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by Jonathan Witmer

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Abstract

The literature on market timing of long-term debt issuance yields mixed evidence that managers can successfully time their debt-maturity issuance. The early results that are indicative of debt-maturity timing are not robust to accounting for structural breaks or to other measures of debt maturity from firm-level data that account for call and put provisions in debt contracts. The author applies the analysis from some recent U.S. studies to aggregate Canadian data to determine whether the market-timing results are robust. Although the relation between debt maturity and future excess returns is in the same direction as in the United States, it is not statistically significant. This mixed evidence, combined with the difficulties in interpreting predictive regressions of this nature, provides little support for the notion that firms can effectively reduce their cost of capital by varying the maturity of their debt issuance to take advantage of market conditions. Managers do, however, try to time their debt-maturity issuance, given that long-term corporate debt issuance in both Canada and the United States is negatively related to the term spread.

JEL classification: G30, G38
Bank classification: Financial markets; International topics

Résumé

Les travaux portant sur la capacité des gestionnaires de bien choisir le moment et la durée de leurs emprunts sont loin d'être concluants. Les premiers résultats abondant en faveur d'une telle capacité ne tiennent plus si l'on envisage la possibilité de ruptures structurelles ou si l'échéance de la dette est établie à partir de données d'entreprises qui prennent en compte les clauses de rachat anticipé des emprunts obligataires. Pour voir ce qu'il en est au Canada, l'auteur applique à des données agrégées canadiennes le cadre d'analyse employé dans de récentes études américaines. Bien que la relation qu'il observe entre l'échéance de la dette et les rendements excédentaires futurs soit de même signe que celle décelée aux États-Unis, elle n'est pas statistiquement significative. Ce résultat ambigu, allié aux difficultés d'interprétation des régressions de cette nature, ne confirme guère l'hypothèse voulant que l'entreprise soit à même de réduire le coût de ses emprunts en sélectionnant leur durée de façon à tirer parti des conditions du marché. Les gestionnaires mènent toutefois des efforts en ce sens, puisque l'émission d'obligations à long terme par les sociétés varie en raison inverse de l'écart entre les taux d'intérêt à court terme et à long terme tant au Canada qu'aux États-Unis.

Classification JEL : G30, G38
Classification de la Banque : Marchés financiers; Questions internationales

1 Introduction

Market timing is the ability of firms to raise finance "in whatever form is currently available at the lowest risk-adjusted cost."[1] Market timing of long-term debt issuance suggests that firms, in aggregate, have an ability to issue long-term debt prior to low future long-term excess bond returns.[2] There are three reasons why it is important to understand whether managers can successfully time their debt issues and, if they are able to time the market, why they are able to do so.

First, by definition, successful market timing of long-term debt issuance implies that firms are able to generate a lower overall cost of capital.[3] That is, if one source of capital (i.e., long-term debt) is temporarily "expensive," firms may substitute to less-expensive sources of capital (on a risk-adjusted basis). In terms of monitoring a firm's cost of capital over time, assuming a (relatively) constant weight for equity and debt costs could potentially overstate the increase in the firm's cost of capital, if firms can successfully time the market. However, evidence that firms can successfully time their debt maturity to lower their cost of capital would suggest that, as a whole, they have some sort of advantage over other sophisticated market participants, such as banks and institutional investors, in recognizing market mispricings or inefficiencies.[4]

Second, successful long-term debt market timing suggests that incremental information may be extracted from corporate issuance decisions in terms of forecasting excess long-term bond returns. However, some suggest that firms' apparent ability to time their long-term debt issuance results from their reaction to governments' debt-maturity decisions, which in itself may predict excess long-term bond returns.[5] Also, managers may be reacting to other variables, such as the term spread, which may predict excess long-term excess bond returns. If this is the case, it would

1. Baker, Greenwood, and Wurgler (2003). Put another way, market timing is the ability of firms to issue (sell) debt or equity when their prices are high. If issuing at high prices, future excess returns should be lower. Hence, aggregate market timing is often tested by examining whether scaled aggregate issuance is negatively correlated with future returns.
2. Generally, the literature on long-term debt market timing assumes the amount of overall debt issuance as a given, and hence determines whether the share of long-term debt in total debt issuance (the maturity of debt issuance) has any predictive power over future long-term excess bond returns. Therefore, long-term debt market timing is often also referred to as debt-maturity timing.
3. Closely related to long-term debt market timing is the aggregate market timing of equity issuance. Baker and Wurgler (2000) examine whether firms issue equity when it is overvalued and do find a negative correlation between the equity share in new issues and future aggregate equity market returns. Xu (2007) finds that equity market timing opportunities slows firms' speed of adjustment towards a target capital structure. Other market-timing studies look at aggregated managerial decision variables such as corporate investment plans (Lamont 2000) and insider buying (Seyhun 1992; Lakonishok and Lee 2001).
4. Butler, Grullon, and Weston (2005) point out that, "Taken at face value, these [market timing] findings have important implications because they suggest that markets are unable to allocate capital efficiently even in the aggregate."
5. There is mixed evidence as to whether the maturity structure of government debt actually affects the yield curve; in the 1960s, the U.S. government tried to flatten the yield curve (with little success) by shortening the maturity structure of its outstanding debt in a program called "Operation Twist" (Modigliani and Sutch 1966a, b). However, Greenwood and Vayanos (2008) do find a relation between government debt maturity and excess bond returns. The focus here is on corporate debt decisions; a full review of the effect of government debt maturity on excess bond returns is beyond the scope of this paper.

suggest that there is little additional information in corporate issuance decisions in forecasting excess long-term bond returns.

