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Abstract

This paper provides a comprehensive analysis of the determinants for the optimal choice of contract terms on Eurobonds issued by UK companies. We examine predictions of extant theories that associate the choice of debt features namely, maturity, call options, convertible options, and protective covenants to firm and market characteristics. Like in Correia (2003), a simultaneous equations approach is adopted to test the alternative use of contract features for mitigating debt-contracting costs. The evidence provides strong support to the prediction that both callable and short-term debt and convertible and debt with protective covenants are used as alternative control devises to mitigate agency costs. Further evidence suggests, however, that contrary to the fundamentals guiding the choice of maturity and callability structures, the use of conversion options and protective covenants in Eurobond contracts seems to be determined by equity agency costs rather than debt agency costs. Also, some support is found for the risk uncertainty theory underlying the use of convertibles and for liquidity risk arguments regarding the choice to include protective covenants.

Resumo

Neste artigo realizamos uma análise abrangente dos factores que determinam a escolha da estrutura óptima dos contratos de Euroobrigações emitidos por empresas do Reino Unido. Testamos as teorias existentes que associam a escolha dos termos da dívida nomeadamente, maturidade, opções de compra, opções de conversão e cláusulas restritivas com as características da empresa emitente e do mercado. Como em Correia (2003), um sistema de equações simultâneas foi adoptado para testar o uso alternativo de termos na redução dos custos de contratação de dívida. Os resultados obtidos confirmam as hipóteses teóricas de que, a dívida de curto-prazo e a dívida com opções de compra, por um lado, e a dívida de curto-prazo, a dívida com opções de conversão e a dívida com claúsulas restritivas são usadas como mecanismos alternativos para reduzir os custos de agência. Investigação adicional sugere, no entanto, que ao contrário dos fundamentos que orientam a escolha da maturidade e da inclusão de opções de compra, a inclusão de opções de conversão e de claúsulas restritivas parece ser determinada por custos de agência associados ao financiamento por capitais próprios e não ao financiamento por dívida. Resultados empíricos conferem também algum apoio à teoria de incerteza quanto ao risco e à teoria do risco de liquidez.

* Previous versions of this paper were presented at seminars at the universities of Strathclyde (UK) and Porto (CEMPRE, Faculdade de Economia do Porto). I would like to thank comments from the participants. The usual caveat applies.

1. INTRODUCTION

Although there has been substantial research on the valuation implications of debt financing, only recently has the design of debt contracts begun to be extensively analysed and its implications for optimal financing decisions assessed. The literature on optimal debt contract design has focused on the choice of contract features that, conditional on firm and market characteristics, lead to a reduction of debt financing inefficiencies. Important aspects of contract design are the interrelationships between contract feature choices themselves but also with choices such as the level of leverage when viewed as alternative control mechanisms for mitigating debt-contracting costs. In spite of considerable theoretical developments, empirical analyses of the optimal structure of debt contracts have been hindered by several factors. First, most of the empirical work in this area (e.g. Barclay and Smith (1995), Guedes and Opler (1996), Stohs and Mauer (1996), Mitchell (1991), Kish and Livingston (1992), Abhyankar and Dunning (1999) and Citron (1995), amongst others) focuses on a single feature of a debt contract ignoring interdependencies between the feature examined and other contract features. This raises an important econometric issue. Potential misspecifications associated with the estimation of regressions when the endogenous character of variables that are jointly determined and related to a common set of explanatory variables is not taken into account can lead to erroneous results. Some of the empirical studies (e.g. Barclays and Smith (1995) and Guedes and Opler (1996)) overcome this problem by excluding from the set of explanatory variables the proxies for jointly determined financing choices. Although this reduces simultaneous-equations bias, it fails to assess the theoretical predictions that postulate the use of debt contract features and leverage policy as alternative control mechanisms for reducing financing inefficiencies. For instance, Myers (1977) argues that short-term debt, protective covenants, and low levels of leverage can be equally efficient in curbing shareholder incentives to underinvest. Similarly, Barnea et al. (1980) postulate that the incentive to invest in low value, high-risk projects can be mitigated by issuing either short-term debt or by including a call provision in the contract indenture. Finally, Jensen and Meckling (1976), Mikkelson (1980), and Smith and Warner (1979) point out that convertible provisions and restrictive covenants constitute alternative mechanisms for reducing agency costs as they lead to a decrease in the asset substitution problems.

Second, previous empirical studies have typically focused on samples that aggregate data from different types of debt contracts. This potentially introduces confounding effects as no clear distinction can be made between the determinants of debt composition for a type of contract and a significant number of other factors affecting the preference for certain types of structured debt. For instance, it is typically reported that small firms use mostly bank loans to finance their activities while medium and large firms utilize 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 may be more difficult for instance in samples containing only bank loans. Finally, apart from Barclay and Smith (1995) all empirical studies that analyse longitudinal data ignore the fact that, classical OLS or Probit (Logit) estimation methods produce inefficient estimators because the underlying correlation between the error terms is not resolved. This issue is important as the lack of independence of the residual disturbances leads to potentially overstated *t*-statistics. In order to resolve these limitations, the current paper provides an empirical evaluation of the debt design predictions using a simultaneous-equations framework over an aggregated data set of proxies for the characteristics of debt issues, issuers, and market conditions. The aggregation of the sample data on Eurobonds issued by 109 UK firms during 1986-1999 permits us to resolve the problem of potential inter-dependence among residual terms.[1] Moreover, this procedure allows the application of a simultaneous-equations framework where the endogenous character of jointly determined variables is considered.

Previously, Dennis et al. (2000) have applied a two-stage simultaneous-equations estimation method to analyse the decision process for the choice of maturity and security status on a panel data of bank revolving credit agreements. Our paper provides a more comprehensive analysis of debt contract design by considering not only maturity but also the choice to include option-like features as part of the contract design.

The evidence from this study provides strong support for the prediction that the choice to include a call feature and the choice to issue short-term debt, on the one hand, and the

[1] The aggregation of data was obtained by quarterly averaging of the values for the dependent and independent variables. A value of one was assigned to the binary variable when the corresponding average value was equal or greater than 0.5 and zero otherwise.

choice to include a conversion option along with the inclusion of protective covenants, on the other hand, are used as alternative control devices to mitigate agency costs. Further evidence suggests, however, that contrary to the fundamentals guiding the choice of maturity and callability structures, the use of convertible options and protective covenants in Eurobond contracts is determined by equity agency costs rather than debt agency costs. Support is also found for the risk uncertainty theory underlying the use of convertibles and for liquidity risk arguments regarding the choice of protective covenants. Finally, no support is found suggesting the choices of debt contract features are related to tax effects or are equilibrium-signalling mechanisms for revealing firm value.

