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Corporate debt issues and interest rate risk management: Hedging or market timing?

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Abstract

Apart from the obvious reasons for raising capital, a firm can hedge its interest rate exposure by issuing debt, the value of which moves in an opposite direction from the value of its assets as interest rate varies. We examine whether firms in the UK market make full use of debt issuances for hedging purposes or if they have other considerations. Our evidence shows that firms' choices of debt issues are primarily driven by debt market conditions in an effort to lower their costs of capital rather than managing their firm-specific interest rate exposures. This suggests that market timing, as opposed to hedging, is the primary motivation behind corporate debt issuances.

JEL classifications: G30; G32; G14

Keywords: Risk management; Debt issuance; Hedging; Market timing

1. Introduction

Standard risk management theory emphasizes the role of derivatives in reducing corporate cash flow exposure. In practice, however, derivatives usage appears to be small compared to the magnitude of firms' overall assets (Brown, 2001; Guay and Kothari, 2003), and firms with more volatile cash flows, such as small firms, make far less use of

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derivatives than otherwise more stable (large) firms (Stulz, 1996). This evidence contradicts the "variance-minimization" notion of modern risk management theory and indicates that the impact of derivatives usage on corporate risk management is limited. Why do corporations not fully hedge their risk exposure with derivatives? Do they use means other than derivatives to manage their risk?

In theory, firms can manage risk exposure by means other than derivatives. For instance, corporate bonds can be employed as an instrument of interest rate risk management (Grinblatt and Titman, 2002; Stulz, 2003). Firms are able to "immunize firm value against changes in interest rates to some degree by matching the interest rate sensitivity of their assets and liabilities through active interest rate risk management (analogous to duration matching for financial intermediaries)…" (Bartram, 2002, p. 108). The value of a firm's assets, V_A, is the sum of its equity, V_E, plus debt, V_D (i.e., $V_A = V_E + V_D$). If, for instance, a firm measures the risk exposure of its equity as having a positive interest rate sensitivity (its share price goes up when interest rates rise, i.e., $\partial V_E/\partial r > 0$), issuing a bond with a negative interest rate sensitivity, i.e., $\partial V_D/\partial r < 0$, can reduce the interest rate exposure of its overall assets. Thus firms are able to hedge against interest rate exposure by correctly designing the interest rate sensitivity of new debt issues. In other words, once managers have measured the interest rate exposure of the firm or an investment project, they can reduce its exposure by issuing bonds, the value of which moves in an opposite direction from the value of the firm or the project as the interest rate varies. It is thus less necessary for these firms to enter into accompanying derivative contracts. For this reason, corporate managers need to address the problem of how to design a reasonable yield and maturity structure for the newly issued debt with a target interest rate sensitivity to match its initial risk.

If corporate bonds per se are an effective instrument of interest rate risk management, the question arises as to whether firms in practice make full use of debt issues for the purpose of hedging or if they have other considerations in mind. In this paper, we examine this question. Focusing on firms' newly issued debts, we examine the latent motivations of corporate debt issues from the perspective of interest rate risk management. We test whether firms, when issuing debt, consider hedging interest rate exposure as their main objective or if there are other goals behind the debt issue decisions. If firms are hedging, the choices regarding the interest rate exposure of their debt should be primarily driven by the interest rate sensitivity of the firms' value or expected cash flows. In the case that a firm's value is sensitive to the interest rate, the firm can hedge its overall interest rate exposure by entering a debt position that has a desirable interest rate sensitivity, for example, choosing the floating rate for the new debt to offset the volatility of the firm's cash flows that are caused by interest rate variability.

Recent studies reveal, however, that the majority of firms do not systematically hedge their risk exposure. The extent to which they choose to hedge depends on the market views of expected volatilities (Bodnar et al., 1998). Most firms adopt "profit-oriented and forecast-based" hedging strategies (Glaum, 2002, p. 121) and adjust them correspondingly with the market variability. In other words, they are timing the market. They attempt to hedge risks with a fluky view that they could correctly predict the future market movements. If this is the case, it implies that firms believe they are capable of timing the markets and thereby reducing their costs of capital. In this respect, debt issues could mainly be driven by the debt market conditions. Therefore, the question examined in this paper is whether corporate debt issues are determined by the intention of hedging or market timing?

We first find that firms' asset interest rate sensitivities increase considerably after new debt is issued that significantly alters the firms' interest rate exposure. We then find that debt issues are significantly correlated with the debt market conditions, such as inflation, real short-term interest rate, and yield spread. Firms have a high incentive to issue floating rate and short-term debt when inflation, real short-term interest rate, and yield spread are high. This indicates a close relation between the decisions of corporate debt issues and the exogenous market factors. Finally, our evidence shows that debt yield type and maturity decisions are driven mainly by market conditions as there is no significant evidence on the relationship between the firm-specific interest rate exposure and the choices of debt yield types and maturity horizons. Taken together, our results suggest that firms are timing the market when issuing debt in an effort to lower their costs of capital rather than hedge the interest rate risk exposure.

The remainder of the paper is organized as follows. Section 2 reviews the related literature. Section 3 provides a description of the data and samples. Section 4 develops the empirical strategy and presents the findings. Section 5 concludes.

2. Literature review

Modigliani and Miller (1958) show that, in a frictionless market with the absence of information asymmetries, transaction costs, and taxes, firms' financing policies are irrelevant. With the same logic, this notion implies that shareholders can choose their own strategies to change their exposure to risky assets no matter what the firms' hedging policies. As a result, firms do not necessarily have any comparative advantage over individual investors. Contrary to the perfect market proposition, market imperfection/incompleteness explains why firms should hedge their risks. First, as long as the costs of the risk management programs are lower than the present value of financial distress[1] costs or bankruptcy costs, risk management adds value to the firm (Smith and Stulz, 1985). Second, taxes play an important role in most financial decisions, including hedging. If taxes are a convex function of earnings, firms can benefit from hedging[2] (Smith and Stulz, 1985; Leland, 1998; Graham and Smith, 1999). Third, costly external funds provide firms with incentives to hedge because hedging adds value to firms by stabilizing cash flows (Froot et al., 1993; Fok, 1997; Geczy et al., 1997; Glaum, 2002). Fourth, information asymmetry raises the demand for risk management for noise reduction and information transparency[3] (DeMarzo and Duffie, 1995). Finally, management interests regarding reputations (Tufano, 1996; Rogers, 2002) and compensations (Stulz, 1984) create incentives for risk management if managers perceive superior knowledge with respect to

[1]Most empirical studies find a positive relationship between firms' hedging and the expected probability of financial distress by employing alternative proxies, such as leverage ratios (Dolde, 1995; Tufano, 1996; Howton and Perfect, 1998; Spano, 2003), leverage ratio multiplied by market to book ratio (Graham and Rogers, 2002), and Altman's Z-score (Brown et al., 2006). A number of recent studies examine the relationship between liquidity risks and hedging level, and provide evidence of the notion that firms with lower liquidity and higher leverage are more likely to use derivatives (Fok, 1997; Geczy et al., 1997; Korn, 2003).

[2]However, empirical evidence does not give consistent support to the theory of tax incentives (Fok, 1997; Geczy et al., 1997; Graham and Rogers, 1999, 2002).

