The Determinants of the Choice of Maturity and Restrictive Covenants in Debt Contracts: A Panel Data Approach

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Abstract

This paper provides a comprehensive analysis for the choice of contract terms included in UK Eurobonds. Typically, the theory associates the choice of debt contract terms to firm and market characteristics, arguing that an adequate choice of debt contract terms allows for the reduction of debt-contracting costs. We use a panel-data approach to examine the validity of extant predictions concerning the choice of maturity, call options, convertible options and other covenants. The findings provide strong support to the agency prediction that debt contract terms function as alternative control mechanisms. The evidence that managers follow a maturity-matching rule and use restrictive covenants when firm's credit quality is low further corroborates agency predictions.

JEL Classification: G15, G24, G32.

Keywords: debt contract design, eurobonds, panel data estimation.

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1 Introduction

Over the past decades, finance literature has focused on the choice of adequate type of financing, which allow for a reduction on contracting costs. Although there has been substantial research on the valuation implications of both debt and equity financing, only recently has the design of debt contracts begun to be extensively analysed and its implications on firm value assessed. Theoretical literature has driven the analysis of debt contract design to the choice of contract features that, conditional on firm and market characteristics, lead to the reduction of the debt financing inefficiencies. More specifically, the literature predicts that the choice of debt features is determined by a set of factors such as agency problems, liquidity costs, information asymmetry, tax effects, interest rate risk and business uncertainty.

Despise the considerable theoretical developments empirical studies on the optimal structure of debt contracts have been hindered by several reasons. First, most of the empirical work (e.g. Mitchell (1991), Kish and Livingston (1992), Barclay and Smith (1995), Citron (1995), Guedes and Opler (1996), Stohs and Mauer (1996), and Abhyankar and Dunning (1999), amongst others) focuses on a single feature, ignoring the impact of the other features included in the debt contract. Second, there are few studies that focus on the determinants for the use of a convertible option or other restrictive covenants[1] in debt contracts. Begley (1994) examines a small sample of bonds and finds the choice to use a conversion option is related to potential agency problems. Nash, Netter and Poulson (2003) find that firms with high growth opportunities are less likely to issue debt containing a conversion feature. However, Bradley and Roberts (2003) find just the opposite, that firms with high growth opportunities are more likely to use conversion options. Citron (1995) provides no evidence of a significant relation between accounting-based covenants and high growth opportunities, thus contradicting agency predictions. Finally, empirical studies typically use samples that include data from different types of debt contracts. This potentially lead to misleading conclusions as no clear distinction can be made between the

[1] For example, covenants that impose restrictions on asset sales, dividend payout, new debt issues and put options in case of event risk

determinants of debt composition and a significant number of other factors affecting the preference for certain types of structured debt. For example, it is typically documented that small firms use mostly bank loans to finance their investments and medium and large firms use both privately placed and publicly traded debt. As bank loans are normally short-term and contain no embedded options, the validation of predictions about debt composition might be more difficult in samples containing a significant proportion of bank loans.

The aim of this study is to provide a comprehensive analysis of the determinants for debt contract design, overcoming the aforementioned limitations of previous empirical studies. We test the extant theories for the choice of debt terms on a sample comprised of Eurobonds issues made by UK companies during 1986-1999 and estimate the model using a panel data estimation approach. Contrary to classical estimation methods, the panel data estimation approach produces robust estimates for samples that vary across time and units. Specifically, as in panel data models the classical assumption of independent errors is unlikely to be satisfied, the estimates for *t*-statistics tend to be overstated. Using a panel data estimation approach we are able to consider all the information about cross-sectional and time-series dispersion, overcoming at the same time the problem of serially correlated errors.

The use of Eurobonds to examine the validity of theories concerning the choice of debt terms is likely to contribute further for the robustness of the results. Firstly, Eurobonds are non-homogeneous instruments providing a useful basis for the study of the choice of contract features available to borrowers. Secondly, the Eurobond market functions as a segmented capital market in which investors are willing to pay more for Eurobond issues than for identically designed securities launched in other markets. In these circumstances, Eurobond issuers are expected to place greater emphasis on the optimal design of the issue in order to guarantee the success of the offering and to be able to capitalise on the comparative advantages of the Eurobond market. Finally, new Eurobond issues are well suited for analysing the impact of factors that have a transient character such as firm tax status, firm credit quality, and market conditions. This provides an interesting experimental design for examining the robustness of studies based on static balance-sheet data (e.g. Stohs and Mauer (1996) and Barclay and Smith (1995)).

Overall, this study provides strong support to the prediction that debt contract terms function as alternative control devices for reducing agency costs. Hence,

consistent with agency theory the results show a direct (inverse) relation between maturity and the use of a call option (additional restrictive covenants). Furthermore, the evidence shows that the inclusion of a convertible option is inversely related with the use of additional restrictive covenants. Additional support is provided to agency theory by the positive relation found between the Eurobonds maturity and the maturity of assets in place and by the inverse relation between the use of other restrictive covenants and the firm's credit quality. The evidence that managers pursue a maturity-matching rule is also in line with liquidity risk predictions. The results also show that the inclusion of a call option is positively related to the firm's credit quality, which confers further support to the liquidity risk argument.

