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The Effects of a Firm's Investment and Financing Decisions on the Welfare of its Security Holders

By EUGENE F. FAMA*

In their classic article, Franco Modigliani and Merton H. Miller showed that in a perfect capital market, and given some other peripheral assumptions, the financing decisions of a firm are of no consequence. Substantial controversy followed, centered in large part on which of the peripheral assumptions are important to the validity of the theorem. For example, Joseph Stiglitz (1969, 1974) argues that in addition to a perfect market, the critical assumption is that bonds issued by individuals and firms are free of default risk. However, in chapter 4 of our book, Miller and I show that the theorem holds when debt is risky as long as stockholders and bondholders protect themselves from one another with what Fama and Miller (hereafter noted F-M) call "me-first rules."

This paper shows that me-first rules are also unnecessary. Propositions about the irrelevance of the financing decisions of firms can be built either on the assumption that investors and firms have equal access to the capital market or on the assumption that no firm issues securities for which there are not perfect substitutes from other firms. With either approach one can show that if the capital market is perfect, then (a) a firm's financing decisions have no effect on its market value, and (b) its financing decisions are of no consequence to its security holders.

The paper begins with a review of existing capital structure theorems, focusing on the

work of Stiglitz and F-M. The discussion of old results has two purposes. The literature in this area has tended to become increasingly mathematical. One of the goals here is to show that the capital structure propositions in fact rest on simple economic arguments. Examining previous results also helps put the new results to be presented into perspective.

Finally, F-M and Stiglitz (1972) note that when firms can issue risky debt, the market value rule for the investment decisions of firms is ambiguous. With risky debt, maximizing stockholder wealth, bondholder wealth, or the combined wealth of bondholders and stockholders can imply three different investment decisions. Stiglitz argues that firms are likely to maximize stockholder wealth, even though this might be less economically efficient than maximizing combined stockholder and bondholder wealth. Miller and I leave the issue unresolved. I argue here that maximizing combined stockholder and bondholder wealth is the only market value rule consistent with a stable equilibrium, and that in its capacity as price setter the market can provide incentives for firms to choose this rule.

I. Arbitrage Proofs of the Market Value Proposition

Much of the early literature is concerned with the proposition that the market value of a firm is unaffected by its financing decisions, and most of the early proofs use arbitrage arguments. The general idea is that if the financing decisions of a firm affect its market value, there are arbitrage opportunities that can be used to produce costless instantaneous increases in wealth. Since the existence of such opportunities is inconsistent with equilibrium in a perfect

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capital market, one can conclude that the market value of a firm is unaffected by its financing decisions. Examples of this approach are the original "risk class" model of Modigliani and Miller and the "states of the world" model of Jack Hirshleifer (1965, 1966).

In all of the arbitrage proofs of the market value proposition, there are five common assumptions:

Assumption 1: Perfect Capital Market. There are no transactions costs to investors and firms when they issue or trade securities; bankruptcy likewise involves no costs; there are no taxes; and there are no costs in keeping a firm's management to the decision rules set by its security holders. The perfect capital market assumption is maintained throughout the paper. Thus, I shall not discuss the interesting problems that arise from the differential treatment of corporate dividend and interest payments in computing corporate taxes, or the problems that arise from the differential treatment of dividends and capital gains in computing personal taxes. Nor shall I discuss any effects of bankruptcy costs or managerial agency costs on the nature of optimal investment and financing decisions by firms.

Assumption 2: Equal Access. Individuals and firms have equal access to the capital market. This means that the types of securities that can be issued by firms can be issued by investors on personal account. For example, suppose an investor owns the same proportion of each of a firm's securities, so that he has a direct share in the firm's activities. Equal access implies that, using the firm's securities as exclusive collateral, the investor can issue the same sort of securities as the firm. If firms can issue securities that contain limited liability provisions, such provisions can also be included in securities issued by investors against their holdings in firms. Moreover, the prices of securities are determined by the characteristics of their payoff streams and not by whether they are issued by investors or firms. Equal access

could logically be included as a characteristic of a perfect capital market, but it plays such an important role in capital structure propositions that it is stated separately.

Assumption 3: Complete Agreement or Homogeneous Expectations. Any information available is costlessly available to all market agents (investors and firms), and all agents correctly assess the implications of the information for the future prospects of firms and securities. For most of what we do, it would be sufficient to assume that all market agents can correctly determine when securities issued by different investors and firms are perfect substitutes, but it seems at best a short step from this to complete agreement. A perfect capital market could be taken to imply complete agreement, but it is common in the literature to state the two as separate assumptions.