Third, long-term debt market timing is one factor in the corporate debt-maturity decision, and it is beneficial from a policy perspective to understand the determinants of corporate debt-issuance behaviour, whether or not firms are successful at timing the market. For example, firms may unsuccessfully attempt to time the market and choose a debt-maturity structure that increases their risk of liquidation.

In this paper, I briefly summarize the literature on long-term debt market timing and the determinants of long-term debt issuance, and analyze Canadian data to determine whether there is evidence of debt market timing in Canada. The next section briefly outlines the traditional factors that explain a corporation's debt-maturity decision. Section 3 examines the theory and evidence as it relates to a manager's ability to issue long-term debt to time market-wide interest rates, and section 4 examines aggregate Canadian data for evidence of long-term debt market timing. Section 5 concludes and suggests areas for future work.

2 Traditional Theories of Debt-Maturity Choice

In perfect, complete, efficient capital markets, capital structure decisions are irrelevant (Modigliani and Miller 1958), and the same holds true for the choice of debt maturity (Kraus 1973; Stiglitz 1974). However, an optimal debt maturity can be produced if the assumptions underlying these early models are relaxed. More specifically, models have been developed whereby (i) debt maturity can be used as a contracting device to reduce agency costs between debt holders and equity holders, (ii) debt maturity can be used to reduce taxes, (iii) debt maturity can be used as a signalling device to convey the private information of firm managers in the presence of issuance costs, and (iv) debt maturity is chosen as a result of the costs of inefficient liquidation.

2.1 Maturity choice and agency theory

Debt maturity may be used as a tool to reduce agency and contracting problems between debt holders and equity holders. For example, with debt in the capital structure, there is higher potential for "risky asset substitution," whereby shareholders may have an incentive to engage in risky, low-quality projects, resulting in a lower overall firm value (Barnea, Haugen, and Senbet 1980). Viewing equity as a call option on the value of the firm, the value of this call option can be increased by choosing projects that increase the volatility of the firm's returns. A project that has a negative net present value with high volatility may be desirable to the equity holder

because it increases the value of the equity holder's stake. To reduce this incentive, firms can issue short-term debt, since its value is less sensitive to a change in the variance of the firm.[6]

Another agency problem is that of underinvestment by the firm (Myers 1977), where the firm's value can be split up into "assets in place," which do not require discretionary investment in the future, and real options, which depend on discretionary investment decisions by the firm. When a firm has risky debt in its capital structure and acts on behalf of shareholders, it will, in certain situations, pass up projects that have a positive net present value, resulting in underinvestment (i.e., it will make suboptimal investment decisions). To overcome this problem, the firm could issue equity instead of debt, it could place covenants in the debt contract, or it could optimally choose the maturity on the debt it provides so that debt holders and equity holders can recontract before investment decisions are made. This also provides some explanation as to why firms should match the maturity of their liabilities with their assets. The portion of the firm's debt corresponding to "assets in place" should mature when the "assets in place" mature, and the portion corresponding to the real options of the firm should mature before the investment option of the firm expires.

Empirically, this would suggest that firms that derive a large portion of their value from real options (e.g., small, high-growth firms) would either not issue debt or they would issue it as short-term debt. Consistent with this explanation, firms with more growth opportunities, as proxied by market-to-book ratios, issue more short-term debt (Guedes and Opler 1996)[7] and have more short-term debt on their balance sheets (Barclay and Smith 1995). Guedes and Opler (1996) also find a positive relation between asset maturity and the maturity of debt issues, providing more support to Myers' (1977) argument.

2.2 Taxes

Although there is not much empirical evidence to support this explanation, some suggest that taxes have implications in the choice of short-term versus long-term debt, and may explain why firms issue long-term debt in the presence of agency costs.[8] Long-term debt provides shareholders with a tax-timing option, if they repurchase debt in the secondary market when it is trading above par and then reissue new debt with identical features to the retired debt, since a firm can claim the premium it pays to repurchase debt on the secondary market as an expense for tax purposes (Mauer and Lewellen 1987; Emery, Lewellen, and Mauer 1988).[9] This transaction does not require any change in a firm's leverage or investment plans, since the reissued debt is

6. Another solution would be to issue callable debt, since the value of the callability option would decrease with a substitution to a risky asset.
7. However, Guedes and Opler (1996) do not find a statistically significant relation between R&D/sales, and they discuss why this may be the case. They also show that utilities, which should have less discretion over investment opportunities, tend to issue longer-term debt.
8. These theories are based on U.S. tax codes in the mid-1980s.
9. This is subject to the condition that the transactions costs associated with repurchasing and reissuing debt are less than the potential tax savings.

identical to the retired debt. All else equal, this tax-timing option will be higher when interest rate volatility is higher, because it increases the probability that a firm's debt will trade significantly above its par value.

A second implication of taxes on debt-maturity structure, as developed in the model by Brick and Ravid (1985), is based on tax imperfections resulting in asymmetric treatment of bondholder cash flows (appreciation and interest). Brick and Ravid (1985) show that, when a firm's bond price appreciation is fully tax deductible, debt maturity is irrelevant. However, in the presence of tax imperfections when bond price appreciation is not fully tax deductible, debt maturity is relevant. Assuming that corporate tax rates are greater than individual tax rates, firms will issue long-term debt when the yield curve is upward sloping, since this maximizes the present value of interest tax shields (i.e., long-term debt implies equal coupon payments in all periods, whereas short-term debt would have coupon payments rising when the term structure is upward sloping).

