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Debt Issue Costs and Issue Characteristics in the Market for U.S. Dollar Denominated International Bonds ⋆

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Abstract. This paper analyzes the issue costs and initial pricing of bonds in the international market. In particular, we investigate the determinants of three components of issue costs: underwriter fee, underwriter spread (the difference between the offering price and the guaranteed price to the issuer), and underpricing (the difference between the market price and the offering price). Total underwriter compensation increases with the bonds' credit risk and maturity, but it is insignificantly related to issue size. Interestingly, underwriters appear to price some issue characteristics directly (by adjusting the fee) and other characteristics indirectly (by setting the guaranteed price). The two compensation components (fee and spread) are negatively related to each other. We provide evidence that this trade-off is consistent with income tax considerations, as well as with two-tier pricing by underwriters. We find no evidence of underpricing.

Key words: international bonds, issue costs, underwriter compensation, underpricing

JEL classification codes: G12; G15; G24; G30

1. Introduction

The internationalization of security markets is beneficial to firms who seek several sources of funding. A major source of funds for firms world-wide is the international bond market. Firms that gain access to this market can simultaneously sell debt securities in one or more foreign markets. International debt offerings

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may reduce the issuer's cost of capital if they are sold at low yields relative to domestic bonds. Foreign buyers may be willing to pay a higher price for international bonds in exchange for the benefit of global diversification. In addition, trading on an international scale may add liquidity, hence reducing price volatility in the secondary market. In recent years corporations have increased their use of the international debt market. In particular, international bonds have partially replaced domestic bonds for the high quality group of corporate borrowers. This debt-debt substitution has reduced the role of domestic debt market and improved the ability of investors worldwide to diversify their debt portfolios. It is therefore important to examine the costs involved in issuing international debt.

Several studies have investigated the issue costs and initial pricing of debt instruments in the U.S. market. In contrast, research on Eurobonds by Courtadon (1985), Hayes and Hubbard (1990), and Melnik and Plaut (1991) has focused on the structural aspects of the international bond market and has not analyzed the pricing of new bond issues. In this paper we extend the literature on the issue costs and initial pricing of bonds to the international market. Specifically, we investigate the determinants of three components of issue costs: underwriter fee, underwriter spread (the difference between the offering price and the guaranteed price to the issuer), and underpricing (the difference between the market price and the offering price).

We find that the issue costs in the Eurobond market are only about 0.37 percent of the market price, and they are determined primarily by the bonds' maturity and credit risk. These two issue characteristics are priced indirectly: instead of increasing the fee to compensate for longer maturity or for higher credit risk, underwriters set a relatively low guaranteed price which results in a higher spread. We find no evidence of underpricing.

Our most interesting finding is the apparent strong trade-off between the cost components. Underwriters appear to set the fee and the spread so that one offsets the other. This trade-off holds on average (the mean fee is 1.03 percent while the mean spread is -0.66 percent) and in the cross-section (the correlation between the fee and the spread is negative and highly significant). Moreover, the fee remains an important explanatory variable for the spread even after controlling for "standard" issue characteristics. We provide evidence that this trade-off is consistent with income tax considerations, as well as with two-tier pricing by underwriters.

The paper proceeds as follows. In the next section we briefly survey the literature on the issue costs and initial pricing of debt securities. In Section 3, we describe the institutional structure of the international bond market. Section 4 describes our sample selection procedure and constructs the primary variables. Section 5 contains the empirical results, and section 6 summarizes the paper.

2. Prior Research

As noted, research on the issuance of international bonds is rather limited. Most previous studies have focused on the domestic U.S. market. These studies provide evidence on the issue costs of debt instruments by examining the at-issue yield spread (and how it changes due to competitive forces), the direct issue costs, and underpricing. In this section, we briefly review each group of studies and discuss the implications of the evidence for the Eurobond market.

A number of studies have examined the determinants of the at-issue yield spread, which is an increasing function of the issue costs (the at-issue yield is measured by equating the net proceeds, after deducting the issue costs, with the present value of the coupon and principal payments). Allen, Lamy and Thompson (1990), Datta, Iskandar-Datta and Patel (1999), as well as other studies, have documented that the at-issue yield spread is negatively related to credit rating and positively related to bond maturity. As issue costs are an important determinant of the at-issue yield spread, these findings imply similar relations for the issue costs.

Following Ang and Richardson (1994) a number of papers examined debt underwriting activities before and after the enactment of Glass-Steagall Act of 1933 in the U.S. For example, Kroszner and Rajan (1997) find that prior to 1933 debt underwritten by commercial banks was less likely to default than debt underwritten by investment banks. A few recent studies examine the impact on the U.S. debt market of the re-entrance of commercial banks into the underwriting market. Gandes, Puri, Saunders and Walter (1997) test differences in debt pricing between investment banks and commercial banks. They find that commercial banks affiliates' underwritings involve lower yields. They suggest that information flows between underwriting and bank affiliates (of the same bank holding company) exist despite Chinese walls. Gandes, Puri and Saunders (1999) examine the competitive impact of commercial bank entry into debt underwriting on gross underwriter spreads. They find that this entry resulted in lower gross spreads for smaller debt issues. They also find that yield spreads are lower, on average, as the share of commercial bank underwriting increases compared to the underwriting by traditional investment banks. All these studies use data from the U.S. domestic public debt market.

Several studies have investigated the determinants of direct issue costs, which consist primarily of underwriter fee (e.g., West, 1967; Livingston, Pratt and Mann, 1995; Lee, Lochhead, Ritter and Zhao, 1996; Jewell and Livingston, 1998; Altinkilic and Hansen, 2000). These studies generally find that the direct issue costs are positively related to bond maturity and are negatively related to issue size and credit quality. There is also weak evidence that bond issues are underpriced. Wasserfallen and Wydler (1988) and Helwege and Kleiman (1998) report results that indicate slight underpricing, but Fung and Rudd (1986) find "no clear evidence of underpricing".