Assumption 4: Only Wealth Counts. Aside from effects on security holder wealth, the financing decisions of a firm do not affect the characteristics of the portfolio opportunities available to investors. Thus the effects of a firm's financing decisions on the welfare of its security holders can be equated with effects on security holder wealth. This assumption is only precise in the context of models that say which characteristics of portfolio opportunities are of concern to investors. We need not be so specific. For our purposes it is sufficient to assume that the capital market satisfies whatever conditions are necessary to ensure the desired correspondence between wealth and welfare. Moreover, we shall see that one of the contributions of more recent treatments of capital structure propositions is to show that this assumption is unnecessary.

Assumption 5: Given Investment Strategies. To focus on the effects of a firm's financing decisions on the welfare of its security holders, all proofs of capital structure propositions take the investment strategies of firms as given. Although decisions to be made in the future are unknown, the rules

that firms use to make current and future investment decisions are given. In addition, investment decisions are made independently of how the decisions are financed. In the last section of the paper, we consider the nature of optimal investment strategies for firms.

Stiglitz (1974, Theorem 2) gives the most general arbitrage proof that Assumptions 1-5 imply that the market value of a firm is unaffected by its financing decisions. Suppose there is an optimal capital structure for the firm, but the firm does not choose this capital structure. Any investor can provide the optimal capital structure to the market by buying equal proportions of the firm's securities and then issuing the optimal proportions on personal account. If the market value of the firm were less than the value implied by an optimal capital structure, by providing the optimal capital structure to the market, the investor could earn an arbitrage profit. Since every investor has an incentive to exploit such opportunities and since exploitation is costless, their existence is inconsistent with a market equilibrium. In equilibrium, the market value of a firm is always the value implied by an optimal capital structure, irrespective of the capital structure chosen by the firm. Thus, at least with respect to its effects on the firm's market value, any choice of capital structure by the firm is as good as any other.

II. Market Value and Security Holder Indifference

In the fourth chapter of our book, Miller and I show that the absence of a relationship between a firm's market value and its financing decisions does not in itself imply that the financing decisions are of no consequence to the firm's security holders. When the firm can issue risky debt, it may be able to use its financing decisions to shift wealth from its bondholders to its stockholders or vice versa.

To illustrate, assume a discrete time world in which the firm can issue two general types of securities, bonds and common

stock. Given a perfect capital market and a market where the financing decisions of a firm do not affect the important characteristics of the portfolio opportunities available to investors, there is nothing the firm can do with its financing decisions at time t that will help or hurt investors who buy the firm's securities at time t . Thus it suffices to examine the effects of the firm's financing decisions at t on the wealths of investors who have held its securities from $t - 1$.

Let $S_{t-1}(t)$ and $B_{t-1}(t)$ be the market values at time t of the firm's common stock and bonds outstanding from $t - 1$. The combined value of these old stocks and bonds at t is the market value of the firm $V(t)$, less the value of new bonds issued at t , $b(t)$, less the market value of new common stock $s(t)$:

$$(1) \quad S_{t-1}(t) + B_{t-1}(t) = V(t) - b(t) - s(t)$$

The firm also makes dividend and interest payments at t , and we assume these are made only on securities outstanding from $t - 1$. Total dividend payments $D(t)$ and interest payments $R(t)$ are defined by

$$(2) \quad D(t) + R(t) = X(t) - I(t) + b(t) + s(t)$$

where $X(t)$ is net cash income at t (cash revenues minus cash costs), and $I(t)$ is the cash outlay for investment. Adding (1) and (2), the total wealth at time t associated with common stock and bonds outstanding from $t - 1$ is

$$(3) \quad [D(t) + S_{t-1}(t)] + [R(t) + B_{t-1}(t)] = X(t) - I(t) + V(t)$$

Since all capital structure propositions take the firm's investment strategy as given, $I(t)$ does not depend on financing decisions at t . The net cash earnings $X(t)$ are the result of past investment decisions and so are independent of financing decisions at t . Assumptions 1-5 ensure that the value of the firm $V(t)$ is unaffected by its financing decisions. Since $X(t)$, $I(t)$, and $V(t)$ are all independent of financing decisions at t , we can conclude from (3) that the combined

wealth of old bondholders and stockholders at time t is independent of the firm's financing decisions at t .

However, there might be financing decisions that the firm can make at time t that change the nature of the claims represented by the bonds outstanding from $t - 1$ and so shift wealth from bondholders to stockholders or vice versa. For example, suppose the firm's old bonds are free of default risk if no new debt is issued, but the firm can issue new debt that has the effect of imposing default risk on the old bonds. The new debt thus brings about a change in the characteristics of the old debt which we would expect to lead to a lower value of $B_{t-1}(t)$. Since the combined wealth of the old bonds and stocks is independent of the financing decision, issuing the new debt has the effect of shifting wealth from the old bondholders to the old stockholders. Alternatively, suppose the old debt is already subject to default risk, and at time t the firm retires some of it but not the entire amount. In the event of bankruptcy at a future date, each of the remaining bonds recovers more than if some of the old bonds are not retired at t . When a firm announces such a financing decision at t , we would expect the value $B_{t-1}(t)$ of all the old bonds to be higher than when no retirement takes place. Thus given constant total wealth, the financing decision implies a shift of wealth from the old stockholders to the old bondholders. In short, the fact that the market value of a firm is independent of its financing decisions does not necessarily imply that the financing decisions are a matter of indifference to the firm's security holders.

