On the Irrelevance of Corporate Financial Policy

By Joseph E. Stiglitz

This paper extends to a multiperiod model, the argument of Franco Modigliani and Merton Miller and the author (1969) that the financial policy of the firm is of no consequence. In doing so, we are able to consider a much wider class of financial policies: not only does the firm choose a debt-equity ratio, but it also selects a dividend-retention ratio and a maturity structure of debt, and it may even decide on holdings of assets (securities) in other firms. I wish to show, in the context of a general equilibrium model, that none of these policies has an effect on the valuation of the firm, under certain seemingly weak circumstances. Whether these assumptions are "realistic" or not is a question of some debate, about which I shall have a few words to say later. But by clarifying the assumptions, I hope at least to focus the discussion on the relevant issues.

The question of the effect of firm financial policy on the valuation of the firm is obviously of central concern to students of corporate finance; if the conditions under which the "irrelevance" theorems obtain are deemed realistic, it robs them of much of their stock in trade. But the question of the irrelevance of financial policy is of far greater significance.

We can divide the decisions of the firm into four groups:

(a) How should the firm finance its investment?
(b) How should the firm distribute its revenue?
(c) How much should the firm invest?
(d) Which projects should the firm undertake (or what techniques of production should the firm employ)?

The first two decisions of the firm are the financial decisions of the firm, the latter two the real decisions. The theory of corporate finance focuses on the financial decisions. The two financial decisions are closely related (see below), and so are the two real decisions. What is not obvious is the relationship between the real decisions and the financial decisions. An answer to this question requires an analysis of the relationship between corporations and the household sector of the economy, and to further our understanding of this relationship is a primary object of this paper. If the hypothesis that the financial policy of the firm makes no difference to the firm's market valuation is correct, it also means that if firms maximize their market value, the real decisions are the only decisions that count, and the financial decisions have no bearing on them. In particular, it means that analyses of the real sector based on "flow of funds analysis"—and conclusions such as that of Nicholas Kaldor that because the flow of funds from the household sector to the corporate sec-
tor is very small, the decisions of households with respect to savings are of relatively little significance in the determination of the equilibrium of the economy—are not likely to give us much insight into what is really going on: at best they provide us with some spurious correlations. Moreover, if the maturity structure of debt is of no consequence, it casts some doubt about the validity of the partial equilibrium models attempting to relate the maturity structure to the term structure of interest rates (see, for instance, my 1970 paper).

In the literature, two different but closely related propositions have been confused: they both assert that the financial policy of the firm has no affect on its valuation. One asserts, however, that the individual is indifferent to alternative financial policies, in particular to debt-equity ratios, and hence there is no determinate debt-equity ratio for the economy as a whole. That is to say, any change in the financial policy of the firm can be completely offset by the actions of the stockholders (and indeed will be offset in the new general equilibrium situation).

The second proposition asserts that the individual may not be indifferent to alternative financial policies, that there may be for instance a determinate debt-equity ratio for the economy as a whole, but the financial policy of any particular firm makes no difference. The first asserts, in other words, the irrelevance of the financial structure for the entire economy, and therefore of the particular firm; the second only asserts the irrelevance of the financial structure of an individual firm. Clearly the former proposition is a much stronger one than the latter. We are concerned here with both kinds of propositions.

The paper will proceed as follows. In Section I, the basic model is set up. In Section II, I prove my fundamental theorem on the irrelevance of the firm's financial policy from the point of view of any individual. Section III will comment briefly on the assumptions made and their limitations. Section IV will show that financial policy need not be of concern to any particular firm, even if it is of concern to individuals, under much weaker conditions than those used to demonstrate the earlier proposition.

I. The Basic Model

A. Firms

The various financial decisions of the firm are very closely related. One of the interests in a multiperiod model is to explore these relationships. A decision to increase the amount to be distributed as dividends means that if the firm were to leave its investment decision unchanged, it would have to raise additional revenue to pay for the planned investment. If it raises more by issuing bonds, the amount left over for distribution next period will be decreased, and hence either retained earnings or dividends next period must be reduced. If it raises the revenue by issuing shares, it means the amount distributed to each shareholder next period (if retained earnings were unchanged next period) would be reduced. Thus, the interrelations among all the decisions are complex and any decision today may have ramifications for many periods into the future.

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1 E.g., the correlation between retained earnings and investment does not provide an explanation of the determination of the level of investment. See, for instance, John Meyer and Edwin Kuh.

2 The Modigliani-Miller theorem was really of the latter type: they show that if there are two or more firms of the same risk class (the same pattern of returns across the states of nature), then the debt-equity ratio of any particular firm is indeterminate. The author's theorem (1969) was of the former type.

