DM/83/12

INTERNATIONAL MONETARY FUND

Fiscal Affairs Department

Impact of Inflation and Taxation on the Level, Allocation, and Financing of Investment: A Survey of Recent Literature

Prepared by Uri Ben-Zion 1/

Approved by Ved P. Gandhi

February 24, 1983

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1/ The paper was completed during the summer of 1982 when the author was a consultant with the Fiscal Affairs Department. It is a part of a larger study on the subject of "Interest Rates and the Tax Treatment of Interest Income and Expenses" being prepared by the Department, with Ved Gandhi acting as the coordinator. Thanks are due to Sheetal Chand, Jitendra Modi, and Menachem Katz for useful suggestions at various stages of the preparation of the paper. Acknowledgement is also due to Joe Yagil for his help in writing Section III of the paper. The final draft has improved as a result of revisions made by Ved Gandhi, and the author is extremely grateful to him. The author, however, bears full responsibility for the contents of the paper.

Contents

This paper surveys the recent literature on the effects of inflation and taxation on the level, allocation, and financing of corporate investment.

The paper is divided into three sections: Section I deals with the impact of inflation and taxation on the level of investment in the corporate sector and surveys the theoretical literature and empirical studies in this area. This section focuses on models that emphasize the important role of the cost of capital variable in the determination of investment; however, studies that use a different approach are also reviewed. Section II deals with the impact of inflation and taxation on the behavior of the stock market and the housing market, which are two important channels of investment for personal savings. The effects of inflation and taxation on stock prices are discussed primarily in the context of the stock market efficiency hypothesis. This section also deals with the effects of the type of tax policy used in the United States on the behavior of the housing market. Section III focuses on the effects of inflation and taxation on the corporate debt-equity policy. It reviews first the classical Modigliani-Miller (MM) approach and then the more recent analyses of taxes, which assume uncertainty. This section also surveys in detail the few available studies that analyze the impact of taxes and inflation on other aspects of corporate financial policy, particularly the choice between retentions and distributions.

I. Level of Investment

This section reviews the literature dealing with the effects of inflation and taxation on the investment behavior of firms. Therefore, only those models of investment behavior that apply to real situations and that incorporate taxes either directly or indirectly in their analyses are described. In most of these models, the cost of capital is an important concept, and much current work on the effects of tax policy and inflation on investment (e.g., the National Bureau of Economic Research project) uses this concept.

1. Cost of capital--a theoretical framework

The impact of taxation and, to a lesser degree, inflation on the level of investment was introduced explicitly in the neoclassical model by Jörgenson (1963), who, in his own work and with others (e.g., Hall and Jörgenson (1967) and Jörgenson and Siebert (1968 a and 1968 b)), has been a leading authority on the study of investment behavior. As the emphasis of this survey is on the impact of taxation and inflation on investment, the concept of the cost of capital, which incorporates these two variables and which has played an important role in the literature (see Jörgenson (1971) and Klein (1974) for the extensive list of econometric studies of investment behavior), will be considered in detail.

Hall and Jörgenson (1967) defined the cost or rental price of capital services as

$$c = q(r+\delta) - \dot{q} \qquad (1)$$

where c = the cost of capital or the rental price of capital;
δ = the rate of economic depreciation;
q = the price of capital goods;
r = the rate of interest; and
$\dot{q}$ = the expected change in the price of capital goods.

a. Introduction of corporate tax

If it is assumed that price expectations are stable (static), the introduction of corporate tax leads to the following redefinition of rental price of capital:

$$c = q(r+\delta)[(1-k)(1-t_cZ)]/(1-t_c) \qquad (2)$$

where t_c = the corporate tax rate;
k = the rate of investment tax credit; and
Z = the present value of the tax depreciation allowance on one dollar of investment.

Using this approach, Hall and Jörgenson (1967) were able to evaluate the direct effect of different tax policies--for example, different methods of depreciation and investment tax credit--on the cost of capital and to estimate the resulting effect on the level of desired stock of capital and investment.