Given the world of Assumptions 1-5, the indifference proposition will hold if we restrict the types of securities that can be issued by firms so as to guarantee that the characteristics of the payoffs on the firm's old bonds are unaffected by its financing decisions at t . One way to accomplish this is to assume that all debt is free of default risk, which is the approach taken by Stiglitz (1969, 1974). In chapter 4 of our book, however, Miller and I show that the desired result is obtained when investors protect

themselves with me-first rules. For example, bondholders insist that any new debt issued is junior to existing debt—in the event of bankruptcy, older bonds are paid off before newer bonds. The stockholders in their turn insist that the firm does not use its financing decisions to improve the positions of any bondholders. For example, if the firm wants to retire debt before its maturity, junior issues must be retired before senior issues, and any issues retired must be retired in full. We formalize these statements with a new assumption.

Assumption 6: A firm's stockholders and bondholders protect themselves from one another with costlessly enforced me-first rules which ensure that the characteristics of the payoffs on the firm's outstanding bonds are unaffected by changes in its capital structure.

In sum, Assumptions 1-5 are sufficient to conclude that the market value of a firm is unaffected by its financing decisions. Risk-free debt or the me-first rules of Assumption 6 then lead to the somewhat stronger conclusion that the financing decisions of the firm are a matter of indifference to all of its security holders.

III. The Irrelevance of a Firm's Dividend Decisions

A firm's dividend decision at any time t is part of its financing decision. The preceding analysis implies that when a firm's securities are protected by me-first rules, the firm's dividend decision at t determines how the wealth of its shareholders is split between $D(t)$ and $S_{t-1}(t)$, but the sum of the two components of shareholder wealth is unaffected by the dividend decision. In short, dividend decisions are a matter of indifference to the firm's security holders whenever financing decisions are a matter of indifference.

However, dividend decisions can be a matter of indifference even when other aspects of the firm's financing decisions are of some consequence. Consider a world

where the market value of a firm $V(t)$ is unaffected by its financing decisions, but the firm has risky debt outstanding which is not protected by me-first rules. By issuing more or less new bonds $b(t)$ at time t , the firm can affect the value of its old bonds $B_{t-1}(t)$, which in turn affects the split of wealth between its old bonds and its old stock. Any such effects on the wealths of old bonds and stocks are, however, due entirely to the choice of $b(t)$. Since the firm can issue more or less new stock $s(t)$ at time t , we can see from equation (2) that the choice of $b(t)$ need not affect the decision about the dividend $D(t)$. We can see from equations (1) to (3) that given any decision about $b(t)$ and its implication for $B_{t-1}(t)$, the dividend decision again just affects the split of shareholder wealth between dividends and capital value.

Keep in mind that we are taking the investment strategy of the firm as given. For example, if a firm that has risky bonds outstanding unexpectedly increases its dividend by selling off assets, there is a shift in wealth from bondholders to stockholders. However, the shift should be attributed to the investment decision, the sale of assets, rather than to the dividend decision since the same shift of wealth takes place, but in the form of a capital gain instead of a dividend, if the firm announces that the proceeds from the sale of assets will be used to repurchase shares.

IV. Dropping the "Only Wealth Counts" Assumption

Beginning with Modigliani and Miller, proofs of capital structure propositions generally include the Assumption 4 that aside from effects on security holder wealth, the financing decisions of firms do not affect the characteristics of the portfolio opportunities available to investors. Thus, the effects of financing decisions on security holder welfare can be evaluated in terms of their effects on security holder wealth. An exception to this approach is Stiglitz (1969, 1974) who shows that assumptions that lead to capital structure propositions also imply

a world where the portfolio opportunities facing investors are unaffected by the financing decisions of firms. Formally:

THEOREM 1: *Suppose the capital market is perfect in the sense of Assumption 1, the equal access and complete agreement provisions, Assumptions 2 and 3, hold, the investment strategies of firms are given in the sense of Assumption 5, and debt is either free of default risk or investors insist on the me-first rules of Assumption 6. Then the characteristics of a general equilibrium, that is, the market values of firms, the positions that investors take in firms and the costs of these positions, are unaffected by the financing decisions of firms. Thus, the financing decisions of firms are of no consequence to investors.*

The intuition of the argument of Stiglitz' theorem is that when investors and firms have equal access to the capital market, the positions in firms that can be created and traded among investors are determined by the investment strategies of firms, and the possibilities are the same for any set of financing decisions by firms. Thus, the financing decisions of firms have no effect on the set of general equilibria that can be achieved in the capital market.