The literature suggests several explanations for the negative relation between the issue costs and credit quality. First, high quality bonds are cheaper to sell due to the existence of a larger and more liquid market, compared to low quality bonds. As noted by Livingston, Pratt and Mann (1995), the primary reason is that many regulated institutions, such as pension funds, are constrained to hold only high quality bonds. Second, if the issuer defaults, the underwriter may suffer damage to its reputation and be open to legal suits by bondholders. Third, the uncertainty associated with the bonds' market price (which is borne by the underwriter) is likely to increase with credit risk (West, 1967; Sorensen, 1979). Fourth, and related to the previous argument, when the issue's credit risk is relatively high, it is harder to estimate the market price. Therefore, as pointed by West (1967), Sorensen (1979) and Livingston, Pratt and Mann (1995), underwriter fee should increase in credit risk to compensate for the additional effort.

The uncertainty and effort associated with the pricing of risky bonds also apply to interest rate risk, hence explaining the positive relation between issue costs and maturity (e.g., West, 1967; Sorensen, 1979). Maturity may be related to issue costs also because the probability of default increases in the bonds' term. As most bonds that are traded on international markets are issued by well-known companies and receive high ratings from the major rating agencies, the relative importance of interest rate risk in determining the issue costs of Eurobonds is likely to be high.

3. The Eurobond Market

A Eurobond is a debt instrument issued by a corporation or a government agency outside the jurisdiction of any single country, and offered to investors in a number of countries at the same time. The Eurobond market was fairly small in the mid-seventies, when the total annual value of new issues was about 20 billion dollars. It grew rapidly during the subsequent two decades, and by the end of the nineties, the nominal value of all new issues exceeded 800 billion dollars per annum.[1] Initially, Eurobonds were issued primarily as fixed rate instruments, denominated in U.S. dollars. Since the mid-80's, an increasing proportion of new issues are in other currencies. Nevertheless, the U.S. Dollar remained the most frequent currency in use. It averaged about 45% of the total in the late 90's. Over the past 20 years, Eurobonds have also become more heterogeneous. They include floating interest rate instruments with possible caps or collars, equity linked bonds, bonds with conversion options, etc.

Corporate borrowers are the dominant group of borrowers. They constituted over 69% of the market during the years 1994–1997. At the same time, the market share of governments and public enterprises reached 23%. The remaining 8% were issued by international agencies, such as the World Bank and the EBRD. The underwriting function in the Eurobond market is performed by international financial

[1] The statistics in this section were extracted from various issues of the OECD's financial market trends (and its compilation of Financial Statistics).

institutions. The underwriters usually hold only limited amounts of the bonds and sell most of them to smaller banks and many non-bank investors, such as insurance companies, mutual funds, pension funds, corporations and wealthy individuals. The secondary over-the-counter market for Eurobonds operates through standard clearing systems that produce low-cost transaction execution and product delivery. Both Standard and Poor's and Moody's rating agencies are rating international bonds on a routine basis.

The issuance arrangements of Eurobonds are fairly simple. Bonds are purchased from the issuer by syndicates of investment banks that are formed on a case-by-case basis. The lead bank (the arranger) draws up the agreement and collects a management fee. The fee, in turn, is shared with the other syndicate members. The members purchase the issue according to a formula agreed upon in the syndication agreement. The participation fees are usually allocated in similar proportions. The lead bank negotiates conditions with the borrower. It prepares a "term-sheet" or "information memorandum" about the issue that is circulated to potential syndicate participants. It also prepares, with the customer, the necessary bond issue documentation. Once the information regarding the issue is finalized, the distribution agreement is drawn up.

As noted by Melnik and Plaut (1996), international bond markets are characterized by a "flat" syndicate structure. Usually there is an arranging (lead) bank. Occasionally, there are two co-arrangers for issues that are particularly large or complex. The other members are "regular managers". Any bank may operate in some syndicates as an arranger (leader) and in others as a "regular" (follower) member.[2]

When the syndication terms are agreed, each member has an obligation to pay for his allotment and right to market his share of the issue either to previously registered customers who ordered a pre-determined number of bonds, or, following the issue day, to the market. Formally, all risks are assigned to syndicate members in proportion to their share of the issue. For straight bonds, syndication members carry a standard underwriting risk. The credit risks associated with bond holdings are borne, of course, by the end investors who hold them in their portfolios.

4. Data

4.1. SAMPLE SELECTION

Our sample covers the period from September 13, 1996 to October 3, 1997. During that period, 1,077 straight fixed-rate U.S. dollar denominated bonds (excluding floating rate notes and bonds with option components) were issued. We sampled

[2] The lead bank serves as an agent for both the client and the other syndicate members. It sets up the necessary accounts and the related book keeping that comes with it. It also handles the technical aspects of clearing arrangements regarding the collection and distribution of the periodical interest payments and principal redemption. The arranging bank usually underwrites a significant amount of a straight bond issue. Other members of the syndicate receive the residual allocation.

334 issues, which represent approximately 31% of all regular U.S. dollar denominated issues during the sample period.[3] Out of these 334 straight bond issues, 79 were deleted due to missing issue costs data, the main variables in the analysis. The remaining 255 bond issues were issued by sovereign governments (12%), international agencies such as The World Bank (3%), and private corporations (85%). Sovereign governments, international agencies, and some financial corporations may enter the market several times a year. Most borrowers, however, use the market infrequently (once or twice a year). However, when they enter the market, they usually borrow large amounts.

For each issue, we collected nine quantitative variables: price information (3 variables), underwriter fee, coupon, maturity, credit rating, issue size and the number of underwriters. We also recorded the identities of the issuer and the lead manager. We next discuss these variables as well as the variables that we constructed from the raw data.