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 privileges, and protective covenants in debt contracts. Section 3 specifies the model and describes the regression estimation method used. Section 4 describes the sample set used in the empirical analysis. Section 5 provides an analysis of the empirical results. Finally, section 6 presents our conclusions.

2. THEORETICAL BACKGROUND

A range of theories has been proposed to explain a firm's choice of debt maturity and the choice to include a conversion option, a call feature, and the collection of protective covenants represented in debt contracts.

2.1. Contract feature interdependencies

Myers (1977) argues that short-term debt, protective covenants, and low levels of leverage act as substitute mechanisms in reducing shareholders' incentive to underinvest. The basic contention has been extended by Barnea et al. (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 protective covenants. These authors conclude that the alternative use of these terms in debt contracts acts to control shareholders' desire to jeopardise creditors interests by pursuing risk-shifting policies that ultimately lead to the erosion of firm value. Essig (1991) argues that low levels of leverage and convertible securities are alternative devises for controlling asset substitution incentives.

In order to test the interdependencies between maturity and call options proposed by Barnea et al. (1980) and between maturity and leverage level (Myers, 1977), the variable call option that measures the propensity of the issue to include a call option and the variable leverage proxying for the debt-to-equity ratio are included in the structural equation for the issue maturity. The endogenous character of the former variables is considered in the two-stage simultaneous-equations framework by replacing the observed values of these variables by their correspondent reduced-form predicted values.

The predicted substitute role played by call provisions, maturity, and leverage level is further tested by including the later variables, in the structural equation for the propensity to issue callable Eurobonds (call option equation). Finally, considering the ability of convertible options, protective 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's (Essig (1991)) incentives, the structural equation for the propensity to attach convertible options (protective covenants) include the variables issue maturity, protective covenants, and leverage (maturity, convertible option, and leverage).

2.2. Debt agency costs hypothesis

The agency costs of debt may influence selection of the debt contract features. One argument suggests the greater a firm's growth opportunities and/or financial risk the higher the agency costs of debt and therefore the more crucial will be the appropriate set of debt contract terms in order to mitigate these costs. Shorter-term maturity debt (Myers (1977)), callable debt (Bodie and Taggart (1978)), and debt with embedded protective covenants (Myers (1977) and Smith and Warner (1979)) are postulated to be the optimal choices for reducing the costs associated underinvestment. As the incentive to forsake profitable investments is exacerbated for high-growth firms, a negative (positive) relation is expected between the variable maturity (call option and protective covenants) and the proxies for future growth opportunities (market-to-book value and intangibles to total assets).[2] Moreover, the incentive for risky firms to pursue low-value, riskier investment is reduced by the issuance of short-term or callable debt (see Barnea et al. (1980)), convertible debt (see Jensen and Meckling (1976), Green (1984), and Smith and Warner (1979)), and debt with protective covenants (see Smith and Warner (1979)). To this extent, a negative (positive) relation is predicted between issue maturity (call option, convertible option, and protective 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 protective covenants equation.

Aiming to test Myers' (1977) prediction that firms should match the maturity of liabilities to the maturity of assets in place for underinvestment controlling purposes, we introduce the variable maturity of assets in place in the maturity equation. A positive sign is expected for the coefficient of this variable.

2.3. Asymmetric information and signalling hypotheses

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 high asymmetric information environments, firms signal their superior quality by issuing short-term debt. On the other hand, Lucas and McDonald (1990) contend that firms take advantage of the existence of uniformed investors and issue longer and necessarily more mispriced debt after a period of good performance in the market. To test these predictions, the variables unexpected earnings and stock return over on year prior the Eurobond issue are included in maturity equation. A negative and a positive sign are expected for the coefficients for unexpected earnings and stock return over one year prior the issue announcement, respectively.

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[2] Unreported results suggest the presence of multicollinearity problems in the structural call feature choice equation when the variable market-to-book value is used as a proxy for future growth opportunities. For this reason, the variable intangibles-to-total assets replaces market-to-book value in the call feature choice equation. Support for the use of intangibles-to-total assets as a proxy for growth opportunities can be found in Long and Malitz (1985) and Myers (1984).

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 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 that high quality firms favour the issuance of debt with embedded protective covenants as such provisions promote a reduction in the adverse-selection and moral hazard costs. To this extent, a positive relation is expected between the protective covenants variable and the proxy for firm credit quality. Firms that have survived for long periods will tend to be larger, ceteris paribus. Thus size may be a reasonable proxy for quality. Like Queen and Roll (1987), we assume a firm's credit quality is proportional to its size.

2.4. Liquidity risk

Diamond (1991) defines to the 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 that 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. This bargaining power exists because either the borrower is critical to running the firm or because he might take an unobserved action and must be provided with proper incentives (Diamond (1993)). Diamond (1991) and Sharpe (1991) suggest even in contexts of symmetry of information about firm's future prospects, liquidity risk plays a key role in the design of debt contracts. In fact, 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 firm's value. A positive relation between debt maturity and maturity of assets in place is predicted by the liquidity risk. Moreover, as low credit quality 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 provide additional managerial flexibility to decrease the amount of borrowings before the maturity date or to remove restrictive covenants (see Pye (1966)), an inverse relation between call options and firm size is expected by the liquidity risk theory.

2.5. Interest tax shield hypothesis

Typically, tax treatments for firm's interest payments and equity payouts are different. Interest payments are typically considered tax deductible for the computation of corporate taxable income. Due to this difference in tax treatment, a number of authors have postulated that the optimal choice of the maturity or call structure for debt issues is affected by tax considerations. To this extent, 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 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 et al. (1985) predict that firms with 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. In particular, Lewis (1990) emphasises that unless other market imperfections like bankruptcy costs are taken into account, changes in the outstanding debt maturity structure will carry no additional tax shield for the firm. Therefore, the rejection of hypothesis five of this research will be in line with Lewis's model predicts debt maturity is not influenced by tax effects.

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 et al. (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. Therefore, the variable taxes paid to total assets can be direct- or inversely related to the variable call option.

2.6. Risk uncertainty hypothesis

Brennan and Schwartz (1988) argue that convertible securities, unlike equity and straight debt, protect investors against 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) models predict the beneficial impact of convertibles is greater the higher the firm's inherent risk, which is proxied by the firm's leverage, growth opportunities, and volatility of cash-flows.

2.7. Interest rate risk hypothesis

According to Pye (1966), the prevalence of callable bonds in capital markets is explained by their ability to act as hedging tools against interest rate risk. Pye (1966) points out that assuming managers and investors have different information about future interest rate shifts, the inclusion of call provisions in bond contracts will always maximize firm value. In fact, 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 options 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 asymmetric information about interest rates (proxied by the variable 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.

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. In other words there should be no relation between the use of call features and risk.