3 The importance of these relationships has often been missed by even as astute students of the theory of corporate finance as William Baumol and Burton Malkiel, and Modigliani and Miller. In discussing the impact of taxation on the optimal financial policy of the firm, they observe that increasing the debt reduces the tax liability of the firm and hence increases its value.
For expositional simplicity, we shall use a "one-commodity" model; each period there is a single commodity input and a single commodity output (dollars or yen). We shall look at the consequences of alternative financial plans on the firm's market valuation, given a "real plan" of the firm. A real plan is characterized by a statement of the investment level and choice of technique in each period contingent on the state of nature (the set of events that have occurred up to that time). Thus, given the real plan, we know the level of profits in each period, depending of course, on the state of nature. Let

\[ I_i(t, \theta(t), k) = \text{the level of investment of the } i\text{th firm at time } t, \text{ if the state of nature at that date is } \theta(t), \text{ under plan } k. \]

\[ X_i(t, \theta(t), k) = \text{the output or gross profits of the } i\text{th firm at time } t, \text{ if the state of nature at that date is } \theta(t) \text{ under plan } k. \]

There are a number of alternative ways a firm may finance its investment:

(a) It can finance its investment with retained earnings or by issuing new securities.

(b) If it issues new securities, it can use a number of different financial instruments: common stock, bonds, preferred stock, convertible bonds, etc. Each of these financial instruments carries with it different contractual rights with respect to the distribution of the gross profits of the firm, and the part the owner of those instruments can play in the decision making of the firm. For instance, bonds yield a fixed sum in every state of nature except when the firm goes bankrupt, in which case the proceeds of the firm are divided among the bondholders. However, except when there is the distinct possibility of the firm not being able to meet its debt obligations, the bondholders generally have no voting rights in the management of the firm.

The return to a common stock, on the other hand, is variable—except when the firm goes bankrupt, in which case it is zero. A shareholder is entitled to receive a proportionate share of the dividends of the firm. The dividends, of course, depend not only on the real policy of the firm but on the particular financial policy chosen.

To know the stream of returns, the shareholder must know both the real and the financial decisions of the firm. On the other hand, if our argument that financial policy is irrelevant is correct, then although changes in dividend policy affect the pattern of returns received by any single share of the firm, the individual is indifferent to these changes. The shareholder (like the bondholder) can sell his shares at any date and receive what he can for them. Finally, ownership of shares generally gives one a proportionate vote in the stockholders' meeting (although some firms also issue shares which do not have voting rights).

In the ensuing analysis, we shall assume for simplicity that there are only two classes of financial instruments, bonds and common shares.
(c) If it decides to issue bonds, it must decide on what maturity—one year, two year, etc.—and what the coupon rate will be. For simplicity we shall assume that bonds carry no coupons. Thus, a t period bond is a promise to pay in t periods 1 dollar. When it is issued, it obviously sells at a discount. Let

$$\rho(t, \tau, \theta(t)) = \text{the price at time } t \text{ in state } \theta(t) \text{ of a bond which promises to pay } 1 \text{ dollar at time } \tau.$$ 

If there is uncertainty, the individual will not know what the price of such a bond will be in future periods except that, if there is no bankruptcy,

$$\rho(t, t, \theta) = 1 \quad \text{for all } \theta, t$$

In the discussion below all variables are state-contingent, but for notational simplicity we omit the \( \theta(t) \) except when it would otherwise be confusing. Similarly, all real variables \( (X_i, I_i) \) are dependent on the "plan \( k \)," but \( k \) too will be suppressed.

The relationships among the various financial decisions are expressed by the two accounting identities: Total investment must be equal to the value of the change in outstanding bonds plus the value of the change in outstanding shares plus retained earnings:

$$I_i(t) = \sum_{\tau=t+1}^{\infty} [\rho(t, \tau)(B_i(t, \tau) - B_i(t-1, \tau)) + q_i(t)(S_i(t) - S_i(t-1))] + RE_i(t)$$

where

$$B_i(t, \tau) = \text{the number of bonds outstanding at the end of period } t \text{ with maturity at time } \tau.$$ 

$$q_i(t) = \text{the price of a share of the } i \text{th firm at time } t.$$ 

Thus, \( E^{-}_i(t) \) is the value of the change in the number of shares outstanding resulting from issuing new shares during the t-th period; this should not be confused with \( E^{-}_i(t+1) - E^+_i(t) \), which is the change in the value of those shares outstanding at the end of the t-th period from the t-th to the t+1st period. The latter is the capital gain (or loss) on existing shares.

The second accounting identity states that total income in state \( \theta \) at time \( t \) must be equal to the income distributed (to bondholders and to shareholders) plus that retained by the firm:

$$X_i(t) = D_i(t) + RE_i(t)$$

where \( D_i(t) \) are the dividend payments to stockholders on record at the beginning of the period; i.e., each share receives \( D(t)/S(t-1) \) or the dividend per dollar invested at time \( t-1 \) is \( D(t)/E^+_i(t-1) \).

Figure 1 illustrates a flow of funds diagram for this economy over time. (Because the flow of funds occurs over time, the diagram is not made circular.) It should be noted that we have drawn the line for retained earnings through the

There are of course still other financial decisions, including ownership claims on other firms, what numeraire to denominate bonds in, etc. All of these could be included in our model—at some expense in notational complexity.

Recall that we are assuming for notational simplicity that there are no coupons on bonds; thus bondholders only receive income from the firm upon maturation of bonds.
household sector with a dotted line: the fact that the earnings do not pass through their hands directly does not necessarily mean that the household sector does not include (in some sense) such retained earnings in their income. As the analysis below shows, the retained earnings will be directly reflected in the price of outstanding shares.

