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Source: *The Journal of Finance*, Vol. 35, No. 5 (Dec., 1980), pp. 1223-1234
Published by: Blackwell Publishing for the American Finance Association
Stable URL: http://www.jstor.org/stable/2327095
Accessed: 28/11/2009 08:22

THE JOURNAL OF FINANCE • VOL. XXXV, NO. 5 • DECEMBER 1980

A RATIONALE FOR DEBT MATURITY STRUCTURE AND CALL PROVISIONS IN THE AGENCY THEORETIC FRAMEWORK

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ABSTRACT

The agency costs of debt are introduced in this paper to explain the existence of complex financial instruments. Two areas of complexities are discussed in detail: the call provision and the maturity structure of debt. Their existence is rationalized as a means of resolving agency problems associated with informational asymmetry, managerial (stockholder) risk incentives, and foregone growth opportunities. It is also demonstrated that both features of corporate debt serve identical purposes in solving agency problems. Complex financial instruments are required because markets fail to provide complete and costless solutions to the agency problems discussed in the paper.

I. Introduction

IT IS WELL KNOWN that under perfect capital markets the choice among various financial instruments is inconsequential to the value of the firm. This basic irrelevancy theorem, originally suggested by Modigliani and Miller [17], covers all types of complexities which commonly characterize corporate financial obligations. The more general proof of the irrelevancy statement in the context of risky debt financing is provided by Stiglitz [21] who invokes a costless financial intermediary. This proof is in a multiperiod framework, and hence it includes corporate decisions relating to the maturity structure of debt.

Many apparent explanations for the observable complex structure of financial instruments are not consistent with the Stiglitz framework. In particular, *call provisions* on corporate bonds are commonly attributed to interest rate uncertainty suggesting that since stockholders are able to reap the added value of the bond caused by a decrease in interest rates, they gain, and bondholders lose commensurately, in an *ex ante* sense. However, in the Stiglitz framework, when arbitrage profits are fully exploited, the value of a non-callable bond will always equal the value of a callable bond plus the value of the call privilege. That is, stockholders pay at issuance an amount which reflects the full value of the call privilege.[1]

We wish to acknowledge helpful comments and suggestions from Alan Kraus and the participants in the Finance Workshop of The University of Wisconsin-Madison

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[1] Other studies on the call provision focus on the problem of optimal timing of the exercise of the call (e.g., Weingartner [22], Pye [19], Kraus [11]). This is an *ex post* problem in the sense that the existence of callable debt is given, and the realization of interest rates is observed.

Financial theory explains the *maturity structure* of debt through a "habitat" argument which implies that "optimal" debt maturity is achieved at the point where debt and asset maturities are matched so as to minimize the uncertainty associated with interest rate fluctuations (e.g., Modigliani and Sutch [16]). Again, however, in the Stiglitz framework, there is no basis for an "optimal" maturity structure so long as capital markets are functioning well.

Recent contributions in the field of finance introduce market imperfections—in particular, agency costs of equity and debt—to bridge the gap between theory and observed reliance by corporations on complex financial instruments. Jensen and Meckling [8] identify such agency costs as bankruptcy costs costs associated with managerial consumption of perquisites (perks), and costs associated with managerial incentive to undertake suboptimal risky projects which transfer wealth from bondholders to stockholders. Recently Myers [18] demonstrates that debt financing by a growth firm in the *MM* sense induces suboptimal investment decisions if the debt maturity falls beyond the date of expiration of the options for future investment opportunities. Finally, market imperfections causing an inability of the entrepreneur to costlessly reveal the exact nature of the firm to debt financiers serve as an additional source of agency problems. This is a problem of informational symmetry.

The purpose of this paper is to demonstrate how debt maturity structure and call provisions can be rationalized as a means of resolving the agency problems of debt associated with informational asymmetry, risk incentives, and Myers-type foregone growth opportunities.[2] In fact, it appears that shortening the maturity of debt and issuing long-term debt with a call provision perform identical tasks in eliminating these agency problems discussed above.