One limitation of the Hall and Jörgenson model for carrying out an analysis of tax policy was the particular form of the cost of capital in the model, equation (1), which was derived assuming a Cobb-Douglas production function and perfect financial and capital goods markets. This criticism led Feldstein and Flemming (1971) to extend the Hall and Jörgenson model by using a constant elasticity of substitution production function and by assuming imperfect capital markets. They derived an extended expression for the cost of capital,

$$(c/p) = (q/p)^{\beta_1} + (r+\delta)^{\beta_2}.(1-t_c)^{\beta_3}.(1-A)^{\beta_4}.F^{\lambda} \qquad (3)$$

where p = a price index of the consumption goods;
A = value of tax depreciation allowance ($A = t_cZ$);
F = a measure of internally generated funds (e.g., retained earnings); and
β's and λ = cost coefficients of the various sources of funds to the firm.

Formula (3) is simply an extension of Hall and Jörgenson's cost of capital equation (2). In the Cobb-Douglas case, where

$$\beta_1 = \beta_2 = \beta_3 = \beta_4 = 1 \text{ and } \lambda = 0,$$

equation (3) is reduced to equation (2).

Feldstein and Flemming's model enabled them to evaluate in greater detail the tax policy in the United Kingdom and to test separately the partial response of investment to the cost of capital, depreciation rules, the corporate tax rate, and the net rate of return. The model also enabled them to evaluate the impact of differential taxation of dividends and retained earnings on investment.

b. Introduction of replacement investment

Feldstein and Rothschild (1974) made an important practical modification on the Hall and Jörgenson model. In the cost of capital concept they incorporated a theory of replacement investment, following the earlier contributions of Feldstein and Foot (1971) and Eisner (1972). Feldstein and Rothschild argued that Hall and Jörgenson's assumption of replacement investment, at a fraction of capital stock and a constant rate of output, was restrictive, since it implicitly assumed a constant exponential decay of all equipment at the same rate and a constant exponential growth of the capital stock. They viewed replacement investment and asset durability as an economic decision, which depended on interest rates and tax laws, especially investment tax credit and depreciation methods. The effect of tax laws on replacement investment could, in practice, be in either the same or the opposite direction as the effect of taxation on the optimal capital-labor ratio and net investment.

c. Introduction of tax deductibility of interest

Some of the studies that have followed the classical work of MM (1958 and 1963) derived the cost of capital from a model of a firm maximizing its value. This approach emphasizes the effect of the financial structure on the cost of capital to a firm and derives the cost of capital separately for different sources of financing.

d. Introduction of personal tax

The tax advantage of debt, and its lower cost of capital to the firm, implies that a value-maximizing firm will finance investment only by issuing debt. This simple conclusion, which stems from MM classical work, was modified by Stiglitz (1973), who took into account personal taxation on dividends and on capital gains and uncertainty.

Stiglitz showed that, under certainty and for riskless debt, a firm uses only debt to finance investment, and the cost of capital of the firm (ignoring depreciation) equals the riskless rate of interest. He also showed that this result is independent of the income tax bracket of the individual contributing to debt and the corporate income tax rate and concluded that "corporate profit tax, with interest rate deductibility provision, is completely nondistortionary." Stiglitz's result is different from Hall and Jörgenson's formula for the cost of capital given in equation (2), which in the case of no economic

depreciation and income tax credit is

$$c/q = r(1-t_cZ)/(1-t_c) \qquad (4)$$

and which certainly is greater than r. This difference is explained by the use of debt only to finance investment in the Stiglitz case.

In the case of uncertainty, Stiglitz attempted to derive an optimal debt-equity ratio and concluded that "firms should have as high a debt ratio as possible, that is, they should at least increase their debt-equity ratio to the point where there is a positive probability of bankruptcy."