The diagram also serves to clarify the timing implicit in our analysis: Let us break into the diagram at a point where the firm has just made its “new” investment decision having raised the requisite capital. The output (profits) next period (which depends not only on investment in the period just ended, but on investment in all preceding periods, as well as the specification of the environmental path for these preceding periods) is unknown; we await the specification of the “environment” for time $t$, for example, the rainfall, temperature, etc. The “state of nature” is then announced, i.e., $\theta(t)$ is then given. This means that the set of possible outcomes for $t+1$ and beyond has immediately been substantially narrowed. In Figure 1 we can, for instance, now completely ignore all but one of the environmental paths passing through $t$.

Given the new information embodied in the announcement of the state $\theta(t)$, the value of the shares and the prices of bonds are determined. In particular, the value of the equity of the firm now is $E(t, \theta(t))$. Moreover, at this point, for the particular plan we have denoted by $k$, we know exactly what the firm plans to do this period: we know its investment, $I(t, \theta, k)$, how much dividends it plans to give out, how much it plans to retain, how many bonds and of what maturity it plans to issue, how many new shares it plans to issue, etc. We still don’t know, of course, what its investment will be in the future; for this we await further information. But we do assume that we know what the firm will do in each contingency.

The assumption that the raising of new capital follows (in each period) the distribution of the profits and the bond payments is made simply for expositional convenience. In fact, these two operations may be
In the theorem presented in the next section, two concepts play a crucial role: one is the value of the firm, the other is bankruptcy.

The total value of the \( i \)th firm is the present value of its outstanding bonds plus the value of its equity: at the beginning of the period (before maturing bonds are redeemed), this is

\[
V_i^- (t) = E_i^- (t) + \sum_{\tau = t}^{\infty} p(t, \tau) B_i(t-1, \tau)
\]

while the value of the firm at the end of the period is

\[
V_i^+ (t) = E_i^+ (t) + \sum_{\tau = t+1}^{\infty} p(t, \tau) B_i(t, \tau)
\]

Using (1) to (3), we can solve for the value of dividends in terms of the change in the value of the firm, its gross profits, and its investment:

\[
D_i(t) = X_i(t) - L_i(t) + V_i^+ (t) - V_i^- (t)
\]

Bankruptcy is somewhat more difficult to define. The basic notion is, of course, that the firm is unable to meet its debt obligations. In the two-period model discussed in my 1969 paper, a firm is bankrupt whenever the profits are less than the nominal claims of bondholders.

\[
X_i < (1 + r) B_i
\]

where \( r \) is the nominal rate of interest on the bond. If \( r^* \) is the nominal rate of interest on a perfectly safe bond, and \( \min X_i(\theta) \) is the minimum profit in any state of nature, the probability of bankruptcy is zero provided

\[
B_i \leq \frac{\min X_i(\theta)}{1 + r^*}
\]

while it is positive if

\[
B_i > \frac{\min X_i(\theta)}{1 + r^*}
\]

See Figure 2. The analogous statement here would be

\[
(5) \quad X_i(L_i(t, \theta(t))) < B_i(t-1, t, \theta(t-1))
\]

But this will not do. For firms always have the option, if their returns in a particular period in a particular state are low, of borrowing more or issuing new shares to meet these debt obligations. Indeed, this is exactly what they would normally do, provided their future prospects of returns are sufficiently good. Therefore the condition stated in (4) is at best a statement about very short-term liquidity, not about the solvency of the given firm. In the last period of a multi-period model with a terminal date, the condition for bankruptcy is given by (5), since the firm cannot (by assumption) issue new shares or borrow further. But there is no reason to restrict ourselves to a finite period model.

Clearly, what we mean by bankruptcy is that at some date, in some state of nature, the value of the maturing bonds of a firm is less than the face value

\[
\rho(t, t, \theta(t)) < 1
\]

for some \( t \) and \( \theta(t) \). This is equivalent to saying that at that date and in that state of nature the value of the equity of the firm is zero (or negative if there is not limited liability).\(^{10}\)

\[
(6) \quad E_i^- (t, \theta(t)) \leq 0
\]

or

\[
(6') \quad V_i^- (t, \theta(t)) \leq \sum_{\tau} B_i(t-1, \tau, \theta(t-1)) \cdot \rho(t, \tau, \theta(t))
\]

\(^{10}\) Clearly, if the price of a share is zero, the firm cannot issue more equity to pay off the debt holders.
The fact that the value of the equity of the firm in some state of nature at some date in the future is zero does not mean that the value of the equity will be zero today; if there is some chance that the firm will not go bankrupt, clearly the value will be positive. But it does mean that bonds issued with maturities at the date of potential bankruptcy or beyond are risky securities, i.e., their terminal value is uncertain, and clearly the price of these bonds will not be the same as the price of a bond whose terminal value is certain. A change in the financial policy which results in a chance of bankruptcy, i.e., in a chance that the firm will not be able to meet its debt obligations, thus changes the prices of the bonds the firm issues, and it is the invariance of the price of the bonds which will be crucial in the argument of the next section.