[3]Accounting report standards in principal countries recently required firms to provide their derivatives uses and hedging activities (FRS 13 published in September 1998 in UK and FSAS 119 in August 1997 in US).

the firms' potential risks and uncertainties[4] (Ljungqvist, 1994; Breedon and Viswanathan, 1998).

Early work on corporate risk management assumes that firms use derivatives purely for hedging purposes, and that the benefits of derivatives usage accrue solely from "the alleviation of market imperfections," (Adam and Fernando, 2006, p. 284). An implicit assumption of the above is that firms not using derivatives are not hedging (Petersen and Thisgarajan, 2000; Graham and Rogers, 2002). However, such firms may not face risks that can be hedged by derivatives, or they may indeed hedge by using some other means. In contrast to the traditional risk management theory, which derives rules from the objective of variance minimization (Carcano and Foresi, 1997; Brenner et al., 2005), numerous survey studies show that a considerable number of firms take a market view in their hedging policies for pursuing goals other than reducing volatility (Bodnar et al., 1995, 1996, 1998; Howton and Perfect, 1998; Glaum, 2002). Managers attempt to hedge risks with a fluky view that they are able to correctly predict future market movements. The concept of "selective hedging" raised by Stulz (1996) implies that firms use derivatives to hedge only the downside risks rather than as primary volatility minimization.

In a survey of corporate derivatives usage, Dolde (1993) shows that in the US, 90% of the firms, comprising 244 Fortune 500 companies, acknowledge that they take a view on the market direction of interest rates or exchange rates and modify their positions to accommodate their views. The Wharton survey series (Bodnar et al., 1995, 1996, 1998) shows that managers of more than 60% of the firms find it difficult to avoid letting their own market views affect their hedging decisions both on hedge timing and hedge size. On the other side of the Atlantic, Grant and Marshall (1997) reveal that a significant number of UK firms do sometimes use derivatives for "yield enhancement." In a similar fashion, Glaum's (2002) survey of German companies shows that, following very heterogeneous risk management practices, the majority of firms adopt "profit-oriented and forecast-based" selective hedging strategies. Recent empirical work also provides evidence consistent with the above survey results. Faulkender (2005) finds that corporate interest rate risk management practices are driven by speculation or "myopia" instead of hedging considerations. Brown et al. (2006) show that the manager's market view has an important impact on corporate hedging policies. Adam and Fernando (2006) investigate shareholder values and cash flows from firms' derivative transactions, and find considerable evidence of selective hedging.

Early empirical studies examining the determinants of corporate debt issues have mainly focused on the relationship between debt maturity and firm-specific characteristics, which include size (Myers, 1977), market-to-book ratio (Barclay and Smith, 1995; Guedes and Opler, 1996), information (Mitchell, 1991), and leverage (Stohs et al., 1996). Recent studies pay more attention to the relationship between firms' debt maturity and debt market conditions.[5] Baker et al. (2003) find that debt market conditions, such as inflation, real short-term interest rate, and term spread, predict excess bond returns and thus determine debt maturity. Kaplin and Levy (2001) examine corporate security issues, including both stocks and bonds, and find that the ratio of aggregate short-term to aggregate long-term

[4]However, empirical evidence on the managerial argument is very weak. Some studies find no evidence or even claim opposite results (e.g., Fok, 1997; Geczy et al., 1997).

[5]However, the notion that debt maturity is related to debt market conditions can be found in several early studies. Since White (1974), and Taggart (1977) find that the market level of corporate debt issues is influenced by interest rates, more debt market factors have been involved in recent studies concerning debt maturity.

debt issues is highly correlated with macroeconomic conditions. These results suggest that firms are trying to time the market in an effort to reduce the costs of capital.

Apart from maturity, a debt issue must also involve the consideration of yield type choices. Yield types of corporate debts are related but do not always coincide with maturity. A firm faces various options in terms of debt yield choices, which are applied to the interest rate risk management. The latent determinants of firms' choices of debt yield type reflect the attitudes and the behavior patterns of their interest rate risk management; however, with the exception of Faulkender (2005), few papers have investigated this issue. While Faulkender's study fills this gap by examining whether the selected interest rate exposure is influenced by market conditions or the firms' cash flow interest rate exposure, it does not cover the issue of debt maturity and its sample is restricted to one industry only.

3. Data and sample description

Firms issue bonds primarily to raise capital, but the details of the bond issue scheme involve comprehensive considerations including timing, debt maturity, and yield types. All these factors are determined by the underlying motivations accompanying debt issues. We examine whether firms take advantage of newly issued debt for interest rate risk management or timing the market in an effort to reduce their costs of capital.

We divide our investigation into three stages. First, we measure firms' interest rate exposure prior to new debt issues, and then measure their after-event interest rate exposure, which tells us whether debt issues significantly alter firms' initial interest rate exposure, as well as whether or not firms hedge their risk exposure when issuing debt. Second, we test whether there is a significant relationship between corporate debt issues and debt market condition factors. Third, we combine these two stages by pooling together both the firm-specific interest rate exposure and the debt market condition factors and then analyzing whether or not corporate debt issues are determined by hedging or market timing.

We build a data set of corporate debt issues of the non-financial firms in the UK for the period 1986–2004.[6] The data comes from Securities Data Corporations (SDC) Platinum. Subject to the estimates of stock price interest rate sensitivity, only public firms are included in the study. We collect a sample of 742 debt issues by 217 firms. Table 1 presents the annual distribution of debt issues sorted by debt maturity and yield types. Overall, 67% are fixed rate debts, 23% are short-term debts (with maturity of less than 5 years), and 32% are long-term debts (with maturity of more than 10 years).

Table 2 presents the sample statistics. Panel A categorizes yield types and horizons of debt maturity. The debt issues in the sample have an average maturity of 14.5 years. The sub-sample of the floating rate debts has a higher mean and standard deviation on maturity than the sub-sample of the fixed rate debts. Panel B presents the quarterly aggregate statistics of the debt market condition variables used in the study: inflation, real short-term interest rate (the difference between the short-term interest rate and the realized inflation rate), and yield spread (the difference between the long-term interest rate and the short-term interest rate). The inflation rate is estimated using the monthly CPI data from the UK National Statistics. The 3-month Treasury bill rates and the 10-year Treasury bond rates are used as proxies of the short-term and the long-term interest rates, respectively, both of which are collected from

[6]SDC provides the data regarding UK corporate public debt issues from 1985. However, subject to the FTSE-ALL index data availability in the Thomson Financial Datastream, we start our sample period from 1986.

Table 1
Sample distributions.

Corporate debt issue data is collected from Securities Data Companies (SDC) Platinum. Debt types cover all convertible and non-convertible bonds, preferred stocks and mortgage/asset-backed and private debts issued by UK non-financial public firms that are available from Datastream. The sample consists of 742 debt issues from 217 firms, spanning the period from 1986 to 2004. The whole sample is sorted by yield type and maturity horizons. Short-term debt has a maturity of less than 5 years, while long-term debt has a maturity of more than 10 years.