Moreover, once a general equilibrium has been achieved, implying an optimal set of holdings in firms by investors, there is no reason why changes in the financing decisions of firms should move the market to a different general equilibrium. When firms perturb a general equilibrium by changing their financing decisions, their actions neither expand nor contract the types of positions in firms that can be created by investors. It follows that an optimal response to the changes in the financing decisions of firms occurs when the general equilibrium remains unchanged. Specifically, the market responds by leaving the values of firms and their previously existing bonds unchanged. Investors respond by exactly reversing the changes in the financing decisions of firms on personal account so that the positions of investors in firms are unaffected by the changes in the financing decisions of firms.

The formal proof of Theorem 1 requires that changes in the financing decisions of firms can be reversed by investors on personal account. For this, the equal access Assumption 2 is required, but it is also assumed either that bonds are free of default risk (the assumption that Stiglitz (1974) uses in his proof of Theorem 1) or that investors insist on and costlessly enforce appropriate me-first rules (the extension of Stiglitz's analysis suggested by F-M). In the presence of risky bonds and in the absence of me-first rules, the firm can use changes in its financing decisions to, in effect, expropriate the positions of bondholders to the benefit of stockholders, or vice versa. And the expropriations cannot always be neutralized by investors on personal account.

For example, suppose the firm increases the dividend paid to stockholders at time t by issuing new bonds that have the same priority as the firm's old bonds in the event of bankruptcy. Even if the shareholders use the increase in dividends to repurchase the new bonds issued by the firm, things are not as they were. The new bonds are still outstanding, so that in the event of bankruptcy each of the old bonds gets less than if no new bonds are issued. By issuing new bonds that have equal priority with the old bonds, the firm has expropriated part of the holdings of the old bondholders to the benefit of its stockholders. Other examples, some involving expropriations of stockholder positions to the benefit of bondholders, are easily constructed.

V. Capital Structure Propositions without Me-First Rules

The assumptions that debt is free of default risk or security holders protect themselves with me-first rules are, however, arbitrary restrictions on the types of securities that can be issued. Some firms or investors may want to issue unprotected bonds, and, appropriately priced, other investors may be willing to hold them. It is now argued that such restrictions on investment opportunities are unnecessary, and this is the first new result of the paper.

THEOREM 2: *Suppose the capital market is perfect in the sense of Assumption 1, the equal access and complete agreement provisions, Assumptions 2 and 3, hold, and the investment strategies of firms are given in the sense of Assumption 5. Then the characteristics of a general equilibrium, that is, the market values of firms, the positions that investors take in firms and the costs of these positions, are unaffected by the financing decisions of firms. Thus, the financing decisions of firms are of no consequence to investors.*

To establish the theorem we return to time 0, the time when the first firms are organized and before they have issued any securities. The firms choose their investment strategies and then they go into the capital market for the resources to finance these investment strategies. At this point it is clear that given a perfect capital market and given equal access to the market by individuals and firms, the financing decisions of firms have no effect on the nature of a general equilibrium. The positions in firms that investors create and hold, the prices of these positions, and thus the market values of firms are independent of the financing decisions of firms.

If unprotected securities are issued at time 0, then when time 1 comes along firms may be able to use their financing decisions to affect the positions of their security holders. When they hold the securities of a firm that are not protected by me-first rules, investors would of course prefer that the firm not engage in financing decisions at time 1 that have the effect of expropriating their positions; or, they would rather that the firm expropriate to their benefit the positions of other investors. But all of this is irrelevant, once we reconsider how it happened that at time 0 some investors put themselves into positions that could be expropriated at time 1. In an equal access market, the financing decisions of firms affect neither the variety of securities that could be traded at time 0 nor the instruments that are chosen by investors. If the positions that investors want to hold in firms are not offered by the firms, investors

can buy up the securities of firms and create their desired positions in trades among themselves. Thus, the positions, protected and unprotected, that investors take in firms at time 0 are the same irrespective of the financing decisions of firms at time 0. If at time 1 some investors profit from or are hurt by unprotected positions taken at time 0, all of this happens to exactly the same extent for any set of financing decisions by firms at time 0.

Likewise, at time 1 firms cannot use their financing decisions to affect the positions in firms that investors choose to carry forward to time 2. Given an equal access market, investors can refinance any firm, buying equal proportions of all its securities, and then issuing preferred proportions on personal account. Thus the types and quantities of claims against firms that investors carry forward from time 1 to time 2 are independent of the financing decisions of firms at time 1. If expropriations take place at time 2 as a result of positions taken at time 1, the same investors are helped or hurt by these expropriations and to exactly the same extent when the unprotected securities are issued at time 1 by firms as when they are issued by investors in trades among themselves.

The arguments are general. When investors and firms have equal access to the capital market, at any point in time the positions that investors take in firms, the prices of these positions and thus the market values of firms are unaffected by the financing decisions of firms. Since the financial history of any investor—what happens to him in the market through time—is unaffected by the financing decisions of firms, the financing decisions of firms are of no consequence to investors.