We shall assume in the subsequent analysis that there is no bankruptcy.

B. Households

Let \( w_i^-(t) \) denote the \( j \)th individual’s wealth at the beginning of the period and \( w_i^+(t) \) be his wealth at the end of the period. If \( E_i^+(t) \) is the individual’s ownership of equity in the \( i \)th firm at the end of the period and \( B_i^j(t, \tau) \) his ownership at the end of the period of bonds maturing at date \( \tau \) (because of the no bankruptcy assumption, the bonds issued by all firms are identical), then

\[
 w_i^+(t) = \sum_i E_i^+(t) + \sum_{\tau=t+1}^{\infty} p(t, \tau) B_i^j(t, \tau)
\]

Hence, using (3), we obtain

\[
 w_j^+(t) = \sum_i \alpha_i^j(t) V_i^+(t)
\]

\[
 + \sum_{\tau=t+1}^{\infty} p(t, \tau) (B_i^j(t, \tau)
\]

\[
 - \sum_i \alpha_i^j(t) B_i(t, \tau)
\]

where \( \alpha_i^j(t) = E_i^j(t)/E_i^+(t) \) is the fraction of the equity of the \( i \)th firm owned by the \( j \)th individual at the end of the \( t \)-th period.

At the beginning of the next period his portfolio is worth

\[
 w_i^-(t + 1) = \sum_i \alpha_i^j(t) V_i^-(t + 1)
\]

\[
 + \sum_{\tau=t+1}^{\infty} p(t + 1, \tau) (B_i^j(t, \tau)
\]

\[
 - \sum_i \alpha_i^j(t) B_i(t, \tau)
\]

Finally, since during the period he will receive dividends equal to \( \sum_i \alpha_i D_i \), if he consumes \( c(t) \), his end of period wealth will be related to his beginning of period wealth by the equation

\[
 w_i^+(t) = w_i^-(t) - c(t)
\]

\[
 + \sum_i \alpha_i^j(t - 1) D_i(t)
\]
Thus, substituting (4), (7), and (8) into (9), we obtain

\[
(10) \quad c^j(t) = \sum_i \alpha_i^j(t-1)X_i(t) - I_i(t) + V_i^+(t) - \sum_{\tau=t}^{\infty} \rho(t, \tau)B_i(t-1, \tau)
+ \sum_{\tau=t}^{\infty} \rho(t, \tau)B_j(t-1, \tau) - w^j(t),
\]

all \( j, \tau \)

Equations (7) and (10) can be thought of as defining the individual's consumption opportunity set. Given any set of ownership of shares \( \alpha_i^j(t-1) \) and bonds \( B_i(t-1, \tau) \) at \( t-1 \), (10) defines the value of consumption plus end of period wealth at \( t \). Given the value of wealth at the end of period \( t \), (7) defines the possible ownership of shares and bonds at \( t \), which in turn defines the value of consumption plus end of period wealth for \( t+1 \). Note that the opportunity locus does not depend on either dividends or retained earnings; the intuitive reason for this will be made clearer in the discussion following the theorem in the next section.

C. General Equilibrium

Market equilibrium requires the total value of ownership claims on the \( i \)th firm equal the value of its equity, i.e.,

\[
\sum_j E_i^j(t) = \sum_j \alpha_i^j(t)E_i^j(t) = E_i^+(t) \quad \text{or}
\]

\[
(11) \quad \sum_j \alpha_i^j(t) = 1 \quad \text{for all } t, i
\]

Similarly, demand for bonds of each maturity must equal the supply:

\[
(12) \quad \sum_i B_i(t, \tau) = \sum_j B_j^+(t, \tau) \quad \text{for all } t, \tau
\]

II. The Basic Theorem

We are now prepared to state and prove our central theorem.

**THEOREM 1:** (a) Assume there is no bankruptcy of any firm in any state of nature. (b) Assume that there is a perfect market for perfectly safe bonds of all maturities. (By perfectly safe, we mean that the amount that they pay upon maturity is known for certain; the price of these different maturities at all other dates may be highly variable.) (c) All firms have already made their real decisions (i.e., the value of \( k \) for each \( i \) is given). (d) Assume there is a general equilibrium, with all markets clearing, characterized by a given price in each state of nature at each time for each maturity bond and each firm having a given valuation in each state of nature and at each time \( t \), and a given financial policy (i.e., a specification of debt-equity ratio, retention ratio, maturity structure of bonds).

Then, there is another general equilibrium solution where any firm (or group of firms) has changed any (or all) of its financial policies, but in which the value of the firm and the price of all maturities of all bonds are unchanged (for all periods and states of nature), and investors have made offsetting portfolio adjustments, i.e.,

\[
(13) \quad \Delta B^j(t, \tau) = \sum_i \alpha_i^j(t)\Delta B_i(t, \tau) \quad \text{all } t, \tau, j
\]

i.e., each investor alters his holdings of bonds by exactly his stockholder’s share of the change in debt of each maturity of all firms and

\[
(14) \quad \Delta \alpha_i^j(t) = 0 \quad \text{for all } i, j, t
\]

or equivalently

\[
(14') \quad \Delta E_i^j(t) = \alpha_i^j(t) \Delta E_i^j(t)
\]

Each investor changes his equity holdings

\[11\] From a consumption point of view, it cannot be said which maturity is the “safer” bond, which is the riskier; i.e., it cannot be said the long-term bonds are riskier than short-term bonds. See my 1970 paper. What we shall show here is that from the point of view of the firm, the maturity structure is irrelevant.
of each firm in proportion to the firm's change in total equity capital.