3. ESTIMATION METHODS

The debt design process is characterised by the choice of a set of terms that cannot be traded independently and that are influenced by a common set of factors (Myers (1977), Smith and Warner (1979), Barnea et al. (1980), amongst others). In order to provide consistent and well-defined estimators for the coefficients of firm characteristics, market conditions, and concurrently chosen terms a two-stage simultaneous equation estimation process is employed. The estimation technique takes into account the mix of two different types of dependent variables in the model, discrete choice variables (call option, convertible option, and protective covenants) and a continuous variable (maturity).[3] We model the Eurobond design process treating the selection of contract features and the leverage decision as jointly determined and influenced by a set of common factors such as, agency costs, liquidity risk, degrees of asymmetry of information, tax effects, interest rate risk, and uncertainty effects. Specifically, we begin by estimating reduced-form predictors by regressing the endogenous variables on all the exogenous variables in the model. These predictors are then used in a second stage, to replace the observed values of the endogenous

[3] See for instance Taylor (1993).

right-side variables in each of the structural equations.[4] Analytically, the structural equations are defined as follows:

$$Maturity = \varphi_{11} Call\_option + \varphi_{12} Leverage + \beta_1' X_1 + e_1 \quad (3.1)$$

$$Call\_option = \varphi_{21} Maturity + \varphi_{22} Leverage + \beta_2' X_2 + e_2 \quad (3.2)$$

$$Convertible\_option = \varphi_{31} Maturity + \varphi_{32} Protective\_covenants + \varphi_{33} Leverage + \beta_3' X_3 + e_3 \quad (3.3)$$

$$Protective\_covenants = \varphi_{41} Maturity + \varphi_{42} Convertible\_option + \varphi_{43} Leverage + \beta_4' X_4 + e_4 \quad (3.4)$$

where, φ_{ij} are the coefficients for the interdependence effects between debt contract term i and debt contract term j, X_K are vectors of the exogenous variables with β_K representing the sensitivity coefficients for these variables, and the e_K are residual terms. 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:

$$X_1 = \begin{bmatrix} constant, \overset{(-)}{size}, \overset{(-)}{market/book}, \overset{(+)}{asset\_maturity}, \overset{(-)}{interest\_volatility}, \\ \overset{(-)}{term\_premium}, \overset{(+)}{earnings\_variance}, \overset{(+)}{tax/assets}, \overset{(-)}{unexpected\_earnings}, \\ \overset{(+)}{return_{-1\_year}} \end{bmatrix} \quad (3.5)$$

$$X_2 = \begin{bmatrix} constant, \overset{(-)}{size}, \overset{(+)}{market/book}, \overset{(+)}{interest\_volatility}, \\ \overset{(+)/(-)}{tax/assets}, \overset{(+)}{unexpected\_earnings}, \overset{(+)}{interest\_level} \end{bmatrix} \quad (3.6)$$

$$X_3 = \begin{bmatrix} constant, \overset{(-)}{size}, \overset{(+)}{market/book}, \overset{(+)}{earnings\_volatility}, \\ \overset{(+)}{unexpected\_earnings}, \overset{(+)}{total\_risk}, \overset{(+)}{debt-target\_deviation} \end{bmatrix} \quad (3.7)$$

$$X_4 = \begin{bmatrix} constant, \overset{(-)}{size}, \overset{(+)}{market/book}, \overset{(+)}{bankruptcy\_risk}, \end{bmatrix} \quad (3.8)$$

[4] OLS and Probit estimation are used to obtain the reduced-form predictors for the continuous variables (maturity and leverage) and for discrete choice variables (call option, convertible option, and protective covenants), respectively.

Classical OLS or Probit (Logit) estimation methods produce inefficient estimators because the underlying correlation between the error terms is not resolved. This issue is important as the lack of independence of the residual disturbances leads to potentially overstated *t*-statistics. In order to resolve these limitations, the current paper provides an empirical evaluation of the debt design predictions using a simultaneous-equations framework over an averaged data set of proxies for the characteristics of debt issues, issuers, and market conditions.

4. The Sample of Eurobonds

Typically, Eurobonds are distinguished from other forms of public debt (i.e. domestic and foreigner bonds) because they are issued in markets other than that of the currency of issue. Although the original impetus for the launching of the Eurobonds market in 1963 has been linked to the imposition of tax barriers by the US government to the acquisition of foreign securities by domestic investors, this market has expanded considerably over the past decades attracting investors and issuers worldwide. Levich (2001) points out that since 1985 roughly 80 percent of all international bond issues have been floating in the Euro market. The increasing importance held by the Eurobond market calls for an in depth analysis of the impact of Eurobond term's choice on the reduction of contracting costs. There are other reasons, however, that make Eurobonds a well-suited and particularly interesting selection for examining the validity of theories about optimal contract design. First, Eurobonds are non-homogeneous instruments providing a useful basis for the study of the choice of contract features available to borrowers. Second, the Eurobond market functions as a segmented capital market in which investors are willing to pay more for the issues than for identically designed securities launched in other markets. In these circumstances, it is plausible to expect that issuers 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 underlying comparative advantages of Eurobond financing. In particular, considering that contracting costs are more pertinent when debt offerings are riskier, it is important to note the differences observed in the design of less risky and more risky Eurobond issues. In our sample, Eurobonds issued by the firms with higher credit quality (i.e. firms in the higher percentile of Altman's Z-score) only 3% include protective covenants, 3% include convertible options, 10% include call options, and have a mean maturity of 9 years.[5] On the other hand, Eurobonds issued by lower credit quality firms (i.e. firms in the lower percentile of Altman's Z-score) 31% include protective covenants, 47% include convertible options, 61% include call options, and have a mean maturity of 12 years. It seems, indeed, that Eurobond issuers are particularly concerned with the choice of debt structure when financing inefficiencies are potentially significant. 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)), which provide inconclusive results for tax-related and asymmetric information theories.

The initial sample is made up of 439 Eurobond issues launched by 146 non-financial UK-based companies during 1986 to 1999. The information about the characteristics of these Eurobond offerings is obtained from the Bondware Database. 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 constructed using financial statements for the financial year-end date 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 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.

