

Debt Maturity:

What Do Economists Say? What Do CFOs Say?

BY MITCHELL BERLIN

L

ike households, firms that borrow money to finance operations must make decisions about the optimal maturity of their debt.

Should a firm take a short-term loan now and refinance later? Or is the firm better off locking in a long-term interest rate now? In this article, Mitchell Berlin discusses recent theories of how firms choose their debt maturity. Some of these theories are very useful for explaining how chief financial officers (CFOs) choose the maturity of their firms' debt. However, CFOs seem to believe that they can predict future interest rates and time their borrowings accordingly, and this behavior fundamentally conflicts with most economic theories.

Any homeowner who has shopped around for a mortgage would recognize many of the concerns facing the chief financial officer (CFO) puzzling over her firm's optimal debt maturity. A CFO may ask, "Should my firm sell a long-term bond and lock in the current 30-year rate, or should my firm sell a five-year note and refinance in five years?" One of the CFO's concerns is that the five-year loan may subject

her firm to the risk of refinancing at an inopportune time, for example, when the bond market is skittish and risk premiums are high, or following a string of negative earnings reports.

There is now substantial evidence that many CFOs also ask themselves, "Do I think that long-term rates are going to fall soon? If so, maybe we should take out a short-term loan now and refinance at a lower rate five months from now." While this reasoning may seem sound to some readers, economic models of the relationship between short-term rates and long-term rates say that the CFO is wasting his or her time hoping to lower the firm's borrowing costs in this way, as I'll discuss later.

Some leading theories of firms' choice of debt maturity are based on

the idea that firms are better informed about their own creditworthiness than are lenders, another consideration that may be familiar to household borrowers. For example, a CFO of a firm with a promising, but untested, new product may reason that by borrowing short-term and reentering debt markets next year, the firm can lower borrowing costs because lenders are likely to raise their projections of firm profitability once initial sales figures come in. Another leading theory says that short-term debt tends to mitigate the conflicting interests of a firm's stockholders and its bondholders about the firm's choice of investments.

Empirical studies of firms' debt maturity choices suggest that finance theorists have made significant progress in explaining these matters; at the same time, these empirical studies have uncovered a few interesting puzzles. Sophisticated borrowers' belief that they can lower their funding costs by timing the maturity of their borrowings based on their forecasts of interest rate movements is one of these puzzles.

PRIVATE INFORMATION MAY AFFECT DEBT MATURITY

Short-Term Loans Make Funding Costs More Sensitive to New Public Information About Firms.

In an influential model by Douglas Diamond, a firm's insiders (its managers and large stockholders) have information about the firm's likelihood of default that is superior to that of outsiders, in this case, its creditors. That is, insiders have what economists call *private information*. This is not to say that creditors are completely uninformed about the firm. They may



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have a number of observable indicators of the firm's credit risk, for example, a credit rating from Moody's. However, the firm's managers will often have better information than creditors about the firm's prospects because of managers' involvement in the running of the firm. This means that two firms that both have B+ ratings from Moody's may actually have quite different probabilities of defaulting on their debts. This is a problem not only for creditors but also for the firm that is truly more creditworthy than other, similarly rated firms. Unless the lower risk firm can find some way to signal its private information to its lenders, it will end up borrowing at the same high rate as all the other B+ firms because creditors will be unable to tell them apart.

Diamond argues that one possible way for the low-risk firm to lower its borrowing costs is to shorten its debt maturity. Matters known only to management today will gradually become more public in the course of time; for example, a firm that has a low risk of default is more likely to generate a good quarterly earnings report in the future than a higher risk firm. When lenders see a new earnings report, they update their beliefs about a firm's credit risk, and the firm will be able to borrow at a lower rate than previously. So a manager with private information that his firm is more creditworthy reasons: "With short-term loans we can make our borrowing costs more sensitive to public information as it becomes available to lenders. Since our earnings report is likely to contain good news about our future prospects, our cost of funds is likely to fall."¹

But Refinancing Short-Term Debt Creates Liquidity Risk. If the future were perfectly predictable, this would be the end of the story. A manager with private information that his firm is low risk would always choose

the shortest possible maturity. However, even firms with low default risk may temporarily suffer low profits and find themselves trying to refinance their debt at an inopportune time. This might simply lead to higher interest costs for a time, or it might force the firm to cut back business or forgo profitable investments. This is called *liquidity risk*. Liquidity risk limits even a low-risk firm's appetite for shortening

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the maturity of its debt. While low-risk firms will take account of liquidity risk, high-risk firms will take it even more seriously because they have a higher likelihood of reporting low profits and facing higher borrowing costs.