It should be emphasized at the outset that we don't claim uniqueness to the rationale provided in this paper. We suggest only that the existence of complex financial contracts may serve as low cost alternatives to resolving agency problems when capital or labor markets are unable to costlessly resolve them. This suggestion explicitly implies that complex contracts are endogenous in an environment in which (1) agency problems prevail and (2) the markets for financial and human capital are unable to resolve those problems completely and costlessly.[3, 4]

[2] This conclusion is consistent with the observation that while almost all corporate debt is callable, most federal government debt is not. Municipal debt does not escape the agency problem of informational asymmetry and risk incentives and thus it may include call provisions to reduce the costs involved in resolving these problems.

[3] Recent studies emphasize the role of well-functioning capital markets in reducing, or eliminating, the costs involved in specific agency problems. Haugen and Senbet [9] discuss agency costs of bankruptcies and, by invoking an arbitrage argument, conclude that these costs are limited to the transactions required for informal reorganizations of the firm in the capital market. Fama [6] aruges that agency problems associated with perk consumption must be of no consequence if the managerial labor market is efficient in the sense that the present value of the manager's future wages adjust to fully reflect "shirking" or excessive perk consumption. Interestingly, it doesn't seem to be widely recognized that discipline in this form from the labor market provides a solution to many, if not all, of the agency problems discussed in the literature. Consider, for example, the incentive signalling problem of Ross [20]. This is a problem of communicating the true nature of the firm without moral hazard. Ross provides for a managerial incentive contract, employing a bankruptcy penalty, which

Our approach is similar to Bodie and Taggart [2] who demonstrate that call provisions can be used to resolve agency problems relating to growth opportunities which are to be exercised by equityholders. We extend their analysis to other sources of agency problems and, in addition, we demonstrate that the issues of debt maturity structure and the call provisions belong to the same family in that both are alternative solutions to specific agency problems.

In the following sections, we use call options and maturity structure of debt to resolve the agent problems associated with informational asymmetry (Section II), risk incentives (Section III), and future investment opportunities (Section IV). Section V concludes the paper.

II. Informational Asymmetry

We consider an entrepreneur who faces the problem of informational asymmetry in the sense that he is unable to reveal (without moral hazard) the precise identity of his investment opportunity (firm). Suppose that the entrepreneur knows that he has the opportunity to invest in a given project (call it A). However, the market believes that he actually has an opportunity to invest in some other project (call it B). If the truth were revealed, the market would place a higher value on A than on B. This asymmetry may be resolved, at a cost, through various signalling mechanisms as discussed in the literature.[5] Due to a moral hazard problem, and in the absence of an unambiguous signal, the entrepreneur is bound to obtain less than the fair value that reflects the true nature of project A. This agency cost resulting from informational asymmetry is permanent if the entrepreneur resorts to long-term financing. The loss is measured by the difference between $V_D(A)$ and $V_D(B)$, the current values of debt associated with projects A and B, respectively.

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enables management to provide an unambiguous signal to the market through the firm's debt-to-equity ratio. However, if the manager suffers the consequences of attempts to deceive the market through changes in the value of his human capital, the moral hazard problem disappears. Thus, in the presence of an efficient labor market, managers are motivated to tell the truth with or without an incentive scheme attached to the signalling device. Thus, the link between financial structure and informational asymmetry disappears.

[4] The existence of complex labor contracts, which determine management compensation, suggests that impediments may characterize labor markets as well as financial markets. For example, it may be necessary to construct a detailed contract for a manager who approaches the age of retirement as changes in the value of his human capital will not fully reflect his *ex post* performance. Also, as a result of informational asymmetry, firms hiring managers may err in assessing their expected future marginal products and hence a complete *ex post* settling up is impeded.

[5] Ross [20] argues that, if a managerial incentive schedule is properly specified, the financial structure of the firm can serve as a signal. Leland and Pyle [12], on the other hand, employ the entrepreneur's equity stake as a signal. The limitations of these signalling mechanisms are discussed in Haugen and Senbet [10], who also attempt to provide *joint* solutions to informational asymmetry and agency problems. Unlike Ross and Leland—Pyle, Haugen and Senbet also argue that signalling through the financial structure of the firm is costly. Like Ross, though it is assumed in this paper that the entrepreneur is not allowed to trade in the liabilities of his own firm. This is in accordance with certain observable legalities which prevent managers from trading in their own firm's liabilities so as to avoid moral hazard problems.