The argument of the proof is simple. I shall show that if the value of the firm and the price of all maturities of all bonds are unchanged (for all periods and states of nature) then the set of consumption possibilities available to any individual is unchanged. Since the set of consumption possibilities is unchanged, the individual will choose the same consumption path (i.e., the same plan of consumption over time, which is clearly a contingent plan, depending on which states of nature occur). To do this, he changes his investment-portfolio allocation plan as described by (13) and (14). Finally, I show that if the set of investment-portfolio allocation plans originally adopted by the different individuals in the economy (that is, before the firm changed its financial policy) was an equilibrium, so that each date and in each state of nature markets cleared, then the set of new investment-portfolio allocation plans also constitutes an equilibrium.

PROOF

1. The consumption opportunity set is unchanged. Consider any feasible consumption path and its associated portfolio allocation. From (7), it immediately follows that if \( w^{j+1}(t), p(t, \tau), \) and \( V^j_t(t) \) are unchanged after a given change in financial policy of a firm, then the changes in portfolio allocation described by (13) and (14) are feasible; and from (10) if these changes are undertaken, then \( c^j(t+1)+w^{j+1}(t+1) \) is unchanged. Thus, if \( c^j(t+1) \) is unchanged, \( w^{j+1}(t+1) \) is unchanged. Clearly, if the values of the firm and prices of bonds are unchanged, the value of \( w^j \) for dates before the contemplated change in financial policy begins is unchanged.

These statements immediately imply that a consumption stream that was feasible in the original situation is feasible with the changed financial policy of the firm, and conversely.

2. Since the consumption opportunity set is unchanged, if a particular consumption path \( \{ c^j(t, \theta(t)) \} \) is preferred to all other consumption paths in the original situation, then it is preferred in the new situation. Thus, the indicated changes in portfolios are not only feasible, but optimal.

3. If in the original situation, all markets cleared at each point of time (for each state of nature), they also do in the new situation. Since \( \alpha^j(t) \) are unchanged, clearly if \( \sum \alpha^j(t) = 1 \) before, it still does, and all markets for securities clear (equations (11) above are all satisfied). The change in demands for bonds of a given maturity at a given date is given by

\[
\sum_j \sum_i \alpha^j_i(t) \Delta B_i(t, \tau) = \sum_i \Delta B_i(t, \tau)
\]
i.e., it just equals the change in supply, so that if demand equaled supply in the original situation (equation (12) was satisfied) it still does.

III. Comments on the Theorem and Its Proof

There are four kinds of comments which I have to make. In Section IIIA we provide an intuitive interpretation of the theorem. In Section IIIB we point out how much weaker the assumptions employed in our analysis are than those used in previous proofs. In Section IIIC we discuss briefly the limitations on the proof, and how critical they are for the general validity of the theorem. In Section IID we discuss the competitive forces at work to eliminate the "inefficiency" resulting from the resource allocation to financial management.

A. Intuitive Interpretation

The basic argument of the theorem is that individuals can exactly "undo" any financial policy undertaken by the firm.
Let us consider verbally what actions of the individuals are required to offset various actions by the firm. Assume the firm decreases its dividend payout ratio. This means that it has more retained earnings, so, if the two basic financial accounting identities are to be satisfied, either it must borrow less (perhaps it even lends) or issue fewer new shares. To make up for the loss in dividends, i.e., to keep the same consumption path, individuals buy fewer new shares in the firm or buy fewer new bonds. Assume the firm simply issued fewer shares. In one case, the value of the equity grew because of issuing new shares, in the other case, the value of the equity grew because of retained earnings. From the point of view of the stockholders, the two are perfectly equivalent. This change in dividend pay-out ratio thus leaves the debt-equity ratio unchanged. On the other hand, if the firm decreases the number of bonds issued, it will lead to a lower debt-equity ratio. Then individuals borrow on their own account. One can think of it as if the individual takes the proceeds of the loan to purchase the increased equity in the firm (since the two are exactly equal, this is only a convenient way of looking at it; since all funds are fungible, there is no real connection between the two). The increased borrowing by individuals exactly offsets the decreased borrowing by firms so markets continue to clear. Similarly, if the firm decides to issue more three-year bonds and fewer five-year bonds, the individual can undertake exactly offsetting actions in his own portfolio.

B. On the Generality of the Theorem

(a) Risk classes, Arrow-Debreu securities, mean-variance analysis. It should be emphasized that in the proof, it is not assumed that there are two or more firms which are otherwise identical; the argument does not require the existence of risk classes, as many states of nature as securities, or the assumption that returns can be described by means and variances, assumptions which have been crucial in other proofs of the more limited theorem on the irrelevance of debt-equity ratios.

