment, and payout. On the other hand, the risk variables are far less significant, and, somewhat disappointingly, the short term debt target deviation variable is only just significant at the 90 percent level. Encouragingly, however, in virtually all cases, the differences between the debt and equity group means are in line with our expectations.

It is clearly not appropriate to include all of the variables listed in Table II in our final predictive model. Not only would this result in a very "bulky" model, but such a model would be highly multicollinear since we have, for example, four different risk variables, and since payout, ROI, and retentions will all be highly correlated. To decide on the final profile of variables, we carried out a number of logit analysis runs using all of the variables in Table II, but including in any one run only one of the four risk variables, and only one of the three variables in the retentions, ROI, and payout group. Any variables which were not significant in any of the runs were excluded from the final model.

In fact, six variables were eliminated on this basis. Three of the four risk variables were dropped, and even the fourth risk variable, the bankruptcy risk proxy, was only marginally significant. Three of the four did, however, have the predicted sign, suggesting that risky companies were more likely to issue equity. The exception was the standard deviation of share returns, but since both this variable and the standard deviation of scaled earnings changes were both negatively correlated (−.31 and −.36 respectively) with company size, it is difficult to disentangle the separate effects of these variables.

We also eliminated the profitability, retentions, and payout variables, in spite of their promising performance on a univariate basis. The latter may possibly be attributable to these variables acting as proxies for the residual timing variable, since both ROI and retentions were positively correlated with the latter while payout was negatively correlated. In other words, companies tend to make equity issues after periods of unusually good share price performance, and the latter tends to be correlated with book measures of profitability such as ROI and our retentions variable. The payout ratio, on the other hand, may be negatively correlated with performance in the short run, as dividends per share adjust only part of the way towards the most recent earnings figures. If this is correct, it

explains the effect of the payout and ROI variables in both Martin and Scott's and our own model, and also why the sign of the retentions variable differs from our prior expectations. We should again stress, however, that none of these variables were remotely statistically significant as determinants of the issue decision on a multivariate basis.

Our final model included the two variables measuring deviations from the long and short term debt targets; three proxies for these targets, namely company size, the percentage of fixed assets, and the bankruptcy risk variable; and the three market condition and timing variables. Table III shows the coefficient estimates for this model using both logit and probit analysis. All of the variables have the predicted sign. Thus companies which are below their long term or above their short term debt targets are more likely to issue debt; smaller companies, those with few fixed assets, and those with greater bankruptcy risk are more likely to issue equity; companies which have recently experienced unusually large share price increases tend to favor equity; and finally, the choice of security depends very much on the expected equity and bond market conditions.[45] Although all of the variables have t-values which are "statistically significant" at the 95 percent level,[46] it is interesting to note that the *t*-values for the timing and market condition variables were generally much higher than those for the remaining variables based on accounting information. Table IV shows the correlation matrix for the eight variables in the final model, illustrating that multicollinearity is not a serious problem. The R^2[47] for the model of 0.37 is comparable with the figures obtained by Baxter and Cragg [4].

To examine the classificatory ability of the model, we used it to estimate the probability of an equity issue for each issue in our original sample. Since the logit and the probit models are so similar, we used only the logit model for this. Table V and Figure 1 present the cumulative distributions of these probability estimatets in both tabular and graphical form. As can be seen from Table V, the mean value of the probability of equity for the 349 equity issues was 0.62, while the mean value for the 399 debt issues was only 0.33. Assuming equal costs of misclassification, Table V shows that the sum of the Type I and Type II errors will be minimized by selecting a classification probability of 0.45.

Table VI shows the classificatory ability of the model when this cutoff probability was used. The model classified 75 percent of the issues correctly, a figure almost identical to that obtained by Martin and Scott [24]. The Type I error, or

[45] To some extent, at least, variables such as size, and the proportion of fixed assets, discriminate between debt and equity issues in our model only because we have restricted debt issues to issues of long term quoted debt. In a more general model of the choice of financing instrument which included the possibility of issues of unquoted and short term debt, these variables would not be expected to discriminate between equity and debt as such, but instead to perform a more complex discriminating role. For example, we would expect to find small companies tending to issue short term debt, unquoted debt, or equity rather than long term quoted debt. Similarly, companies with few fixed assets would tend to issue short term debt or equity rather than long term debt of any kind.