This paper is organised as follows. Section 2 highlights and explains the theoretical hypotheses underlying the choice of maturity and the inclusion of call options, convertible options, and additional restrictive covenants in debt contracts. Section 3 explains the empirical specifications of the model and the estimation methods used. Section 4 describes the data sample that supports the empirical study. Section 5 provides an analysis of the empirical results. Finally, section 6 presents our conclusions.

2 Theoretical background

2.1. Agency costs

Myers (1977) argues that short-term debt, restrictive covenants, and low levels of leverage act as substitute mechanisms in reducing shareholders' incentive to underinvest. The basic contention has been extended by Barnea, Haugen and Senbet (1980) regarding the alternative choice between maturity and the inclusion of call options and by Jensen and Meckling (1976), Mikkelson (1980), and Smith and Warner (1979) concerning the substitute nature of convertible privileges, maturity, and restrictive covenants. These authors conclude that the use of these terms in debt contracts contribute for controlling shareholders' incentives to jeopardise creditors interests by pursuing risk-shifting policies that ultimately lead to the erosion of firm value. Essig (1991) argues low levels of leverage and convertible securities are alternative devises for mitigating asset substitution incentives.

We test the interdependencies between the choice of maturity, the inclusion of call provisions and the choice of leverage level by including in the structural equation for maturity a binary variable that proxies for the propensity to issue callable bonds and

a measure of firm's leverage (debt-to-equity ratio). The predicted substitute role played by the call provision, maturity, and leverage level is further tested by including the latter variables in the structural equation for the propensity to issue callable bonds. Finally, considering the ability of convertible options, restrictive covenants, and maturity status to align creditors and shareholders interests (Jensen and Meckling (1976), Mikkelson (1980), and Smith and Warner (1979)) and their capacity to control, along side with leverage choice, underinvestment (Myers (1977)) and risk-shifting (Essig (1991)) incentives, the structural equation for the propensity to attach convertible options (restrictive covenants) includes the variables: issue maturity, restrictive covenants, and leverage.

Further to provide an explanation for the interrelationships established between contract terms, the agency theory also contents that the characteristics of issuers can influence the selection of debt contract features. One argument suggests the greater a firm's growth opportunities and/or financial risk the higher the agency costs of debt. Shorter-term maturity debt (Myers (1977)), callable debt (Bodie and Taggart (1978)), and debt with embedded restrictive covenants (Myers (1977) and Smith and Warner (1979)) are postulated as optimal choices for reducing the costs associated with underinvestment. As the incentive to forsake profitable investments is exacerbated for high-growth firms, a negative (positive) relation is expected between the choice of maturity (call option and restrictive covenants) and the proxies for future growth opportunities (market-to-book value and intangibles-to-total assets). Moreover, the incentive for risky firms to substitute safe projects for low-value, riskier investments is reduced by the issuance of short-term or callable debt (see Barnea, Haugen and Senbet (1980)), convertible debt (see Jensen and Meckling (1976), Green (1984), and Smith and Warner (1979)), and debt with restrictive covenants (see Smith and Warner (1979)). To this extent, a negative (positive) relation is predicted between issue maturity (call option, convertible option, and restrictive covenants) and the degree of firm financial risk (measure by the debt-to-equity ratio). Moreover, in order to test the risk-shifting and claims dilution arguments proposed by Smith and Warner (1979) that are related to firms facing particularly high bankruptcy risk a proxy for firm's operational risk is included in the restrictive covenants equation.

To test Myers' (1977) prediction that firms should match the maturity of liabilities to the maturity of assets in place to control for underinvestment, we introduce the variable maturity of assets in place in the maturity equation. A positive sign is

expected for the coefficient of this variable.

2.2. Asymmetric information and signalling mechanisms

The choice of debt contract terms can be used to reduce adverse-selection costs or to signal a firm's superior quality when information asymmetry about its future prospects exists. Flannery (1986) and Kale and Noe (1990) argue that in highly asymmetric information environments, firms signal their superior quality by issuing short-term debt. On the other hand, Lucas and McDonald (1990) contend firms take advantage of the existence of uniformed investors and issue longer and necessarily more mispriced debt after a period of good performance. Therefore, a negative and a positive relation are expected between issue maturity and the proxies for the quality of a firm's future projects (unexpected earnings), and a firm's market performance (stock return over one year prior to the issue announcement), respectively. Furthermore, Diamond (1993) argues that whenever asymmetric information and liquidity costs are significant the relation between firm's credit risk and debt maturity will follow a non-monotonic pattern, where both good and bad quality firms issue short-term debt while middle quality firm will issue in the middle of the maturity spectrum. Thus, we expect that the issue maturity to be positively related to the proxy for firm's credit quality (the Altman's Z-score) but inversely relate to the square value of this variable.