The call privilege entitles the issuer of the bond to a premature retirement. For the sake of simplicity, consider a scenario in which the true nature of the firm (A or B) is revealed at $t = 1$ and that the call option is also exercisable at $t = 1$. At that time, the value of the debt is state-contingent with a price $V_D(s)$, where s denotes a particular state of nature. Also for purposes of exposition only, assume that the debt matures at $t = 2$ at which time its value $V(z)$ would depend upon the second period states of nature, where $z \in Z$ is a particular state of nature revealed at $t = 2$. Thus, at $t = 1$:

$$V_D(s) = \int_{-\infty}^{\infty} q(z \mid s) \min [V(z \mid s), F] \, d(z \mid s) \tag{1}$$

where

$q(z \mid s)$ = the z-state price given that s, the state of nature at $t = 1$, is revealed.
$V(z \mid s)$ = the z-state contingent value of the firm given s.
F = the face value of the debt.

Clearly, the call option is exercised at $t = 1$ if $V_D(s) > P$. The current value of the call privilege can be written at $t = 0$ as

$$V_C = \int_{-\infty}^{\infty} q(s) \max[0, V_D(s) - P] \, ds \tag{2}$$

In our framework, the value of a callable bond must be equal to the value of a non-callable bond (with equivalent face value) less the value of the call privilege. In the absence of informational asymmetry and agency problems, there is no possibility of wealth transfer among the securityholders and the issuer is indifferent between the callable and the non-callable issue. However, such is not the case when the entrepreneur suffers from the consequences of informational asymmetry. The value of a call privilege associated with A, $V_C(A)$, exceeds that of $V_C(B)$. While the entrepreneur suffers in the form of the discrepancy between $V_D(A)$ and $V_D(B)$, he can recapture part of it through the issuance of a callable debt in the amount of $(V_C(A) - V_C(B))$. Thus, there exists a definite preference for callable debt in an environment characterized by informational asymmetry.[6]

As a caveat, it should be pointed out that the call feature mitigates a transfer of wealth only to the extent that the true nature of the firm is revealed prior to the maturity of the debt. To maximize the benefit associated with the call, the

[6] The wealth recaptured through the increased value of a call privilege occurs without impairing the amount of financing needed. Given F and project B, an identical amount of debt capital can be raised with both a callable and a noncallable contract if the call privilege is made worthless by adjusting P. As shown in equation (2), $V_C = 0$, if $P \geq V_D(s)$ for all s. Note that $V_D(s)$ itself is constrained by (1), and it is a finite amount so long as F is finite. Depending upon P, this call privilege is worthy in the context of project A but worthless in the context of project B. Thus, the entrepreneur is able to recapture part of the cost of informational asymmetry through the increased value of a call privilege. Given the amount of financing needed and the associated F, determining P is a constrained optimization problem in which $V_C(A)$ is maximized subject to the constraint that $V_C(B) = 0$.

expiration date must immediately follow revelation of the true nature of the firm. The sooner that this revelation occurs the more effective the call option in preventing expropriation of stockholder wealth by bondholders. If the *revelation* period is extremely small and the *expiration* period is of a corresponding length, nearly all of the wealth transfer can be avoided. If, however, the revelation period is equal to the term of maturity on the bonds, none of the wealth transfer is avoided. If the call date and maturity dates are equal, adding a call feature (with an exercise price less than the face value) is tantamount to merely reducing the amount (rather than the maturity) of debt in the capital structure, which is an unacceptable solution to the asymmetry problem. Thus, the call has an *optimal* expiration period which relates to the timing of the release of information associated with the asset being financed.

It appears that either the expiration date of the call or the maturity of the outstanding debt are important corporate decisions which affect the distribution of wealth among holders of its securities. Agency costs which result from informational asymmetry may explain, in this context, the observable multiplicity of maturities on corporate debt.[7]

At this point, we wish to point out that the entrepreneur can also reduce the cost associated with informational asymmetry by shortening the maturity of debt. In terms of purpose, shortening the maturity of the debt serves as the analog of attaching a call provision to the bond issue. This is not surprising if one views the call provision as a means of shortening the expected value of the life of the debt contract. In this context, the essential difference between short-term debt and a callable long-term debt arises with respect to uncertainty about the date of premature retirement.

It should again be stressed that shortening the maturity of the debt to *within* the period prior to revelation of the true nature of the firm is of no value. While the degree of undervaluation of each individual short term issue may be smaller than for a bond with a maturity equal to the revelation period, as the short term issues are rolled over, the firm suffers the full consequences of undervaluation by the market. Extending the maturity date beyond the revelation date, however, results in a needless expropriation of stockholder wealth.