There is empirical evidence that liquidity risk is a real concern for firms and that it affects their choice of debt maturity. CFOs responding to John Graham and Campbell Harvey's extensive survey of 392 financial executives cite the "cost of refinancing in bad times" as the second most important factor affecting their debt maturity choice.

¹High-risk firms would prefer to make their borrowing costs less sensitive to public information by locking in today's rate. But in Diamond's model, they are forced to mimic the low-risk firms and borrow short-term funds or else be revealed as high-risk firms. Economists call this type of equilibrium a *pooling* equilibrium. Mark Flannery's paper also highlights private information and low-risk firms' desire to make funding costs more sensitive to public information as it arrives. In his paper, the countervailing cost of short-term debt is that underwriters must be paid each time firms sell a new debt issue. He presents a *separating* equilibrium in which managers with private information that their firm is high risk do not mimic the managers of low-risk firms; low-risk firms issue short-term debt and high-risk firms issue long-term debt.

The Firm's Optimal Debt Maturity Depends on Observable Measures of Credit Risk. Consider two firms, one of which creditors view as riskier than the other based on observable indicators of credit risk. Although in the real world the information available to creditors is a lot broader than the credit rating alone, I'll use the shorthand term *credit rating* to summarize these observables. In

Diamond's model, firms with a higher credit rating are more likely to report strong earnings in the future than those with a lower credit rating. That is, at higher credit ratings it is more likely that the manager of a firm has private information that the firm is low risk. This means that firms with higher credit ratings face less liquidity risk, and thus, Diamond predicts firms with higher credit ratings will use more short-term debt than firms with lower credit ratings.

Actually, there is a twist. For some very risky firms, lenders are simply unwilling to lend long term because lenders will lose money too often if they are unable to raise their rate or will refuse to provide further funding based on the most current information. As a result, lenders will provide only very short-term financing for such firms to keep them on a short leash.² So Diamond predicts that both very low-risk and very high-risk firms will use short-term debt.

²Lenders use a number of other contractual devices for such borrowers, especially collateral and detailed loan covenants.

The Empirical Evidence for the Signaling/Liquidity Risk Tradeoff.

Studies of large firms with access to public securities markets uniformly support Diamond's predictions.³ Researchers have found that a firm's debt maturity increases as its credit rating falls, at least until its credit rating becomes speculative (BB or lower).⁴ They also find that firms without a credit rating typically use more short-term debt. There are two ways to think about the absence of a credit rating. No credit rating usually means that there is little public information about a firm — which investors view as a source of risk in itself — or it may mean that a firm is smaller and riskier than the typical firm with public ratings.

Studies of small firms, which have more limited access to financial markets than large firms, provide less consistent support for Diamond's model. These firms typically borrow from banks or from finance companies rather than by selling bonds to the public. There are difficulties testing Diamond's predictions for firms without credit ratings because researchers often can't observe what information is actually available to lenders.

Allen Berger, Marco Espinosa-Vega, W. Scott Frame, and Nathan Miller take the interesting approach of using the internal risk ratings that banks assign their loan customers as a summary measure of the information available to a firm's lender and find that debt maturity is longer for riskier loans, as Diamond predicts for

firms with low and moderate credit risk. However, there is no switch in the relationship for the riskiest borrowers. One possible explanation for this finding is that bank loan contracts to the riskiest borrowers are likely to include very close monitoring by the lender; thus, the relationship between credit risk and maturity may be more complicated than in Diamond's model.⁵ This monitoring includes the extensive use

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of covenants that require the borrower to prove its financial health to avoid default; longer-term debt with extensive covenants may be viewed as a relatively close substitute for short-term debt. In itself, the availability of such a substitute may confound the relationship between credit risk and maturity in the Diamond framework.