However, there is no significant relation between the maturity of debt issues and a firm's tax rates or the size of a firm's tax loss carry-forwards. Furthermore, interactions of this tax rate with the term premium and interest rate volatility are not significantly related to debt maturity (Guedes and Opler 1996). All in all, there is little empirical evidence to suggest that taxes play a major role in firms' debt-maturity choices.

2.3 Asymmetric information: does debt-maturity choice convey firm-specific information?

There are also implications for debt-maturity decisions when managers have private information about the credit quality of their firm. Without an ability to signal their private information, firms with favourable inside information ("good" firms) will get pooled together with firms with unfavourable inside information ("bad" firms), and will pay the average interest rate of "good" and "bad" firms. Thus, the "good" firms would be willing to incur a cost to reveal their true type if it differentiates them from bad firms and results in an interest rate consistent with their favourable inside information. Specifically, in the presence of transactions costs of issuing debt (Flannery 1986) or correlated changes in firm values (Kale and Noe 1990), a separating equilibrium can develop in which "good" firms issue short-term debt and "bad" firms issue long-term debt.[10] The Flannery (1986) model assumes that short-term debt incurs more transactions costs of issuance relative to long-term debt due to a fixed cost of issuing debt of any maturity (i.e., short-term debt will have to be issued more frequently over a given time period). These transactions costs must be sufficient to make it too costly for the "bad" firms to misrepresent themselves as "good" firms by issuing short-term debt (i.e., it is more costly for them to pay the

10. Without transactions costs, a pooling equilibrium will develop in which all firms issue short-term debt (Flannery 1986). The firms with favourable private information will want to issue short-term debt, to avoid locking in long-term financing costs before their type is revealed. The firms with unfavourable inside information have an incentive to mimic the "good" firms, so as not to reveal themselves as "bad" firms. Kale and Noe (1990) also show that it is possible for a pooling equilibrium – where all firms issue long-term debt – to develop if there is a correlation of the changes in firm values over time.

average rate together with transactions costs than it is for them to pay their true, full information rate).

If short-term debt is a signal, there should be a positive stock price reaction to a firm's debt issue if the debt issue shortens the maturity of the firm's outstanding debt. Moreover, one would expect a greater likelihood of credit-rating upgrades and positive earnings surprises following short-term debt issuance. And, all else equal, firms or industries with more information asymmetry should be more likely to use short-term debt as a signal of credit quality. Empirically, Barclay and Smith (1995) find a statistically significant, but economically insignificant, negative relation between a firm's balance-sheet debt maturity and future abnormal earnings. Similarly, Guedes and Opler (1996) do not find a significant relation between future 2-year abnormal stock returns and firms' maturity of debt issuance.

2.4 Liquidity risk

Diamond (1991a), using a model of liquidity risk to explain debt maturity, assumes that short-term debt has a higher likelihood of liquidation relative to long-term debt, because lenders can liquidate upon maturity of the debt issue, giving short-term lenders a greater number of opportunities to liquidate over a given time frame. This liquidation is costly, or inefficient, because the liquidation value of the firm is less than the value of the firm to the borrower.[11] In Diamond's model, there are type G firms and type B firms, and each firm has a credit rating (f) which is the probability of a firm being a type G firm. The type G firm has a profitable project, while the type B firm has a project of negative net present value, and hence it would not be able to borrow if it revealed its type. Therefore, conditional on credit ratings, there is a pooling equilibrium in which type B firms mimic the behaviour of type G firms so as not to reveal their type.

Diamond's (1991a) model shows that firms with the best credit ratings will borrow short term in the public markets (e.g., commercial paper) to maintain an option to refinance with the arrival of good news.[12] Firms with intermediate credit ratings will borrow long term to avoid the costs of inefficient liquidation associated with short-term debt.[13] However, very poor firms (i.e., those with very poor credit ratings) will be screened out of the long-term debt market because the higher interest rate the lenders would have to charge them could induce risky asset substitution.

11. Lenders liquidate because borrowers cannot pledge all future rents to lenders (either because of private information, moral hazard, or monitoring costs). Lenders liquidate when pledgeable rents are less than the liquidation value of the firm. This is inefficient, because the liquidation value is less than the full value of future rents.
12. The type G firms will want to borrow short term and the type B firms will also borrow short term, so as not to reveal their type. However, the type B firms have a higher probability of being downgraded and/or a higher probability of being liquidated, and hence pay a higher cost at the refinancing date. The type G firms are willing to bear this cost when they have high credit ratings, because a downgrade/liquidation is much less likely for a type G firm than for a type B firm with high credit ratings.
13. This is different than the case for firms with the best credit, because there is a higher probability that type G firms will be pooled with type B firms at the interim refinancing date, and hence type G firms will have a lower advantage of using short-term debt.

Diamond (1984, 1991b), given the lower costs of arranging liquidation for intermediaries, suggests that the low-rated borrowers will issue privately placed debt.

This segmentation of debt maturity corresponds to stylized facts of debt issuance. Empirically, this suggests that firms with a higher probability of default should want to issue longer-term debt; therefore, assuming that smaller firms have a higher default probability, the smaller firms would like to publicly issue long-term debt. Lower-quality issuers should tend to privately issue short-term debt (i.e., through bank loans), because they are unable to issue long-term debt. Guedes and Opler (1996) use issuance data that excludes bank loans, and find that smaller firms issue more long-term debt.