4.2. VARIABLE MEASUREMENT

In the process of issuing Eurobonds, there are three prices that merit attention. First, the syndicate guarantees a given price to the issuer. This guaranteed price (P_G) represents the gross proceeds to the issuer (i.e., before deducting the fee). The second price, which is determined by the syndicate a few days later, is the offering price (P_O). At this price the underwriters are usually able to sell the entire issue.[4] The third price is the market price after trading commences (P_M). It is measured here as the average of the first five transactions that were executed in the following two days. Using these three prices and the underwriter fee (FEE), we calculate the total issue cost and its components. In practice, the issuer has to bear some additional direct costs such as accounting, legal, printing, etc. We do not have information on the actual magnitude of these costs. There are also small rating maintenance costs that we do not consider in this study.

In a typical bond issue transaction, the issuer provides an instrument that has a market value of P_M, pays a fee (FEE) and receives a guaranteed price (P_G). Percentage-wise, the total cost to the issuer (i.e., the percentage of the bonds' value that the issuer loses) is

$$\text{COST} = \frac{\text{FEE} + P_M - P_G}{P_M} = \frac{\text{FEE}}{P_M} + \frac{P_M - P_O}{P_M} + \frac{P_O - P_G}{P_M}$$

$$= \text{RFEE} + \text{UNDERPR} + \text{SPREAD}.$$

[3] The data set was provided by a major investment bank from a list of "participation offers".

[4] In our sample period, only 2% of the issues did not sell out completely at the offer price. About 6% of the agreements required last minute adjustments of terms.

RFEE denotes the relative fee. UNDERPR represents the implicit cost associated with underpricing; that is, the loss to the underwriter (and indirectly to the issuer) that results when the underwriter sells the bonds below their market value. SPREAD represents an indirect payment to the underwriter, referred to as the underwriter spread.[5] Total underwriter compensation (relative to the bonds' market value) is

$$\text{COMP} = \frac{\text{FEE}}{P_M} + \frac{P_O - P_G}{P_M} = \text{RFEE} + \text{SPREAD}.$$

We use the number of years to maturity (MATUR), the coupon rate, the market price, and information on market interest rates, to calculate the yield spread (YS). Specifically, we measure the yield spread as the difference between the bond yield after trading commences and the yield on a U.S. treasury bond with similar maturity at that time.[6] As discussed below, we use the yield spread as an indirect measure of credit risk. We also use a direct measure of credit quality (DQ, discussed below) that is based on bond rating.

The rating process of international corporate bonds is similar to that of domestic bonds.[7] For corporate bonds, we measure credit quality based on the ratings of S&P and Moody's. In the few cases when the ratings are not identical, we follow the procedure of Jewell and Livingston (1998) and average them. We group the issues into 5 numerical cells and set the value of DQ accordingly. The top rank is assigned to AAA or Aaa (DQ = 5). The second group includes the group of AA+ and AA or Aa1 and Aa2 (DQ = 4). The third group includes the rating AA− and A+ or Aa3 and A1 (DQ = 3). The fourth rank includes the group of A and A− or A2 and A3 (DQ = 2). The final group covers the BBB range or the corresponding Baa (DQ = 1). All the results reported in the next section are insensitive to the use of individual dummy variables for the different ratings instead of the multinomial DQ variable.

Most of the sovereign debt is issued by governments of stable western countries, such as France, Germany, Japan, Netherlands, Norway, Singapore, and U.K. Some agencies of the U.S. government (such as the Federal National Mortgage Co. and the Federal Home Loan Bank) also borrow frequently in the Eurobond market. These issues routinely receive the highest grade by all rating firms. In our sample, the sovereign debt of such countries receives the top ranking (DQ = 5). Other countries are assigned ranking of 4, 3 and 2, depending on the relevant group.[8]

[5] A number of previous studies use the term "underwriter spread" as synonymous to "underwriter fee". In addition, some studies ignore the portion that we define as underwriter spread and instead focus on the fee component only.

[6] We obtain similar results when using an index of the yield on AAA U.S. dollar denominated Eurobonds instead of the U.S. treasury yield in measuring the yield spread.

[7] For a description of the rating process, see Cantor and Packer (1995) and Jewell and Livingston (1999).

[8] In general, all rating agencies view country risk as being composed of three primary components: political risk, economic risk and financial risk. Each country risk index is an amalgamation of

The remaining variables are AMOUNT and UNDER. AMOUNT measures the total nominal face value of the issue in millions of U.S. dollars and UNDER measures the number of syndicate members.[9]

5. Empirical Analysis

5.1. UNIVARIATE RESULTS

Table I presents descriptive statistics for the distribution of the variables. The variables can be divided into two groups: issue costs and their components (total cost, underwriter fee, underwriter spread, underwriter compensation and underpricing) and issue characteristics (maturity, amount, number of underwriters, credit rating and yield spread). As shown, the mean issue size is 336 million dollars, and the average syndicate includes 25 underwriters. The average credit rating is 3.6, which is high compared with domestic bonds. This could be due to self-selection (only high quality borrowers sell their debt in the international market) as well as to the inclusion of sovereign debt (which has high credit quality on average).

Consistent with the high level of credit rating, the average yield spread is only 0.65%. In addition, the maturity of the bonds at the time of issue is relatively short: both the mean and the median are less than five years. Thus, the interest rate risk of Eurobonds is also likely to be smaller than that of domestic bonds. The high average credit quality of the issues and the relatively short maturity suggest that the uncertainty associated with the offering price of Eurobonds is relatively low. Indeed, the average issue cost is very small, only about 0.37% from the bonds' market value. This figure may be compared with the cost of large domestic debt issues. For example, Lee, Lochhead, Ritter and Zhao (1996) report that the average floatation cost for large debt issues (proceed greater than 200 million dollars) is about 2%. However, for investment grade straight bonds with proceeds between 200 and 500 million dollars (i.e., the bond issues most comparable to our sample), they report average gross spreads of only 0.5%.