With regard to the financing of investment, Stiglitz concluded that "the policy, that seems to be pursued by most firms, of financing most of their new investment by retained earnings and raising any additional capital required by issuing bonds, is, in fact, optimal." According to him, the cost of capital for using retained earnings is given by:

$$c = r(1-t_p)/(1-t_c) \qquad (5)$$

which is modified to

$$c = r(1-t_p)^2/(1-t_c)(1-tg) \qquad (6)$$

where t_p = personal income tax rate;
t_c = corporate tax rate; and
tg = capital gain tax rate.

Equation (6) applies only for riskless investments (i.e., a case of no equity) and risk-neutral individuals. In the case of risk, the cost of capital c will increase, as a risk premium will have to be added to the interest rate r.

The implicit or explicit assumption of risk neutrality, or perfect certainty, is common in studies of the cost of capital as a determinant of investment. King (1974) justified this assumption on the grounds that it would simplify the analysis and thus lead to unambiguous theoretical results with respect to the effects of certain tax policies and also allow comparability with the neoclassical model. King's model of optimal control, in which the firm maximizes its present market value under constraints of positive dividend and positive debt, yields those elements of a firm's investment policy that are comparable to those of Stiglitz, even though the assumption and methods of derivation are quite different.

The models of the cost of capital and investment behavior discussed above have dealt mainly with the U.S. and U.K. tax rules. Similar models have been developed more recently with regard to the specific

tax rules in other countries. In a detailed model for Sweden, Bergström (1976) assumed that the firm maximized an objective function, which is the present value of the expected profits, to infinity. The theoretical results of his model, although similar in nature to the U.S. and U.K. results (but somewhat more complicated), are then used to estimate the cost of equity and debt under three different methods of tax depreciation allowances. Bergström's theoretical results, which considered only corporation tax, were broadened by Södersten (1977) to include personal income tax on dividends and capital gains. Cost of capital expressions were also calculated for France and Germany (e.g., Artus and others (1981)). However, the fact remains that detailed expressions that incorporate personal and corporate income taxes have been developed only for the United States and Sweden.

e. Introduction of inflation

The effect of inflation on the cost of capital and investment has been determined only in recent years with the growing theoretical and empirical interest in the impact of inflation and taxation on financial markets and the behavior of firms. An important contribution in this direction is that of Bergström and Södersten (1981), for Sweden, who showed that a firm's cost of capital is approximated by the weighted average of the costs of debt and equity. (The cost of debt before tax is the interest rate (r), while the cost of equity before tax is k; and the latter is deflated by $(1-t_c)$, where t_c is the corporate tax rate. The differential effects of corporate taxes on the two components of capital are the result of the tax deductibility of interest payments.) According to them, with the current corporate tax system, inflation affects the cost of capital as follows:

(1) "Inflation increases capital cost because depreciation charges are taken on historical cost. This effect is stronger, the shorter the investment period."

(2) "Inflation decreases capital cost because deduction of the nominal cost of debt is allowed. The higher the debt ratio, the stronger is this capital cost decreasing effect of inflation."

When both the personal income tax and the capital gain tax are incorporated, the results are somewhat modified. In particular, inflation reduces the cost of capital if the stockholder's marginal income tax is greater than, or equal to, the taxation of retained profit, that is, the corporate tax rate and the effective rate of capital gains tax.

A similar and related analysis for the United States was developed by several authors, in particular, Bradford (1981), Hall (1981), and Jörgenson and Sullivan (1981). Bradford, for example, started with the

simple definition for the cost of capital, c,

$$c = i + \delta \tag{7}$$

where i = the real interest rate; and
δ = the rate of economic depreciation.

With inflation, and assuming the modified Fisher effect, he argued that

$$r = i + \pi/(1-t_p) \tag{8}$$

where t_p is the marginal tax rate on the individual and π the expected inflation rate.