2.5 Summary of traditional explanations

Table 1 summarizes the empirical predictions of each of the four theories of optimal debt choice, giving the expected sign of each variable with respect to the maturity of a firm's debt. The predictions that have had statistical significance in previous studies are highlighted in yellow. As discussed earlier, there is little empirical support for the tax hypothesis or for the pure signalling hypothesis. However, the evidence seems to be consistent with both the agency and the liquidity hypotheses. In certain cases, the theories have predictions of the opposite sign on some variables (e.g., firm size), but different studies have found significance for each. The reason for the difference on the firm-size variable is that the Barclay and Smith (1995) study uses Compustat data, which examines the level of debt on firms' balance sheets and includes bank loans; since smaller firms tend to use shorter-term bank loans, this confirms a positive relationship. Guedes and Opler (1996) use issuance data, which does not include bank loans, and they find a negative relation between size and debt maturity. This is because the larger, safer firms tend to use the public debt markets in the short-term maturities (an extreme example of this would be the commercial paper market).

There is a negative relation between the term premium and maturity of debt issuance, and there is an agency explanation for this. Specifically, it could be that "firms have difficulty borrowing long-term in high interest rate environments because the required rate of return creates an incentive to shift to risky projects."[14] Nonetheless, this relation may also be due to managers' reluctance to "lock-in" what they consider a relatively high cost of debt. This is essentially an attempt at market timing and will be discussed below.

3 Theory of Market Timing of Debt Issuance: Can Managers Successfully Time Market-Wide Interest Rates?

There is general agreement that managers tailor their debt maturity to *try* to time market-wide interest rates; in a survey of corporate managers by Graham and Harvey (2001), a significant

14. Guedes and Opler (1996).

proportion of managers agree that they issue short-term debt "when short-term interest rates are low compared to long-term rates" or when "waiting for long-term market interest rates to decline." The main disagreement is about whether managers can *successfully* time the maturity choice of their debt issuance. Early empirical evidence has found a relation between debt-maturity choice and debt market conditions, such as the level of the term spread (e.g., Taggart 1977; Bosworth 1971). One explanation is that managers are using their debt-maturity choice to time the market and exploit temporary mispricings.[15]

3.1 Evidence for timing of market-wide interest rates

Baker, Greenwood, and Wurgler (2003) study whether corporate managers can successfully issue long-term debt ahead of low long-term bond returns. They examine the annual long-term share of total corporate debt issuance (hereinafter, long-term share) using aggregate U.S. Federal Reserve Flow of Funds data[16] vis-à-vis future 1-year and 3-year excess long-term bond returns. They perform their tests using both government excess long-term bond returns (long-term government bonds over short-term government bills) and corporate excess long-term bond returns (high-grade long-term corporate bonds over commercial paper).[17] Their main finding is that the statistically significant negative relation between future excess bond returns and the long-term share is largely derived from the long-term share's contemporaneous movement with other variables that predict excess bond returns, such as the term spread and the real short-term interest rate; it therefore appears that managers use publicly available market information to try to time the debt market.[18] The authors concede that this does not mean that "issuing firms are actually reducing the overall cost of capital, however, because of the usual difficulties in interpreting predictability regressions."

Firms can successfully time the debt market and reduce their overall cost of capital only if markets are inefficient. As noted earlier, in efficient and integrated markets, Modigliani and Miller's (1958) theorem states that financing decisions have no impact on a firm's overall cost of capital. Baker, Greenwood, and Wurgler (2003) conclude that the relation between future excess long-term bond returns and the long-term share could be the result of either:

(a) rational firms in an efficient market,

(b) firms that are trying unsuccessfully to time an efficient market, or

(c) firms that are successfully timing an inefficient market.

15. Another explanation is that managers are attempting to minimize their current interest expense (Faulkender 2005; Chernenko and Faulkender 2008).
16. Long-term debt issuance is equal to the change in the level of long-term debt outstanding plus 10 per cent of the previous year's level of long-term debt to account for the maturing of long-term debt, which is assumed to have a maturity of 10 years.
17. The results are similar using both measures, given that they are highly correlated (0.95).
18. Furthermore, Baker, Greenwood, and Wurgler (2003) do not find a statistically significant difference between the long-term share of debt issues in recessions relative to the long-term share of debt issues in expansions.

In (a), firms are not trying to time the market but make optimal maturity decisions based on the theories discussed in section 2. To result in the relation between excess bond returns and the long-term share, these optimal maturity decisions need to vary inversely with a rational risk premium, which predicts long-term excess bond returns. However, Baker, Greenwood, and Wurgler (2003) do not find compelling evidence for a rational risk premium that is related to the long-term share, nor do they have strong arguments as to why optimal maturity decisions would be related to future excess bond returns. Moreover, as mentioned at the beginning of this section, survey evidence shows that market timing plays a role in a manager's long-term debt issuance decisions. While the authors have eliminated (a) as an explanation, they cannot distinguish whether (b) or (c) is driving their results. That is, they cannot determine whether firms are actually lowering their overall cost of capital. For example, in an efficient and integrated market, a lower cost of debt capital may be offset by a higher cost of equity capital.