(b) Competitiveness of capital market. No assumption about the competitiveness of the capital market has been made; the only assumption is that there be no discriminatory pricing, i.e., the price paid by one individual (firm) for a bond (or share) be the same as for all other individuals. But the market rate of interest—and hence the interest rate paid by a firm—may be affected by the amount of capital it raises from the market.

(c) Rationality of consumers. The only restriction on individual behavior is that given a set of feasible consumption paths, he always selects the same consumption path. Thus, the individual may maximize his discounted expected utility, but no such restrictive assumption is required for the result to obtain.

(d) “Control” of firm. Even if the individual does care about his political power (control) within the firm (which he may if the real decisions of the firm depend on the stockholders), if the role of each stockholder in decision making is simply a function of the proportion of the total shares he owns, the financial policy makes no difference, since political power of any shareholder is identical in the two situations.

One might have argued that a smaller equity base would make a “take-over” more likely; but under the assumption of no bankruptcy, this would not be true, since the group taking over the firm could borrow on the strength of the equity in the firm as collateral; if in the low equity situation, the group taking over could raise the requisite capital for a take-over,
they would have no problem doing so in the high equity situation.\textsuperscript{12}

(e) \textit{Source of uncertainty}. No assumption about the source of uncertainty is required.\textsuperscript{13}

(f) \textit{Multiplicity of equilibrium}. Theorem 1 is a theorem about market equilibria. It states that there are an infinite number of general equilibrium solutions of the economy all of which are identical in all respects except for the financial policies of firms and the value of bonds and shares (separately) held by individuals (although the proportions of the shares of each firm owned by any individual are the same). There may of course be more than one general equilibrium solution to the economy at any given set of financial policies. As usual, very strong conditions would be required to ensure uniqueness. But what our theorem does assure us is that if there are two (or three or \ldots) equilibria at a given set of debt-equity ratios, then there are two (or three or \ldots) at any other set of debt-equity ratios. The theorem has nothing to say about the important question as to which one of these will in fact be chosen.

(g) \textit{Differing expectations}. The argument of the proof does not require that individuals have the same expectations. The only agreement in expectations that is required is that the firm will not go bankrupt in any state of nature. (See below for a discussion of this assumption.)

(h) \textit{Market clearing}. The particular path described in the above analysis is an equilibrium path where individuals make plans all of which are \textit{consistent} with one another, i.e., they are market clearing. In fact, the only thing required for the analysis is market clearing at time 0. In making his portfolio-consumption decision for time 0, the individual must have expectations of prices and firm valuations at all future dates and states. These may not, of course, be realized; at each successive date expectations are then revised. It is important to the analysis that these revisions depend on "real events" not on the financial structure of the firm (see below).

C. \textit{Limitations on the Theorem}

There are three critical limitations on the theorem.

(a) \textit{Independence of expectations from financial policy}. Our analysis requires that these \textit{expectations} be unchanged as the firm changes its announced financial policy for the future.

If it should turn out that these expectations are a function of the financial policy of the firm, then in fact the financial policy of the firm will affect its valuation this period. The expectations that financial policy will affect market valuation are, at least in this very rough sense, fulfilled. But note that the argument for equilibrium paths shows that there is no reason that these expectations ought to change.

(b) \textit{Individual borrowing an imperfect substitute for firm borrowing}. Perhaps the major objection to the proposition that the firm's financial policy is irrelevant is that individual borrowing is not a perfect substitute for firm borrowing. There are four principle reasons for this: 1) higher interest rates for individual borrowing than for

\textsuperscript{13} For a more extended discussion of the relationship between debt-equity ratios, bankruptcy, and take-overs, see my 1972 paper.

\textsuperscript{14} In particular the distinction between technological uncertainty and price uncertainty, which played such an important role in Diamond's analysis, is of no consequence here. It should also be noted that Diamond's assertion that his results do not depend on the no-bankruptcy assumption is incorrect.
corporate borrowing; 2) limitations on the amount that individuals can borrow from the market; 3) transactions costs; and 4) special tax provisions (differential treatment of capital gains and deductibility of interest payments for the corporate income tax). I have discussed these limitations in greater detail elsewhere (1969, 1973). Here I wish only to make a few observations.

First, the higher nominal interest rates individuals pay and the quantitative restrictions on their borrowings are primarily a reflection of the higher probability of default on the part of individuals. They are, in other words, a particular manifestation of the general problems that the chance of bankruptcy brings to the analysis.

Second, the first three reasons given above place restrictions on the set of financial policies among which the individual is indifferent, but there is no reason to believe that these restrictions are very severe. They may mean that firms cannot have all-equity policies, but individuals will still be indifferent among a wide set of debt-equity ratios. If, for instance, a firm were to decrease its debt-equity ratio, the analysis does not require that individuals borrow from the market to purchase the additional shares issued by the firm; it only requires that they decrease their holdings of bonds. Hence so long as the total debt of those firms whose shares the individual owns is sufficiently large that the individual is a net lender rather than a net borrower, the individual is indifferent. This places a lower bound on the “average debt-equity ratio” of the firms in the individual’s portfolio (although not on the debt-equity ratio of any single firm). This constraint may become an important constraint if at those debt-equity ratios there is a finite probability of bankruptcy; that is, it is only in conjunction with the bankruptcy constraint that this constraint becomes significant.