Robbins and Schatzberg (1986) stress that when managers hold private and favourable information about a firm's future prospects they tend to issue callable debt to separate themselves from lower quality firms. On the other hand, conversion options are predicted to convey the same favourable information about the quality of a firm's future investment projects (Constantinides and Grundy (1989), Stein (1992), and Nyborg (1995)). A positive sign is therefore predicted for the coefficient of the variable unexpected earnings in both equations. Finally, Chan and Kanatas (1986) and Chan and Thakor (1987) argue high quality firms favour the issuance of debt with embedded restrictive covenants as such provisions promote a reduction in adverse-selection and moral hazard costs. To this extent, a positive relation is expected between our measure of the presence of restrictive covenants and the proxy for firm credit quality.

2.3. Liquidity risk

Diamond (1991) defines liquidity risk as the borrower's incapacity to refinance short-term debt at favourable conditions, which might result in important losses regarding the borrower's control rents. These control rents which cannot be assigned to

creditors, represent part of the future return of a project that can accrue to the borrower due to the bargaining power held by him over the project's proceeds. Diamond (1991) and Sharpe (1991) argue that whenever debt is of shorter maturity than assets and the firm is unable to service its obligations, creditors can force liquidation which unless there are no control rents pledged to the owner-manager leads to a loss in the firm's value. A positive relation between debt maturity and maturity of assets in place is predicted by this argument. Moreover, as smaller and potentially less credible firms are more likely to prefer long-term debt in order to avoid the inherent costs of financial distress, a negative relationship is expected between issue maturity and firm size. Considering that the inclusion of embedded call options in bond contracts provides additional managerial flexibility to decrease the amount of borrowings before the maturity date or to remove restrictive covenants (see Pye (1966)), an inverse relation is expected between the inclusion of a call provision and firm size.

2.4. Interest tax shield

A number of authors have postulated the optimal choice of the maturity or call structure for debt issues is affected by tax considerations. It is argued that for increasing slopes of default risk and interest rate term structures, firms are more likely to issue long-term debt due to the time-value of the interest tax shield (Brick and Ravid (1985)) or the repurchase-premium tax savings (Mauer and Lewellen (1987)). Brick and Ravid (1985) postulate that for upward sloping interest rate term structures, the issuance of long-term risky debt embeds comparative advantages because it allows the firm to maximise debt tax gains by accelerating interest payments. On the other hand, Mauer and Lewellen (1987) point out whenever the interest term structure is upward sloping and long-term debt is traded above its face value, shareholders are able to capture tax gains by repurchasing the outstanding debt as long as these gains exceed the after-tax transaction costs. Moreover, Kane, Marcus and McDonald (1985) predict firms with a high marginal corporate tax rate and more volatile cash flows maximise their tax gains by rebalancing their capital structure more frequently and therefore should optimally issue short-term debt. Thus, a positive (negative) sign is expected for the coefficients of the variables that proxy for interest rate volatility and for the slope of the yield curve (effective tax rate and earnings volatility) in the maturity equation. In contrast, Lewis (1990) contends that when debt-maturity structure and optimal leverage are chosen simultaneously, the impact of the firm's tax liability on its maturity structure irrelevant.

Boyce and Kalotay (1979) and Marshall and Yatwitz (1980) demonstrate that as long as the corporate tax rate exceeds the personal tax rate borne by the marginal investor, callable bonds will always dominate non-callable bonds. These authors argue that both borrowers and creditors should favour callable bonds due to the interest tax savings resulting from exercising the call option (Boyce and Kalotay (1979)) or to the call premium tax benefit (Marshall and Yatwitz (1980)). Brick and Wallingford (1985) and Mauer, Barnea and Kim (1991) in contrast argue that even if Miller's (1977) tax irrelevance equilibrium does not hold, other forms of debt financing confer comparatively more tax advantages than callable debt. We test whether a variable defined as taxes paid to total assets is related to the inclusion of a call provision.

2.5. Business risk

Brennan and Schwartz (1988) argue that convertible securities, unlike equity and straight debt, protect investors against a firm's intrinsic risk because of their hybrid nature. This protection also safeguards investors against discretionary risk-shifting policies pursued by shareholders. Therefore, like Jensen and Meckling (1976) and Green (1984), Brennan and Schwartz (1988) contend that the inclusion of conversion options in debt contracts contribute to a reduction in the conflict of interests between bondholders and shareholders. On the other hand, Brennan and Kraus (1987) stress that convertible issues can act as a signalling mechanism for the firm's intrinsic risk, reducing the contracting costs of financing and consequently contributing to the maximization of firm value. Both the model of Brennan and Schwartz (1988) and that of Brennan and Kraus (1987) predict the beneficial impact of convertibles is greater the higher the firm business risk. Considering that high growth firms, with higher earnings volatility and relatively small size tend to face a higher business risk and/or a greater uncertainty surrounding the estimation of this risk, we expect a positive (negative) relation between the convertible option choice and the proxies for firm growth opportunities and earning variance (firm size).