An argument against (c) is that, as a whole, corporate managers should not have inside information on the evolution of future market interest rates, so the evidence that their issuance decisions predict interest rates raises the question as to how firms in the aggregate have some sort of advantage over other sophisticated market participants, such as banks and institutional investors, in recognizing market mispricings. To explain this, Greenwood, Hanson, and Stein (2009) propose a "gap-filling" theory, whereby corporate issuers act as macro liquidity providers (e.g., by issuing long-term debt) in a segmented bond market where certain groups of investors have fixed maturity preferences for long-term assets.[19] Consistent with this theory, they show that corporations issue more long-term debt when the government issues relatively less long-term debt.[20] Moreover, they use firm-level data to show that larger firms and firms in better financial position are more likely to engage in "gap filling." If long-term Treasuries provide a lower expected return when their supply decreases relative to short-term Treasuries,[21] this provides an explanation of the apparent ability of corporations' aggregate issuing characteristics to predict future bond returns.

3.2 Evidence against timing of market-wide interest rates

Since the original work by Baker, Greenwood, and Wurgler (2003), other studies have emerged contradicting the ability of corporate issuance to predict market interest rates. One argument, by Butler, Grullon, and Weston (2005), is that the evidence for aggregate managerial market timing may be an aggregate version of pseudo-market timing (Schultz 2003). Their basic argument is that if managers respond to the market by issuing more (less) long-term debt after past high (low)

19. Time-varying preferences for different maturities may also imply a relation between corporate long-term bond maturity and excess bond returns. Greenwood, Hanson, and Stein (2009) focus on the effect of government bond supply and assume fixed maturity preferences. If the government also responded to changes in preferences in investor maturity, this would weaken the results in favour of finding no relation.
20. This result also holds when controlling for two leads and two lags of the NBER recession dummy.
21. This theory is discussed by Modigliani and Sutch (1966a, b), but they find little evidence for supply effects on the term spread; Greenwood and Vayanos (2008) find a relation between government debt maturity and excess returns. However, some of these empirical results are critiqued by Cochrane (2008).

long-term excess bond returns, there will be a spurious in-sample correlation between long-term debt issuance and future excess long-term bond returns. It may therefore appear that managers can predict future returns when they may, in fact, be responding to past returns. Also, using the same data as Baker, Greenwood, and Wurgler (2003), and conditioning on a structural break in excess bond returns around 1982, when there was a significant change in U.S. monetary and fiscal policy, there is no relation between the long-term share and future excess bond returns (Butler, Grullon, and Weston 2006), so the relation found earlier seems to be the result of corporate managers' reactions to this structural break, rather than to an ability of managers to predict low excess bond returns.

Baker, Taliaferro, and Wurgler (2005) defend the evidence for managerial market timing by arguing that pseudo-market timing bias is just another name for small-sample bias, and they measure the size of this bias using simulation techniques. The relevant factors affecting the size of the bias are the persistence in the predictor variable (e.g., the long-term share) and the contemporaneous correlation between the disturbances of this predictor variable and the predicted variable (e.g., excess long-term bond returns). Using in-sample measures of these parameters, Baker, Taliaferro, and Wurgler (2005) show that pseudo-market timing explains only 1 per cent of the value of the long-term share coefficient in Baker, Greenwood, and Wurgler (2003). In the presence of pseudo-market timing when assuming a contemporaneous correlation in disturbances of 1, they show that the *p*-value associated with the Baker, Greenwood, and Wurgler results is still statistically significant at 1.7 per cent. They further analyze the effect of regime shifts on market-timing bias and find that they have little effect on the size of the pseudo-market timing bias. Regime shifts could still lead to biased results (e.g., a spurious predictive relationship), but the form of this bias would not be what the authors define as pseudo-market timing bias.

Another method for testing whether debt-maturity timing exists is to examine firm-level data on corporate debt issuance, which can more accurately measure the effective maturity of bond issues by accounting for provisions that change a bond's maturity, such as call and put features. There is some evidence supporting debt-maturity timing before accounting for these provisions, but, once accounting for these provisions, firm-level evidence from Thomson SDC does not support the contention that managers are able to successfully predict excess bond returns (Barry et al. 2005). Therefore, the early evidence for debt-maturity timing may be a result of imprecise measurement of the maturity of debt issues in aggregate data. The evidence in the firm-level data is consistent with backward debt-maturity timing: Barry et al. (2005) show that debt-maturity choices are impacted by the level of interest rates relative to historical levels.