STOCKHOLDER/BONDHOLDER CONFLICTS MAY AFFECT DEBT MATURITY

When Firms Have Too Much Long-Term Debt, Managers May Forgo Profitable Investments. Another classic article by Stewart Myers

³Berger and co-authors also find evidence that supports the empirical significance of private information for the debt maturity of bank loans. Specifically, they show that the relationship between the bank's rating and the firm's maturity is weaker for loans in which the bank used credit scoring as part of the loan underwriting process. The authors argue (plausibly) that information asymmetries are less significant for such loans.

begins by making the crucial distinction between investments already in place and *growth opportunities*, options to make an investment sometime in the future. The key to Myers's theory is that the way in which the investments in place have been financed — in particular, whether with debt or with equity, and if debt, whether with short- or long-term debt — affects the profits stockholders make from exercising growth options.

To see the issues, begin with the simple case where the growth opportunity is profitable on a stand-alone basis — that is, the project has positive net present value — and the firm has no existing debt. In this case, existing stockholders would evaluate the growth opportunity separately from the investment in place and would support exercising the growth opportunity because it is profitable.⁶ But if the firm has debt outstanding, stockholders will have to share future profits with the bondholders who provided the funds to finance the investment in place. When the outstanding debt is large enough to affect a firm's investment decisions, it is often referred to as the *debt overhang*. If the debt overhang is large, the bondholders will capture a relatively large share of the projected revenues from the new profits, and the firm might forgo the profitable growth opportunity. This is known as the *underinvestment problem*.

To see how this can happen, consider a firm that owns a fleet of carts that sell roasted chestnuts in Central Park. The firm is considering whether to purchase a second fleet of ice cream stands. The chestnut carts are profitable only in cold weather, while the ice

⁶Myers assumes that managers faithfully carry out the interests of the firm's existing stockholders. Other prominent models in finance emphasize the conflict between managers' interests and those of the firm's stockholders.

cream stands are profitable only when the sun is shining. Forecasters are predicting an early spring and a long summer, which means that the chestnut carts are likely to be unprofitable, and the firm may even have to default on its debt if it doesn't diversify into ice cream sales.

How will the firm's managers reason? According to Myers, they may argue: "Most of the profits from the new ice cream stands are going to go to pay off the old debt used to finance the chestnut carts, rather than to the firm's stockholders. The profits received by current stockholders are much lower than the profits that would be generated by the ice cream stands alone. Since we are concerned about our existing stockholders, we shouldn't make the investment, even though it would be profitable."⁷

While stockholders might support this decision in the short run, in the long run, they would actually prefer that the firm find a way to avoid underinvestment. To see this, think about a firm that systematically says no to profitable new investments; such a firm would suffer from an endemically low stock price because its profits will be low. So stockholders—especially the stockholders of firms with significant growth opportunities—would support policies to induce managers not to pass up profitable investments.

Firms with large growth opportunities can reduce the underinvestment problem in two ways. First, they can borrow less to begin with. The less debt a firm has, the lower the possibility that creditors' and stockholders' interests will conflict in a material way. (Microsoft is an example of a firm with

⁷The discerning reader may ask why stockholders and bondholders can't strike some kind of deal to ensure that the profitable investment is made. Myers's model assumes that there are impediments to renegotiating the terms of the debt.

no debt outstanding.) Second, for any given amount of debt, the firm can use primarily short-term debt, specifically debt that matures before its existing investments. For example, a firm that uses three-month bank loans or commercial paper that matures in three months can't shift risks to its creditors because the creditors can insist on a new interest rate in line with current risks every three months.

The Evidence for a Relationship Between Underinvestment and Debt Maturity. One of the predictions of Myers's model mirrors a standard practitioner's rule of thumb: A firm should try to match the maturity of its assets and liabilities. Indeed, for Graham and Harvey's CFOs, matching assets and liabilities is the most commonly cited factor determining debt maturity. In all empirical studies of firms' choices of debt maturity, firms with longer-lived assets have longer-term debt. While there is significant empirical evidence for maturity matching, Myers underinvestment story is not the only theoretical rationale for this practice. (See *Enforcement Concerns May Affect Debt Maturity*.)