Year	Short-term debt	Median-term debt	Long-term debt	Fixed rate debt	Floating rate debt	Annual issues
1986	2	4	2	8	0	8
1987	3	7	2	5	7	12
1988	10	1	8	17	2	19
1989	3	3	5	6	5	11
1990	3	5	6	2	12	14
1991	8	9	11	14	14	28
1992	6	10	6	12	10	22
1993	3	18	9	15	15	30
1994	1	11	11	7	16	23
1995	3	9	9	11	10	21
1996	5	17	9	23	8	31
1997	8	27	20	33	22	55
1998	3	20	21	30	14	44
1999	9	21	27	45	12	57
2000	36	27	18	59	22	81
2001	26	29	22	57	20	77
2002	21	35	17	45	28	73
2003	11	48	26	70	15	85
2004	13	30	8	37	14	51
Sum	174	331	237	496	246	742

Thomson Financial Datastream. As can been seen, the signs of the real short-term rates and the yield spread vary over time. The long-term rate is not always higher than the short-term rate, which may affect the firm's decision on debt maturity if they seek to reduce the costs of capital. We cumulate the quarterly deal numbers of every type of debt and standardize them by the total quarterly aggregate issues. All pairs of quarterly aggregate data are significantly different both on the issue numbers and the levels, which indicates that debt issues tend to be correlated to yield type and maturity. Panel C presents the sample statistics of individual observations instead of the aggregate data. We retain 579 debt issue events due to the consolidation of events where there is more than one event in the event window. Beta-pre-G_{lt} and beta-pre-G_{st} denote asset sensitivity to the long-term and short-term interest rates prior to the debt issues, respectively. The market condition variables, market values and market-to-book ratios are recorded on the debt issue dates.

4. Empirical design and results

4.1. Impact of debt issues on firms' interest rate exposure

Firms face interest rate risk if the variability of interest rates leads to volatile cash flows or firm values. If cash flows of assets are sensitive to interest rates, a firm with intentions to

Table 2
Sample statistics.

Panel A presents the maturity statistics of the whole sample and the sub-samples sorted by yield type and maturity. Panel B presents the quarterly aggregate debt market factors and corporate debt issues. Inflation is the real quarterly inflation drawn from the announced UK consumer price index (CPI). The real short-term rate is estimated as the 3-month Treasury bill rate minus actual inflation. The yield spread is the difference between the 10-year Treasury bond rate and the 3-month Treasury bill rate. (1) to (5) denote the aggregate quarterly deal numbers of floating rate (D_f), fixed rate (D_F), short-term (D_s), medium-term (D_m), and long-term (D_l) debts; (6) to (10) denote the aggregate percentages of deal numbers of all types of the above debt to the total issued debt during each quarter. Panel C presents the pooled data employed in the multivariate hypotheses tests. Beta-pre-Glt and Beta-pre-Gst denote the stock price interest rate sensitivity to the short-term and long-term interest rates before new debt issues. Other market condition variables are defined as in Panel B, but recorded at the dates of issuance events instead of aggregate types.

	N	Mean	SD	Median	Difference (*t*-value)
Panel A: Sample maturity statistics					
Total sample	742				
Maturity (year)		14.5	20.2	10.1	
Fixed rate bonds	496				
Maturity (year)		12.6	12.2	10.1	
Floating rate bonds	246				
Maturity (year)		18.8	30.8	8.1	
Long-term bonds	237				
Maturity (year)		21.69	24.53	11.03	
Medium-term bonds	331				
Maturity (year)		6.93	1.16	7.13	
Short-term bonds	174				
Maturity (year)		2.37	1.27	2.28	
Panel B: Quarterly aggregate data statistics					
Quarterly debt market conditions					
Inflation (%)	76	3.77	2.20	3.13	
Real short-term rate (%)	76	3.91	1.61	3.77	
Term structure (%)	76	0.04	1.78	0.21	
Quarterly aggregate bond issues					
(1) D_f	76	3.1	3.1	3	(1)–(2) [−4.357]***
(2) D_F	76	6.3	5.8	5	
(3) D_s	76	2.2	2.7	1	(3)–(4) [−3.699]***
(4) D_m	76	4.3	4.1	3	(4)–(5) [1.974]**
(5) D_l	76	3.0	2.5	3	(3)–(5) [−2.294]**
(6) $D_f/(D_F+D_f)$	76	0.36	0.29	0.33	(6)–(7) [−5.720]***
(7) $D_F/(D_F+D_f)$	76	0.63	0.30	0.67	
(8) $D_s/(D_l+D_m+D_s)$	76	0.23	0.41	0.35	(8)–(9) [−3.298]***
(9) $D_m/(D_l+D_m+D_s)$	76	0.24	0.28	0.25	(9)–(10)[4.372]***
(10) $D_l/(D_l+D_m+D_s)$	76	0.17	0.43	0.33	(8)–(10)[1.240]
Panel C: Cross-sectional variable statistics					
Beta-pre-Glt	579	0.013	0.758	0.084	
Beta-pre-Gst	579	−0.092	1.782	−0.174	
Inflation (%)	579	2.95	1.58	2.76	
Gst-Inflation (%)	579	3.26	1.39	3.32	
Glt-Gst (%)	579	0.21	1.38	0.32	
MV ($ Mil)	579	4504.23	8062.48	2101.61	
MTBV	579	2.47	8.34	2.02	
Maturity (years)	579	15.07	21.42	10.14	

*, **, and *** correspond to the coefficients being significant at the 10%, 5%, and 1% levels, respectively.

hedge interest rate exposure should make the cash flows of its new debt sensitive, but with an opposite sign, to the interest rates. Thus, the firm's interest rate exposure will be fully hedged or, to some extent, reduced. With this logic, we measure firms' asset interest rate exposure prior to debt issues and examine the incremental interest rate exposure resulting from the newly issued debt. A direct comparison between interest rate exposure before and after debt issues reveals whether or not firms adopt hedging strategies to manage their interest rate exposure.

The first task is to find out which risk factors need to be involved in measuring the interest rate risk exposure. The simplest method introduces only one factor, i.e., the yield to maturity, with the assumption that the yield curve moves in a parallel manner. However, accurate measurement requires covering as many factors as possible, while the complication of the modeling process stops further investigations. Therefore, various methods are employed in the trade-off between parsimony and accuracy. Following Brennan and Schwartz (1979),[7] we introduce one short-term rate and one long-term rate in our measurement of firms' asset interest rate risk exposure.[8] Meanwhile, we also control for market returns to exclude the influence of the overall stock market for the consideration of the firm-specific interest rate exposure measurement. In terms of the dependent variable, Faulkender (2005) employs 20 continuous quarterly cash flows covering the time period of five fiscal years prior to debt issues to measure firms' interest rate exposure. It can be argued that a 5-year period is too long, since firms' financial characteristics may change pronouncedly during this time, and 20 observations is a relatively low number by which to accurately measure firms' interest rate exposure. Further, the use of cash flows may be problematic, since firms first intend to decorate their financial statements to smooth out their cash flows (Kaplin and Levy, 2001), and second, due to the discontinuous nature of cash flows (cash flows are usually reported annually or semi-annually), it is inaccurate to measure a firm's interest rate sensitivity by using cash flows that ignore the interest rate volatility during the periods between the two dates when cash flows are reported. To get around these problems, we employ stock prices instead of cash flows to estimate the firm's interest rate sensitivity. Specifically, we use stock returns of the firm for the 50 weeks before and the 50 weeks after debt issues to estimate the firm's pre- and post-issue interest rate exposure, which is measured by the asset sensitivity to the changes in both short- and long-term interest rates. In particular, we run the following regression to examine the interest rate exposure based on stock prices:

$$R_{i,t} = \alpha + \gamma R_{m,t} + \beta_{s,i} I_{s,t} + \beta_{l,i} I_{l,t} + \varepsilon_{i,t} \tag{1}$$

where $R_{i,t}$ is the weekly stock return of the ith stock at week t. $R_{m,t}$ is the weekly return on UK FTSE-All index which proxies the market return. The weekly changes of 3-month Treasury bill rates, $I_{s,t}$, and 10-year Treasury bond rates, $I_{l,t}$, proxy for short- and long-term interest rate exposure, respectively. $\beta_{s,i}$ and $\beta_{l,i}$ measure the ith firm's operation exposures to the short- and long-term interest rates before or after the debt issues. A direct comparison of β_s or β_l prior to and following each debt issue shows the influence of the new debt issues on the

[7]This paper develops an arbitrage model of the term structure of interest rates based on the assumption that the whole term structure at any point in time may be expressed as a function of the yields on the longest and shortest maturity default-free instruments.