2.6. Interest rate risk

Pye (1966) has argued the prevalence of callable bonds in capital markets is explained by their ability to act as hedging tools against interest rate risk. He argues that as long as the reduction of financial risk is not fully reflected in the lower callable bond price, firms will always favour the issuance of bonds with call provisions as the potential financial loss inherent to a decrease in interest rates is eliminated by the call

option's exercise. To this extent, Pye (1966) predicts that the higher the degree of uncertainty about interest rates (proxied by interest rate volatility) and the stronger the manager's expectations of a decrease in the level of interest rates, the higher the probability of bond issues that include call options provisions.

Several authors (see e.g. Myers (1971) and Bodie and Taggart (1978)) alternatively argue that unless managers possess special expertise in forecasting interest rates, firms will not profit from the issuance of callable bonds. These authors contend that even in the presence of market imperfections, like asymmetry of information about interest rates, arbitrage will assure that no benefit will be retained by the firm from the issuance of callable rather than non-callable bonds.

3 Model Specification

The debt design process is characterized by the selection of a set of contract terms that are influenced by a set of firm-level characteristics and market conditions. To overcome the problem of serially correlated errors, we use a random-effects estimation method to obtain the regression estimates for the relevant contract features namely maturity, call option, convertible option and other restrictive covenants. On the other hand, in order to take into account the probabilistic character of the three latter variables, we use a Probit random-effects method to estimate the parameters for the correspondent regression models. Analytically, the four regression models are defined as follows:

$$\text{Maturity}_{it} = \alpha_0 + \alpha_1 \text{Call\_option}_{it} + \alpha_2' X_1 + \mu_i + e_{it} \quad (1)$$

$$\text{Call\_option}_{it} = \beta_0 + \beta_1 \text{Maturity}_{it} + \beta_2' X_2 + \mu_i + e_{it} \quad (2)$$

$$\text{Convertible\_option}_{it} = \chi_0 + \chi_1 \text{Maturity}_{it} + \chi_2 \text{Protective\_covenants}_{it} + \chi_3' X_3 + \mu_i + e_{it} \quad (3)$$

$$\text{Protective\_covenants}_{it} = \varphi_0 + \varphi_1 \text{Maturity}_{it} + \varphi_2 \text{Convertible\_option}_{it} + \varphi_4' X_4 + \mu_i + e_{it} \quad (4)$$

where, $\rightarrow$, $\downarrow$, $\Re$, and $\ni$ are respectively the regression coefficients for each of the structural equations, X_K are vectors of the exogenous variables, μ_i is the ith firm-specific disturbance term (random effect) and e_{it} is the regression disturbance term across firms and time. Taking into account the debt design predictions discussed in section 2, the explanatory variables included in the vectors X_K and the expected signs

for the related coefficients can be summarised as follows:

$$X_1 = \begin{bmatrix} \text{constant}, & \overset{(-)}{\text{size}}, & \overset{(-)}{\text{market/book}}, & \overset{(+)}{\text{asset\_maturity}}, \\ \overset{(-)}{\text{interest\_volatility}}, & \overset{(-)}{\text{term\_premium}}, & \overset{(+)}{\text{earnings\_variance}}, & \\ \overset{(+)}{\text{tax/assets}}, & \overset{(-)}{\text{unexpected\_earnings}}, & \overset{(+)}{\text{return}}_{1-\text{year}-\text{before}} & \end{bmatrix} \tag{5}$$

$$X_2 = \begin{bmatrix} \text{constant}, & \overset{(-)}{\text{size}}, & \overset{(+)}{\text{market/book}}, & \overset{(+)}{\text{interest\_volatility}}, \\ \overset{(+)/(-)}{\text{tax/assets}}, & \overset{(+)}{\text{unexpected\_earnings}}, & \overset{(+)}{\text{interest\_level}} & \end{bmatrix} \tag{6}$$

$$X_3 = \begin{bmatrix} \text{constant}, & \overset{(-)}{\text{size}}, & \overset{(+)}{\text{market/book}}, & \overset{(+)}{\text{earnings\_volatility}}, \\ \overset{(+)}{\text{unexpected\_earnings}}, & \overset{(+)}{\text{total\_risk}}, & \overset{(-)}{\text{deviation\_from\_debt\_target}}, & \\ \overset{(+)}{\text{bankruptcy\_risk}} & & & \end{bmatrix}^{2} \tag{7}$$

$$X_4 = \begin{bmatrix} \text{constant}, & \overset{(-)}{\text{size}}, & \overset{(+)}{\text{market/book}}, & \overset{(+)}{\text{bankruptcy\_risk}} \end{bmatrix} \tag{8}$$

The appendix describes the explanatory variables.