Myers's model also predicts that firms with larger growth opportunities should use more short-term debt. Think of a fast-growing firm or one with substantial investments in R&D as examples of firms with significant growth opportunities.⁸ Although the literature is not unanimous, most studies support this prediction. Shane

⁸Most studies use the ratio of a firm's market value to its book value as a measure of growth opportunities. The market value includes the firm's outstanding stock measured at market prices and the value of its debt, while the book value is the original sale price of the stock plus the value of its debt. The idea behind using this ratio as a measure of growth opportunities is that the firm's stock price will include investors' valuation of future investments. Many studies also use the firm's investment in R&D as an indicator of growth opportunities.

Johnson's article is probably the most thorough empirical study so far. First, he finds that firms with larger growth opportunities take on less debt. Second, he finds that firms that use primarily short-term debt have higher debt loads than firms that use primarily long-term debt. These findings are consistent with the idea that firms try to avoid underinvestment both by reducing their reliance on debt and by shortening the maturity of the debt they use.⁹

MARKET TIMING MAY AFFECT DEBT MATURITY

Managers Seem to Believe That They Can Time the Market. The empirical literature has consistently found evidence suggesting that managers time their borrowings in the belief they can use their forecast of interest rate movements to lower their cost of funds. This is the third most common reason given by CFOs in Graham and Harvey's survey. Specifically, CFOs say that they issue short-term debt when "short-term rates are low compared to long-term rates," or when "we are waiting for long-term rates to come down." This is particularly important for large firms, which have relatively easy access to financial markets. Other studies have consistently found that short-term borrowings are higher when the term spread—the difference between the 10-year and the one-year interest rate on Treasury securities—is high, that is, when long-term rates are relatively high compared to short-term rates.¹⁰ Graham and Harvey's response

⁹Johnson's paper takes explicit account of *both* the firm's choice of leverage and of the maturity of its debt as a means of resolving underinvestment. This resolves some contradictory findings in the earlier contributions.

¹⁰These studies include those by Barclay and Smith; Jose Guedes and Tim Opler; and Faulkender and Petersen.

ENFORCEMENT CONCERNS MAY AFFECT DEBT MATURITY



liver Hart and John Moore present a model of debt maturity in which the borrower can't fully commit to a stream of future debt payments. In particular, an entrepreneur can always threaten to walk away from her debts. Although she can be compelled to turn over the physical assets of the firm in the event of default, her accumulated skills and knowledge (her human capital) can't be touched by her creditors. Thus, each debt payment potentially gives rise to bargaining between the lender and the borrower, in which the lender threatens to take the firm's assets and the borrower answers that assets are worth less in the hands of another manager (so that the lender would be shooting himself in the foot by carrying out the threat).

While this scenario may seem a little melodramatic as a description of a routine debt transaction, Hart and Moore argue that, ultimately, the borrower's threat to walk away and the lender's threat to seize assets determine the feasibility of a particular stream of debt payments. If the debt maturity is too long term, i.e., if debt payments are postponed until too late in the productive life of the assets they finance, the borrower's threat to walk away becomes a serious problem. In this case, the contract would be calling upon the borrower to make large repayments precisely when the lender's threat to liquidate is weakest. When the remaining life of the assets is very short: (1) the borrower's lost profits from losing control of the assets are small, so the costs of walking away are small;^a (2) the value of the assets to the lender is small (because the assets have depreciated), so

the gains to the lender from seizing assets are small.

At the same time, the firm's debt can be too short term. Investments yield profits over time, and the firm's accumulated cash flow from a project may be too small to cover large debt payments early on. One possibility is to use short-term debt that might be renegotiated if current cash flows are too small to cover promised payments. But efficient renegotiation may be impossible. The problem is that even if future revenues are high enough to shift some payments into the future under a renegotiated agreement, the borrower has only limited ability to make credible commitments to make debt payments out of future revenues. So renegotiations would only lead to promises that would never be kept.^b

Hart and Moore's theoretical analysis includes two interesting empirical predictions. The first is that firms will match the maturity of their assets and their debts; thus, Hart and Moore provide another explanation of this businessman's maxim (borne out by Graham and Harvey's survey findings). As assets become longer lived, they provide the creditor with the security to wait longer before being repaid; the lender's threat to seize assets is more credible when assets are longer lived. A second prediction is that more fungible assets — those that can be more readily used by another firm — can more readily support long-term debt. Again, the firm's ability to commit to making debt payments out of future revenues is enhanced by the strength of the lender's threat to seize assets. This prediction has recently found empirical support in a historical study of the U.S. railroads by Efraim Benmelech.