[8]In Faulkender (2005), 6-month LIBOR is chosen as the only benchmark interest rate because most commercial debt is primarily tied to LIBOR if it is floating. Moreover, the variability of LIBOR rates provides a good proxy for interest rate movement.

firm's interest rate exposure. If during the 50-week measurement period before or after the debt issue event there is another debt issue event, it will be consolidated with the original event, and the 50-week measuring window will be extended outwards.

Our evidence shows that 56% of debt issue events (324 out of 579)[9] significantly alter the initial interest rate exposure[10] of issuers by either adding additional risk exposure or offsetting the original risk exposure. If firms intend to hedge their risk exposure, the after-event interest rate exposure should decrease significantly. However, when we examine the difference between the pre-event and post-event interest rate exposures for the whole sample, we observe that the after-event interest rate exposure is significantly larger than the initial interest rate exposure. When examining only the significant sub-sample, which contains all significant pre- and/or post-event interest rate exposure, we find more cases in which new debt issue has a significant impact on firms' interest rate exposure. The mean of the pre-event exposure is small and insignificant, while the after-event exposure becomes large and significant. This is in line with our prior that debt is normally negatively related to the interest rate, which creates an incremental interest rate exposure to firms. Thus, Table 3 demonstrates that debt issues significantly affect firms' interest rate exposure.

4.2. Choices of corporate debt issues and debt market conditions

After examining the influence that debt issues have on firms' interest rate exposure, we now move to investigate whether yield types and maturity of corporate debt issues are affected by market conditions. Following Baker et al. (2003), we use aggregate bond issues data and run the following regression to examine whether or not a relationship exists between market-wide debt issues and market conditions:

$$D_t = a + b_1 INF_t + b_2(G_{st} - INF_t) + b_3(G_{Lt} - G_{St}) + \varepsilon_t \quad (2)$$

We sort all debt issues from 1986 to 2004 by yield type, i.e., floating rate or fixed rate debt, and maturity. We employ the standard usage to define debt with maturity less than 5 years as short-term debt, and more than 10 years as long-term debt. We standardize the dependent variable by generating the levels of all types of debt over the total debt issues to eliminate the measurement error that may be caused by changes in the deal numbers.[11] D_t denotes the quarterly aggregate percentages of deal numbers of the floating rate debts, the fixed rate debts, the long- and short-term debts, respectively, in different specifications. The realized inflation rate, INF_t, the real short-term rate, $G_{st}-INF_t$, (the difference between the 3-month Treasury bill rates and inflation rates), and the yield spread, $G_{lt}-G_{st}$, (the difference between the 10-year Treasury bond rates and the 3-month Treasury bill rates) are employed as the proxies of debt market conditions.[12] In addition to the

[9]This percentage is lower than what we expect, and may potentially result from the relative magnitudes of the debt issued. In Section 4.4 we examine the size effect on firms' decisions regarding hedging or market timing.

[10]The interest rate exposure is significant at the 10% level.

[11]As suggested by Baker et al. (2003), if the numbers of different debt issued are volatile, the levels of various types of debt divided by the total debt issues more accurately measures the preference than the changes.

[12]Since the objective here is to identify the potential relationship between debt issues and debt market condition, it is not necessary to involve as many variables as possible that are potentially associated with the debt market conditions unless all such factors are excluded from the linkage. Following Baker et al. (2003) and Faulkender (2005), we measure debt market conditions by three typical variables: inflation, the realized real short-term interest rate, and the yield spread. As long as the important market factors are identified as relating to the debt issues, whether they can cover all situations of the market environment is irrelevant.

Table 3
Impact of debt issues on firm's interest rate exposure.

The 50-week stock returns before and after the debt issue dates form the event windows for our estimates of the impact that new debt issues have on the sensitivities of stock prices to interest rate variability. If there is more than one debt issue in the event window, they are consolidated into a sole event, and the window is extended further. After the adjustment, there are 579 firm-issue events remaining. For each event, weekly stock returns for 50 weeks before and after the debt issue are used to determine the sensitivity of the firm to changes in the short-term and long-term interest rates:

$$R_{i,t} = \alpha + \gamma R_{m,t} + \beta_{s,i} I_{s,t} + \beta_{l,i} I_{l,t} + \varepsilon_{i,t} \quad (1)$$

$$R_{i,t} = \alpha' + \gamma' R_{m,t} + \beta'_{s,i} I_{s,t} + \beta'_{l,i} I_{l,t} + \varepsilon_{i,t} \quad (1)'$$

where $R_{m,t}$ denotes the weekly returns of FTSEA-ALL index as the proxy for market returns, $I_{s,t}$ is the weekly variations of 3-month Treasury bill rates, and $I_{l,t}$ is the weekly variations of 10-year Treasury bond rates. $B_{s,i}$, $B_{l,i}$, $B'_{s,i}$, and $\beta'_{s,i}$ measure the firm's interest rate exposures to the short- and long-term interest rates before and after the debt issues, respectively. The differences between $B_{s,i}$ and $B'_{s,i}$, and $B_{l,i}$ and $\beta'_{s,i}$ reflect the impact of debt issues on the firm's interest rate exposure. Panel A presents the differences between interest rate sensitivities before and after the debt issue events for the whole sample. Panel B covers only observations that have at least one significant coefficient, i.e., the samples with significant variation of interest rate exposure after the debt issue events.

	$\beta_{l,i}$	$\beta'_{l,i}$	Difference	$\beta_{s,i}$	$\beta'_{s,i}$	Difference
Panel A: Whole sample						
Mean	0.013	−0.192	[−1.372]*	−0.092	−0.442	[−1.270]*
SD	0.758	0.783		1.782	2.608	
Number of observations	579			579		
Panel B: Significant sub-sample						
Mean	0.043	−0.473	[−2.751]**	−0.106	−0.427	[−1.452]*
SD	1.113	1.682		3.973	2.691	
Number of observations	324			324		

* and ** correspond to the coefficients being significant at the 10% and 5% levels (one-tailed test), respectively.

investigation of the contemporary relationship between all types of debt issues and the market factors, we also examine the extent to which different types of debt are affected by the market condition factors to identify the underlying behavior and preference behind the choices of debt issues.