In terms of components of issue costs, the evidence is as follows. Total underwriter compensation (COMP) has a mean of 0.37% and a standard deviation of 0.42%, and it is negative for about 8% of the observations. These statistics suggest that the uncertainty regarding the offering price at the time when the fee and the guaranteed price are determined is not trivial. The distributions of the components of COMP (RFEE and SPREAD) are surprising. The mean of the underwriter fee (RFEE) is about 1.03%, which is large relative to total flotation cost of comparable domestic issues (see, e.g., Lee, Lochhead, Ritter and Zhao, 1996). However, the

quantitative and qualitative information about such factors. Details on the distinction between the various methods are provided in Erb, Harvey and Viskanta (1994, 1996). We group the countries into the 5 ranking categories by averaging the score of three rating organizations: International Country Risk Guide, Institutional Investor, and Euromoney.

[9] None of the results we report is sensitive to measuring AMOUNT or MATUR in logarithm form.

Table I. Summary statistics

	OBS	Mean	SD	Min	P25	P50	P75	Max
COST	255	0.37	0.58	−0.77	0.02	0.31	0.62	4.44
RFEE	255	1.03	0.50	0.10	0.63	1.00	1.38	2.13
SPREAD	255	−0.66	0.61	−2.34	−1.18	−0.62	−0.18	1.46
COMP	255	0.37	0.42	−0.71	0.19	0.25	0.50	3.09
UNDERPR	255	0.00	0.35	−0.94	−0.22	0.02	0.21	1.54
MATUR	255	4.80	3.27	1.00	3.00	4.00	5.00	30.00
AMOUNT	255	336	286	100	200	250	400	3000
UNDER	208	24.8	11.9	4.00	16.0	22.5	33.0	72.0
DQ	201	3.58	0.89	1.00	3.00	4.00	4.00	5.00
YS	255	0.65	0.81	−0.72	0.37	0.47	0.62	5.35

The issue costs are measured relative to the market value of the issue a day after trading commences, and are expressed in percentage points. COST is total issue costs. RFEE is the underwriter fee. SPREAD is the indirect component of the underwriter compensation, that is, the difference between the offering price and the price guaranteed to the issuer. COMP is the sum of RFEE and SPREAD. UNDERPR is underpricing, that is, the difference between the market price and the offering price by the underwriter. MATUR is the number of years to maturity on the issue date. AMOUNT is the amount issued in millions of U.S. dollars. UNDER is the number of underwriters. DQ is a debt quality measure that receives values between 1 and 5, where 5 is the highest grade and 1 is the lowest grade. YS is the yield spread a day after trading commences, measured relative to the yield on U.S. Treasury bonds with similar maturity.

underwriter spread (SPREAD) is negative on average (−0.66%) and for more than 75% of the observations, suggesting that the guaranteed price is set above the expected offering price. These two compensation components sum up to 0.37% on average. Finally, the mean of UNDERPR is zero, indicating that Eurobonds are offered to investors at a price that is close to their expected market price.

The above statistics reveal an interesting aspect of the structure of issue costs, and in particular underwriter compensation. Both compensation components are important: the fee is positive and large, but the guaranteed price to the issuer is set above the expected offering price, which results in a negative spread. One possible explanation for this pricing structure is that issuers prefer high fee and low spread for income tax purposes. The spread affects the issuer's taxable income by changing the effective interest rate used in calculating the periodic interest deduction from taxable income. The periodic interest deduction is calculated as the product of the bonds' book value and the effective interest rate (the bonds' yield measured using the guaranteed price). Thus, the tax consequences of the spread (i.e., the effect of setting a guaranteed price which is different from the offering price) are distributed over the bonds life in proportion to the periodic interest deductions. To the extent that issuers are able to accelerate the deduction of the fee for income tax purposes, therefore, they would prefer high fee and low spread. Underwriters, on

the other hand, recognize both compensation components as income in the current year, so they are indifferent to the composition.

To examine this conjecture, we perform the following two analyses. First, we split the sample between issuers that do not pay income taxes (international agencies, sovereign governments and U.S. government agencies) and those that pay (all other issuers), and calculate the average values of the issue cost components for each group. If the above tax explanation holds, the spread should be negative only for corporate borrowers (or especially for corporate borrowers, if additional factors besides tax contribute to the above phenomenon). Indeed, the mean fee for issuers that do (do not) pay income taxes is 1.09% (0.63%) and the mean spread is −0.74% (−0.17%). Thus, while total underwriter compensation is similar for the two groups (0.35% for issuers that pay taxes and 0.46% for issuers that do not pay taxes), the components are very different, and the differences are consistent with the tax interpretation. Moreover, both differences are highly significant: the t-statistic for the difference in mean fee (mean spread) between the corporate and sovereign issuers is 5.53 (−5.59). However, it appears that additional factors besides tax contribute to the negative spread, as the mean spread for sovereign borrowers is still negative and significant (−0.17%, t-statistic of −2.53).

Next we focus on corporate issuers and examine whether the inflation of fees and deflation of spreads were systematically larger for companies with high marginal tax rates. To this end we match the list of corporate issuers in our sample with that in the COMPUSTAT annual files. As COMPUSTAT coverage is available primarily for U.S. firms, estimates of marginal tax rates are available only for 44 issues. Following previous studies (e.g., Porcano, 1986), we measure the marginal tax rate as the ratio of the current portion of the income tax expense to pre-tax book income, where pre-tax book income excludes equity income from unconsolidated subsidiaries and includes income from minority interests. We sort the observations by the estimated tax rates and form two portfolios of 22 observations each. If the tax explanation holds, the fee (spread) should be especially positive (negative) for the high tax group. Indeed, the mean RFEE for the high tax group (median tax rate of 39.6%) is 1.28%, compared with 0.86% for the low tax group (median tax rate of 26.2%). In addition, the mean spread is −1.00% (−0.49%) for the high (low) tax group. As with the previous partition, we observe that while total underwriter compensation is similar for the two groups (0.28% for the high tax group and 0.37% for the low tax group), the components are considerably different. Specifically, consistent with the hypothesized tax effect, RFEE is larger for the high tax group and SPREAD is smaller (t-statistic of 3.20 (−3.07) for the difference in RFEE (SPREAD) between the high and low tax groups).