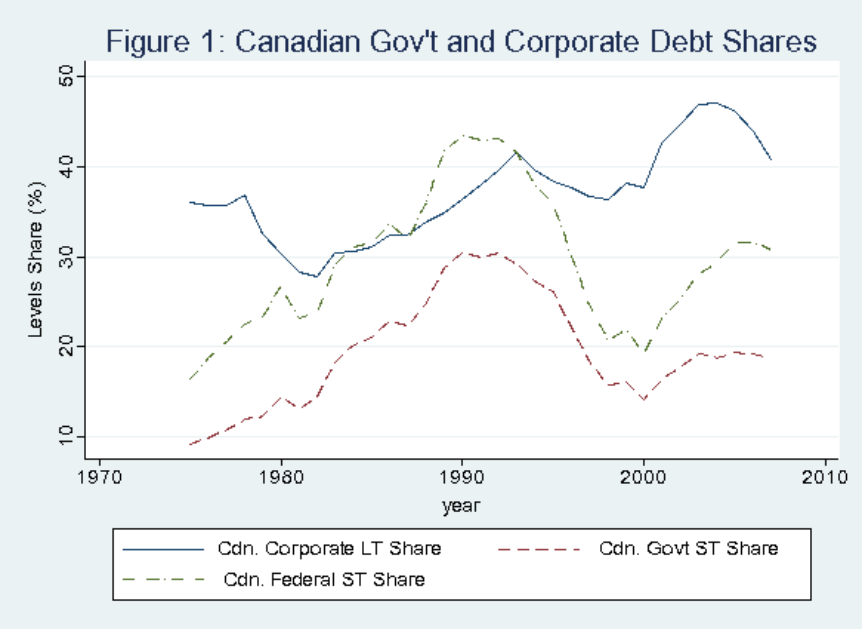
4 Canadian Evidence

In this section, I replicate the results of the U.S. debt market timing studies using aggregate Canadian debt issuance data.[22] As mentioned in the introduction, the study of debt market timing is important: successful debt market timing implies that firms can reduce their overall cost of capital and that aggregate corporate debt issuance patterns may provide forecasting power for future excess long-term bond returns. Canada, as a small open economy, is interesting to study because its behaviour may be different than that of the United States in terms of whether firms react to government debt maturity and whether corporate debt-maturity choice has any predictive power for future excess long-term bond returns. Moreover, given the concerns with the evidence on debt-maturity timing in the United States, an examination of debt-maturity issuance in Canada for evidence of market timing and gap filling provides a useful robustness check.

Data on aggregate Canadian corporate short-term and long-term debt outstanding from 1975 to 2007 are taken from the *Bank of Canada Banking and Financial Statistics* (BFS), a monthly publication by the Bank of Canada. Where possible, an effort is made to concentrate on Canadian-dollar debt, because this study tests to determine whether there is any predictive power of the long-term share for Canadian excess long-term bond returns, and issuance in other currencies is likely driven by other, largely unrelated, factors. Short-term corporate debt outstanding includes business loans, banker's acceptances, and commercial paper, but excludes foreign currency loans by chartered banks and securitizations by special-purpose corporations.[23] Long-term corporate debt outstanding is measured as the sum of non-residential mortgages, leasing receivables, and bonds and debentures issued in Canadian dollars.[24] Analogous measures for total Canadian-dollar government debt outstanding (federal, provincial, and municipal) are measured using treasury bills as well as commercial paper issued by provinces and municipalities as short-term debt, and Canadian-dollar bonds issued by the three levels of government as long-term debt.[25]

Figure 1 plots the Canadian corporate long-term share of total corporate debt outstanding (solid line) against the Canadian total government short-term share of total government debt outstanding (dashed line) and the Canadian federal government short-term share of federal government debt outstanding (dash-dotted line). If there is evidence of gap filling, the solid and dashed lines should move together, given that corporations should hold more long-term debt when the government has more short-term debt outstanding. Over the full period, there does appear to be some co-movement between these two series, since the peak in government short-term debt around 1990 is matched by a local peak in corporate long-term debt at that time.

22. The traditional theories of debt-maturity choice yield predictions that are more cross-sectional in nature and hence would require firm-level issuance data. An investigation of this is left for future research.
23. BFS Table E2, CANSIM number V122639, less CANSIM numbers V122634 and V122653.
24. BFS Table E2, CANSIM numbers V122656–V122659, V800015, V122661, V122632, V800016, and BFS Table K8, line 9.
25. BFS Table G4, CANSIM number V37331, BFS Table F2, CANSIM numbers V122256 and V122257, and BFS Table K8.



Before discussing these results, I will look into the drivers of Canadian corporate debt maturity by replicating the analysis in Greenwood, Hanson, and Stein (2009) on Canadian data. The dependent variable is the long-term share of corporate debt outstanding (Table 2, columns 1 and 2) or the long-term share of corporate debt issues (columns 3 and 4). Corporate debt issues are constructed as in Baker, Greenwood, and Wurgler (2003) and Greenwood, Hanson, and Stein (2009): short-term issues are equal to the level of short-term debt outstanding, and long-term debt issues are equal to the change in the level of long-term debt outstanding plus 10 per cent of the previous year's level of long-term debt, to account for the maturing of long-term debt.[26] Independent variables include the government long-term share of total government debt outstanding, short-term interest rates, the term spread, and a time trend.

Consistent with Greenwood, Hanson, and Stein (2009), long-term debt outstanding and long-term debt issuance are inversely related to short-term interest rates and inversely related to the term spread, while the time trend is insignificant. This is consistent with managers issuing more long-term debt when current information that predicts future returns (see Table 4) suggests future returns will be lower. However, contrary to Greenwood, Hanson, and Stein's (2009) results, there is not a statistically significant negative relation between corporate debt maturity and government debt maturity. While the lack of statistical significance may partially be attributed to

26. Baker, Greenwood, and Wurgler (2003) and Greenwood, Hanson, and Stein (2009) use 10 per cent as the proportion of debt maturing because the average maturity of debt is approximately 10 years. They also find similar results if they do not account for maturing debt.

sample size (33 years here versus 43 years in their study), the magnitude of the coefficient on the government long-term share variable is much smaller than in their analysis (-0.109 in column 2 here versus -0.387 in their Table 3), and is actually positive when looking at the share of long-term debt in total corporate issuance instead of levels.