[46] But see footnote to Table III.

[47] For maximum likelihood analysis, R^2 is defined by $R^2 = (1 - \exp(2(L_c - L_A/N)/(1 - \exp(2(L_c - L_{MAX})/N))$ where L_c is the maximum of the log likelihood function using only a constant; L_A is the maximum using all variables; and L_{MAX} is the maximum possible. N is the number of observations. See also Baxter and Cragg [4].

Table III

Logit and Probit Analysis Coefficient Estimates

		Explanatory Variables									
		Deviations from Target		Proxies for the Target			Timing/Market Conditions				
	Time Period	Long Term Debt	Short Term Debt	Size	Risk	Fixed Assets	Equity Issue Forecasts	Debt Issue Forecasts	Residual Return in Past Year	Constant Term	R^2
Logit Analysis	1959–70	−.027[a]	.009	−.292	.080	−.016	.013	−.008	1.026	.233	.37
		(−3.1)[b]	(2.3)	(−4.6)	(1.7)	(−3.4)	(8.2)	(−4.7)	(4.0)	(.5)	
	1959–64	−.028	.014	−.400	.072	−.019	.003	−.009	.227	2.669	.24
		(−2.4)	(2.4)	(−4.6)	(1.2)	(−3.2)	(1.1)	(−2.4)	(.8)	(3.3)	
	1965–70	−.038	.003	−.005	.353	−.018	.014	−.004	2.057	−.982	.36
		(−2.5)	(.5)	(−.04)	(3.0)	(−2.0)	(5.1)	(−1.5)	(3.8)	(−1.4)	
Probit Analysis	1959–70	−.016	.005	−.179	.046	−.010	.008	−.005	.516	.172	.37
		(−3.0)	(2.3)	(−4.8)	(1.6)	(−3.4)	(8.4)	(−4.8)	(3.9)	(.6)	
	1959–64	−.017	.009	−.246	.042	−.011	.002	−.005	.108	1.647	.24
		(−2.4)	(2.9)	(−4.8)	(1.2)	(−3.2)	(1.1)	(−2.5)	(.7)	(3.5)	
	1965–70	−.022	.002	−.016	.191	−.010	.008	−.002	1.130	−.556	.36
		(−2.5)	(.4)	(−.3)	(3.0)	(−2.1)	(5.2)	(−1.7)	(3.9)	(−1.4)	

[a] These coefficients correspond to B', the vector of coefficients in Equation (3). Positive values indicate that an increase in the variable concerned would increase the probability of an equity issue. In the case of logit analysis, B' can be interpreted as the vector of the elasticities of the odds in favor of an equity issue.

[b] t-values in brackets. Since the final model was developed by eliminating the weakest variables, any tests of significance should be treated with caution, since the results are, strictly speaking, conditional upon the above model being known to be correct.

Table IV

Correlation Matrix for the Variables in the Predictive Model

Deviations from Debt Targets							
Long Term							
	Short Term	Proxies for the Targets					
.02	.10	Size					
.20	.06	−.12	Risk				
−.09	.05	.23	−.03	Fixed Assets			
.15	.02	−.20	−.03	.02	Timing/Market Conditions		
−.07	0	0	.05	−.03	−.14	Equity Issue F' cst	
.02	.05	−.21	.10	−.11	.10	−.07	Debt Issue F' cst
−.07							Residual Returns

Table V

Cumulative Distributions of "Probability of Equity" Estimates and Classification Errors

Classification Probability (P) (Predict Equity if Value of Logit Function exceeds P)	Percentage of Issues with Estimated Probability of Equity ≤ P		Type 1 Error (%) (Predict Debt when Equity)	Type II Error (%) (Predict Equity when Debt)
	Equity Issues	Debt Issues		
.05	0	5	0	95
.10	0	15	0	85
.15	3	25	3	75
.20	6	37	6	63
.25	8	48	8	52
.30	11	53	11	47
.35	15	59	15	41
.40	18	65	18	35
.45	22	73	22	27
.50	30	76	30	24
.55	34	82	34	18
.60	40	86	40	14
.65	49	89	49	11
.70	56	92	56	8
.75	66	95	66	5
.80	73	96	73	4
.85	83	98	83	2
.90	92	98	92	2
.95	97	99	97	1
1.00	100	100	100	0
Mean value of Probability of Equity	.62	.33		
Number of Observations	349	399		