4 Sample description

The original data set is made up of 439 Eurobond issues launched by 146 non-financial UK-based firms during the period 1986 to 1999. The information about the characteristics of these Eurobond offerings is obtained from the Bondware Database (Euromoney) and was checked against information obtained from issuance prospectuses. Floating Rate Notes (FRN) are excluded. Datastream is the source for the accounting and financial information used in the construction of the variables that proxy for firm and market characteristics. Proxies for firm-specific characteristics were

[2] The variables total risk and deviation from debt target are included as control variables. Empirical studies (see e.g. Billingsley, Lamy and Thompson (1988)) have shown that the propensity for firms to issue more equity-like or more debt-like issues depends on the firm risk and on the deviation from firm's debt-equity target.

constructed using financial statements for the financial year-end just preceding the announcement of the Eurobond issue.

Forty-nine (49) Eurobonds are excluded due to the lack of data required for the construction of proxy variables. Specifically, data were not available from Datastream for 35 issuers because 29 companies are not listed on the LSE, 4 issuers are privately owned and 2 companies are not identifiable with those listed in the Bondware database. Finally, 13 issues are excluded due to the lack of accounting information for the financial year-end prior to the Eurobond issue. Overall, the data set contains 377 Eurobond issues made by 109 non-financial companies distributed across 25 different industries.

As the panel data estimation requires the time-series observations to be evenly spaced across all cross-sectional units, a decision had to be made about the relevant sub-periods to be considered for the estimation sample. In order to avoid a large number of missing observations across issuing firms, we decide to aggregate the original data set into half-yearly observations for all firms in analysis. Thus, whenever a firm issued more than once during a half-yearly period, the firm, market, and issue proxies were averaged across time and a single observation was considered for this firm at this particular six-month period[3]. The aggregation of the time-series into evenly spaced half-year intervals, reduces the number of issues used in the estimation from 377 to 289. This data set was further reduced as all firms that issue only once were excluded to satisfy the required number of degrees of freedom for an accurate estimation of the regression parameters[4].

Overall, the final sample corresponds to an unbalanced panel data of 245 Eurobond issues made by 65 companies from January 1986 to December 1999. From this panel data 94 Eurobonds include a call option, 57 include a convertible option and 85 include other restrictive covenants.

Table 1 reports the descriptive statistics of the variables used in this study. This table shows that, on average, the maturity of the UK Eurobonds issued between 1986 and 1999 is approximately equal to 11.5 years, more than one third of these issues

[3] For the case of the dichotomous dependent variables, a value of one was assumed when the average value is equal to or greater than 0.5, and zero otherwise.

[4] Matyas and Sevestre (1992) point out, the generalised least square random-effect model yields unbiased estimators if and only if $N \geq K + 5$ and $T \geq 2$, where N is the number of cross-section units, K is the number of regressors and T is the number of observations per cross-section unit.

include a call option or other restrictive covenants but only 23% of the issues uses a convertible option.

Insert Table I

Table 2 shows the binary correlation coefficients for all the dependent and independent variables present in the estimation model. A particularly strong correlation is observed between a pair of dependent variables (maturity and call option) and a pair of independent variables (interest level and market-to-book value). The significant correlation between the latter variables determines the replacement of the variable market-to-book value by intangibles-to-total assets as a proxy for a firm's growth opportunities in the call option equation.

5 Results

The four columns of Table 3 show the multivariate panel data coefficient estimates and diagnostic tests for each model. Column A reports the results for maturity, column B reports the results for call option choice, column C reports the results for the convertible option choice and column D reports the results for other restrictive covenants choices. All the variables with coefficients that were not significantly different from zero are eliminated from the models presented. The coefficient estimates for the maturity model are obtained using the random-effects Generalised Least Square method and the coefficient estimates for the convertible option and other restrictive covenants models are obtained using the random-effects Probit method as these are binary variables. Preliminary tests show that the latter method is, however, not adequate for estimating the third binary variable model (call option model) as, in this case, the hypothesis of absence of unit-specific effects cannot be rejected[5]. For this reason the estimation results reported in Table 3 – Column B are obtained using a pooled Probit regression model.

Generally, the evidence suggests that contracts terms function as alternative control devises for reducing agency costs. Hence, the results show significant

[5] Greene (1998) reports two tests (the Wald test and the Likelihood ratio test) to assess the significance of unit-specific effects in probabilistic models applied to panel data sets. In the case of the call option model, both of these tests fail to reject the hypothesis of absence of unit-specific effects, at the 5% significance level.

interrelations between various Eurobond features, namely between short-term and callable debt (see Barnea, Haugen and Senbet (1980)), between restrictive covenants and convertible options (see Jensen and Meckling (1976), amongst others), and between short-term debt and restrictive covenants (see Myers (1977)). Furthermore, the maturity choice is significant and positively related with the maturity of assets in place, which corroborates the agency prediction that the optimal matching of the duration of assets and liabilities contributes to reduce shareholders/creditors conflicts of interest. The evidence that managers pursue a maturity-matching rule is also consistent with the liquidity risk prediction that the choice of debt term is determined by the manager's incentive to avoid excessive liquidity costs.