Third, it does not place restrictions on the debt-equity policy to be pursued by any particular firm, only the set of debt-equity policies that groups of firms can follow; i.e., even if the constraint is binding, in general one firm can increase its debt-equity ratio when another firm decreases its debt-equity ratio. One cannot speak of an optimal debt-equity or optimal retention ratio.

(c) Bankruptcy. In my judgment, the most restrictive assumption is that of no bankruptcy.

The careful reader may have wondered where the restriction of no bankruptcy was used in the proof. Because of limited liability laws, it is clear (as I noted before) that $E_i \geq 0$. If the firm issues a sufficiently large number of bonds so that in some state of nature at some date $\sum pB_i > V_i$ for $V_i$ to be the same as in the original (reference) situation, $E_i$ would have to be negative. But this is impossible. The assumption was not only critical to the proof, but I would argue, critical to the general validity of the theorem. To put it one way, it is not reasonable to assume that the price of bonds for which there is a positive probability of default at maturation would be the same as a perfectly safe bond. One might argue that the decline in the nominal value of bonds is compensated for by an equivalent increase in the value of equity, and under certain circumstances—the existence of as many securities as states of nature or the mean-variance model with homogeneous expectations—this is true. But in the more general case, bankruptcy changes the opportunity set facing a given individual so that the value of the firm is changed. Not only is the financial policy of importance, but no separation between the financial and real decisions is possible.¹⁴ (See my 1972 paper.)

¹⁴ These remarks should serve to clarify the difference between my theorem, both its meaning and its proof,
D. Competitive Forces to Eliminate “Waste” of Resources on “Financial Management”

One might ask, if financial policy is really of no importance, why do firms waste resources on “money managers”—shouldn’t competitive forces lead all firms to ignore financial policy? Since worrying about it costs resources and can’t increase the market valuation of the firm, clearly firms that spend resources on financial management have lower profits to distribute to their stockholders than firms who don’t. There are five answers to this:

1) I have ignored some important considerations, in particular, taxes, which do make it profitable to worry about financial structures. Does this mean that I believe that in the absence of taxation financial managements would wither away? Not necessarily, or only very slowly, as the remaining points argue.

2) I have already argued that if individuals believe that financial policy affects firm valuation, then it will, and the firm that ignores the popular “prejudices” may do worse than one which takes them into account. There may have been no rational reason for the prices of tulip bulbs to rise as they did in the tulip bulb mania, but since they were rising, at least in the short run, one could make a “profit” by investing in them (see below).

3) Moreover, this relationship between the firm’s financial policy and expectations about profits may not be as “irrational” as the above analysis suggests. Changes in financial policy may be an important signal for the “real prospects” of the firm. This would not be the case in my model, because in it there is no such thing as a liquidity crisis; but in the real world bankruptcy may be important, and the fact that banks and other lending institutions are unwilling to lend the firm money (for instance forcing a reduction in dividends to meet the liquidity requirements) may be a signal that those who know more about the prospects of the firm than the relatively uninformed shareholder are not sanguine about the prospects of the firm.15

4) There is, moreover, no reason that in the short run the different valuations lead to any inconsistencies or more generally that there are any forces leading individuals to reformulate their expectations so that valuations are independent of financial policies. Even if we have two firms which are identical in every real respect (that is, they belong to the same risk class, in the terminology of Modigliani and Miller), there is not necessarily any method by which individuals can arbitrage (over any short- or medium-run16 period).17

15 Indeed, one might argue that this signalling effect of financial policy is one of its more important functions. If firms never issued dividends, simply retaining earnings (even in the form of bond purchases) then it might be possible for firms to postpone letting shareholders know when they are in “bad straits” even longer than they do at the present. This may provide part of the explanation of why, in spite of strong tax advantages for not issuing dividends, firms continue to do it.

16 This qualification is imposed because, under certain circumstances, it can be shown that if different financial policies are pursued with the firms having different valuations and equal returns to the individual, then, in finite time, the relative valuations must become infinite. But finite, in this context, may be very long indeed. Such differences in valuations are (at least mathematically) very similar to the speculative booms (or depressions) which often seem to characterize price movements on the stock market. For a general discussion of these problems in a slightly different context, see Karl Shell and the author.

17 To see this in the extreme case, we need only con-
5) Finally, we note that the resources wasted on financial management may be relatively minor (relative, say, to total profits of the firm) and hence the "competitive forces" to eliminate this inefficiency may operate with relatively little strength.

IV. Irrelevance of Financial Policy of Any Particular Firm

The above proposition established the irrelevance of the financial structure of the economy as a whole. The crucial assumption employed was that of no bankruptcy. We can remove this assumption and prove a weaker theorem about the irrelevance of the financial policy of any particular firm.