Table 1 reports information on the distribution of issues across years and the aggregate amounts issued in pounds. The number and amount of Eurobond issues in the sample by

[5] Altman's Z-score is a measure of a firm's credit quality proposed by Altman (1968). It is defined by the expression: 3.3*EBIT/Total sales+1.0*Total sales/TA+1.4*RE/TA+1.2WC/TA+0.6*MV/Total debt where EBIT is earnings before interest and taxes, RE is retained earnings, WC is working capital, TA is total assets, and MV is market value of equity.

follow a steady trend until 1996. After this year an exponential increase is observed and, in 1999, maximum values of 84 and 29.608 million pounds are reached, respectively, for the number and amount of Eurobonds issued. One of the reasons for the substantial growth of Eurobond offerings in 1999 is likely due to the introduction of the euro (Claes et al, 2000). The need for UK firms to hedge against the exchange rate risk associated with the European Monetary System (EMS) together with the depth of the investor base for euro denominated securities, makes the Eurobond market an attractive source for UK companies' debt financing. Another reason for the expansion of the Eurobond market, after 1996, is linked with the incapacity of bank borrowings to satisfy the increasing amounts of funding required to finance mergers and acquisitions and the aim of issuers to create a sufficiently liquid secondary market to facilitate the placement of subsequent issues (Economic Bulletin, March 2000, p. 54).

Table 1: Number and Nominal Value of Eurobond Issues per Year in Sample

Year	Nominal value (in millions of GBP)	(%)	Number of issues	(%)
1986	1,526	1.8	17	4.5
1987	1,530	1.8	17	4.5
1988	1,780	2.1	16	4.2
1989	2,021	2.4	12	3.2
1990	2,724	3.3	20	5.3
1991	3,012	3.6	20	5.3
1992	4,291	5.2	39	10.3
1993	4,308	5.2	29	7.7
1994	2,059	2.5	11	2.9
1995	5,176	6.2	18	4.8
1996	5,412	6.5	23	6.1
1997	8,875	10.7	29	7.7
1998	10,939	13.1	42	11.1
1999	29,608	35.6	84	22.3
Total	83,261	100.0	377	100.0

Table 2 shows that Utility companies are responsible for approximately 50% of the total issues with protective options. These offerings, most of which launched during the 1990's, were fuelled by the privatisation and take-over processes that occurred in Electricity, Water, and Telecommunication industries. Moore (2001) points out that the inclusion of protective covenants in Eurobonds offered by these industries reflects the uncertainty arising from the new status of Electricity and Water companies as privatised entities.

The privatisation and restructuring processes that occurred during the 1990's in the transport industry might also explain number of issues in this sector that contained protective covenants (i.e. 22.6% of the total). The Utility, Retailer, and Transport sectors were also the largest users of callable bonds (respectively, 34.3%, 13.9%, and 10.9%). The distribution of convertible issues is more evenly spread across industries. The Building Materials, Media, and Transport sectors were the largest users of convertible Eurobonds (10.4%, 9.1%, and 9.1% respectively). This may be due to the higher exposure of these sectors to the risk of economical cycles.

Table 2: Eurobonds' Embedded Options across Industries

Code[a]	Industry	Protective Covenants		Call Options		Convertible Options	
		Issues	(%)	Issues	(%)	Issues	(%)
12	EXTRACTIVE INDUSTRIES		–	5	3.6%	6	7.8%
15	OIL, INTEGRATED		–	3	2.2%		–
16	OIL EXPLORATION & PRODUCTION	5	4.3%	2	1.5%	2	2.6%
21	CONSTRUCTION		–	1	0.7%	2	2.6%
22	BUILDING MATERIALS & MERCHANTS	4	3.5%	8	5.8%	8	10.4%
26	ENGINEERING	3	2.6%	3	2.2%	4	5.2%
27	ENGINEERING, VEHICLES		–	1	0.7%		–
32	ALCOHOLIC BEVERAGES		–	2	1.5%	2	2.6%
33	FOOD PRODUCERS	1	0.9%	4	2.9%	5	6.5%
34	HOUSEHOLD GOODS &TEXTILES		–	1	0.7%	1	1.3%
36	HEALTH CARE		–	2	1.5%	2	2.6%
37	PHARMACEUTICALS	1	0.9%	1	0.7%	1	1.3%
38	TOBACCO		–	1	0.7%		–
41	DISTRIBUTORS		–	1	0.7%	1	1.3%
42	LEISURE & HOTELS	9	7.8%	9	6.6%	5	6.5%
43	MEDIA	3	2.6%	10	7.3%	7	9.1%
44	RETAILERS, FOOD	12	10.4%	9	6.6%	6	7.8%
45	RETAILERS, GENERAL	5	4.3%	8	5.8%	5	6.5%
46	TELECOMMUNICATIONS	14	12.2%	16	11.7%	4	5.2%
47	BREWERIES, PUBS & RESTAURANTS		–	3	2.2%	2	2.6%
48	SUPPORT SERVICES		–	1	0.7%	1	1.3%
49	TRANSPORT	15	13.0%	15	10.9%	7	9.1%
62	ELECTRICITY	26	22.6%	15	10.9%	3	3.9%
68	WATER	17	14.8%	16	11.7%	3	3.9%
	TOTAL	115	100.0 %	137	100.0 %	77	100.0 %

(a) Industry classification according to Financial Times-Stock Exchange Actuaries System as at 30/11/1999.

Table 3 reports a number of descriptive statistics on the variables used. The table shows that over the sample period the average value for maturity is approximately 11 years, around 43 percent of the quarter observations include a call option, and more than two thirds involve no conversion options or protective provisions.

Table 3: Descriptive Statistics

Panel A: Descriptive statistics for the dependent and independent variables included in the simultaneous-equations models for maturity, call option choice, convertible option choice, and the inclusion of protective covenants.

Percentiles			Max	Min	Range	Std. Deviation	Median	Mean	N	
75%	50%	25%								
1	0	0	1	0	1	0.46	0	0.30	56	Protective covenants
0	0	0	1	0	1	0.43	0	0.23	56	Convertible option
1	0	0	1	0	1	0.50	0	0.43	56	Call option
13.57	10.89	9.06	26.39	3.10	23.28	4.42	10.89	11.35	56	Maturity
15.00	14.71	14.37	15.54	13.28	2.26	0.51	14.71	14.63	56	Size
1.73	1.42	1.24	2.83	0.93	1.89	0.40	1.42	1.53	56	Market-to-book value
7.09	2.32	0.00	30.15	0.00	30.15	6.28	2.32	4.87	56	Intangibles/Assets (%)
2.37	1.91	1.62	3.39	-0.32	3.71	0.67	1.91	1.94	56	Asset maturity
0.65	0.41	0.29	0.85	0.19	0.66	0.19	0.41	0.46	56	Interest volatility
1.77	-0.23	-1.13	2.85	-3.71	6.56	1.85	-0.23	-0.06	56	Term premium
3.40	2.55	1.83	4.51	1.00	3.51	0.98	2.55	2.61	56	Earning variance (%)
3.46	2.53	1.99	5.66	0.57	5.10	1.05	2.53	2.72	56	Tax paid (%)
1.67	1.29	1.01	3.53	-0.72	4.25	0.65	1.29	1.39	56	Leverage
8.67	6.48	4.37	71.53	-3.62	75.15	11.34	6.48	8.83	56	Bankruptcy risk
0.24	0.17	0.08	0.74	-0.37	1.11	0.16	0.17	0.17	56	Stock return_1 y before
1.49	0.55	-0.26	6.05	-6.66	12.71	1.89	0.55	0.39	56	Unexpected earnings (%)
1.95	1.51	1.26	4.25	1.02	3.23	0.55	1.51	1.67	56	Std.dev. return_3 m before (%)
0.10	0.00	-0.12	2.22	-0.96	3.18	0.49	0.00	0.02	56	Deviation target
9.66	8.78	7.47	11.38	4.44	6.93	1.72	8.78	8.45	56	Interest level (%)

Table 4: Pearson Correlation Matrix

This table provides a measure of linear association for each pair of dependent and independent variables included in the structural models for maturity, call option choice, convertible option choice, and the inclusion of protective covenants. The correlation coefficients are computed for a sample of 56 quarterly average observations. *,** indicate significance at the 10% and 5% levels (two-tailed test).