The model for the choice of other restrictive covenants shows a negative relation between the use of these type of covenants and the measure of firm's operational risk, which contradicts agency arguments. Further tests show, however, that this contradiction is only apparent, as it results from a non-linear relation between the firm's operational risk and its proxy (the relation is more U shaped).[6] An inverse relation is found between the use of restrictive covenants and the proxies for the firm's credit quality (firm size and Altman's Z-score). This result, that strongly contradicts the signalling predictions, might be explained by the particular characteristics of the Eurobond market. Indeed, the strong disclosure regulation, the close market scrutiny and the international exposure that characterise the Eurobond market guarantee a level of information symmetry that seems to impel low credit quality firms to include additional restrictive covenants in debt issues in order to avoid excessive contracting costs. This finding is again in line with agency arguments.

The negative and significant coefficient for firm size in the convertible equation supports Brennan and Schwartz (1988) and Brennan and Kraus (1987) argument that smaller firms, whose risk is more difficult to be estimated, are more likely to issue an instrument that is relatively insensitive to the variations of firm's risk such as convertible securities. Nevertheless, the statistical insignificance of the other proxies for firm risk's uncertainty (i.e. earnings variance and level of growth opportunities)

[6] Indeed, further tests show that the relation between the use of restrictive covenants and the proxy for bankruptcy risk is only statistically significant for the range where the latter variable assumes positive values. For this range, high earnings before interest and taxes' volatility (the denominator of bankruptcy risk proxy) corresponds to low values for bankruptcy proxy but high operational risk for the firm. Therefore, the negative relation between the use of restrictive covenants and this proxy for bankruptcy risk is, indeed, consistent with agency predictions.

mitigates the explanatory power of risk uncertainty hypothesis.

Finally, the model for the use of a call option show an inverse relation between the inclusion of this feature and the proxies for the firm's effective tax rate and the firm size. The former result corroborates Brick and Wallingford (1985) and Mauer, Barnea and Kim (1991) argument that high tax paying firms benefit from not including a call option in their debt indentures. On the other hand, the evidence that smaller and typically less credible firms tend to attach a call option to Eurobond contracts provides support to the liquidity risk arguments.

Insert Table III

6 Conclusions

This paper examines the determinants of the debt contract terms on a sample made up of Eurobond issues offered by UK-based companies during the period of 1986 to 1999. We use a panel data estimation approach in order to obtain robust results, overcoming the problems related to serially correlated error terms. The evidence in this paper confers strong support to agency prediction that debt contract features are interrelated. Thus, strong interdependence is found between the choice of maturity and the inclusion of a call option or of other restrictive covenants. Additionally, the inclusion of other restrictive covenants is inversely related with the inclusion of a convertible option, as predicted by agency theory. Further support is provided to the agency theory by the evidence that managers follow a maturity-matching rule and tend to include additional protective covenants when firm's credit quality is low. Finally, in line with liquidity risk prediction, lower credit quality firms are more likely to include a call option in the contract indenture to reduce the costs of financial distress.

Table 1: Descriptive Statistics

Descriptive statistics for the dependent and independent variables included in the panel data models for maturity, call option, convertible option, and restrictive covenants. Sample size equals 245.

	Mean	Median	Std. Deviation	Min	Max
Restrictive covenants	0.35	0	0.48	0	1
Convertible option	0.23	0	0.42	0	1
Call option	0.38	0	0.49	0	1
Maturity	11.48	10.05	7.71	0.56	50.09
Size	14.85	14.80	1.08	10.84	17.49
Market-to-book value	1.59	1.40	0.96	0.10	10.56
Intangibles (%)	4.62	0.00	10.48	0.00	66.80
Assets maturity	2.09	2.32	0.99	-0.62	4.09
Interest volatility	0.45	0.44	0.17	0.19	0.86
Term premium	-0.24	-0.44	1.70	-3.76	2.88
Earning variance (%)	2.43	1.80	2.04	0.19	14.23
Z-score (adj.)	1,59	1,55	0,50	0,02	3,83
Z-score squared (adj.)	2,77	2,42	1,75	0,00	14,64
Tax paid (%)	2.69	2.36	2.04	-3.52	15.60
Leverage	1.45	1.10	1.66	-5.89	11.92
Bankruptcy risk	8.08	3.87	20.10	-27.94	249.73
Stock return_1 year before	0.17	0.18	0.31	-0.83	2.18
Unexpected earnings (%)	0.23	0.51	3.00	-24.09	12.78
Std. dev.return_3 m before (%)	1.73	1.55	0.73	0.30	4.83
Deviation target	0.03	0.02	1.11	-4.84	9.09
Interest level (%)	7.78	8.09	2.03	4.19	11.60

Table 2: Pearson Correlation Matrix

This table provides a measure of linear association for each pair of dependent and independent variables included in the Panel data models for maturity, call option, convertible option, and restrictive covenants. The correlation coefficients are computed for a sample of 245 observations. *,** indicate significance at the 10% and 5% levels, respectively (two-tailed test).