Table 4 examines the levels of all debt types over the total debt issues and shows that all dependent variables are significantly correlated to the market condition factors. Panel A indicates that the issue tendency of floating rate debt is opposite to that of fixed rate debt under certain market conditions. In other words, the levels of floating rate debt are positively correlated to the market condition factors, while the levels of fixed rate debt move in an opposite direction. First, if the yield spread decreases or there is a flat yield curve, firms are more likely to issue a fixed rate debt than a floating rate debt. This is consistent with the finding of Faulkender (2005) that firms tend to issue a floating rate exposure when the yield curve is steep. Second, the positive signs of the coefficients suggest that with a high inflation and interest rate, firms prefer floating rate to fixed rate debt. Panel B shows that the levels of short-term debt exhibit a movement opposite to that of long-term debt as the market condition factors vary. Since we find that all dependent

Table 4
Corporate decisions on bond issues and debt market conditions.

Table 4 contains all 742 debt issue observations. The samples are sorted by yield type and maturity, and the deal numbers are accumulated for each quarter from 1986 to 2004 (76 quarters altogether).

$$D_t = a + b_1 INF_t + b_2(G_{st} - INF_t) + b_3(G_{Lt} - G_{St}) + \varepsilon_t \quad (2)$$

Inflation (*INF*) is the quarterly inflation data drawn from the UK consumer price index (CPI). The real short-term interest rate (*Gst-INF*) is estimated as the 3-month Treasury bill rate minus the actual inflation. The yield spread (*Glt-Gst*) is the difference between 10-year Treasury bond rate and 3-month Treasury bill rate. The independent variable, D_t, is the variable shown in the first column. Panel A shows the aggregate percentages of debt issue deal numbers sorted by the yield type, i.e., the floating rate debt, D_f, and the fixed rate debt, D_F, to the total issued debt in each quarter. Panel B shows the aggregate percentages of debt issue deal numbers sorted by maturity, i.e., the short-term debt, D_s, (with maturity shorter than 5 years), the medium-term debt, D_m, (with maturity between five years and ten years), and the long-term debt, D_l, (with maturity longer than ten years) to the total issued debt in each quarter. *t*-statistics are heteroskedasticity robust and correct for time-series dependence up to 2 lags.

D_t	N	*INF*		*Gst-INF*		*Glt-Gst*		Constant		*R*-square
		b1	[*t*]	b2	[*t*]	b3	[*t*]			
Panel A: Sub-group sorted by the yield type										
The fixed rate bond share of total bond issues										
$DFt/[DFt + Dft]$[a]	76	−0.074	[−3.45]***	−0.054	[−1.67]*	−0.072	[−2.65]**	0.909	[7.90]***	0.140
Panel B: Sub-group sorted by the maturity										
The short-term share of total bond issues										
$Dst/[DLt + DMt + DSt]$	76	0.044	[2.67]***	0.005	[1.77]*	0.020	[2.12]**	0.082	[2.94]***	0.105
The long-term share of total bond issues										
$Dlt/[DLt + DMt + DSt]$	76	−0.051	[−2.52]**	−0.026	[−2.19]**	−0.048	[−1.99]**	0.135	[2.28]**	0.127

*, **, and *** correspond to the coefficients being significant at the 10%, 5%, and 1% levels, respectively. Since the quarterly percentage of floating debt issues over total debt issues, $Dft/(DFt + Dft)$, is equal to $1\text{-}DFt/(DFt + Dft)$, for the reason of brevity, the results are not reported.

variables exhibit first-order auto-correlation, which suggests that information of a quarter prior to the issue date influences the debt issues at the market-wide level, we thus take one lag for the market factors as a robustness check. Our results from the lead-lag relationship (not reported here) are similar to the contemporary tests examined earlier.[13] Therefore, our evidence shows that firms make decisions on yield type and maturity in response to the current market conditions, as well as on their expectations of market movements in the near future.

These results have several implications. Obviously, in terms of the debt yield type, firms tend to select a low cost way based on the exogenous market conditions. They choose floating rate for new debt because the costs of capital implied by inflation and short-term rates are relatively high but are expected to be lower in the future. Otherwise, firms will prefer a fixed rate to lock the ''expected'' increase of the costs. Another implication regarding yield type choices is that these market variables implicitly proxy for time-varying

[13]For the interests of brevity, we do not report the lagged results here. However, the results are available upon request.

costs of interest rate risks. As suggested by Estrella and Mishkin (1996), a steep yield curve is correlated with a low likelihood of a subsequent economic recession. During non-recessionary periods, the likelihood of distress is relatively low, and the cost of bearing interest rate volatility may thus be lower. Thus, firms are better positioned to weather their interest rate exposures by choosing a floating rate. On the other hand, firms would prefer to lock in their interest payments if volatile interest rate payments are costly during economic downturns. The capital costs also explain the choices of debt maturity. Firms tend to shorten the maturity of their new debt when the long-term rate is much higher than the short-term rate, as implied by a steep yield curve. Meanwhile, when a low inflation rate and interest rate suggest economic growth, firms are more confident to issue a long-term debt than a short-term debt when their ability of enduring risk exposure is high. Clearly, the choices involved in corporate debt issues have a significant relationship with the intention of market timing.

4.3. The determinants of corporate debt issues

After examining the incremental interest rate exposure and the relationship between debt issues and debt market conditions, we next study the determinants of corporate debt issues. Since the market-wide aggregate data ignores the cross-sectional variations in firm-specific characteristics, the pooled firm-level data of individual debt issue events is better equipped to identify the differences of the preferences of debt financing, with the control of firm-specific financial characteristics. If firms are hedging, debt issues should be driven by the firm-specific interest rate sensitivity. Alternatively, if firms are timing the market, debt issues should be connected to the market conditions. We conduct multivariate tests to examine the above hypotheses by synchronously involving both firm-specific interest rate exposure and debt market condition factors, such as firm size and market-to-book ratio. Using pooled firm-level data, we run the following Probit regression to search for the determinant factors on firms' choices of debt yield types and maturity:

$$D_i = a + b_1\beta_{s,i} + b_2\beta_{l,i} + \sum_{j=1}^{3} c_j\gamma_{i,j} + \sum_{t=1}^{2} d_t\varphi_{i,t} + \varepsilon_i \tag{3}$$

The sample contains 579 debt issues adjusted by the event windows as described in the regression (1) and the estimation of firm-specific interest rate exposure in Table 3. The independent variables comprise three sets of variables. First, $\beta_{s,i}$ and $\beta_{l,I}$, generated from the regression model (1), measure the ith firm's operation exposures to the short- and long-term interest rates before and after the debt issues. Second, $\gamma_{i,j}$ are a series of variables of debt market conditions in the corresponding month when debt is issued, which includes inflation, real interest rate, and yield spread as defined in the regression model (2). Finally, $\varphi_{i,t}$ are the firm-specific factors, i.e., firm size and market-to-book ratio, as defined in the regression model (3). We control firm size and market-to-book ratio to eliminate the effects of firm-specific characteristics on debt issue preference because both variables are widely accepted as important factors affecting firms' debt issues.[14]

[14]According to the literature regarding capital structure choices and the determinants of debt issues, the preference of debt issues varies across firms with different financial characteristics. Consistent with Myers (1977), Barclay and Smith (1995) indicate that firms that have few growth options, or are large, have more long-term debt. Baker and Wurgler (2002) find that firms with high market valuations, as measured by the market-to-book

The dependent variable D_i is a dummy variable. In the case of yield type, D_i takes the value of one if the yield type is floating, and zero otherwise. In the case of debt maturity,[15] D_i takes the value of $+1$ for short-term debt, -1 for long-term debt, and zero otherwise. To examine firms' debt maturity choices while eliminating the potential bias resulting from the definitions of short- and long-term debts, we replace the dummy dependent variable D_i with the year horizons of debt maturity M_i in the Tobit regression as the alternative specification.