Table II provides the Pearson (lower triangle) and Spearman (upper triangle) correlation coefficients. The coefficients in both triangles are generally similar, indicating that outliers are not likely to affect the inference. Coefficients above 0.16 in absolute value are significant at the 1% level. When considering the issue cost components, most notable is the negative correlation between SPREAD and RFEE.

This correlation is consistent with the results of the tax-based partitions above. In the next section we further analyze the apparent trade-off between the underwriter fee and the guaranteed price to the issuer (which determines SPREAD).

Total issue costs (COST) are positively correlated with maturity (MATUR) and with the yield spread (YS). These correlations are consistent with a positive relation between the issue cost and the bonds' risk (interest rate risk and credit risk). Total issue cost is not significantly related to credit rating. We examine the reason for this unexpected result in the next section.

As expected, debt quality is negatively and strongly related to the yield spread, indicating that both variables reflect credit risk. Additional relations that are consistent with expectations include the positive correlations between the yield spread and maturity (Merton, 1974), maturity and amount, and amount and underwriters.

5.2. REGRESSION RESULTS

Table III presents OLS results of regressing the total issue costs and each of their components (underwriter fee, underwriter spread, total underwriter compensation and underpricing) on the issue characteristics. In all the regressions, the issue characteristics include maturity (MATUR), issue size (AMOUNT), and a measure of credit risk (YS or DQ). The table contains three panels; in Panels A and C, the measure of credit risk is the yield spread (YS), and in Panel B the measure of credit risk is the credit rating (DQ). Panel A is based on all available observations, while Panels B and C use only observations for which the credit rating is available.

The first regression in Panel A of Table III indicates that total issue costs is positively related to maturity and to the yield spread, but is insignificantly related to the issue size. That is, the issue costs increase in the bonds' risk (interest rate risk and credit risk), but there is no evidence of economies of scale. While the results for total issue costs are generally as expected, the results for the component regressions provide additional insights. Underpricing is not only small on average (see Table I), but it is also uncorrelated with any of the issue characteristics. Accordingly, the estimates from the total underwriter compensation (COMP) regression are similar to those from the total issue cost regression. Interestingly, the two issue characteristics that affect total underwriter compensation (maturity and credit risk) are priced indirectly: instead of increasing the fee to compensate for longer maturity or for higher credit risk, underwriters set a relatively low guaranteed price.

Panel B of Table III presents results where credit rating serves as the measure of credit risk instead of the yield spread. Unlike the results in Panel A, debt quality does not appear to affect total issue cost. However, the coefficients on the other variables are similar to those in Panel A. In particular, the coefficient on MATUR is positive and significant, while the coefficient on AMOUNT is insignificant. Consistent with previous studies, RFEE is negatively related to AMOUNT and DQ (second regression), but these relations are offset by the positive association

Table II. Pearson (lower triangle) and spearman (upper triangle) correlation coefficients among the variables

	COST	RFEE	SPREAD	COMP	UNDERPR	MATUR	AMOUNT	UNDER	DQ	YS
COST		−0.02	0.43	0.70	0.68	0.21	0.10	−0.03	0.02	0.15
RFEE	0.09		−0.76	−0.01	−0.09	−0.13	−0.15	0.02	−0.37	−0.13
SPREAD	0.48	−0.72		0.55	0.09	0.23	0.14	0.00	0.25	0.25
COMP	0.80	0.13	0.59		0.07	0.33	0.10	0.05	0.03	0.23
UNDERPR	0.69	−0.01	0.09	0.12		0.04	0.06	−0.08	0.08	0.00
MATUR	0.26	−0.05	0.24	0.29	0.08		0.40	0.25	0.12	0.37
AMOUNT	0.09	−0.12	0.17	0.10	0.02	0.53		0.57	0.22	0.12
UNDER	−0.02	0.00	0.01	0.01	−0.04	0.23	0.62		−0.07	0.09
DQ	−0.02	−0.35	0.23	−0.08	0.06	−0.02	0.10	−0.02		−0.17
YS	0.24	−0.01	0.20	0.28	0.07	0.43	0.14	0.13	−0.40	

The issue costs are measured relative to the market value of the issue a day after trading commences, and are expressed in percentage points. COST is total issue costs. RFEE is the underwriter fee. SPREAD is the indirect component of the underwriter compensation, that is, the difference between the offering price and the price guaranteed to the issuer. COMP is the sum of RFEE and SPREAD. UNDERPR is underpricing, that is, the difference between the market price and the offering price by the underwriter. MATUR is the number of years to maturity on the issue date. AMOUNT is the amount issued in millions of U.S. dollars. UNDER is the number of underwriters. DQ is a debt quality measure that receives values between 1 and 5, where 5 is the highest grade and 1 is the lowest grade. YS is the yield spread a day after trading commences, measured relative to the yield on U.S. Treasury bonds with similar maturity.

Table III. Regressions of components of issue costs on issue characteristics

Panel A: yield spread (YS) as the measure of credit quality

	Intercept	MATUR	AMOUNT	YS	R^2	N
COST	0.1461	0.0384	−0.0001	0.1134	0.0906	255
	2.3411	3.5861	−0.8865	1.6277		
RFEE	1.0856	0.0034	−0.0002	−0.0002	0.0142	255
	18.063	0.2841	−1.5981	−0.0045		
SPREAD	−0.8997	0.0278	0.0001	0.0957	0.0731	255
	−13.114	2.2773	0.9976	1.9805		
COMP	0.1859	0.0312	−0.0001	0.0955	0.1154	255
	4.2882	4.1108	−1.1807	2.2548		
UNDERPR	−0.0398	0.0072	0.0000	0.0178	0.0076	255
	−0.9583	1.0090	−0.2464	0.4229		