III. The Risk Incentive Costs of Debt

Black and Scholes [1] view stockholders in a levered firm as holding a European call option to buy back the entire firm at an exercise price equal to the face value of the debt. In this respect, bondholders can be viewed as taking a positive position in the assets of the firm and a negative position in the call option. Since the value of this call option is an increasing function of the variance of the cash flows of the underlying asset (firm), stockholders have incentive to engage in high risk activities at the expense of debtholders. If bonds are sold for the stated

[7] The solution via a call provision cannot signal out the true current value of the firm, but it can serve as a means of recapturing (at least partially) the welfare loss to the entrepreneur induced by informational asymmetry. The residual loss not recaptured by a call provision is, of course, analogous to the cost associated with a signalling mechanism.

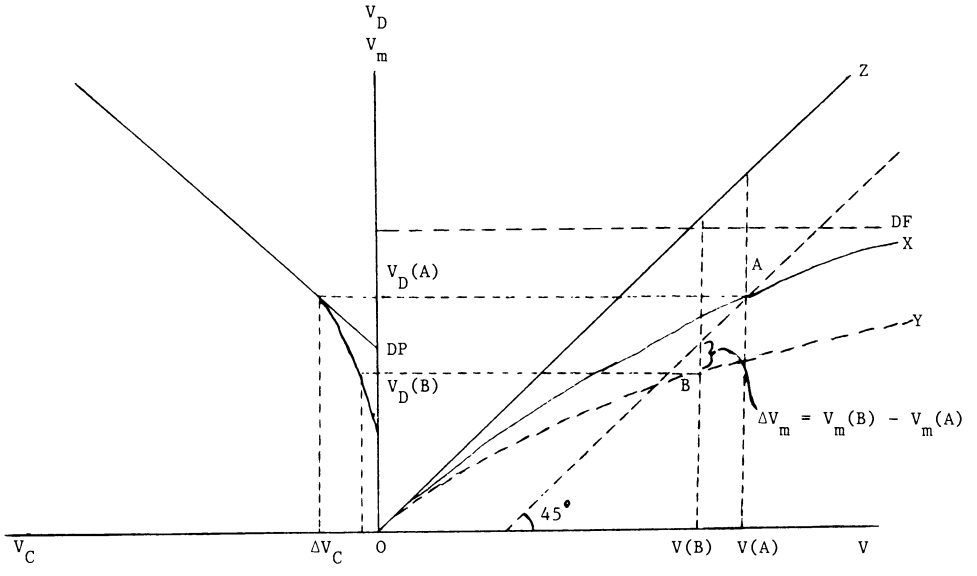

Figure 1. Addressing Risk Incentive Problem with a Call Provision

purpose of engaging in low variance activities at a price reflecting the low risk, stockholders can increase their wealth at the expense of debtholders by shifting into high risk projects. If both low and high risk projects command the same market value, the asset substitution does not alter the total value of the firm, but it transfers wealth among the two classes of securityholders. If bondholders are fully aware of the incentive problem, its effects are discounted in the price at which they buy the debt. For instance, if the entrepreneur faces two alternative equal cost (but differential risk) investment projects with equal value, debt is issued with the presumption that the higher risk project will be adopted. Thus, in this case, the problem of wealth transfer ceases to exist.

Suppose, however, that the entrepreneur is financing investment opportunity A, but that an alternative opportunity B is available where $\sigma(B) > \sigma(A)$ and where $\Delta V = V(B) - V(A) < 0$. This creates an incentive for the entrepreneur to shift to B so long as the change in the equity value is positive. For expositional purposes only, the entrepreneur is assumed to be the sole equity owner. The change in equity value, $\Delta V_m = V_m(B) - V_m(A)$, is depicted in Figure 1. The value of the firm is depicted on the right hand side of the horizontal axis, while the debt and equity (V_m) values are shown on the vertical axis. The curve OX is drawn with the presumption that the equity of the firm is valued in accordance with the Black-Scholes model and investment opportunity A is chosen. The curve OY is drawn under the presumption that the higher variance project B is chosen.[8] Since

[8] Long [13] points out the difficulty in applying the model for the pricing of corporate liabilities, if the total value of the firm is dependent on its capital structure. This dependence occurs, because the probability distribution of the future cash flows may be affected by bankruptcy costs and tax subsidies, and hence the stochastic process underlying the total value of the firm cannot be specified without reference to the prices of the firm's bonds. The functional dependence leads to a non-linear differential equation leading to the difficulty in obtaining the bond pricing formula. In light of Long's argument we follow the tradition (e.g., Jensen and Meckling [8]) and use the Black-Scholes model *qualitatively* wherever applicable in this paper.

debt is a complement of equity, the curve is drawn concave to the origin such that the vertical differences between the 45-degree line OZ and OX depict equity values.