^a Of course, borrowers will also be concerned about their reputation and their access to future finance.

^b An implication of this line of reasoning is that the borrower's inability to commit to forgo seeking to renegotiate the contract can lead to underinvestment (for reasons different from those emphasized by Myers). That is, some essentially profitable investments simply can't be financed. This will happen if the borrower has to borrow a large share of the initial investment, if the project yields cash flows too late in the life of the project, and if the project's liquidation value is too low.

to their findings sums up researchers' typically puzzled response: "[I]t is not clear to us why firms pursue this strategy" (p. 233).¹¹

Michael Faulkender's article presents striking evidence that firms' managers believe they can time their borrowings to reduce their cost of funds. He examines financing policies for firms in the chemical industry between 1994 and 1999.¹² In particular, Faulkender examines these firms' use of interest rate swaps undertaken jointly with their new borrowings. In the simplest interest rate swap, one party exchanges the interest payments on its own debt for the interest payments on another party's debt. So a firm that pays a floating rate on its own debt can exchange these variable payments for another firm's fixed interest rate payments.

When a firm increases its short-term debt, it will end up paying higher interest costs if interest rates rise. Conversely, when it increases its long-term debt, it will be paying higher interest rates than those prevailing in the market if interest rates fall. This is called *interest rate risk*. When firms undertake a new borrowing they may take an accompanying swap position to offset, or *hedge*, their interest rate risk. For example, a firm that takes on new floating rate debt will be hurt if interest rates rise. The firm can hedge

¹¹ One theory of debt maturity by Ivan Brick and Abraham Ravid does predict that the term premium should affect firms' optimal debt maturity through tax effects. But their model has been consistently rejected by the data, with the puzzling exception of Stohs and Mauer's paper.

¹² Focusing on firms in a single industry is attractive for two reasons. First, since firms in a single industry face similar operating environments, it is less likely that empirical findings are driven by unobserved differences between firms. Second, it is easier to find comparable measures for factors that researchers expect will affect firms' borrowing policies, for example, factors affecting industry risk.

this risk by exchanging the interest rate payments on its floating rate debt for fixed interest rate payments in the swap market.¹³ However, a CFO who firmly believes that he or she can forecast interest rates might not hedge against the risk of interest rates rising but might purchase a swap that amplifies the firm's exposure to rising rates. This behavior is called *speculation*.

The belief that CFOs can time the market is equivalent to the belief that sophisticated lenders are systematically taken to the cleaners by corporate CFOs.

Faulkender finds that the swaps undertaken in conjunction with new borrowings are not taken for hedging purposes. That is, a firm that takes on new floating rate debt is not typically swapping floating interest payments for fixed interest payments. In itself, this is surprising. Most academic observers have simply assumed that these swaps were undertaken to hedge the new debt. Further, the likelihood that a firm takes a speculative position depends on the term premium. So a firm is not only more likely to borrow using floating rate debt when the term premium is high; it is also more likely to swap fixed interest payments for floating interest payments at the same time as the debt offering when the term premium is high.