Panel B: credit rating (DQ) as the measure of credit quality

	Intercept	MATUR	AMOUNT	YS	R^2	N
COST	0.1737	0.0399	0.0000	−0.0105	0.0570	201
	1.1384	4.5950	−0.2609	−0.2626		
RFEE	1.7679	0.0024	−0.0002	−0.1912	0.1369	201
	10.629	0.2446	−1.5046	−4.4299		
SPREAD	−1.4717	0.0365	0.0001	0.1576	0.1144	201
	−7.6009	3.4910	0.9566	3.2283		
COMP	0.2962	0.0389	−0.0001	−0.0335	0.0902	201
	2.8158	5.6663	−0.9103	−1.1900		
UNDERPR	−0.1225	0.0010	0.0000	0.0231	0.0057	201
	−1.1562	0.1250	0.3963	0.8441		

Panel C: yield spread (YS) as a measure of credit quality, and using only observations with available rating

	Intercept	MATUR	AMOUNT	YS	R^2	N
COST	0.1395	0.0429	0.0000	−0.0266	0.0575	201
	2.1676	3.4117	−0.3328	−0.2943		
RFEE	1.0946	0.0121	−0.0003	−0.0448	0.0255	201
	15.743	0.9170	−1.8052	−0.6693		
SPREAD	−0.9212	0.0242	0.0002	0.0794	0.0696	201
	−12.382	1.7632	1.3554	1.1010		
COMP	0.1734	0.0363	−0.0001	0.0346	0.0878	201
	3.4711	4.1008	−1.1401	0.5299		
UNDERPR	−0.0339	0.0066	0.0000	−0.0611	0.0138	201
	−0.8638	0.7677	0.5236	−1.2625		

Heteroscedasticity consistent (White, 1980) t-statistics are reported below the coefficient estimates. The issue costs are measured relative to the market value of the issue a day after trading commences, and are expressed in percentage points. COST is total issue costs. RFEE is the underwriter fee. SPREAD is the indirect component of the underwriter compensation, that is, the difference between the offering price and the price guaranteed to the issuer. COMP is the sum of RFEE and SPREAD. UNDERPR is underpricing, that is, the difference between the market price and the offering price by the underwriter. MATUR is the number of years to maturity on the issue date. AMOUNT is the amount issued in millions of U.S. dollars. DQ is a debt quality measure that receives values between 1 and 5, where 5 is the highest grade and 1 is the lowest grade. YS is the yield spread a day after trading commences, measured relative to the yield on U.S. Treasury bonds with similar maturity.

of SPREAD with AMOUNT and DQ (third regression). As a result, COMP is insignificantly related to AMOUNT and DQ (fourth regression).[10]

Since there are missing values for the credit rating, it is difficult to compare the regressions in Panel A (that use the yield spread) with the regressions in Panel B (that use the credit rating). Therefore, we repeat Panel A's regressions using only observations for which credit rating is available. The results, reported in Panel C, indicate that the missing credit ratings are not likely to be random. In particular, the coefficient that relates the yield spread to total issue cost is now insignificant, consistent with the results in Panel B.

To further investigate the difference between the results in Panels A and B, we compare the distribution of the yield spread for the sub-samples with and without available credit rating. We find that the mean yield spread is 0.58 percent for the 201 observations with available credit quality rating and 0.89 percent for the 54 observations with unavailable debt rating. This difference is statistically significant (t-statistic equals 1.92). That is, issues with relatively high credit risk are more likely to have missing rating, and hence the results in Panel A are more representative than those in Panels B or C.

The differences in the mean values of the cost components between the sub-samples of borrowers partitioned based on the tax rate (see subsection 5.1), as well as the strong negative correlation between RFEE and SPREAD (see Table II), indicate that there are additional factors that have opposite effects on RFEE and SPREAD, besides the issue characteristics that we examine. Indeed, the residuals from the RFEE and SPREAD regressions are strongly negatively correlated.[11] This correlation suggests that the fee, which is determined before the spread, may help to predict the spread.

Accordingly, Table IV presents results of regressing the underwriter spread on the underwriter fee in addition to the issue characteristics. The first, second and third regressions correspond to the spread regression in Panels A, B and C of Table III, respectively. In each of the three regressions, the coefficient on underwriter fee is negative and highly significant, reinforcing the inference that the two cost components substitute for each other. Namely, underwriters appear to set the two cost components so that one compensates for the other. The magnitude of offset is not perfect, however. In each of the three regressions, the RFEE coefficient is about -0.88, which is greater than -1 (the t-statistics for the difference between the RFEE coefficient and -1 range between 2.20 and 1.55 for the three regressions). The other coefficients in Table IV are similar to the corresponding coefficients in Table III, except that the coefficient on debt quality (DQ) is insignificant now.

[10] As a robustness check, we rerun the regressions with dummy variables for the five different levels of credit rating instead of the variable DQ. We obtained results consistent with those reported.

[11] The correlation between the residuals from the RFEE and SPREAD regressions ranges between -0.68 and -0.73 for the regressions in Panels A through C of Table III.

Table IV. Regressions of underwriter spread on fee and issue characteristics

Intercept	RFEE	MATUR	AMOUNT	YS	DQ	R^2	N
0.0531	−0.8777	0.0308	−0.0001	0.0956		0.5800	255
0.8771	−15.846	4.2225	−0.7847	2.3407			
0.0943	−0.8858	0.0386	0.0000		−0.0117	0.5547	201
0.6079	−12.053	5.8082	−0.6083		−0.3744		
0.0377	−0.8760	0.0348	0.0000	0.0401		0.5560	201
0.5167	−13.324	4.1513	−0.6415	0.6522			

Heteroscedasticity consistent (White, 1980) t-statistics are reported below the coefficient estimates. The issue costs are measured relative to the market value of the issue a day after trading commences, and are expressed in percentage points. SPREAD is the indirect component of the underwriter compensation, the difference between the offering price and the price guaranteed to the issuer. RFEE is the underwriter fee. MATUR is the number of years to maturity at the time of issue. AMOUNT is the amount issued in millions of U.S. dollars. DQ is a debt quality measure that receives values between 1 and 5, where 5 is the highest grade and 1 is the lowest grade. YS is the yield spread a day after trading commences, measured relative to the yield on U.S. Treasury bonds with similar maturity.