The left hand side of the horizontal axis depicts the value of a call privilege.[9] This privilege is an option written on a non-callable bond with the exercise price equal to the call price, P. While the graph presumes that the call price is less than the face value of the debt, it should be remembered that we are dealing in present values in the right hand portion of the figure. The *present value* of the face payment (at the risk free rate) is likely to exceed the market value of the non-callable bond. The market value of the callable bond will be even less than this. Consequently, the call price indicated on the vertical axis may well lie in the neighborhood of the market value of the callable debt. Thus, while the debt is depicted in the graph seems to be characterized by a negative call premium, this is not necessarily inconsistent with the call provisions commonly observed in conventional bonds. Notice that so long as the debt value associated with B, $V_D(B)$ falls below the 45-degree dotted line [i.e., if $V_m(B) > V_m(A)$], the entrepreneur profits by shifting to B. However, with rational expectations, debt-holders again recognize the incentive problem and discount the debt value accordingly, such that they would offer $V_D(B)$ and not $V_D(A)$ in return for their claim. In the absence of mechanisms which resolve the incentive problem, the entrepreneur incurs the agency costs in the amount of $V(A) - V(B)$.

It is in the best interests of the entrepreneur to seek contracts which ensure that he has no incentive to shift to high risk, low value, projects. The issuance of debt with a call provision accomplishes this purpose. The value of a call privilege associated with A is higher than the one associated with B for the same call price. The rationale for this is provided in the previous section, where the call privilege pricing function is presumed to be specified in accordance with the Black-Scholes Model. The solution to the incentive problem is to design the call price (i.e., the exercise price) such that the change in equity value is exactly offset by the change in the value of the call privilege. In the parlance of Figure 1, this occurs when $\Delta V_C = \Delta V_m$. In sum, the issuance of a callable debt with an appropriate call price resolves the agency problem associated with risk shifting. Since the risk incentive problem is neutralized, the entrepreneur can raise debt in the amount of $V_D(A)$.

The risk incentive problem can also be resolved through shortening debt maturity. Consider again the preceding scenario whereby the entrepreneur faces investment opportunity A, but an alternative opportunity B exists such that $\sigma(B) > \sigma(A)$ and $V(B) < V(A)$. If the entrepreneur finances A with a long-term debt, an incentive exists on his part to shift to B so long as the change in equity values, ΔV_m^L, is positive. Of course, with rational expectations, debt holders recognize the incentive problem and fully discount it in the price at which they purchase bonds. They would offer $V_D^L(B)$ and not $V_D^L(A)$. Again, the entrepreneur suffers from the consequences of the incentive problem unless appropriate steps are taken to resolve it.

[9] The curve depicting the relationship between the value of the call and the value of the bond would also be expected to shift slightly with a shift in investment. This isn't shown, however, for the sake of simplicity.

The problem can be resolved by specifying an appropriate shorter maturity t^* with corresponding face value F_S. Unlike the case of informational asymmetry, the solution here is obtainable by controlling two parameters, namely the face value F_S and the time to maturity t^*. Under informational asymmetry t^* is constrained by the time of the revelation of the nature of the project. In essence, the problem is neutralized because the value of the shorter term debt is less sensitive to a shift into the lower value-higher variance project. This is true for two reasons. First, if $V(B)$ is greater than the discounted face value of the bond, the value of the bond is less sensitive to a change in the *value* of the underlying assets of the firm. Second, the value of a shorter term option is less sensitive to a change in the *variance* in the distribution of returns to the underlying asset. Hence, the value of the shorter term bond is less sensitive to the difference in risk associated with the two projects.