Most Economists Believe That CFOs Can't Time the Market. To a first approximation, the main factor

¹³ The reader may wonder why a firm would ever want to borrow short term using floating rate debt if it preferred a fixed interest rate (or vice versa). A number of explanations are possible. One is that the firm chooses its debt maturity to avoid underinvestment. While short-term debt might be attractive for this reason, a firm may not want to bear the additional interest rate risk.

affecting the relationship between short-term and long-term interest rates is investor expectations about future interest rates. For example, according to the expectations theory of the yield curve, the 10-year Treasury rate is simply the average of investors' expected one-year T-bill rates over the next 10 years. While it is plausible that corporate CFOs might have private

information about their firms' financial condition — as in Diamond's model — they are very unlikely to have superior information about future interest rate movements, and thus, they are not likely to produce systematically better interest rate forecasts than other market participants.¹⁴ If CFOs don't have superior forecasts, economic theory says that borrowing short term and refinancing should lead to the same (risk-adjusted) borrowing costs as borrowing long term.¹⁵

One way to see this is to imagine that CFOs *could* systematically reduce borrowing costs by borrowing short term when short-term rates are

¹⁴ I am simplifying here. Factors other than expectations affect the precise shape of the yield curve and the theory of the yield curve is a venerable and continuing controversy in economics. Nonetheless, the main point still holds. There is little reason to imagine that corporate treasurers have systematically better information than other market participants about other factors affecting the supply and demand for funds at different maturities.

¹⁵ Just to be clear, in this discussion I am not taking account of the issues considered by Diamond. Think about a world in which all information about a firm's creditworthiness is public information.

unusually low and switching to long-term rates when long-term rates are unusually low. This would mean that borrowers are systematically profiting at lenders' expense. It should be kept in mind that these lenders are large banks, insurance companies, money market funds, and so forth. Thus, the belief that CFOs can time the market is equivalent to the belief that sophisticated lenders — whose business is to make money by borrowing and lending — are systematically taken to the cleaners by corporate CFOs.

Why do CFOs believe they can time the market? One possibility is that CFOs are simply wrong and that their firms' cost of funds is not lowered by market timing. Indeed, Graham and Campbell's survey uncovers a number of capital budgeting and financing policies that are very common, yet don't appear rational from the standpoint of a financial economist. Another possibility is that CFOs are actually able to lower their cost of funds, but for reasons other than their ability to forecast interest rate movements. Perhaps managers have hit upon a rule of thumb that has actually worked, but not because CFOs have better models of the yield curve.

In their article, Malcolm Baker, Robin Greenwood, and Jeffrey Wurgler, using U.S. data between 1953 and 2000, present empirical evidence that large firms do indeed borrow short term when long-term borrowing would have been more expensive (and vice versa). The authors suggest that managers may actually be able to exploit inefficiencies in debt markets to lower their borrowing costs, although they do not identify a particular type of market inefficiency that would explain this possibility.

Alexander Butler, Gustavo Grullon, and James Westen have argued that Baker and coauthors' results are

flawed on econometric grounds.¹⁶ Apart from these concerns, most economists will remain unconvinced about the profitability of market timing without a plausible economic mechanism to explain corporate treasurers' success. Ultimately, Baker and coauthors' main argument for taking the possibility of profitable market timing seriously is that corporate treasurers *believe* it is profitable. But essentially irrational practices can persist as long as the available data do not provide strong evidence that the practice is losing money. The correlations unearthed by Baker and coauthors suggest that during the postwar period, corporate treasurers could convince themselves that they were not losing money for their firms, even if their dreams of timing the market were delusory.

CONCLUSION

Financial economists have made significant progress in understanding firms' debt maturity decisions. Substantial empirical evidence supports the view that firms' private information about their credit risk is an important determinant of debt maturity. In particular, the evidence is broadly consistent with a model in which firms balance two opposing factors. Short-term debt makes borrowing costs more sensitive to public information but may force a firm to borrow at an inopportune time. Substantial evidence also supports the view that firms with significant growth opportunities will choose the maturity of their debt to

¹⁶ Butler, Grullon, and Westen's article makes a convincing argument that the empirical patterns in Baker et al. are spuriously driven by structural shifts during the 1980s. In particular, they argue that both excess returns and firms' debt maturity policies changed in response to changes in monetary and fiscal policy in the 1980s, leading to a spurious correlation in Baker et al.'s data.

avoid debt overhang, which can lead the firm to forgo profitable investments.

While it is not the business of economists to slavishly produce models that reinforce businessmen's prejudices, both views find support in survey responses by CFOs, who state that they choose debt maturity to match the maturity of their assets and liabilities and that their borrowing choice reflects their desire to avoid having to borrow at an inopportune time. CFOs' own statements provide financial economists with some comfort that they are not theorizing about debt maturity in a vacuum.