In all versions of the capital structure propositions discussed so far, equal access to the capital market by investors and firms is assumed. However, the assumption is stronger when debt is neither free of default risk nor protected by me-first rules. One is likewise leaning harder on the complete agreement assumption. Investors must be able to specify the details of potentially ex-

propriative contracts in the same way as firms. If investors issue unprotected bonds against their holdings in firms, they subsequently expropriate (for example, issue more unprotected bonds) in the same circumstances as would the firms. This requires either that the conditions or states of the world in which expropriations will take place at any time t are stated explicitly in loan contracts or that investors make accurate assessments of the probabilities and extent of expropriations in different future states of the world. Probabilistically speaking, neither issuers nor purchasers of loan contracts are ever “fooled” by anything that happens during the life of a contract, and the price of a contract always properly reflects the possibilities for future expropriations.

I now show that the capital structure propositions can be established without the equal access assumption. The cost, however, is a new assumption which precludes a firm from issuing any securities monopolistically. In effect, we set up conditions that lead to a capital market which is perfectly competitive with respect to the financing decisions of a firm.

VI. Capital Structure Propositions without Equal Access

In Theorem 2, as in Theorem 1, the portfolio opportunities facing investors turn out to be independent of the financing decisions of firms. However, firms can still be monopolists in their investment decisions. A firm may have access to investment opportunities that allow it to create securities with payoff streams whose characteristics cannot be replicated by other firms. Nevertheless, when there is equal access to financial markets, investors can issue the same claims against their holdings in firms that the firms themselves can issue. As a consequence, once firms have chosen their investment strategies, there is nothing further they can do through their financing decisions to affect the opportunity set facing investors.

If this result is to hold when the equal ac-

cess assumption is dropped, we must restructure the world in such a way that the actions that investors (with equal access) take to free the investment opportunity set from any effects of financing decisions by firms, can be taken instead by firms. To accomplish this, firms are no longer allowed to issue securities for which there are not perfect substitutes issued by other firms. This implies that firms can no longer have monopolistic access to investment opportunities. Firms must also be given the motivation to act in the manner that leads to the validity of the capital structure propositions. In contrast, in an equal access world, once firms choose their investment strategies, what then happens when they get themselves to the capital market is beyond their control.

The specific new assumptions are:

Assumption 7: No firm produces any security monopolistically. There are always perfect substitutes issued by other firms. Moreover, if a firm shifts its capital structure, substituting some types of securities for others, its actions can be exactly offset by other firms who carry out the reverse shift, with the result that aggregate quantities of each type of security are unchanged.

Assumption 8: The goal of a firm in its financing decisions is to maximize its total market value at whatever prices for securities it sees in the market. Since firms are shown to be perfectly competitive in the capital market, the assumption is unobjectionable.

The arguments in the proof of the theorem that follows are similar to those used by the author and Arthur Laffer in discussing sufficient conditions for perfect competition in product markets in a world of perfect certainty. Also relevant are papers by the author (1972) and Fischer Black and Myron Scholes.

THEOREM 3: *Suppose the capital market is perfect in the sense of Assumption 1, the complete agreement assumption, Assumption*

3, holds, the investment strategies of firms are given in the sense of Assumption 5, and Assumptions 7 and 8 also hold. Then given a general equilibrium in the capital market at any time t : (a) The market value of a firm is unaffected by changes in its financing decisions; (b) the financing decisions of a firm are of no consequence to investors; that is, the firm's financing decisions do not affect what happens to any investor through time; and (c) the capital market is perfectly competitive in the sense that aggregate supplies and prices of different types of securities are unaffected by changes in the financing decisions of a firm.

Consider first the case where debt is free of default risk or investors protect themselves from one another with the me-first rules of Assumption 6. Suppose the capital market achieves a general equilibrium at time t and then, for whatever reason, some firm perturbs the equilibrium by changing its capital structure.

In the original equilibrium, firms, including the firm that subsequently shifts, chose securities so as to maximize their market values at the original equilibrium values of security prices. This means that at the original prices, the new securities that the shifting firm issues had exactly the same market value as the securities it no longer issues. It also means that the market can achieve a "new" general equilibrium if other firms instantly respond to the disturbance of the initial equilibrium by exactly offsetting the change in the shifting firm's capital structure, and if the prices of securities remain at their old equilibrium values. When this happens, the market value of any firm is the same as it was in the old general equilibrium, and firms have no further incentives to change their capital structures. In addition, since debt is assumed to be either free of default risk or securities are protected by me-first rules, the wealths of individual investors are the same in the new general equilibrium as in the old. Since the aggregate supplies and prices of different securities are unchanged, each investor can choose a portfolio identical to the one

chosen in the initial general equilibrium; just the names of the firms issuing particular types of securities may be different. In short, with *me-first* rules and the perfectly competitive capital market produced by the offsetting financing decisions of other firms, investors are completely immunized from any effects of shifts in the financing decisions of any firm.