	Protective Covenants	Convertible option	Call option	Maturity	Size	Market-to-book value	Intangibles (%)	Asset Maturity
Convertible option	-0.18							
Call option	0.14	0.29*						
Maturity	0.13	-0.02	0.37*					
Size	-0.09	-0.33*	-0.24	-0.04				
Market-to-book value	-0.16	-0.13	-0.02	0.01	0.35*			
Intangibles/Assets (%)	-0.30*	-0.18	0.23	-0.21	-0.01	-0.05		
Asset Maturity	0.37**	0.15	0.08	0.13	0.20	0.02	-0.42**	
Interest Volatility (%)	-0.29*	0.45*	0.05	-0.12	-0.09	0.00	-0.08	-0.05
Term premium (%)	-0.14	-0.31*	-0.01	-0.05	-0.04	0.05	0.25	-0.29*
Earning variance (%)	0.11	0.14	0.19	0.16	0.02	0.25	-0.05	-0.08
Tax paid (%)	-0.06	-0.05	-0.08	-0.12	0.06	0.23	0.08	0.12
Leverage	-0.32*	-0.12	-0.18	0.03	0.11	-0.02	0.20	-0.35**
Bankruptcy risk	-0.28*	0.01	-0.06	0.18	0.12	-0.07	-0.08	-0.03
Stock return_1 y before	0.02	0.18	0.27*	0.07	-0.20	0.14	-0.06	0.14
Unexpected earnings (%)	-0.23	0.20	0.03	0.06	-0.24	0.01	-0.10	0.04
Std.dev. return_3 m before	-0.14	-0.15	-0.18	-0.17	0.14	0.17	-0.01	-0.32*
Deviation target	-0.12	0.05	0.14	0.00	-0.12	0.03	-0.01	0.04
Interest level (%)	0.13	0.44**	-0.02	0.03	-0.34**	-0.53**	-0.29*	0.08

	Interest volatility (%)	Term premium (%)	Earning variance (%)	Tax paid (%)	Leverage	Bankruptcy risk	Stock return_1 year before	Unexpecte d earnings
Term premium (%)	-0.17							
Earning variance (%)	0.00	-0.36**						
Tax paid (%)	-0.20	0.08	-0.02					
Leverage	-0.02	0.18	0.00	0.07				
Bankruptcy risk	0.30*	0.30*	-0.38**	-0.19	-0.03			
Stock return_1 y before	0.05	-0.14	0.02	0.02	-0.43**	0.01		
Unexpected earnings (%)	-0.14	0.10	-0.11	0.22	-0.10	0.07	0.23	
Std.dev. return_3 m before	0.18	-0.15	0.20	-0.32*	0.15	-0.01	-0.15	-0.13
Deviation target	-0.16	0.20	-0.11	0.34*	0.37**	-0.09	-0.18	0.09
Interest level (%)	0.18	-0.39**	0.20	0.03	-0.02	-0.12	-0.15	0.17

	Std.dev. return_3 m before	Deviation target
Deviation target	-0.26	
Interest level (%)	-0.24	-0.05

Table 4 presents the correlation coefficients for the entire dependent and independent variables in the model and shows a strong correlation between a pair of endogenous variables (call option and maturity) and a pair of exogenous variables (interest rate and market-to-book value). The strong correlation between the later variables determines the replacement of the variable market-to-book value by intangibles to total assets as the proxy for firm's growth opportunities in the call option equation (see footnote 3 in section 2).

5. RESULTS

Preliminary estimation results on the structural equation (3.1) suggest the existence of a trend component in the average issue maturity that should be taken into account to avoid misspecification bias in the regression estimation. Specifically, the Durbin-Watson test could not reject the hypothesis of autocorrelation indicating that, a misspecification bias possibly due to omitted variables, was affecting the regression estimation. Moreover, Hansen's (1992) instability test indicates the absence of constancy in the within sample estimation of one of the regression parameters which, according to Judge et al. (1985, p.260), might be resolved by removing the non-stochastic component from the time-series dependent variable. A trend variable that assigns a value from 1 to 56 to each of the quarter-period observations was introduced in the structural equation (3.1). Subsequent estimation results reveal that not only is the coefficient of the trend variable statistically significant in the maturity equation at the 5% level but the hypotheses of no autocorrelation and parameter stability could no longer be rejected by the Durbin-Watson and Hansen tests, respectively.

The final estimation results for the two-stage structural maturity equation are reported in Table 5 – Column A. Although the trend variable is considered in the estimation of this structural equation, the sample estimate for this variable is not reported. Moreover, three statistically insignificant explanatory variables namely, the average firm's tax paid, the average firm's unexpected earnings, and the average interest term premium were excluded from the final estimation model following the recommendation by Greene (1993, p.590).

Table 5: Two-Stage Estimates of Structural Equations

Independent Variables	(A)[d] Maturity	(B)[e] Call option	(C)[e] Convertible option	(D)[e] Protective covenants
Intercept	-29.28 (-1.26)	5.58 (0.87)	15.87 (2.08)**	2.87 (1.23)
Maturity[a]		0.19 (1.82)*	-0.39 (-2.02)**	0.18 (1.44)
Call option[a]	3.89 (3.04)***			
Protective covenants[a]			-0.15 (-2.25)**	
Convertible option[a]				- 0.28 (-1.66)*
Market/Book	2.95 (1.50)		-1.54 (-1.58)	-1.49 (-2.50)**
Intangibles/Assets(%)[c]		0.09 (2.36)**		
Asset maturity	-2.29 (-1.57)			
Interest level (%)		-0.20 (-0.16)		
Interest volatility (%)	-5.59 (-1.78)*	1.06 (1.00)		
Term premium (%)				
Tax paid/Assets (%)				
Earnings variance (%)[(b)]	-1.54 (-1.63)		1.08 (2.64)***	
Unexpected earnings (%)				
Stock return 1-year-before	-14.41 (-2.14)**			
Size	4.32 (2.21)**	-0.57 (-1.42)	-0.56 (-1.03)	
Bankruptcy risk				-0.19 (-2.72)***
Std. Returns 3-months - before			-1.05 (-1.42)	
Deviation from leverage target			1.15 (1.35)	
Leverage[a]	-5.60 (-2.04)**	-0.34 (-0.67)	-2.55 (-1.95)*	-1.83 (-2.14)**