Rather than account for persistence in these series using Newey-West (1987) standard errors, as a robustness test a similar analysis is performed using Prais-Winsten (1954) generalized least squares (GLS) regressions in Table 3, which measure and account for AR(1) serial autocorrelation of the residuals in the regression equation. This GLS specification does not change the magnitude, incorrect sign, or statistical significance of the impact of government long-term share on the long-term share of corporate issuance (columns 3 and 4). However, the coefficient on the government long-term share is negative and statistically significant when the dependent variable is the long-term share of corporate debt outstanding (columns 1 and 2). This contrasts with Greenwood, Hanson, and Stein (2009), who find statistical significance for the government long-term share in their original (debt outstanding) regressions, but a lack of statistical significance in the Prais-Winsten (1954) GLS regressions. In sum, their result of statistical significance of the government long-term share coefficient in the long-term share of corporate debt outstanding regression is not robust to the Prais-Winsten specification, while the lack of statistical significance in this paper is not robust to the Prais-Winsten specification.

In this paper and in the work of Greenwood, Hanson, and Stein (2009), the autocorrelation coefficient (rho) is close to one in the Prais-Winsten GLS equations on the long-term share of corporate debt outstanding, so these regressions are very similar to first-differenced regressions. Greenwood, Hanson, and Stein (2009) place less weight on these results, since lags in the adjustment of corporate debt maturity to government debt maturity may make it unrealistic to assume, as implied by a first-differenced regression, that changes in the government long-term share of debt outstanding are contemporaneously related to changes in the corporate long-term share of debt outstanding. However, because of this argument, it is puzzling that the results in Canada are stronger using the Prais-Winsten specification. Nonetheless, the government long-term share coefficient in the share of corporate issuance regressions is positive (and insignificant) in all specifications.

The "gap-filling" theory was proposed to explain why managers have an apparent ability to time interest rates; while there is not strong evidence for "gap filling" in Canada, this does not necessarily mean that managers do not have an ability to time interest rates by issuing long-term debt ahead of low excess long-term returns. Therefore, to investigate whether there is evidence for debt-maturity market timing in Canada, Table 4 examines whether the long-term share of corporate debt issues can predict future excess long-term bond returns using a regression of excess 3-year long-term bond returns ($re_{t,\,t+3}$) on the term spread (y_{lt} - y_{st}), real short-term interest

rates ($y_{st} - \pi_t$), inflation (π_t) a constant, and the corporate long-term share of issuance.[27, 28] The relation between excess future bond returns and the term spread and real short-term interest rates in Canada is similar to what has been found in the United States: future 3-year long-term excess bond returns are higher when the term spread is higher and when real short-term rates are higher. As in Baker, Greenwood, and Wurgler (2003), the sign on the long-term corporate share is negative and the magnitude of the coefficient decreases when including other variables that can explain future excess returns; however, the relation between future excess returns and the long-term share figure is not statistically significant.

5 Concluding Remarks

The evidence on whether managers can successfully time their debt-maturity issuance is, at best, mixed. The early results that are indicative of debt-maturity timing are not robust to accounting for structural breaks or to other measures of debt maturity from firm-level data that account for call and put provisions in debt contracts. In Canada, the relation between debt maturity and future excess returns is in the same direction as in the United States, but it is not statistically significant. This mixed evidence, combined with the difficulties in interpreting predictive regressions of this nature, provides little support for the notion that firms can effectively reduce their cost of capital by varying the maturity of their debt issuance to take advantage of market conditions.

Managers do, however, try to time their debt-maturity issuance, given that longer-term corporate debt issuance in both Canada and the United States is negatively related to the term spread. In the United States, corporations also may be providing liquidity at a macro level, since corporate debt issuance is negatively related to the proportion of government long-term debt outstanding. In Canada, there is less evidence for a relation between these two variables. Hence, while managers are not successful at forecasting future returns, they at least attempt to do so, and changing their maturity structure in such a way could increase the risk of liquidation if managers issue more short-term debt in an attempt to time interest rates. But the increased liquidation risk at the end of the sample period caused by debt-maturity timing is probably minimal, given that Canadian corporations had a long-term share of corporate debt outstanding comparable to historic norms.

As in the United States, the aggregate data may not be accurately measuring the effective maturity of corporate debt in Canada, since it does not account for call and put provisions and gives only an estimate of long-term (> 1 year) versus short-term (< 1 year) issuance. Future work

27. Bond return data are not available for the entire period of the study. Therefore, yearly long-term bond returns are measured as follows: future 1-year long-term return $rL_{t,\,t+1}$ = current long-term bond yield – 8*(next year's long-term bond yield – current long-term bond yield). This assumes a duration of eight years. Long-term bond yields are measured using the average yield of Government of Canada bonds over 10 years (BFS Table F1, CANSIM number V122487). This measure of bond returns has a 0.98 correlation with the return on ScotiaMcLeod's long-term government bond index (from 1979 on). Short-term bond returns are measured using ScotiaMcLeod's 90-day treasury bill index. Three-year excess bond returns are calculated as: $re_{t,\,t+3} = (1+rL_{t,\,t+1})\,(1+rL_{t+1,\,t+2})\,(1+rL_{t+2,\,t+3})\text{^}(1/3) - (1+rS_{t,\,t+1})\,(1+rS_{t+1,\,t+2})\,(1+rS_{t+2,\,t+3})\text{^}(1/3)$.
28. These results are robust to using 1-year, 2-year, or 5-year cumulative bond returns.

could use firm-level issuance data in Canada to better measure the effective maturity of debt issuance and to get a better understanding of the determinants of maturity choice and different aspects of debt market timing in Canada. For example, Greenwood, Hanson, and Stein (2009) use U.S. firm-level data to test whether larger firms and firms in a better financial position are more likely to time the market. Another aspect of debt market timing in Canada is the decision to issue in U.S. dollars or Canadian dollars; this could be analyzed further using firm-level data. Finally, future work could also focus on decomposing corporate yields into the risk-free rate, a default-risk premium, and a credit-risk premium, and analyze the ability of managers to time the different components of corporate yields.