Table 5 presents our regression results. The first thing to notice is that the firms' initial interest rate exposures (betas) do not affect their choice of yield types or debt maturity. If firms are hedging, the coefficient sign of the beta should be positive, indicating that they are matching the exposure of their assets to the exposure of their debts. However, the beta coefficients are statistically insignificant and do not exhibit the expected sign for the maturity analysis.[16] To check its robustness, we also explore the alternative measures of the asset interest rate exposure for each regression. We take the value of beta to examine the existence of a quantitative relationship between the pre-issue interest rate exposure and the choices of debt issue if the estimated interest rate exposure is statistically significant and take the value of zero if otherwise. In addition, in line with Faulkender (2005), we use a discrete measure of the interest rate exposure, which takes the value of $+1$ when the estimated exposure is significantly positive and -1 when it is significantly negative, and zero otherwise. We adopt these specifications because the signs of beta could affect the hedging strategy of the firm. Firms are supposed to adopt different hedging strategies if the interest rate exposures they face have different signs. More specifically, firms that face a positive asset interest rate exposure will benefit from issuing floating rate debt that reduces the volatility of stock prices resulting from the interest rate movements. The results from these new specifications are nonetheless similar to our initial finding that interest rate exposures do not affect firms' choices of yield types or debt maturity. The only weak significance appears on the coefficient of discrete long-term interest rate beta,[17] but this is

(*footnote continued*)
ratio, raise fewer debt funds than those with low market valuations. In addition, Guedes and Opler (1996) use a number of variables regarding the debt issuers' characteristics; the firm size and the market-to-book ratio significantly affect the maturity of firms' debts.

[15]Like the yield type choice, decisions regarding debt maturity may be affected by either exogenous or endogenous factors. On the one hand, since the firm's value varies as different debt maturity changes the future cash flows, the firm with a plan of raising debt funds will consider matching the debt maturity to the time horizon of the investment project, as well as matching the future cash flows of both debt funds and the investment project to avoid the extra volatility of cash flows. On the other hand, the exogenous factors may induce firms to consider the debt issue strategy rather than hedge risk exposure.

[16]Since the interest rate exposures, β, are not fixed, but estimated in the time-series regression (1), the standard errors of the coefficients are asymptotic. We made the Shanken's correction to adjust the standard errors of the β coefficients. Following Shanken (1992), the adjusted standard error of estimated coefficients of β in regression (3) is: $Ad.Se = \sqrt{(1+c)(Se^2 - Var_{I_1}/T) + Var_{I_1}/T}$, where $c = \lambda^{-1}\sum_f^{-1}\lambda$, λ is the coefficient matrix of factors in the time-series regression (1), and Σ_f is the covariance matrix of factors in time-series regression (1). We obtained $c_1 = 0.34$ for all sample (Panel A, Table 3) and $c_2 = 0.57$ for significant interest rate exposure (Panel B, Table 3), and adjusted the standard errors and t-values of β coefficients in Table 5. The t-values of β coefficients in Tables 6 and 7 have been adjusted as well. All adjustments of coefficients and standard errors are verified by the Litzenberger and Ramaswamy (1979) estimator following Lehmann (1990).

[17]We doubt the potential reason on the relative magnitude of the debts or the outliers, since in the robustness check we find the same phenomenon only on the *large size* issues, when dividing the whole sample into two subgroups by the relative sizes.

Table 5
Determinants of corporate bond issues.

Table 5 examines whether the choices of corporate debt issues are determined by firm-specific interest rate exposure or by debt market conditions after controlling for firm size and market-to-book (MTBV) ratios.

$$D_{f,t} = a + b_1\beta_{s,i} + b_2\beta_{l,i} + c_1 INF_t + c_2(G_{st} - INF_t)_i + c_3(G_{Lt} - G_{St})_i + d_1 MV_i + d_2 MTBV_i + \varepsilon_i \quad (3)$$

$$D_{m,t} = a + b_1\beta_{s,i} + b_2\beta_{l,i} + c_1 INF_t + c_2(G_{st} - INF_t)_i + c_3(G_{Lt} - G_{St})_i + d_1 MV_i + d_2 MTBV_i + \varepsilon_i \quad (4)$$

$$M_i = a + b_1\beta_{s,i} + b_2\beta_{l,i} + c_1 INF_t + c_2(G_{st} - INF_t)_i + c_3(G_{Lt} - G_{St})_i + d_1 MV_i + d_2 MTBV_i + \varepsilon_{i_i} \quad (5)$$

The sample contains all 579 debt-issue observations with short-term and long-term interest rate exposures, $B_{s,i}$, and $B_{l,I}$, as shown in Table 3. In the regression model (3), the dependent variable $D_{f,i}$ takes on the value of one if the final yield type of the debt is floating, and zero otherwise. In the regression model (4), the dependent variable $D_{m,i}$ takes the value of $+1$ if the maturity is shorter than five years, -1 if the maturity is longer than ten years, and zero otherwise. Finally, in regression model (5), the dependent variable M_i denotes the years to maturity of the new debt.

For each regression model, the interest rate betas, which include all beta values of the whole sample, are replaced by alternative specifications. The interest rate beta (significant exposure) only involves the values that are significantly different from zero, and take the value of zero otherwise. Discrete interest rate beta takes the value of $+1$ if the estimated beta is significantly positive, -1 if significantly negative, and zero otherwise.

$B_{s,i}$, and $B_{l,i}$ measure firms' interest rate exposures to short- and long-term interest rates before debt issues, respectively, estimated in the same way as in Table 3. The t-values of beta coefficients have been adjusted based on the Shanken's correction (see footnote 16). Debt market condition factors include inflation, real interest rate (the difference between 3-month Treasury bill rates and inflation), and yield spread (the difference between 10-year Treasury bond and 3-month Treasury bill rate). These factors correspond to the month when debt is issued. Control variables, including firm size (natural log) and market-to-book-value ratio, are generated from the monthly data corresponding to the time when the bonds are issued.