While the theories seem to have been successful in explaining the borrowing choices of large firms, financial economists have made less headway in understanding maturity decisions for smaller firms.

However, CFOs also state that their debt maturity choices are partly driven by the desire to borrow short term when short-term rates are unusually low or to lock in a long-term rate when they believe long-term rates are likely to rise. There is also substantial empirical evidence that firms' financing decisions do, in fact, reflect this motive. Here, there is less comfort for economists because economic models do not support the idea that firms can systematically reduce borrowing costs this way.

While economists are often puzzled and challenged to explain business practices — is the practice simply irrational, or is there some logic to it? — CFOs' belief that they can reduce borrowing costs by timing the maturity of their borrowings is even more puzzling, because there is some recent evidence that such timing may actually work. Unsurprisingly, this evidence has been forcefully challenged and remains an open area for research. 

REFERENCES

- Baker, Malcolm, Robin Greenwood, and Jeffrey Wurgler. "The Maturity of Debt Issues and Predictable Variation in Bond Returns," *Journal of Financial Economics* (November 2003).
- Barclay, Michael J., and Clifford W. Smith Jr. "The Maturity Structure of Corporate Debt," *Journal of Finance*, 50 (June 1995), pp. 609-31.
- Barclay, Michael J., Leslie M. Marx, and Clifford W. Smith Jr. "The Joint Determination of Leverage and Maturity," *Journal of Corporate Finance*, 9 (2003), pp. 149-67.
- Benmelech, Efraim. "Asset Salability and Debt Maturity: Evidence from the 19th Century American Railroads," Working Paper, Harvard University, (2004).
- Berger, Allen N., Marco A. Espinosa-Vega, W. Scott Frame, and Nathan H. Miller. "Debt Maturity, Risk, and Asymmetric Information," *Journal of Finance*, 60, 6 (December 2005), pp. 2895-2923.
- Brick, Ivan, and Abraham Ravid. "Interest Rate Uncertainty and the Optimal Debt Maturity Structure," *Journal of Financial and Quantitative Analysis*, 26 (March 1991), pp. 63-81.
- Butler, Alexander, Gustavo Grullon, and James Westen. "Can Managers Successfully Time the Maturity of Their Debt Issues?" Working Paper, Rice University (July 2004).
- Diamond, Douglas. "Debt Maturity Structure and Liquidity Risk," *Quarterly Journal of Economics* (August 1991), pp. 709-37.
- Faulkender, Michael. "Hedging or Market Timing? Selecting the Interest Rate Exposure of Corporate Debt," *Journal of Finance*, 60 (April 2005), pp. 931-62.
- Faulkender, Michael, and Mitchell A. Petersen. "Does the Source of Capital Affect Capital Structure?" *Review of Financial Studies*, 19, 1 (Spring 2006), pp. 45-79.
- Flannery, Mark J. "Asymmetric Information and Risky Debt Maturity Choice," *Journal of Finance*, 41 (March 1986), pp. 19-37.
- Graham, John R., and Campbell R. Harvey. "The Theory and Practice of Corporate Finance: Evidence from the Field," *Journal of Financial Economics*, 60 (2001), pp. 187-243.
- Guedes, Jose, and Tim Opler. "The Determinants of the Maturity of Corporate Debt Issues," *Journal of Finance*, 51 (December 1996), pp. 1809-33.
- Hart, Oliver, and John Moore. "A Theory of Debt Based on the Inalienability of Human Capital," *Quarterly Journal of Economics*, 109 (1994), pp. 841-79.
- Johnson, Shane A. "Debt Maturity and the Effects of Growth Opportunities and Liquidity Risk," *Review of Financial Studies*, 16 (Spring 2003), pp. 209-36.
- Myers, Stewart C. "Determinants of Corporate Borrowing," *Journal of Financial Economics*, 5 (1977), pp. 147-75.
- Stohs, Mark H., and David C. Mauer. "The Determinants of Corporate Debt Maturity," *Journal of Business*, 69 (July 1996), pp. 279-312.