The cost of capital was then derived by Bradford in terms of the nominal interest rate, r,

$$c = [\{\delta+(1-t_p)r-\pi/\delta+(1-t_p)i\}](i+\delta) \tag{9}$$

Bradford used this equation, then, to evaluate the alternative investment incentives, like accelerated depreciation and direct grants. Accelerated depreciation, coupled with tax shelter retirement savings, reduces the marginal income tax, while direct grants reduce the cost of investment. Bradford showed that accelerated depreciation, if specified appropriately, can reduce the sensitivity of the cost of capital--net of taxes--to the rate of inflation. Hall (1981) extended Bradford's analysis by incorporating alternative sources of financing (debt versus equity) and alternative rates of depreciation on different assets (e.g., plant, equipment, and intangible assets).

f. Other models of investment

Another approach to modeling aggregate investment consists of using the firm's market value as an indicator of its desired stock of capital. This approach, which was developed by Grunfeld (1960), was extended by Tobin. Tobin (1965) developed a measure known as Tobin's q, the ratio of market valuation of the firm's assets to the replacement costs of those assets. In equilibrium, the value of a q is unity, whereas the value of $q > 1$ will induce the firm to increase its stock of capital. As with other models of investment behavior, a change in the desired level of capital (which results from a change in q) will affect investment in a distributed lag fashion over long periods of time. Authors who have used Tobin's q (such as Malkiel, von Furstenberg, and Watson (1979) and Summers (1981)) have not included corporate risk directly in their models. As shown by Fromm and Ciccolo (1979), however, the market value of firm and Tobin's q do implicitly incorporate an optimal capital structure and risk level.

2. Empirical studies

Jörgenson (1971) surveyed a large number of econometric studies on investment behavior carried out until the late 1960s. His survey indicated that the issue of tax policy, particularly under inflationary conditions, was not addressed in any detail in many of the empirical studies. It is only recently, however, that empirical work has focused on the effect of investment incentives and taxation on the level of corporate investment.

One issue in studying the impact of taxation on investment is the "appropriate" tax rate. In other words, is it the rate of taxation on dividends or the corporate tax that matters? King (1972) suggested that for the United Kingdom the relevant tax rate is the corporate tax rate. King also found that tax incentives played an important role in plant and machinery investment in the United Kingdom during 1948-68.

A recent empirical test of King's view was conducted for the U.K. two-digit industry data by Sarantis (1979). He found that, while profitability and change in output tended to have the predicted positive effect on investment, the tax rate variable tended to have the expected negative effect on investment in 8 of the 11 two-digit industries. Generally, the coefficient of the tax rate variable was not statistically different from zero.

Sarantis also tested the effects of investment incentives. Like King, he found that investment incentives have a significant effect on the level of investment. He also found that changes in incentive programs in the United Kingdom in the past have not always been in the right direction with respect to their effects on investment.

The effects of different investment incentives on investment in the United States were analyzed by Eisner and Lawler (1975), using the data of the McGraw-Hill capital expenditure survey. They showed that such incentives have had only a minor effect on investment.

An empirical application of Tobin's q to the study of investment in the United States is presented in Summers (1981). He developed a concept of tax-adjusted Q that depends on the original Tobin's q (ratio of the market value of the firm to the book value of asset evaluated at replacement cost), the present depreciation allowances, the firm's financial leverage (estimated in market value terms), the investment tax credit, and the present value of future depreciation allowances, tax rates on capital gains, dividends, and corporate income. In his empirical work, Summers calculated the value of adjusted Tobin's q for the United States in the period 1932-78 and presented regression results of the investment equation for that period. The estimated series of Tobin's q shows that q was less than 1 during the decade 1950-59, amounted to significantly more than 1 in 1960-69, remained stable at the value of 1 in 1970-74, and declined steadily to 0.67 in 1978. The value of Q, on the other hand, seemed to fluctuate much more over time and maintained a stable value of about 2.0 during 1962-69.