Going back to Figure 1 again, we can see that so long as the issuance of debt with a shorter term maturity ensures its value to be above the 45 degree line, it would be irrational on the part of the entrepreneur to shift to B, because he is bound to lose from the shift. The risk incentive problem is entirely neutralized, and hence debt in the amount of $V_D^L(A)$ can be raised. In terms of resolving the risk incentive problem, the entrepreneur is indifferent between the issuance of either a callable debt or a short-term debt. Thus, the process of eliminating this important class of agency problems provides a strong rationale for the existence of variable maturities and call provisions in capital structure.

IV. Suboptimal Future Investment Decisions

The value of the firm with future discretionary investments can be broken into the present value of currently held assets and the present value of future growth opportunities. Growth opportunities command value only to the extent that their yield exceeds the cost of capital, and hence they are analogous to options and valued as such.

Suppose that the current investment strategy is fixed in an environment devoid of informational asymmetry and risk incentive problems. In the absence of growth opportunities, capital structure decisions do not alter the value of the firm. However, if investment opportunities are expected to occur in the future, the issuance of debt for the purpose of financing current investments can impair future investment incentives. One may argue that growth opportunities are reflected in the value of the debt at the time of issuance and hence passed on to the equityholders. However, this argument cannot survive, since the "moral hazard problem" exists in the absence of mechanisms which would force management to undertake *optimal* future investment strategies.

Bodie and Taggart [2] analytically demonstrate the existence of agency costs of debt associated with suboptimal future investments. The firm with risky debt outstanding, which makes decisions in the interests of its stockholders, cannot capture the full benefits of future investment opportunities, because they partially accrue to debtholders in the form of a reduction in probability of default, and a corresponding increase in the value of the debt. Consequently, investment incen-

tives are curtailed despite the possibility that these opportunities generate a positive net present value. In the absence of some contractual enforcement, the investment incentive is impaired even if the bondholders reward the stockholders at the time of issuance in the form of a higher price for the debt. This is true, because with rational expectations, bondholders recognize that the incentive problem still exists, and hence equityholders bear its consequence.

Bodie and Taggart demonstrate that a call provision on the debt increases the welfare of shareholders. However, with the exception of a special numerical example, their general result with callable debt may not restore the value of the firm to that which exists under all equity financing in which investments have positive present value. Under certain states of nature in which it is still unprofitable to call the debt, the investment incentive is further impaired; this is because the firm faces higher fixed charges with a callable debt than would be faced if noncallable debt is initially issued. Nonetheless, the issuance of callable debt is shown to stochastically dominate the case of a noncallable debt, and hence a strong case is established for the inclusion of a call provision in all corporate debt contracts.

Myers [18] looks at a similar agency problem, but he deals with the case where currently issued debt is *entirely* supported by a growth opportunity. In other words, debt is issued against goodwill, and the proceeds from the issuance can be viewed as a return of capital. For expositional purposes, suppose that the states are ordered in terms of increasing value of the firm, $V(s)$. Accordingly, we can specify that for $s \geq s_a$, $V(s) \geq I$ and for $s \geq s_b$, $V(s) \geq I + P$, where I and P are the required investment and the promised payment, respectively. The optimal value maximizing strategy is to adopt all investments for which $V(s) > I$.

The pursuit of the optimal investment strategy depends on the maturity of the debt. If the debt matures prior to the investment decision, stockholders exercise the option if $V(s) - I \geq P$. However, if $V(s) - I < P$, bondholders will take over and exercise the option to invest if $V(s) > I$. Consequently, the value of the firm is unaffected as shown below,

$$V = V_D + V_M = \int_{s_a}^{s_b} q(S)[\,V(s) - I]\,ds + \int_{S_b}^{\infty} q(s)\,P ds + \int_{S_b}^{\infty} q(s)[V(s) - (I + P)]\,ds = \int_{S_a}^{\infty} q(s)[\,V(s) - I]\,ds \quad (3)$$

where

V_D = the current value of debt;
V_m = the current value of equity; and
$q(s)$ = the current equilibrium price of a dollar delivered at period 1 if and only if state s occurs.