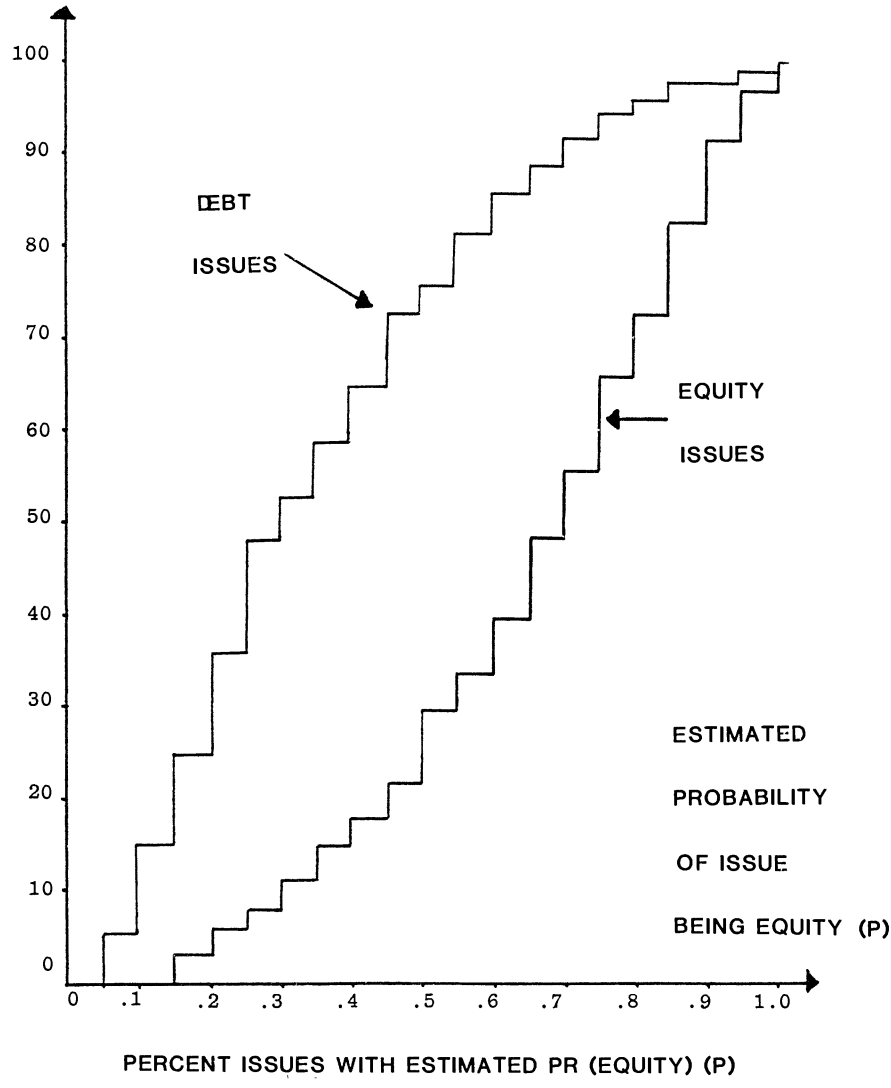

Figure 1. Cumulative Distributions of "Probability of Equity" Estimates for both Debt and Equity Issues.

the proportion of equity issues which were incorrectly predicted to be debt was 22 percent, while the Type II error was 27 percent. Clearly, we are looking here only at the classificatory ability of the model, since we are applying the model to the same data that we used to develop it. We look at the model's predictive ability in the next section.

VII. Tests of the Model

We carried out two tests of the model's predictive ability. First, we looked at the model's stationarity by splitting the sample into two subperiods 1959–64 and 1965–70 and re-estimating the coefficients. The results are shown in Table III.