Table 5 continued

Number of observations	56	56	56	56
Adjusted R^2	0.096			
Model chi-square		$\chi^2(6)=11.9$*	$\chi^2(8)=18.06$**	$\chi^2(5)=26.10$***
Zero restrictions[b]	F(3,43)=0.06	$\chi^2(2)=0.03$	$\chi^2(1)=0.00$	$\chi^2(1)=0.01$
	[0.98]	[0.99]	[0.97]	[0.92]

This table shows the two-stage regression estimates of the average maturity and three dummy variables that proxy for the average propensity to include a call option, a convertible option or protective covenants (respectively) on a set of explanatory variables for a time-series sample from 1986 to 1999. Average maturity is regressed on fitted value of the average propensity to include a call option, average market-to-book value, average asset maturity, average interest volatility (%), average interest term premium, average earnings variance (%), average tax paid to total assets (%), average unexpected earnings (%), average stock return over one year prior to issue announcement, average firm size and fitted value of average leverage. Average propensity to include a call option is regressed on fitted value of average maturity, average intangibles to total assets (%), average interest level (%), average interest volatility (%), average tax paid to total assets (%), average unexpected earnings (%), average firm size and fitted value of average leverage. Average propensity to include a convertible option is regressed on fitted value of average maturity, fitted value of average propensity to include protective covenants, average market-to-book value, average earnings variance (%), average unexpected earnings (%), average firm size, average standard deviation of returns over 3 months prior to issue announcement, average deviation of debt/equity ratio and fitted value of average leverage. Average propensity to include protective covenants is regressed on fitted value of average maturity, fitted value of average propensity to include a convertible option, average market-to-book value, average bankruptcy risk, average firm size, and fitted value of average leverage. *t*-statistics in parentheses. p-values in square brackets. *,**,*** indicate significance at the 10%, 5%, and 1% levels.

(a) Treated endogenously – using predicted values from reduced form estimates
(b) Tests of zero restrictions for omitted variables: (1) unexpected earnings (%), tax paid/assets (%) and interest term premium in the maturity equation; (2) unexpected earnings (%) and tax paid/assets (%) in the call option regression; (3) unexpected earnings (%) in the convertible option equation; and (4) size in protective covenants equation
(c) Intangibles/assets (%) replaces market/book as a proxy for growth opportunities in the call option regression
(d) Estimated using OLS estimator
(e) Estimated using Probit estimator

Columns B through D of Table 5 present the estimates for the binary dependent variable models for the call option, convertible option, and protective covenant choices. Once again, some explanatory variables were excluded from these equations due to their statistical insignificance and irrelevance for the validation of simultaneous model's identification conditions (see Greene *ibid.*). Specifically, the variables average firm's unexpected earnings and tax-paid are excluded from the call option equation (3.2). The variable average firm's unexpected earnings is removed from the convertible option equation (3.3). Finally, the variable average firm size is excluded from the protective covenants equation (3.4). The null hypothesis that the coefficients of these variables are equal to zero could not be rejected by the correspondent χ^2 statistics.

The final estimation results of the structural equation in (3.1) report an adjusted R^2 of 0.096, which is lower than in other incremental debt studies (e.g. 0.163 for Dennis et al. (2000) and 0.147 for Guedes and Opler (1996)) but not unreasonable considering the size of the sample set and the aggregate-type data. Moreover, χ^2 Likelihood ratio statistics reject the null hypothesis of zero coefficients in the call, convertible and protective covenant choice equations at the at 10% level of significance for equations 3.2 and 3.3 and at the 1% level of significance for equation 3.4.

2.8. Interdependence and debt agency costs hypotheses

The first four rows of Table 5 show the coefficients of the fitted variables proxying for Eurobond contract terms. The results suggest contract terms are interdependent. Strong support is found for a bi-directional relationship between short-term maturity choice and the choice of the call feature and between the conversion choice and the choice to include protective provisions. On the other hand, the negative and significant coefficient for the fitted maturity variable in the convertible equation strongly contradicts the alternative use of these contract features to control for debt agency costs. Focusing on the coefficients of the proxies for firm's characteristics, it can be shown that the evidence strongly supports the asset substituting and underinvestment hypotheses regarding the use of short-term and callable Eurobonds (respectively). Thus, as in Dennis et al. (2000), the coefficient for the fitted value of leverage (the proxy for growth opportunities) is significant and inversely (directly) related to the use of short-term (callable) debt. Conversely, the underinvestment and asset-substitution hypotheses are strongly rejected by the evidence on the protective provisions. Likewise, the significant and negative coefficient for the fitted value of leverage in the convertible choice equation contradicts the agency costs prediction about the use of convertibles to control asset-substitution incentives.

The contrasting results obtained for call and maturity features, on the one hand, and for convertible and protective provisions, on the other hand, suggest that these two sets of contract terms might be used to fulfil different roles in mitigating financing inefficiencies.

One possible explanation for the unexpected result obtained for the convertibles and protected Eurobonds is that the choice of these features might be influenced by equity rather than debt agency costs. Indeed, Haugen and Senbet (1981) for instance argue that convertibles, as put options retained by external investors, reduce owner-manager's incentives to consume perks because perk consumption leads to a decrease on firm's total value which ultimately results in an increase in the manager's liability to convertible-holders.

On the other hand, Stulz (1988) contends that the issuance of risky debt reduces a manager's discretionary power over firm's investment policies because managers are bound to lose their control rights whenever debt obligations are not serviced and creditors force bankruptcy. One plausible argument is that inclusion of protective covenants in debt contracts increases the disciplinary control of creditors and reduces managers' desire to pursue policies that deplete a firm's overall value. This is particularly true in the case of Eurobond issues when it is observed that 76% of the original sample of protected issues includes a put option that is triggered by an event risk (e.g. take-over, financial restructuring, loss of operating license) leading to a credit downgrading by a rating agency. To this extent, the definition of a lower boundary for firm credit quality that if breached can lead to a loss of managerial control rights might play an important role in aligning managers interests with those of shareholders and allow for a decrease in equity agency costs.