The relationship in (3) is identical for the firm which is all-equity financed. The issuance of debt creates no agency problem when the debt matures at or prior to the expiration of the option to invest. Such is not the case when the debt

matures *after* the firm's investment option expires. The debtholders are unable to exercise the option when $V(s) - I < P$ even if $V(s) \geq I$. The value of the firm shrinks, because debtholders recognize the incentive problem and discount it accordingly in the current price at which they purchase the debt. Equityholders bear the full consequences of the agency problem. Consequently, the value of the firm can be expressed as

$$V' = V'_D + V_M = \int_{s_b}^{\infty} q(s)P ds + \int_{s_b}^{\infty} q(s)[V(s) - (I + P)]\, ds$$

$$= \int_{s_b}^{\infty} q(s)[V(s) - I]\, ds \quad (4)$$

Accordingly, the agency costs of debt can be given as

$$V - V' = \int_{s_a}^{s_b} q(s)[V(s) - I]\, ds \quad (5)$$

The Myers' agency problem, despite its similarity to the one identified by Bodie and Taggart, cannot be eliminated through the issuance of debt with a conventional call provision. This is because the debt itself is entirely supported, and issued against, the growth opportunity. This is a phenomenon not readily observed in the real world, and hence it begs a solution which is not readily observable. One feasible solution is to issue callable debt with a stochastic call price conditioned on the profitability of the investment opportunity. Suppose that the debt contract is written with the provision that the debt be called when $V(s) - I < P$ at a call price $\max[0, \alpha(V(s) - I)]$, where $0 < \alpha < 1$. Or alternatively, the debt is callable at $\alpha(V(s) - I)$ when $V(s) - I < P$ but $V(s) > I$. This call strategy can fully restore the value of the firm.[10] The call provision aligns the interests of both bondholders and stockholders in terms of following the optimal investment strategy. Consequently, the value of the firm can be expressed as

$$V = V''_D + V'_M = \int_{s_a}^{s_b} q(s)\alpha[V(s) - I]\, ds + \int_{s_b}^{\infty} q(s)\, P ds$$

$$+ \int_{s_a}^{s_b} q(s)(1 - \alpha)[V(s) - I]\, ds + \int_{s_b}^{\infty} q(s)[V(s) - (I + P)]\, ds$$

$$= \int_{s_a}^{\infty} q(s)[V(s) - I]\, ds \quad (6)$$

Notice that (3) and (6) are identical, indicating that the call provision, by raising V'_D V''_D and V_M to V'_M, has fully restored the value of the firm.

[10] Recall that this case is unlike that of Bodie and Taggart [2] who are unable to obtain the general result which fully restores the value of the firm. The Myers' problem can also be solved through the use of convertible or "puttable" bonds. Puttable bonds (see Boyce and Kalotay [3]) are issued by the U.S. Government (e.g., E and H Savings Bonds), but are still unobserved in the private sector.

By now it should also be obvious that, once again, shortening the maturity of the debt accomplishes the same task as the call strategy. If the debt matures prior to the exercise of the investment option, the agency problem disappears. The strategy then must be to roll over short maturity debt claims.

Both Bodie-Taggart and Myers recognize that shortening the maturity of the debt can overcome the incentive problem associated with future investment opportunities. However, they conjecture that firms issue long-term debt so as to avoid costs associated with the issuance of short-term debt. The implication is that firms prefer long-term debt to short-term debt. Bodie and Taggart admit that their paper does not provide a rationale for such a preference, but Myers undermines short-term maturity stating that "this [a policy of rolling over short term maturity] seems to be a good solution, but that there are costs of maintaining such a continuous, intimate and flexible relationship" (Myers [18], p. 159).[11]

V. Conclusion

Market imperfections in the form of agency costs of debt are introduced in this paper to explain the existence of complex financial instruments. Two areas of complexities are discussed in detail: the call provision and the maturity structure of debt. We rationalize their existence as mechanisms to solve agency problems associated with informational asymmetry, managerial (stockholder) risk incentives, and foregone growth opportunities. We also demonstrate that both features of corporate debt serve identical purposes in solving agency problems. Complex financial instruments are required because markets fail to provide complete and costless solutions to the agency problems discussed above.

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[11] The existence of preferred maturity structure can be explained by a tradeoff between agency costs which are an increasing function of the quantity of long-term bonds and transaction (floatation) costs which are a decreasing function of this quantity. It is often suggested in the literature, however, that differential transaction costs alone rationalize the existence of preferred maturity. We find this view to be inconsistent with equilibrium in the bond market because it ignores the possibility that in equilibrium bonds of different maturity ar' priced to yield differentially so as to reflect the transaction cost differential.

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