The same analysis applies in the absence of *me-first* rules, once we understand the restrictions implied by the perfect substitutes Assumption 7. In particular, the fact that different firms issue securities at time $t - 1$ that are perfect substitutes does not imply that these firms make the same financing decisions at time t . However, if unprotected securities issued by different firms at $t - 1$ are perfect substitutes, any expropriations that take place at time t must be the same for all of these firms. It follows that if a firm issues unprotected securities at any time $t - 1$, the expropriations that take place in any given state of the world at time t must be the same for all financing decisions that the firm might make in that state at t .

Suppose now that time t comes along, the state of the world is known, firms make their financing decisions, and a general equilibrium set of securities prices and values of firms is determined. Some firm then perturbs the general equilibrium by shifting its capital structure. Given what was said above, even though the firm may have unprotected securities in its capital structure, the shift cannot cause expropriations of security holder positions beyond those associated with the firm's original financing decisions at t . Thus, just as in the case where debt is risk free or securities are protected by *me-first* rules, the market can regain a general equilibrium if other firms exactly offset the change in the shifting firm's capital structure, leaving aggregate supplies and prices of different securities unchanged. Since no new expropriations take place, the wealths of investors are also unchanged, and each investor can choose a portfolio identical to the one chosen in the initial general equilibrium.

In the initial general equilibrium that follows the occurrence of a state of the world at time t , the positions of a firm's security holders are, of course, affected by any expropriative financing decisions. But in the world of the complete agreement Assumption 3, investors properly assessed the possibilities for future expropriations when they decided to hold the firm's securities at time $t - 1$, and these possibilities were properly reflected in the prices of the securities at $t - 1$. If the firm hadn't issued these potentially expropriative securities, its security holders would have purchased perfect substitutes from other firms. Thus the financing decisions of any firm are of no consequence to any investor in the sense that what happens to any investor through time happens irrespective of the financing decisions of any particular firm.

VII. Some Perspective on Capital Structure Propositions

Given a perfect capital market, and given the investment strategies of firms, there are two approaches that lead to the conclusions that the market value of a firm is unaffected by its financing decisions, and a firm's financing decisions are of no consequence to its security holders. One approach is based on the assumption that investors and firms have equal access to the capital market. The other assumes that no firm offers securities to the market for which there are not perfect substitutes from other firms. The fundamental argument in both approaches is that, given the investment strategies of firms, there are mechanisms that insulate the opportunity set facing investors from any effects of the financing decisions of firms. With the equal access assumption, the offsetting actions that produce this result can come from investors or firms, while in the perfect substitutes approach, changes in the financing decisions of a firm are offset by other firms.

The types of capital structure propositions obtained with the two approaches are somewhat different. With equal access one gets statements about the effects of the

financing decisions of all firms. When investors and firms have equal access to the capital market, then given the investment strategies of firms, the positions in firms that can be traded among investors are independent of the financing decisions of firms. As a consequence, the characteristics of a general equilibrium in the capital market are unaffected by the financing decisions of firms. In contrast, with the perfect substitutes approach, only firms issue securities so one can't conclude that the characteristics of a general equilibrium are independent of the financing decisions of all firms. One is limited to partial equilibrium statements about the irrelevance of the financing decisions of any individual firm.

The analysis here goes beyond earlier treatments in several respects. First, although earlier approaches generally use both assumptions in one form or another, it is evident from the work of Stiglitz (1969, 1974) that in an equal access market, the validity of the capital structure propositions does not also require the perfect substitutes assumption. However, Stiglitz argues that it is necessary to assume debt is risk free if the financing decisions of firms are to be a matter of indifference to security holders. The analysis here shows that in an equal access market, even the *me-first* rules of F-M are unnecessary restrictions on the types of securities that can be issued. In essence, in an equal access market investors can and will choose the same positions, protected and unprotected, irrespective of the financing decisions of firms. Thus, the fact that firms might issue unprotected securities does not invalidate the proposition that the financing decisions of firms are a matter of indifference to investors.

In a recent paper, Frank Milne argues that with the perfect substitutes assumption, the proposition that the market value of a firm is independent of its financing decisions does not also require the equal access assumption. However, Milne's framework is less general than that examined here. First, he allows unrestricted short selling of all securities, an assumption close to equal access. To emphasize the power of

the perfect substitutes assumption, in the analysis presented here securities are only issued by firms. Second, Milne assumes that the capital market is perfectly competitive, whereas we show how the actions of firms lead to a world where the total supplies and prices of securities of different types are unaffected by the financing decisions of any individual firm. Showing how the existence of perfect substitutes leads to such a strong form of perfect competition seems a substantial enrichment of the analysis. Finally, Milne works in a one-period context and investors do not come into the period already holding the securities of firms. In this world, the analytical difficulties that arise from potential expropriations of security holder positions never have to be faced. In contrast, I analyze the capital structure propositions in a multiperiod framework where firms are allowed to issue unprotected securities. It is shown that with the strong form of perfect competition in the capital market that arises from the perfect substitutes assumption, the financial history of any investor, that is, the protected and unprotected portfolio positions that he takes through time, are unaffected by the financing decisions of any individual firm.