2.9. Other cost-contracting hypotheses

The convertible option equation's estimates for the coefficients on earnings variance, size, and market-to-book value reported on Table 5 - Column C suggests mixed support for the risk uncertainty hypothesis. More specifically, the positive and significant (at 99% of confidence level or higher) coefficient for the average earnings variance is consistent with the arguments of Brennan and Schwartz (1988) and Brennan and Kraus (1987) that firms for which business risk is more difficult to estimate benefit from issuing convertible debt.

Although the estimates on protective covenants equation reported on Table 5 – Column D provide unequivocal evidence against debt agency costs as an explanatory hypothesis, they are in line with the predictions from liquidity risk theory. Thus a significant and negative relationship found between the propensity to include restrictive covenants and the average values for the proxies of growth opportunities, bankruptcy risk, and leverage is consistent with the argument that, whenever the chances of excessive liquidity risk are enhanced, firms choose not to include protective covenants in their bonds issues. According to Sharpe (1991), the higher the value of growth opportunities the higher the liquidity costs resulting from the incapacity of the firm to obtain credit after forced bankruptcy being triggered by bondholders. Moreover, the higher the bankruptcy risk and leverage the lower the capacity for the firm to refund the original credit at competitive rates. Thus, liquidity risk constraints seem indeed to influence the use of covenants in Eurobonds.

None of the results reported on Table 5 provide support for hypotheses built upon asymmetric information arguments. This result is, however, not unexpected taking into account that the level of information asymmetry about an issuer's future prospects is low amongst Eurobond market participants. Indeed, considering that Eurobond markets are clearly open to large firms with high credit quality and subject to strong disclosure regulations for quoted companies, the conclusion should come as no surprise. Moreover, as Eurobond issuers target not only domestic but also foreign investors, close market scrutiny is imposed on Eurobond issuers with a significant number of investment analysts continuously assessing firm performance and credit quality and generating financial forecasts about firm's earnings and prospects.

Finally, the lack of significance for the variables that proxy for firm potential tax advantages in the maturity choice and call option choice equations (see Table 5 – Columns A and B) suggests little support for tax-related effects as determinants of contract features.

6. CONCLUSIONS

Theoretical predictions on debt contract design point out the existence of interdependence among contract features that are alternatively used to control for financing inefficiencies. Most of the previous empirical studies (e.g. Barclays and Smith (1995), Guedes and Opler (1996), Stohs and Mauer (1996), Kish and Livingston (1992), Abhyankar and Dunning (1999) and Citron (1995), amongst others) that have investigated contract design focus on a single feature of the debt contracts ignoring these interdependencies. This study directly examines the interdependencies between debt contract feature choice by implementing a simultaneous-equation framework capturing the joint determination of maturity choice and the choices to include a call feature, a conversion feature, and protective covenants. The structural equations are formulated to test competing hypotheses regarding the determinants of these choices: agency costs, asymmetric information, tax effects, liquidity risk, interest rate risk, and risk uncertainty. The results provide strong support to the existence of interdependencies between maturity and call option decisions, on the one hand, and between convertibles and protective covenants, on the other hand. Further evidence suggests, however, that contrary to the fundamentals guiding the choice of maturity and callability structures, the use of convertible options and protective covenants in Eurobond contracts seems to be determined by factors other than debt agency costs. We suggest that this result might be explained by the influence exerted by equity agency constraints. This influence is likely to be exacerbated by the particular characteristics and relationships established between a Eurobond issuer's claimants. The fact that a relatively high proportion of Eurobond creditors are also shareholders of the issuer company (e.g. insurance companies and mutual funds) together with the premise that managerial perquisite incentives tend to be particularly important in firms with a typically large and diffuse base of equity-holders, can explain the higher impact of equity rather than debt agency costs on the choice of Eurobond covenants. As in Essig (1991), some support is found for the risk uncertainty hypothesis (Brennan and Schwartz (1988) and Brennan and Kraus (1987) that postulates the use of convertibles to overcome mispricing costs driven by creditors/managers divergent opinions about a firm’s inherent risk. Finally, the results suggest the inclusion of protective covenants is motivated by liquidity risk issues suggesting that firms facing high default risk tend to issue Eurobonds with no protective mechanisms in order to avoid excessive financial distress or inefficient liquidation.

REFERENCES

Abhyankar, A., and Dunning, A. (1999), Wealth effects of convertible bond and convertible preference shares issues, pp. An empirical analysis of UK market, *Journal of Banking and Finance*, 23(7), pp. 1043-1065.

Altman, E. I. (1968), Financial ratios, discriminant analysis and the prediction of corporate bankruptcy, *Journal of Finance*, 23(4), pp. 589-609.

Barclay, M. J., and Smith, C. W., Jr. (1995), The maturity structure of corporate debt, *Journal of Finance*, 50(2), pp. 609-631.

Barnea, A., Haugen, R. A., and Senbet, L. W. (1980), A rationale for debt maturity structure and call provisions in the agency theoretic framework, *Journal of Finance*, 35(5), pp. 1223-1234.

Bodie, Z., and Taggart, Jr., R. A. (1978), Future investment opportunities and the value of call provisions on a bond, *Journal of Finance*, 33(4), pp. 1187-1200.

Boyce, W. M., and Kalotay, A. J. (1979), Tax differential and callable bonds, *Journal of Finance*, 34(4), pp. 825-838.

Brennan, M. J., and Kraus, A. (1987), Efficient financing under asymmetric information, *Journal of Finance*, 42(5), pp. 1225-1243.

Brennan, M. J., and Schwartz, E. S. (1988), The case for convertibles, *Journal of Applied Corporate Finance*, 1(2), pp. 55-66.

Brick, I. E., and Ravid, S. A. (1985), On the relevance of debt maturity structure, *Journal of Finance*, 40(5), pp. 1423-1437.

Brick, I. E., and Wallingford, B. A. (1985), The relative tax benefits of alternative call features in corporate debt, *Journal of Financial and Quantitative Analysis*, 20(1), pp. 95-105.

Chan, Y. S., and Kanatas, G. (1985), Asymmetric valuations and the role of collateral in loan agreements, *Journal of Money, Credit and Banking*, 17(1), pp. 84-95.

Chan, Y. S., and Thakor, A. V. (1987), Collateral and competitive equilibria with moral hazard and private information, *Journal of Finance*, 42(2), pp. 345-363.

Citron, D. B. (1995), The incidence of accounting-based covenants in UK public debt contract, pp. An empirical analysis, *Accounting and Business Research*, 25(99), pp. 139-151.

Claes, A., De Ceuster, M. J. K., and Polfliet, R. (2000), Anatomy of the Eurobond market 1980-2000, Working paper, University of Antwerp, Antwerp.

Constantinides, G. M., and Grundy, B. D. (1989), Optimal investment with stock repurchase and financing as signals, *Review of Financial Studies*, 2(4), pp. 445-465.