5.3. SENSITIVITY TO BORROWER TYPE

Different borrowers may face different debt contracts. Indeed, as we have shown in subsection 5.1, issuers who face no tax consequences pay lower fee and higher spread on average. The sensitivity of the issue costs and their components with respect to the different issue characteristics may also depend on borrower type. To examine this hypothesis, we re-estimate the first four regressions from Panel A of Table III and the first regression from Table IV for two sub-samples partitioned according to borrower type. Specifically, we split the sample between sovereign issues (international agencies, sovereign governments and U.S. government agencies) versus corporate issues.

Table V presents the results. For both groups, total underwriter compensation is positively related to the yield spread (COMP regression in each panel). However, for sovereign issues, underwriters charge for credit risk directly (RFEE regression in Panel A), while for corporate issues, they charge indirectly (SPREAD regression in Panel B). Consistent with the univariate results in subsection 5.1, the RFEE (SPREAD) intercept is larger for corporate (sovereign) borrowers. Thus, the differences in the mean values of the cost components between the two subsamples cannot be explained by the issue characteristics, providing further support for the tax explanation.

Another characteristic of borrowers that may affect the issue costs is the expected total amount of borrowing (currently and in the future). Underwriters may use a two-tier pricing mechanism which offers a fee/spread "menu" to separate borrowers according to their expected amount of borrowing. To examine this hypothesis, we use the total amount of borrowing by each issuer over all issues included in our

Table V. Regressions partitioned on borrower type

Panel A: sovereign and international agencies							
	Intercept	RFEE	MATUR	AMOUNT	YS	R^2	N
COST	0.1174		0.0431	−0.0001	0.0277	0.2553	37
	0.9070		2.1546	−0.5196	0.1312		
RFEE	0.5049		0.0055	−0.0002	0.2969	0.3091	37
	4.6009		0.3688	−1.3086	1.9551		
SPREAD	−0.2440		0.0087	0.0000	0.0040	0.0274	37
	−2.2026		0.6411	0.1511	0.0326		
SPREAD	0.1495	−0.7795	0.0129	−0.0001	0.2354	0.4996	37
	1.3863	−5.7570	1.4126	−1.5048	1.9164		
COMP	0.2609		0.0141	−0.0002	0.3009	0.5029	37
	3.3234		1.3692	−1.8972	2.2739		
Panel B: corporate borrowers							
	Intercept	RFEE	MATUR	AMOUNT	YS	R^2	N
COST	0.0963		0.0487	−0.0001	0.1154	0.0679	218
	1.0961		2.2705	−0.3550	1.4428		
RFEE	1.2510		−0.0041	−0.0003	−0.0639	0.0337	218
	15.280		−0.1709	−1.5858	−1.3575		
SPREAD	−1.0311		0.0303	0.0002	0.1507	0.0737	218
	−10.199		1.0655	0.8940	2.6026		
SPREAD	0.0551	−0.8683	0.0267	−0.0001	0.0951	0.5364	218
	0.6474	−14.456	1.8878	−0.5607	2.0028		
COMP	0.2199		0.0262	−0.0001	0.0867	0.0536	218
	3.6375		1.9287	−0.8781	1.7337		

Heteroscedasticity consistent (White, 1980) t-statistics are reported below the coefficient estimates. The issue costs are measured relative to the market value of the issue a day after trading commences, and are expressed in percentage points. COST is total issue costs. RFEE is the underwriter fee. SPREAD is the indirect component of the underwriter compensation, that is, the difference between the offering price and the price guaranteed to the issuer. COMP is the sum of RFEE and SPREAD. MATUR is the number of years to maturity on the issue date. AMOUNT is the amount issued in millions of U.S. dollars. DQ is a debt quality measure that receives values between 1 and 5, where 5 is the highest grade and 1 is the lowest grade. YS is the yield spread a day after trading commences, measured relative to the yield on U.S. Treasury bonds.

sample (TAMOUNT) as a proxy for the issuer's expected total amount of borrowing. We rerun the regressions including this variable as an additional explanatory variable. Since the pricing of sovereign debt is different from that of corporate debt (see Table V), and the total amount of borrowing is larger for sovereign issuers (average of 1,262 million dollars per sovereign issuer versus 766 million for corporate issuers; t-statistic for the difference equals 3.6), we focus on corporate issuers to

Table VI. Regressions including total borrowing (TAMOUNT) and using corporate issues only

	Intercept	FEE	MATUR	AMOUNT	YS	TAMOUNT	R^2	N
COST	0.1470		0.0460	0.0001	0.1049	−0.0001	0.0789	218
	1.5012		2.1998	0.3831	1.2895	−1.7583		
RFEE	1.1846		−0.0006	−0.0005	−0.0501	0.0001	0.0618	218
	14.347		−0.0256	−2.3632	−1.0747	2.7350		
SPREAD	−0.9415		0.0255	0.0005	0.1320	−0.0002	0.1062	218
	−9.0121		0.9451	1.8957	2.3374	−2.6682		
SPREAD	0.0699	−0.8538	0.0250	0.0000	0.0892	−0.0001	0.5406	218
	0.8196	−13.514	1.8140	0.1517	1.8507	−1.4031		
COMP	0.2431		0.0249	−0.0001	0.0819	0.0000	0.0580	218
	3.6056		1.8807	−0.4168	1.6034	−1.0673		

Heteroscedasticity consistent (White, 1980) t-statistics are reported below the coefficient estimates. The issue costs are measured relative to the market value of the issue a day after trading commences, and are expressed in percentage points. COST is total issue costs. RFEE is the underwriter fee. SPREAD is the indirect component of the underwriter compensation, that is, the difference between the offering price and the price guaranteed to the issuer. COMP is the sum of RFEE and SPREAD. MATUR is the number of years to maturity on the issue date. AMOUNT is the amount issued in millions of U.S. dollars. DQ is a debt quality measure that receives values between 1 and 5, where 5 is the highest grade and 1 is the lowest grade. YS is the yield spread a day after trading commences, measured relative to the yield on U.S. Treasury bonds. TAMOUNT is the total amount of borrowing by the issuer (over all issues included in the sample).

mitigate potential bias. The results (reported in Table VI) should be interpreted with caution, since any measurement error in TAMOUNT may be correlated with the disturbance; for example, issuers may borrow additional amounts if they experience low issue costs. Nevertheless, the results are consistent with the hypothesis that underwriters use two-tier pricing to attract borrowers: underwriters appear to charge "big" issuers a relatively high fee but offer a low spread, which more than offsets the high fee (the net effect is lower cost for big issuers).