Number of observations ($N = 579$)	D_f (3)	D_m (4)	Maturity (5)
Interest rate exposure			
Long-term interest rate beta	0.009	−0.020	0.858
t-Value	[1.13]	[−1.38]	[1.10]
Short-term interest rate beta	0.007	−0.020	−0.122
t-Value	[1.26]	[−1.2]	[−0.512]
Long-term interest rate beta (significant exposure)	0.016	−0.007	1.137
t-Value	[1.19]	[−0.325]	[0.846]

Table 5 (*continued*)

Number of observations ($N = 579$)	D_f (3)			D_m (4)			Maturity (5)		
Short-term interest rate beta (significant exposure)		0.009			−0.015			−0.212	
t-Value		[1.19]			[−1.09]			[−0.619]	
Discrete long-term interest rate beta			0.106			0.100			1.132
t-Value			[0.98]			[0.936]			[1.30]
Discrete short-term interest rate beta			0.045			−0.073			−1.360
t-Value			[0.87]			[−0.764]			[−0.571]
Market timing									
Inflation	0.055	0.055	0.053	−0.044	−0.037	−0.038	1.476	1.440	1.384
t-Value	[3.43]***	[3.41]***	[3.33]***	[−2.15]**	[2.18]**	[2.12]**	[2.09]**	[2.04]**	[1.96]**
Real short-term rate	0.018	0.018	0.016	−0.015	−0.014	−0.012	1.529	1.608	1.501
t-Value	[2.12]**	[2.10]**	[2.01]**	[−1.71]*	[−1.56]	[−1.40]	[2.17]**	[2.29]**	[2.12]**
Yield spread	0.052	0.050	0.052	−0.064	−0.062	−0.059	0.956	0.838	0.869
t-Value	[2.77]***	[2.67]***	[2.82]***	[−2.43]**	[−2.42]**	[−2.36]**	[2.17]**	[2.03]**	[2.06]**
Control variables									
Market value (LgMV)	−0.018	−0.020	−0.020	0.109	0.116	0.115	−2.455	−2.543	−2.605
t-Value	[−1.21]	[−1.36]	[−1.37]	[4.20]***	[4.45]***	[4.41]***	[−3.87]***	[−4.02]***	[−4.12]***
Market-to-book-value ratio	0.001	0.001	0.001	−0.003	−0.003	−0.003	−0.100	−0.111	−0.118
t-Value	[0.426]	[0.342]	[0.238]	[−0.678]	[−0.640]	[−0.735]	[−0.971]	[−1.07]	[−1.13]
Constant	0.250	0.268	0.276	−1.125	−1.146	−1.101	24.364	24.854	25.766
t-Value	[1.69]*	[1.82]*	[1.86]*	[−4.24]***	[−4.29]***	[−4.11]***	[3.75]***	[3.83]***	[3.95]***
Pseudo *R*-squared	0.095	0.099	0.098	0.053	0.043	0.043	0.088	0.089	0.086

*, **, and *** correspond to the coefficients being significant at the 10%, 5%, and 1% levels, respectively.

accompanied by a negative coefficient of short-term interest rate beta. Thus, our results suggest that hedging firm-specific asset interest rate risk exposure may not be the primary objective of a firm when it issues debt.

Looking at the market condition factors, we find that inflation and real short-term interest rate are significantly correlated with the choices of debt yield types. The coefficients of both inflation and real short-term interest rates are statistically significant at the 1% level, which indicates that firms are more likely to issue a fixed rate debt when inflation and short-term interest rate are low. Further, firms' choice of floating rate or fixed rate debt is significantly affected by the yield spread. Finally, the horizon of debt maturity is also influenced by inflation and real short-term interest rate. The significant positive coefficients suggest that as inflation and real short-term interest rate increase, firms tend to extend the maturity of their new debt.

As for the control variables, we find that debt maturities are negatively correlated with firm size. The negative sign implies that large firms issue more short-term debt than small firms. Since large firms have better capacity to finance themselves internally, they raise short-term debt to temporarily fill their funding gap. In contrast, small firms rely more heavily and chronically on external funds. This is in line with the "clientele effect" of Guedes and Opler (1996). However, there is no obvious evidence that firm size significantly affects firms' yield type choices.

4.4. Robustness checks

There are other possible interpretations of firms' choices of yield type and maturity. We intend to examine whether managers feel confident in timing the debt market regardless of the risk exposure of their firms. Firms may respond to market conditions only when issuing small debt relative to their total market values. After all, the larger the debt is, the riskier it is to speculate. To test this possibility, we sort the whole sample into two sub-samples based on the size of the debt issue relative to the firm's market value. If the size of the newly issued debt as a percentage of the firm size is smaller than the average, it is regarded as a small debt, otherwise it is classified as a large debt. We examine the two sub-groups separately by replicating the earlier procedure. Table 6 presents the results and shows that both the large issues and the small issues exhibit a similar pattern to the one displayed for the whole sample in Table 5, which is also consistent with the general conclusion of Faulkender (2005) concerning the size effect. We notice that the coefficient significance of the market factors in the large-size sample is weaker than that of the small-size sample, while the coefficient of the long-term interest rate beta exhibits a weak significance. It shows that firms indeed view market timing to be an overly risky strategy. As a result, firms are more likely to make this decision in small-size issues but are more cautious when issuing a large debt.

Further, we consider whether firms' credit ratings affect their choice of debt yield type and maturity, since credit rating is an effective benchmark in measuring the risk level of the debt. Besides the firm's financial characteristics per se, credit rating of the new debt depends on yield type and the length of maturity as well. Therefore, firms may consider raising their credit ratings when designing the debt structure. If a firm attempts to lower the exposure of newly issued debt and its overall risk, credit rating of new debt can reflect the firm's intention. As a result, credit rating may influence firms' choice of debt yield type and maturity. Otherwise it is possible that the firm has an objective other than hedging the

Table 6
Impact of size effect on debt issue decisions.

Table 6 presents the regression results on the sub-samples categorized by the relative debt issue sizes. The sample contains all 579 debt-issue observations with the short-term and long-term interest rate exposures, $B_{s,i}$, and $B_{l,I}$, as shown in Table 3. We sort the whole sample into two sub-samples based on the size of the debt issue relative to firm's market value. If the size of the newly issued debt as a percentage of the firm size is smaller than the average, it is regarded as a small debt (426 observations), otherwise it is regarded as a large debt (153 observations). Other notations in the regressions are the same as those in Table 5. The t-values of beta coefficients have been adjusted based on the Shanken's correction (see footnote 16).

	Small size issuance ($N = 426$)			Large size issuance ($N = 153$)		
	D_f	D_m	Maturity	D_f	D_m	Maturity
Interest rate exposure						
Long-term interest rate beta	0.012	−0.019	0.637	0.090	−0.074	0.689
t-Value	[1.29]	[−1.49]	[0.985]	[1.25]	[−0.999]	[1.52]*
Short-term interest rate beta	0.008	−0.020	0.030	−0.190	0.192	0.146
t-Value	[1.18]	[−1.46]	[0.115]	[−1.35]	[1.31]	[0.734]
Market timing						
Inflation	0.064	−0.047	1.140	0.023	−0.062	0.071
t-Value	[3.37]***	[−2.17]**	[1.95]**	[1.86]*	[−2.18]**	[1.83]*
Real short-term rate	0.017	−0.012	1.933	0.007	−0.012	1.038
t-Value	[2.10]**	[−1.63]*	[2.5]**	[1.58]	[−2.62]**	[1.93]*
Yield spread	0.064	−0.068	0.532	0.080	−0.029	0.473
t-Value	[2.78]***	[−2.41]**	[2.07]**	[1.66]*	[−2.31]**	[2.14]**
Control variables						
Market value (LgMV)	−0.012	0.082	−1.527	−0.001	0.089	−1.515
t-Value	[−0.555]	[1.99]**	[−1.76]*	[−0.252]	[1.63]*	[−2.54]**
Market-to-book-value ratio	−0.001	0.000	−0.116	0.001	0.006	−0.009
t-Value	[−0.448]	[0.0112]	[−1.13]	[1.07]	[0.98]	[−0.92]
Constant	0.222	−0.807	16.090	0.517	−0.052	−0.362
t-Value	[0.993]	[−1.88]*	[1.8]*	[3.97]***	[−0.38]	[−1.96]**
Pseudo R-squared	0.091	0.131	0.172	0.046	0.187	0.389

*, **, and *** correspond to the coefficients being significant at the 10%, 5%, and 1% levels, respectively.

interest rate exposure. We thus sort the whole sample into two sub-samples based on their Standard & Poor's credit ratings. Corporate debt with a credit rating of A or above is regarded as high rating debt, otherwise it is classified as low rating debt. A dummy variable for the credit rating is introduced to examine the relationship between credit rating and debt structure. It takes the value of one for high rating debt and zero for low rating debt. As can be seen in Table 7, there is no significant evidence that credit rating affects a firm's debt structure of new issues. The coefficient of the credit rating dummy variable is not significant in any of the specifications, and little change has been detected on the magnitudes and significances of other variables, which is consistent with our preceding main results. Therefore, firms do not intend to raise their credit ratings and lower their interest rate risk exposures by effectively designing a debt structure regarding yield types and maturity for their new debt issues.