Many have quarreled with the realism of the equal access assumption. (See, for example, the comments of David Durand on the Modigliani and Miller paper.) One can certainly also quarrel with the perfect substitutes assumption. It would seem that if for any securities issued by a firm there are perfect substitutes issued by other firms, then either there exist risk classes of firms in the sense of Modigliani and Miller (that is, there are classes of firms wherein the net cash flows of different firms are perfectly correlated) or the markets for contingent claims discussed by Hirshleifer cover all possible future states of the world. The existence of such risk classes or of complete markets for contingent claims is questionable.

In economics, however, formal propositions never provide pictures of the world that are realistic in all their details. The role of such propositions is to pinpoint the fac-

tors that can lead to certain kinds of results. In this view, the analysis of capital structure propositions suggests two factors that push the capital market toward equilibria where the market values of firms are independent of their financing decisions, and where the financing decisions of firms are of no consequence to their security holders. The first factor covers any possibilities investors have to issue claims against the securities of firms that they hold. The second is the natural incentive of firms to provide the types of securities desired by investors, and the ability of firms to provide securities that are close substitutes for those of other firms. In pure form, and in combination with a perfect capital market where contracts are costlessly written and enforced, either of these factors leads to irrelevance of capital structure propositions. In less pure form, but perhaps acting together, they are factors that help to push the market in the direction of the capital structure propositions.

VIII. The Market Value Rule for Investment Decisions

The previous sections discuss the financing decisions of firms, given their investment strategies. I turn now to problems that arise in determining an optimal investment strategy when the capital market is perfect and when a firm can affect the portfolio opportunities facing its security holders only through the effects its investment decisions have on the wealths of its security holders. All other characteristics of portfolio opportunities are assumed to be unaffected by the investment and financing decisions of the firm.

Given that the investment decisions of a firm only affect the wealths of its security holders, the objectives of the security holders are clear. More wealth is better than less. In chapter 4 of our book, however, Miller and I point out that the "maximize securityholder wealth" rule can be ambiguous when the firm has risky debt. The firm might be able to use its investment decisions to make its previously issued bonds more or less risky and so to shift

wealth from bondholders to stockholders or vice versa. One can easily construct examples where the rules "maximize stockholder wealth," "maximize bondholder wealth," and "maximize combined stockholder-bondholder wealth" all lead to different investment decisions.

A. *The Pressure of Possible Takeovers*

We can apply the argument of Ronald Coase to show that of the three market value rules, only the rule maximize combined stockholder-bondholder wealth is consistent with a stable capital market equilibrium. Note first that when the capital market is perfect and when the characteristics of portfolio opportunities are independent of the actions of any individual firm, there is nothing the firm can do with its investment decision at t to help or hurt investors who buy its securities at t . Thus it suffices to examine the effects of the firm's investment decision at t on investors who have held its securities from $t - 1$.

From equation (3), the combined wealth at time t of the firm's bonds and stocks outstanding from $t - 1$ is $X(t) + V(t) - I(t)$. Since net cash earnings $X(t)$ are assumed to result from past decisions, they are unaffected by the investment decision at t . Thus maximum combined stockholder-bondholder wealth implies maximizing $V(t) - I(t)$, the excess of the market value of the firm at t over the investment outlays needed to generate that market value.

Suppose the firm is controlled by its stockholders, and they choose the rule maximize stockholder wealth. It will pay for the firm's bondholders to buy out the stockholders, paying them the value their shares would have under the rule maximize stockholder wealth. If the bondholders then maximize $V(t) - I(t)$, we can see from (3) that their wealth is larger than if they had allowed the shareholders to proceed with the investment rule maximize stockholder wealth. The same arguments apply, but with the roles of the stockholders and bondholders reversed, when the firm is initially controlled by its bondholders who

wish to follow the rule maximize bondholder wealth. Alternatively, if the firm announces an investment rule other than "maximize $V(t) - I(t)$," it pays for outsiders to buy up the firm's securities and then to switch to the rule maximize $V(t) - I(t)$. The outsiders can even afford to pay a premium for the firm as long as it is no greater than the difference between the maximum value of $V(t) - I(t)$ and the value of $V(t) - I(t)$ under the investment policy chosen by the firm.