	Restrictive Covenants	Convertible option	Call option	Maturity	Size	Market-to-book value	Intangibles (%)	Asset Maturity
Convertible option	-0.18**							
Call option	0.17**	0.50**						
Maturity	0.29**	0.03	0.41**					
Size	-0.20**	-0.26**	-0.28**	-0.06				
Market-to-book value	-0.08	-0.04	-0.03	-0.13*	0.32**			
Intangibles (%)	-0.23**	0.01	0.01	-0.14*	0.02	0.01		
Asset Maturity	0.29**	0.00	0.08	0.20*	0.01	-0.22**	-0.53**	
Interest Volatility (%)	-0.22**	0.30**	0.11	0.00	-0.09	0.01	-0.05	-0.05
Term premium (%)	0.03	-0.13*	-0.03	-0.02	0.00	0.01	0.07	-0.09
Earning variance (%)	0.04	0.05	0.09	0.01	-0.03	0.41**	0.12	-0.13*
Tax paid (%)	-0.06	-0.21**	-0.25**	-0.12	0.24**	0.24**	0.05	-0.05
Leverage	-0.14*	0.00	-0.09	-0.07	-0.01	-0.07	0.18**	-0.26**
Bankruptcy risk	-0.16*	-0.01	-0.08	-0.02	0.05	-0.05	0.04	-0.14*
Z-score (adj.)	-0.17**	-0.02	-0.11	-0.12	-0.06	0.14*	-0.16*	-0.21**
Z-score squared (adj.)	-0.14*	0.00	-0.07	-0.11	-0.07	0.19**	-0.16*	-0.22**
Stock return_1 y before	0.01	0.26**	0.22**	0.03	-0.02	0.29**	-0.03	-0.06
Unexpected earnings (%)	-0.04	0.15*	0.09	0.02	-0.02	-0.03	-0.02	0.08
Std.dev. Return_3 m before	0.02	-0.07	-0.08	-0.08	0.09	0.24**	-0.02	-0.16*
Deviation target	0.04	-0.01	0.04	0.02	-0.08	-0.06	-0.06	0.09
Interest level (%)	-0.02	0.27**	0.01	-0.02	-0.23**	-0.24**	-0.11	0.04

	Interest volatility (%)	Term premium (%)	Earning variance (%)	Tax paid (%)	Leverage	Bankruptcy Risk	Z-score (adj.)	Z-score squared (adj.)
Term premium (%)	-0.35**							
Earning variance (%)	0.01	-0.12						
Tax paid (%)	-0.11	0.09	0.12					
Leverage	-0.04	0.07	-0.07	0.09				
Bankruptcy risk	0.14*	0.14*	0.22**	-0.09	0.00			
Z-score (adj.)	0.07	-0.01	0.06	0.31**	0.06	-0.04		
Z-score squared (adj.)	0.08	-0.03	0.11	0.28**	0.01	-0.05	0.96**	
Stock return_1 y before	0.08	-0.01	0.12	-0.14*	-0.14*	-0.09	-0.20**	-0.13*
Unexpected earnings (%)	-0.08	0.13*	0.03	-0.03	-0.08	-0.01	-0.01	0.01
Std.dev. return_3 m before	0.11	-0.20**	0.02	-0.13*	0.02	0.03	-0.19**	-0.12
Deviation target	-0.10	0.12	0.10	0.11	0.45**	-0.01	-0.09	-0.12
Interest level (%)	0.14*	-0.17**	0.13*	0.00	0.01	-0.04	0.28**	0.23**

	Stock return_1 year	Unexpected earnings	Std.dev. return_3 m	Deviation target
Unexpected earnings (%)	0.16*			
Std.dev. return_3 m before	0.08	-0.06		
Deviation target	-0.12	0.00	-0.08	
Interest level (%)	-0.06	0.06	-0.35**	0.01

Table 3: Panel Data Estimates of Continuous and Qualitative Dependent Variables

Independent Variables	(A) Maturity	(B) Call option	(C) Convertible option	(D) Restrictive covenants
Intercept	5.88	3.67	6.16	10.38
	(4.12)***	(2.82)***	(4.09)***	(3.36)***
Maturity		0.08		0.08
		(5.89)***		(3.12)***
Call option	6.14			
	(6.09)***			
Restrictive covenants			-1.01	
			(-3.44)***	
Convertible option				-1.66
				(-3.88)***
Asset maturity	1.48			
	(2.43)**			
Tax paid/Assets (%)		-0.15		
		(-2.91)***		
Altman's Z-score adj.				-1.15
				(-2.92)***
Size		-0.30	-0.46	-0.66
		(-3.43)***	(-4.45)***	(-3.19)***
Bankruptcy risk				-0.04
				(-2.03)**
Total observations	245	245	245	245
R^2	0.20			
Model chi-square		$\chi^2(3)$=	$\chi^2(3)$=	$\chi^2(6)$=
		70.19***	35.23***	106.44***
Diagnostic tests				
Random-effects tests				
Hausman	0.19 [0.91]	–	–	–
Lagrange multiplier	12.82 [0.00]	–	–	–
Likelihood ratio	–	–	5.57 [0.02]	43.21 [0.00]
Wald	–	–	2.10 [0.04]	6.60 [0.00]