Correia, M. R. (2003), The design of corporate debt, pp. Evidence from Eurobond issues made by UK companies, Unpublished Ph.D. thesis, University of Strathclyde, Glasgow.

Dennis, S., Nandy, D., and Sharpe, I. G. (2000), The determinants of contract terms in bank revolving credit agreements, *Journal of Financial and Quantitative Analysis*, 35(1), pp. 87-110.

Diamond, D. W. (1991), Debt maturity structure and liquidity risk, *Quarterly Journal of Economics*, 106(3), pp. 709-737.

Diamond, D. W. (1993), Seniority and maturity of debt contracts, *Journal of Financial Economics*, 33(3), pp. 341-368.

Economic Bulletin (2000), The euro-area bond market, Banca d'Italia, (March), 30, pp. 54-61.

Essig, S. (1991), Convertible securities and capital structure determinants, Unpublished Ph.D. thesis, Graduate School of Business, University of Chicago, Chicago, IL.

Flannery, M. J. (1986), Asymmetric information and risky debt maturity choice, *Journal of Finance*, 41(1), pp. 19-37.

Green, R. C. (1984), Investment incentives, debt and warrants, *Journal of Financial Economics*, 13(1), pp. 115-136.

Greene, W. H. (1993), *Econometric analysis*, Second edition, Prentice Hall, Inc., Englewood Cliffs, New Jersey.

Guedes, J., and Opler, T. (1996), The determinants of the maturity of corporate debt issues, *Journal of Finance*, 51(5), pp. 1809-1833.

Hansen, B. E. (1992), Testing for parameter instability in linear models, *Journal of Policy Modeling*, 14(4), pp. 517-533.

Haugen, R. A., and Senbet, L. W. (1981), Resolving the agency problems of external capital through options, *Journal of Finance*, 36(3), pp. 629-647.

Jensen, M. C., and Meckling, W. H. (1976), The theory of the firm, pp. managerial behavior, agency cost, and ownership structure, *Journal of Financial Economics*, 3(4), pp. 305-360.

Judge, G. G., Griffiths, W. E., Hill, R. C., Lutkepohl, H., and Lee, T. (1985), *The theory and practice of econometrics*, Second edition, John Wiley and Sons, New York.

Kale, J. R., and Noe, T. H. (1990), Risky debt maturity choice in a sequential game equilibrium, *Journal of Financial Research*, 13(2), pp. 155-165.

Kane, A., Marcus, A., and McDonald, R. L. (1985), Debt policy and the rate of return premium to leverage, *Journal of Financial and Quantitative Analysis*, 20(4), pp. 479-499.

Kish, R. J., and Livingston, M. (1992), Determinants of the call option on corporate bonds, *Journal of Banking and Finance*, 16(4), pp. 687-703.

Levich, R. M. (2001), *International financial markets, pp. prices and policies*, Second edition, McGraw-Hill Irwin, New York;

Lewis, C. M. (1990), A multiperiod theory of corporate financial policy under taxation, *Journal of Financial and Quantitative Analysis*, 25(1), pp. 25-43.

Long, M. S., and Malitz, I. B. (1985), Investment patterns and financial leverage, in Friedman, B. M. (ed.), *Corporate capital structures in the United States*, NBER, University of Chicago Press, Chicago.

Lucas, D. J., and McDonald, R. L. (1990), Equity issues and stock price dynamics, *Journal of Finance*, 45(4), pp. 1019-1043.

Marshall, W., and Yatwitz, J. B. (1980), Optimal terms of the call provision on a corporate bond, *Journal of Financial Research*, 3(2), pp. 203-211.

Matyas, L., and Sevestre, P. (1992), *The econometrics of panel data, pp. Handbook of theory and applications*, Kluwer Academic Publishers, Netherlands.

Mauer, D. C., and Lewellen, W. (1987), Debt management under corporate and personal taxation, *Journal of Finance* 42(5), pp. 1275-1291.

Mauer, D. C., Barnea, A., and Kim, C. S. (1991), Valuation of callable bonds under progressive personal taxes and interest rate uncertainty, *Financial Management*, 20(2), pp. 50-59.

Mikkelson, W. H. (1980), Convertible debt and warrant financing, pp. A study of the agency cost motivation and the wealth effects of calls of convertible securities, Unpublished Ph.D. thesis, University of Rochester, Rochester, New York.

Miller, M. H. (1977), Debt and taxes, *Journal of Finance*, 32(2), pp. 261-275.

Mitchell, K. (1991), The call, sinking fund, and term-to-maturity features of corporate bonds, pp. an empirical investigation, *Journal of Financial and Quantitative Analysis*, 26(2), pp. 201-222.

Moore, P. (2001), *Autostrade to the superhighway, pp. The future of the global debt markets*, Euromoney Books, ISMA, London.

Myers, S. C. (1971), Discussion, *Journal of Finance*, 26(2), pp. 538-539.

Myers, S. C. (1977), Determinants of corporate borrowing, *Journal of Financial Economics*, 5(2), pp. 147-175.

Myers, S. C. (1984), The search for the optimal capital structure, *Midland Corporate Finance Journal*, 2(1), pp. 6-16.

Nyborg, K. G. (1995), Convertible debt as delayed equity, pp. forced versus voluntary conversion and the information role of call policy, *Journal of Financial Intermediation* 4(4), pp. 358-395.

Pye, G. (1966), The value of the call option on a bond, *Journal of Political Economy*, 74(2), pp. 200-205.

Queen, M., and Roll, R. (1987), Firm mortality, pp. Using market indicators to predict survival, *Financial Analysts Journal*, 43(3), pp. 9-26.

Robbins, E. H., and Schatzberg, J. D. (1986), Callable bonds, pp. a risk reducing signalling mechanism, *Journal of Finance*, 41(4), pp. 935-951.

Sharpe, A. S. (1991), Credit rationing, concessionary lending, and debt maturity, *Journal of Banking and Finance*, 15(3), pp. 581-604.

Smith, C. W., Jr., and Warner, J. B. (1979), On financial contracting, pp. an analysis of bond covenants, *Journal of Financial Economics*, 7(2), pp. 117-161.

Stein, J. C. (1992), Convertible bonds as backdoor equity financing, *Journal of Financial Economics*, 32(1), pp. 3-21.

Stohs, M. H., and Mauer, D. (1996), The determinants of corporate debt maturity structure, *Journal of Business*, 69(3), pp. 279-312.

Stulz R. M. (1988), Managerial control of voting rights, pp. Financing policies and the market for corporate control, *Journal of Financial Economics*, 20(1-2), pp. 25-54.

Taylor, J. B. (1993), *Macroeconomic policy in a world economy*, First edition, W. W. Norton & Company, New York.

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