Table VI

Predictive Value of Logit Analysis Model

Panel A: Estimation Sample (748 issues)

Predicted Outcome	Actual Outcome		
	Equity	Debt	Total
Debt	271	107	378
Equity	78	292	370
Total	349	399	748

Type I error = Probability (debt predicted when actually equity) = 22%

Type II error = Probability (equity predicted when actually debt) = 27%

Panel B: Holdout Sample (110 issues)

Predicted Outcome	Actual Outcome		
	Equity	Debt	Total
Debt	51	15	66
Equity	17	27	44
Total	68	42	110

Type I error = Probability (debt predicted when actually equity) = 25%

Type II error = Probability (equity predicted when actually debt) = 37%

Clearly, there are some differences between the two subperiods. First, the equity market condition and the residual return variables were far less important in the first subperiod, probably reflecting the much lower variability of the equity market during this time. The deviation from the short term debt target was somewhat less significant and the size variable was markedly less important during the second subperiod. Both effects, however, may reflect differences in the types of companies represented in the sample rather than changes in corporate behavior, since changes in the rules for inclusion in the DTI file meant there were far fewer very small companies during the second subperiod.[48] Finally, the bankruptcy risk variable appears to assume much greater importance during the second subperiod.

However, in spite of these differences, all coefficients had the predicted signs in both subperiods, and in both cases, five out of the eight were "significant" at the 95 percent level in spite of the smaller sample sizes. The two subperiod models taken together were able to correctly classify some 73 percent of the total sample of 748 issues.

Second, we tested the model's predictive ability when applied to the 110 issues

[48] The DTI changed its qualifications by increasing the minimum company size limits in both 1960 and 1969 with subsequent reductions in the number of small companies (defined as those with capital employed of less than £10 million (in £1972)) of 22% and 38% respectively. We have argued that the size variable acts as a proxy for the debt composition target largely because of flotation costs. The elimination of these very small companies may therefore be responsible for the significant reduction in the importance of the size variable.

in the holdout sample, covering the subsequent period from 1971–74. We used the logit model estimates for the period 1959–70, and adopted the same cutoff probability of 0.45. The model gave the correct prediction in some 71 percent of the cases.[49] The mean estimates of the probability of equity were 0.69 and 0.37 for the equity and debt issuing groups respectively, compared with 0.62 and 0.33 for the estimation sample. The Type 1 error, or the percentage of the equity issues which were incorrectly predicted to be debt was 25 percent, while the Type II error was 35 percent. Clearly, this is a most encouraging performance,[50] since the model's predictive ability is only marginally lower than its classificatory ability on the original estimation sample.

VIII. SUMMARY AND CONCLUSIONS

On the basis of both the theory and the existing empirical evidence, we have developed a descriptive model of the choice between equity and debt. While any study of this sort can only be exploratory, it does thow some light on a number of important issues. First, it demonstrates that companies are heavily influenced by market conditions and the past history of security prices in choosing between equity and debt. Indeed, these factors appeared to be far more significant in our model than, for example, other variables such as the company's existing financial structure. Second, this study provides evidence that companies do appear to make their choice of financing instrument as though they had target levels in mind for both the long term debt ratio, and the ratio of short term to total debt. Finally, the results are consistent with the notion that these target levels are themselves functions of company size, bankruptcy risk, and asset composition.

The predictive model itself could be used by investment analysts concerned with forecasting the financial policy of particular companies. Furthermore, financial managers faced with the choice between an equity and a debt issue could use the model to gain insight into the decision other managers would make under the same circumstances. Used in this way, the model would also provide managers with some indication of what the market was anticipating. Our major objective in developing the model, however, has been to gain a little more insight into how companies actually choose between equity and debt.

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[49] This figure may be less informative that the Type I and II errors since it is difficult to know what naive figure to compare it with. It is tempting to compare our 71% with a figure of 50%, but this is inappropriate since we do not have equal numbers of debt and equity issues over either the estimation or prediction period. Furthermore, the percentage of equity issues was much higher during the prediction period (62%) than during the estimation period (47%).

[50] Particularly since we have restricted ourselves to the use of fairly naive, readily-available, published information. By restricting ourselves largely to the use of data from the last set of annual accounts prior to the issue, we shall frequently have been using data which are more than a year out of date. In principle, with more recent accounting data; with forecasts of future cash flows of the type which the company's management, or investment analysts might be making; and with additional information on management's attitudes and on other factors such as control, we could almost certainly develop a far more powerful model. The costs of doing so, however, would be very high.

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