This table shows the random-effect regression estimates of the choice of maturity, the choice to include a convertible option or other restrictive covenants (respectively) and the pooled regression estimates of the choice to include a call option on a set of explanatory variables. The estimates are obtained for a sample of 245 Eurobonds issues. *t*-statistics in parentheses. p-values in square brackets. *,**,*** indicate significance at the 10%, 5%, and 1% levels.

Appendix: Exogenous Variable Descriptions

Size: Similar to previous empirical work (see e.g. Dennis, Nandy and Sharpe (2000) and Stohs and Mauer (1996)) firm size is calculated as the natural log of 100 times the firm's market value deflated by the UK consumer price index (using 1982 as the base year).

Market-to-book value: The market-to-book value of the issuing firm. This measure is obtained by dividing the firm's market value (i.e. total assets + equity market value – book value of equity) by the firm's total assets.

Intangibles/Assets (%): This is a proxy for growth opportunities. The measure is the ratio of intangible assets to total assets (percentage).

Asset maturity: The proxy for the issuing firm's asset maturity. Similar to Dennis, Nandy and Sharpe (2000), the firm's asset maturity is defined as the natural log of the product between the net fixed assets scaled by the total assets and the net fixed assets divided by the total depreciation.

Interest volatility: This is the proxy for the interest rate volatility measured by the standard deviation of the daily 10-year UK government bond yield over the year prior to the announcement date.

Term premium: The measure for the interest rate term premium is defined as the difference between the 10-year UK government bond and the 3-month UK Treasury bill daily yields average over one year prior to the issuance of the Eurobond.

Earning variance (%): The proxy for the variance of firm's earnings measured as the standard deviation of the earnings before interest, tax, and depreciation (EBITD) over the last three financial years-ends preceding the issue announcement date scaled by the average total assets over the same period.

Tax paid (%): The proxy for firm's effective corporate tax rate is defined as the ratio of tax paid to total assets and is expressed in percentage.

Leverage: The proxy for firm financial leverage is computed as the firm's total debt divided by the firm's book value of equity.

Bankruptcy risk: This is the proxy for firm's operational risk and is calculated as the difference between firm's fixed charges and firm's earnings before interest and taxes (EBIT) scaled by the standard deviation of the EBIT for the three financial years-ends prior to the issue announcement.

Stock return_1 y before: This is an indicator of firm's prosperity and it is calculated as the firm's stock return over one year prior to the issue announcement.

Z-score (adjusted): This is the proxy for firm's credit quality and, similar to Dennis, Nandy and Sharpe (2000) and Hulburt and Scherr (2001), is obtained by excluding the term assessing "firm solvency" (i.e. the ratio of the market value of equity to total debt) from the original expression proposed by Altman (1968). A reduced formulation of the proxy of firm's credit quality used due to the high correlation observed the standard Altman's measure and the explanatory variable market-to-book value (preliminary test reports a partial correlation coefficient of 0.71). Analytically, this measure is defined as 3.3*EBIT/Total sales + 1.0*Total sales/TA + 1.4*RE/TA + 1.2*WC/TA where EBIT is firm's earnings before interest and taxes, RE is the firm's retained earnings, WC is the firm's working capital, and TA is the firm's total assets. To exclude the negative values from the proxy for firm credit quality this variable is censored from below at zero.

Z-score squared (adjusted): The squared value of the proxy for firm's credit quality.

Unexpected earnings (%): This is a proxy for firm's unexpected earnings and is calculated as the difference the earnings per share at the financial year-end following the issue announcement and the earnings per share at the financial year-end of the announcement scaled by the stock price at the financial year-end of the announcement.

Std. dev. return_3 m before: This is the proxy for firm's total risk. It is calculated as the standard deviation of the firm's daily stock returns over the three months prior to the issue announcement.

Deviation target: This is the proxy for the deviation from firm debt target and is computed as the difference between firm debt target and firm total debt to book value of equity at the financial year-end prior to the issue announcement. The debt target is computed as the historical average of debt to equity ratio over the three years prior the issue announcement. Billingsley, Lamy and Thompson (1988) provide evidence suggesting that the higher the deviation from firm's debt-equity target the higher the propensity for the firm to issue more debt-like securities. To this extent, the lower (higher) the current level of the firm gearing compared with its historical target the lower (higher) the propensity to issue a hybrid security such as convertible Eurobonds.

Interest level (%): This is the 3-month UK Treasury bill rate prevailing at the time of the issue announcement.

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