THEOREM 2: Assume there is a general equilibrium for the economy which is characterized by a given market rate of interest (on safe bonds), by a given nominal rate of interest on the risky bonds of each of the firms which faces a chance of bankruptcy, and by each firm having a given market valuation and a financial policy (dividend-retention ratio, maturity structure of debt, etc.), and in which a given fraction of the shares of the firm are owned by the i-th individual.

Let any firm (or any group of firms) change its financial policy. If financial intermediaries may be established costlessly, then there exists a new general equilibrium solution for the economy with the same market rate of interest, in which every firm has exactly the same market valuation as before, and in which the proportion of each firm's shares owned by the i-th individual, either directly or indirectly through intermediaries, is exactly the same as before.

Since the argument for changes in debt-equity ratio is perfectly analogous to changes in other financial policies, I shall focus my remarks on the debt-equity ratio. Assume in the initial equilibrium, there were no financial intermediary purchasing bonds and shares of the given firm. The firm changes its debt-equity ratio. A financial intermediary is created which reconstitutes the firm, i.e., purchases all of its bonds and shares, then issues bonds and shares in exactly the same ratio as in the original situation. The opportunity set facing the individual is completely unchanged, and hence the market valuations, rates of interest, etc. are completely unchanged.\(^{18}\)

\(^{18}\) More generally, assume the original debt-equity ratio of the firm is \(d\), and the \(k\)th financial intermediary purchases \(\alpha^k\) of the bonds and equity of the firm and issues a debt-equity ratio of \(d'\). Thus \(1 - \sum \alpha^k\) is the proportion of the firm purchased directly by individuals (not through intermediaries). Now assume the firm changes its debt-equity ratio to \(d'\). Then all intermediaries except the one for which \(d = d'\) are unaffected. It now issues a debt-equity ratio of \(d\), and purchases \(1 - \sum \alpha^k\) of the bonds and equity of the firm.
One might argue, however, that the opportunity set has been changed, because in principle the individual can buy bonds and shares in the firm directly as well as through the intermediary. Thus, if there is a probability of bankruptcy, his opportunity set is larger now than it was before. This may lead to an increase in the demand for the securities (bonds and stocks) of the given firm, so that the new situation is not an equilibrium one. There will be a new general equilibrium situation, with the value of bonds and equities of the firm greater than before. But this would imply that the original situation could not have been an equilibrium. For a financial intermediary could have purchased and issued the same fraction of the bonds and stocks of the given firm, thus obtaining a given fraction of the income of the firm in every state of nature, and then issued bonds and shares in the ratio of the debt-equity ratio of the "new" situation. The organizers of the intermediary would have then made a pure profit for themselves, equal to the difference between the value of the firm in the two situations.

The point of the argument is the following: If, corresponding to a given set of real and financial decisions of the other firms, the financial decision of the firm does make a difference, free entry of financial intermediaries will ensure that a set of financial securities will be marketed which maximizes the value of the firm regardless of the debt-equity ratio of the firm.

If one took the assumption of costless creation of intermediaries seriously, there is no reason to suppose that the process of proliferation of intermediaries would stop short of creating as many securities as states of nature; in which case, not only is the financial structure of any individual firm of no consequence, the financial structure of the economy is irrelevant.\(^{19}\)

\[^{19}\text{That is, all financial structures that provide as many securities as states of nature are equivalent.}\]

\[^{20}\text{As in those circumstances in which the portfolio separation theorem is valid. See David Cass and the author.}\]

\[^{21}\text{Included in "transactions costs" are the cost of obtaining information about different securities. If there is a finite probability of bankruptcy, purchasers of bonds have to evaluate the riskiness of the bonds. Thus not only does bankruptcy result in transactions costs when it occurs, but the potentiality of bankruptcy results in transactions costs at the time the bonds are sold.}\]

\[^{22}\text{Besides the obvious distortionary effects of taxation.}\]
policy; 2) individual borrowing not a perfect substitute for firm borrowing; 3) bankruptcy. Whether these limitations are important in practical applications is a moot question. But whether they are or are not, the theoretical importance of the theorem is not diminished: an understanding of it is to corporate finance as an understanding of the frictionless surface is to the understanding of the physics of motion. For some practical problems, friction can be ignored in a first approximation; in others it cannot. But even when it cannot, an understanding of what would happen in the absence of friction is essential. The empirical testing of the model is another matter: in physics we can attempt to approximate a frictionless surface and observe motions under those conditions; to do the analogous thing here would require us to create a world without transactions costs, tax distortions, and other frictions, and see if in these circumstances firms ignored their financial structure. It is, of course, essentially impossible to do this. Fortunately, the issue is not whether under those circumstances the financial policy would be irrelevant—most of us would agree that it would be—the issue is: how significant are the "limitations" and in what way do they affect corporate financial policy. The tests performed so far—such as examining the value (per unit scale) of firms thought to be essentially identical except for their debt-equity ratio—do not discriminate between worlds in which Theorem 1 is valid, those in which Theorem 2 is valid but not Theorem 1, or worlds in which neither theorem is valid (in which financial policy is important, but in which value-maximizing firms have selected the set of financial policies which maximize the firm's valuation). What is required is a greater understand-

ing of the implications of these limitations and more refined tests to discriminate among the alternative hypotheses.

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