5.4. SENSITIVITY TO UNDERWRITER TYPE

Some underwriters are very active in the market. Do they offer different contracts? The mere fact that those underwriters are able to generate more business may indicate that they offer different contracts. Indeed, Livingston and Miller (2000) find that high-prestige underwriters charge low fees and set high offering prices. On the other hand, Michel and Shaked (1990) argue that high-prestige underwriters may charge higher fees to compensate for the potential damage to their reputation in case the issuer defaults.

To examine whether underwriter type affects the sensitivity of issue costs with respect to the issue characteristics, we re-estimate the regressions from Panel A of Table III and the first regression from Table IV for sub-samples partitioned based

Table VII. Regressions partitioned on underwriter type

Panel A: top underwriters							
	Intercept	FEE	MATUR	AMOUNT	YS	R2	N
COST	0.1222		0.0414	−0.0001	0.1166	0.1726	128
	1.7150		4.4531	−0.9787	1.6850		
RFEE	0.9923		0.0117	−0.0001	−0.0588	0.0102	128
	13.930		0.8784	−0.6580	−0.9948		
SPREAD	−0.8312		0.0176	0.0001	0.1679	0.1117	128
	−10.558		1.3491	0.2970	2.5616		
SPREAD	0.0372	−0.8751	0.0278	0.0000	0.1165	0.6868	128
	0.5521	−12.083	4.2334	−0.7055	2.8535		
COMP	0.1611		0.0292	−0.0001	0.1092	0.2193	128
	3.8687		4.2931	−0.9895	2.5882		
Panel B: other underwriters							
	Intercept	FEE	MATUR	AMOUNT	YS	R2	N
COST	0.1876		0.0280	−0.0001	0.1156	0.0351	127
	1.5202		0.8257	−0.2824	0.9568		
RFEE	1.2661		−0.0272	−0.0004	0.0683	0.0524	127
	12.647		−0.9776	−1.9754	1.2326		
SPREAD	−1.0901		0.0678	0.0003	0.0117	0.0571	127
	−9.2292		2.0745	1.4927	0.1375		
SPREAD	0.0162	−0.8737	0.0441	0.0000	0.0714	0.4868	127
	0.1309	−9.7152	1.9466	−0.2515	0.9156		
COMP	0.1760		0.0406	−0.0001	0.0800	0.0550	127
	2.1366		1.8478	−0.5860	1.0549		

Heteroscedasticity consistent (White, 1980) t-statistics are reported below the coefficient estimates. The issue costs are measured relative to the market value of the issue a day after trading commences, and are expressed in percentage points. COST is total issue costs. RFEE is the underwriter fee. SPREAD is the indirect component of the underwriter compensation, that is, the difference between the offering price and the price guaranteed to the issuer. COMP is the sum of RFEE and SPREAD. MATUR is the number of years to maturity on the issue date. AMOUNT is the amount issued in millions of U.S. dollars. DQ is a debt quality measure that receives values between 1 and 5, where 5 is the highest grade and 1 is the lowest grade. YS is the yield spread a day after trading commences, measured relative to the yield on U.S. Treasury bonds.

on underwriter type. Specifically, we split the sample between issues for which the lead underwriter is one of the top ten underwriters by market activity in 1998 ("top underwriters"), and all others.[12] As shown in Table VII, the estimated coefficients for the two subsamples are generally similar, suggesting that underwriter type

[12] The top underwriters are: Merrill Lynch, Morgan Stanley, Warburg Dillon Read, JP Morgan, Goldman Sachs, Credit Suisse First Boston, Lehman Brothers, Deutsche Bank, Salomon Smith

does not systematically affect the issue costs of international bonds.[13] However, the standard errors of the coefficient estimates are substantially smaller for top underwriters, suggesting that top underwriters are less "flexible" in setting their compensation components.

6. Summary and Conclusions

This study investigates the determinants of issue costs in the international bond market. Using a sample of 255 straight dollar denominated bond issues, we document the following results. Consistent with the unique features of Eurobonds (low level of credit risk, short maturity, large issue amount), the issue costs are only 0.37 percent on average, and they are determined primarily by maturity and credit risk. These two issue characteristics are priced indirectly: instead of increasing the fee to compensate for longer maturity or for higher credit risk, underwriters set a relatively low guaranteed price which results in a higher spread. We find no evidence of underpricing.

Our most interesting result is the trade-off between the cost components. Underwriters appear to set the two cost components (fee and spread) so that one offsets the other. This result holds on average, in the cross-section, and after controlling for "standard" issue characteristics. The trade-off is consistent with income tax considerations, as issuers may prefer high fee and low spread while underwriters are indifferent to the composition of their compensation. The trade-off is also consistent with the hypothesis that underwriters use a two tier-pricing mechanism to separate borrowers according to their expected total amount of borrowing.

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Barney, and ABN Amro. The ranking of underwriters by reputation is very stable. The same ten underwriters are ranked as "top ten" by the Capital Market Review and nine of these underwriters are ranked in the top ten by Medium Term Notes Programmes (CSFB is not included in that list). Interestingly, the stability of the list of reputable underwriters is evident also in the U.S. debt market. Livingston and Miller (2000) provide a list of the top five underwriters in the U.S. bond market for the period 1990–1997. Almost all the names that they mention appear on our list as well.

[13] We also examined whether top underwriters charge differently from the rest by adding a dummy variable to the equations that explain the issue costs and their components. Consistent with the results in Table VII, the dummy variable was insignificant in all cases.

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