B. The Pressures Applied by the Market in its Capacity as Price Setter

Potential takeovers are not the only pressure pushing the firm toward the investment rule maximize $V(t) - I(t)$. In its role as price setter, the market has an additional way to motivate the firm to maximize the total wealth of its security holders.

Consider the firm's bondholders. When the firm issues bonds, the price of a given promised stream of payments depends on the investment strategy that the market perceives the firm to follow. If the firm in fact follows this strategy, the investment strategy is of no consequence to the bondholders. If they had the choice again, with the same uncertainties about the future, they would choose to hold the firm's bonds or perfect substitutes for them. In a capital market where the investment and financing decisions of a firm do not affect the portfolio opportunities facing investors, such perfect substitutes exist or they can be created from the securities of other firms. Since the market for shares is likewise a market of perfect substitutes, given that a firm sticks to the investment strategy that investors perceive it to follow, the choice of strategy is of no consequence to those who purchase its shares when it is an ongoing firm. In this situation, the choice of an investment strategy by the firm affects only the firm's original shareholders or organizers, those who own the rights to its investment opportunities before any securities are issued.

Let us return, then, to the point, call it

time 0, when the firm is organized. The firm wishes to choose the investment strategy that maximizes the wealth of its organizers. The wealth of the organizers is $V(0) - I(0)$, the difference between the value of the firm and the investment outlays necessary at time 0 to generate that value. Thus the optimal investment decision at time 0 is to maximize $V(0) - I(0)$.

The value of the firm $V(0)$ depends also on the investment strategy the market thinks the firm will follow at time 1. Since the wealth at time 1 of securities outstanding from time 0 is $X(1) + V(1) - I(1)$, the value of the firm at time 0 is just the market value at time 0 of the distribution of $X(1) + V(1) - I(1)$. The earnings $X(1)$ observed at time 1 are a consequence of the investment decision taken at time 0. In every possible state of the world at time 1, the policy "maximize $V(1) - I(1)$ " obviously produces as large a value of $V(1) - I(1)$ as any other investment strategy. It follows that if the firm's statements about investment policy are accepted by the market, the announcement at time 0 that the firm will maximize $V(1) - I(1)$ at time 1 maximizes the contribution of the investment decision at time 1 to $V(0)$ and thus to $V(0) - I(0)$.

Since the market value of the firm at time 1 is just the market value of the distribution of $X(2) + V(2) - I(2)$, $V(1)$ and thus $V(1) - I(1)$ depend in turn on the investment strategy that will be followed at time 2. Arguments analogous to those above imply that the announcement, at time 0, that the firm will maximize $V(1) - I(1)$ at time 1 implies the announcement, at time 0, that it will maximize $V(2) - I(2)$ at time 2. In short, to maximize $V(0) - I(0)$, the wealth of its organizers at time 0, the firm must convince the market that its investment strategy in each future period will likewise be maximize $V(t) - I(t)$. If the firm sticks to this strategy, this means that at any time t it chooses the investment decisions that maximize the combined wealth of bonds and stocks outstanding from $t - 1$.

Using the analysis of "agency costs" provided by Michael Jensen and William

Meckling one can argue that the essence of the potential problems surrounding conflicting stockholder-bondholder interests is that once time 0 passes it will be difficult for the stockholders to resist the temptation to try to carry out an unexpected shift from the rule maximize $V(t) - I(t)$ to the rule maximize stockholder wealth. But the market has the means to motivate firms to stay in line. To maximize $V(0) - I(0)$, the wealth of its organizers, the firm must convince the market that it will always follow the investment strategy maximize $V(t) - I(t)$. The market realizes that the firm might later try to shift to another strategy and it will take this into account in setting $V(0)$. To get the market to set $V(0)$ at the value appropriate to the strategy maximize $V(t) - I(t)$, the firm will have to find some way to guarantee that it will stay with this strategy.

The important point is that the onus of providing this guarantee falls on the firm. In pricing a firm's securities, a well-functioning market will, on average, appropriately charge the firm in advance for future departures from currently declared decision rules. The firm can only avoid these discounts in the prices of its securities to the extent that it can provide concrete assurances of its forthrightness. Thus, firms have clear-cut incentives to evolve mechanisms to assure the market that statements of policy can be taken at face value, and they have incentives to provide these assurances at lowest possible cost. In a multiperiod world, this might not be so difficult since firms continually have opportunities to behave in ways that reinforce their credibility.

Remember also that if the firm does not follow the strategy maximize $V(t) - I(t)$, it pays for outsiders to acquire the firm and then switch to this strategy. The outsiders are then in the position of the firm's organizers. That is, the firm will not be priced at the value implied by the strategy maximize $V(t) - I(t)$ unless the market is convinced that the firm will adhere to this strategy in future periods. If other forms of assurance prove difficult or costly, one possibility is to finance the firm entirely with equity, or more generally, never to issue risky debt. Then the rules maximize

stockholder wealth and maximize $V(t) - I(t)$ coincide.

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