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Table 1: Determinants of the Maturity of Corporate Debt (adapted from Guedes and Opler 1996)

This table summarizes the empirical predictions of each of the four theories of optimal debt choice, giving the expected sign of each variable with respect to the maturity of a firm's debt. The predictions that have had statistical significance in previous studies are highlighted in yellow.

Variable	Agency	Taxes	Signalling	Liquidity
Asset maturity	+			+
IG bond rating	+			Non-linear
Business risk				+
Firm size	+			-
Market-to-book	-	+		+
R&D/sales	-			+
Utility industry	+			-
Pre-issue return			+	
Post-issue return			-	
Loss carry-forwards		-		
Taxes/assets		+		
Term premium	-			
Taxes/assets * term premium		+		
Interest rate volatility		+		
Taxes/assets * IR volatility		+		

Table 2: Determinants of the Maturity of Corporate Debt (1975–2007)

The dependent variable is the long-term share of corporate debt outstanding (first two columns) or the long-term share of corporate debt issues (last two columns). Corporate debt issues are constructed as in Baker, Greenwood, and Wurgler (2003) and Greenwood, Hanson, and Stein (2009): short-term issues are equal to the level of short-term debt outstanding, and long-term debt issues are equal to the change in the level of long-term debt outstanding plus 10 per cent of the previous year's level of long-term debt to account for the maturing of long-term debt. Independent variables include the government long-term share of total government debt outstanding, short-term interest rates (y_{st}), the term spread ($y_{lt} - y_{st}$), a constant (suppressed), and a time trend. *t* statistics are shown in parentheses, and are based on Newey-West (1987) standard errors with up to two lags. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

	BFS: Levels		**BFS: Issues**	
	(1)	**(2)**	**(3)**	**(4)**
Government long-term share (level)	-0.153	-0.109	0.059	0.037
	(1.19)	(1.24)	(0.74)	(0.47)
y_{st}		-1.391		-0.342
		(5.13)***		(1.96)*
$y_{lt} - y_{st}$		-1.142		-0.697
		(2.48)**		(1.59)
Time trend		0.000		-0.000
		(0.25)		(0.56)
Observations	33	33	32	32

Table 3: Determinants of the Maturity of Corporate Debt (1975–2007): GLS Regressions

This table reports Prais-Winsten (1954) GLS regressions, which account for autocorrelation in the regression residuals (rho). The dependent variable is the long-term share of corporate debt outstanding (columns 1 and 2) or the long-term share of corporate debt issues (columns 3 and 4). Corporate debt issues are constructed as in Baker, Greenwood, and Wurgler (2003) and Greenwood, Hanson, and Stein (2009): short-term issues are equal to the level of short-term debt outstanding, and long-term debt issues are equal to the change in the level of long-term debt outstanding plus 10 per cent of the previous year's level of long-term debt to account for the maturing of long-term debt. Independent variables include the government long-term share of total government debt outstanding, short-term interest rates (y_{st}), the term spread (y_{lt} - y_{st}), a constant (suppressed), and a time trend. *t* statistics are shown in parentheses. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

	BFS: Levels		**BFS: Issues**	
	(1)	**(2)**	**(3)**	**(4)**
Government long-term share (level)	-0.408	-0.425	0.026	0.028
	(3.26)***	(3.57)***	(0.33)	(0.30)
y_{st}		-0.342		0.072
		(1.02)		(0.28)
y_{lt} - y_{st}		-0.003		0.046
		(0.01)		(0.11)
Time trend		-0.000		0.000
		(0.17)		(0.11)
Observations	33	33	32	32
R-squared	0.52	0.61	0.18	0.19
Rho	0.95	0.94	0.55	0.57

Table 4: Long-Term Excess Bond Returns and Corporate Issuance (1975–2007)

Excess 3-year long-term bond returns ($re_{t, t+3}$) are regressed on the term spread (y_{lt} - y_{st}), real short-term interest rates ($y_{st} - \pi_t$), inflation (π_t), a constant (suppressed), and the corporate long-term share of issuance. Corporate debt issues are constructed as in Baker, Greenwood, and Wurgler (2003) and Greenwood, Hanson, and Stein (2009): short-term issues are equal to the level of short-term debt outstanding, and long-term debt issues are equal to the change in the level of long-term debt outstanding plus 10 per cent of the previous year's level of long-term debt to account for the maturing of long-term debt. *t* statistics are shown in parentheses, and are based on Newey-West (1987) standard errors with up to three lags. * significant at 10 per cent; ** significant at 5 per cent; *** significant at 1 per cent.

	(1)	**(2)**	**(3)**
y_{lt} - y_{st}	2.579		2.200
	(2.21)**		(2.05)*
$y_{st} - \pi_t$	1.550		1.424
	(2.02)*		(1.86)*
π_t	0.180		-0.016
	(0.31)		(0.02)
Corp. long-term share (issuance) $_t$		-0.958	-0.408
		(1.39)	(1.04)
Observations	30	29	29