Table 7
Impact of credit rating and industrial effect.

Table 7 presents the regression results that take into account the credit ratings of new debt and firms' industrial variations. The sample contains all 579 debt-issue observations with the short-term and long-term interest rate exposures, $B_{s,i}$, and $B_{l,i}$, as shown in Table 3. The credit rating dummy variable, based on the Standard & Poor's debt ratings, takes the value of one if the rating of the debt is A or above (199 debt issues), and takes the value of zero otherwise (380 debt issues). The whole sample contains nine different industries: Materials, Energy & Power, Consumer Staples, Retail, Media & Entertainment, Industrials, Healthcare, Consumer Products & Services, and High Technology. Eight industry dummy variables are introduced into the regression to account for the industrial characteristics. Other notations in the regressions are the same as those in Table 5. The *t*-values of beta coefficients have been adjusted based on the Shanken's correction (see footnote 16).

$N = 579$	D_f	D_m	Maturity	D_f	D_m	Maturity
Interest rate exposure						
Long-term interest rate beta	0.009	−0.014	0.864	0.011	−0.009	0.824
t-Value	[1.11]	[−1.58]	[0.925]	[1.38]	[−0.994]	[1.34]
Short-term interest rate beta	0.007	−0.019	0.123	0.007	−0.018	0.136
t-Value	[1.26]	[−1.37]	[0.517]	[1.43]	[−1.74]*	[0.569]
Credit rate	−0.001	0.257	0.245			
t-Value	[−0.0165]	[0.96]	[0.115]			
Market timing						
Inflation	0.055	−0.042	1.483	0.057	−0.034	1.383
t-Value	[3.41]***	[−2.18]**	[2.09]**	[3.51]***	[−1.67]*	[1.93]*
Real short-term rate	0.018	−0.014	1.524	0.016	−0.017	1.510
t-Value	[2.12]**	[−1.73]*	[2.15]**	[2.02]**	[−1.54]	[2.12]**
Yield spread	0.052	−0.064	0.956	0.051	−0.054	0.806
t-Value	[2.77]***	[−2.42]**	[2.17]**	[2.75]***	[−2.19]**	[1.98]**
Control variables						
Market value (LgMV)	−0.017	0.070	−2.492	−0.022	0.082	−2.464
t-Value	[−1.07]	[2.42]**	[−3.50]***	[−1.44]	[3.05]***	[−3.65]***
Market-to-book-value ratio	0.001	−0.005	−0.102	0.001	0.000	−0.119
t-Value	[0.423]	[−1.10]	[−0.976]	[0.565]	[−0.0526]	[−1.12]
D1				−0.279	−0.419	−6.568
t-Value				[−2.21]**	[−1.88]*	[−2.17]**
D2				−0.339	−0.637	−2.759
t-Value				[−2.78]***	[−2.98]***	[−1.65]*
D3				−0.170	−0.063	−7.307
t-Value				[−1.37]	[−0.289]	[−1.33]
D4				−0.341	−0.236	−5.862
t-Value				[−2.70]***	[−1.06]	[−1.05]
D5				−0.295	−0.575	−2.864
t-Value				[−2.36]**	[−2.62]***	[−2.56]**
D6				−0.367	−0.708	−4.155
t-Value				[−2.92]***	[−3.21]***	[−2.74]**
D7				−0.123	−0.451	−7.337
t-Value				[−0.758]	[−1.58]	[−1.02]
D8				−0.362	−0.576	−12.339
t-Value				[−2.27]**	[−2.06]**	[−1.75]*
Constant	0.153	−0.918	24.562	0.570	−0.508	29.770
t-Value	[1.62]*	[−3.37]***	[3.65]***	[3.00]***	[−1.52]	[3.53]***
Pseudo *R*-squared	0.095	0.068	0.088	0.077	0.124	0.100

*, **, and *** correspond to the coefficients being significant at the 10%, 5%, and 1% levels, respectively.

Finally, we also examine the industrial effects on corporate debt issues due to the different preferences and features across different industries, which might potentially distort the results regarding the determinant of firms' debt issues. According to the industrial categories and the definitions of SDC, our whole sample covers firms from nine industries.[18] Eight dummy variables are introduced accordingly to control for the industrial effects on corporate debt issues. Table 7 presents the results and shows that, except for the Consumer Staples and Healthcare industries, all industries exhibit different preferences in choosing specific yield type or debt maturity for new debt issues. They respond consistently to the changes of debt market conditions regardless their own interest rate exposures. The limited variety on the magnitudes and the significance of coefficients of the factors supports our earlier finding that debt market condition factors, rather than firm-specific interest rate exposure, determine the choice of debt issues. On the other hand, the industrial effect on corporate debt issue also suggests that, to some extent, the industrial features and economic conditions affect the firm's debt issue policies.

In sum, our research shows that yield type and debt maturity are significantly correlated to the market condition factors rather than firm-specific interest rate exposures under all the specifications. Our results, taken as a whole, are most naturally explained by the notion that firms' choices of debt issues concerning yield types and lengths of maturity are determined by the debt market conditions with an intention to lower their costs of capital. Therefore, market timing rather than hedging is likely to be the primary motivation behind corporate debt issues.

5. Conclusion

Early work on corporate risk management assumes that firms use derivatives purely for hedging purposes. An implicit assumption of this is that firms not using derivatives are not hedging. However, theory tells us that firms can manage their risk exposures by means other than derivatives. For instance, corporate bond per se can be employed as an effective instrument for interest rate risk management. By correctly choosing the interest rate sensitivities of equities and liabilities, firms can hedge their interest rate exposures by issuing debt. Using this logic, in this paper we examine whether firms make full use of debt issues for hedging purposes or if they have other considerations.

We find that firms' choice of debt issues are primarily driven by debt market conditions in an effort to lower their costs of capital, rather than managing their firm-specific interest rate exposures. Our evidence suggests that market timing rather than hedging is the primary motivation behind corporate debt issues. Our findings also add evidence to the growing field of behavioral corporate finance that sees managerial decisions as primarily driven by market conditions and managers' desire to time the market.

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[18]Industry categories include Materials, Energy & Power, Consumer Staples, Retail, Media & Entertainment, Industrials, Healthcare, Consumer Products & Services, and High Technology.

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