Summers presented alternative investment equations using Tobin's q and his tax-adjusted Q. The results indicated that the use of tax-adjusted Q improves the explanatory power of the theory and that Q has a positive and significant effect on the investment equation. Summers used simulations, including tax factors, to analyze the effect of unex-unexpected changes in the rate of inflation on the market value and investment. He found that a permanent increase in the rate of inflation from 0 to 8 per cent had an immediate effect, reducing the market value of the stock by 15 per cent and investment by 10 per cent. The long-term effects on both were approximately 28 per cent. If the firm used a last-in-first-out (LIFO), rather than a firstin-first-out (FIFO) method of inventory valuation, 8 per cent inflation would reduce investment in the short run and in the long run by 6 per cent and 17 per cent, respectively. Similar simulations also showed the positive effect on investment of increasing the investment tax credit and of reducing the corporate and individual tax rates on capital gains and dividends.

In evaluating the investment incentive policies, Summers recommended focusing on incentives for investment in plant and equipment rather than on incentives for saving in general, because the supply of funds to the corporate sector is highly elastic, and only a fraction of any increase in national saving would find its way into corporate capital. Summers' findings suggest that the most desirable investment incentives are those which reduce the "effective" purchase price of new capital goods. Reductions in the corporate tax rate and capital gains tax rate also tend to increase investment in the short and long runs. Reduction in the dividend taxes, which significantly increase the market value of stocks, seems to have no effect on investment. That is because such a reduction is completely offset by the increase in the after-tax cost of retained earnings.

An elaborate analysis of the effect of inflation and taxation on aggregate investment in the United States is presented in Feldstein (1982). He attempts to assess the extent to which changes in tax incentives and disincentives--and, in particular, those changes that are due to inflation--alter the flow of investment.

Feldstein's data indicates a significant decline in investment-gross national product (GNP) ratio during 1975-78, which follows with a possible lag the decline in the net (after-tax) return.

Using a simple regression model that relates the investment-GNP ratio to the net rate of return and a measure of capacity utilization, he finds, for U.S. data during 1953-78, that

$$(I/y)_t = \underset{}{-0.014} + \underset{(0.095)}{0.459}\ R_{t-1} + \underset{(0.025)}{0.028}\ UCAP_{t-1} \qquad (10)$$

where (I/y), R, and UCAP are measures of investment-GNP ratio, net return on investment, and Federal Reserve Board index of capacity utilization, respectively. These results indicate the importance of the net rate of return variable in explaining investment. These results seem to be quite resistant to changes in the sample period and alternative model specifications.

In an alternative model, Feldstein (1982) defines the maximum potential net return (MPNR) as the maximum post-tax nominal yield that the firm, given the current rules of the tax system, can pay on its mix of funds. Calculating the MPNR for a hypothetical project with a fixed pretax yield, Feldstein found that the MPNR increased by only 2 per cent during 1956-76, although the cost of funds (COF) increased by approximately 4 per cent because of inflation. This suggests a reduction in the profitability of investment that has taken place over the period. Using a simple regression frame, Feldstein estimated the following model for the United States during 1956-76.

$$(I/y) = \underset{}{-0.040} + \underset{(0.095)}{0.316}\ (MPNR - COF)_{t-1} + \underset{(0.020)}{0.073}\ UCAP_{t-1}.\ \bar{R}^2 = 0.784 \quad (11)$$

He estimated that a 2 per cent decrease in net profitability (MPNR-COF) between 1956 and 1976 explains a reduction of about 4 points (or about 20 per cent) in the investment-GNP ratio.

In a recent paper, Hendershott and Sheng-Cheng Hu (1981) analyzed the effect of inflation and different tax policies on the cost of capital and, in turn, on the level of investment in producer's equipment. Using data for the United States for 1953-78, they found the cost of capital to be an important determinant of investment in producer's equipment. The results of Hendershott and Hu's analysis of the impact of tax incentives for the economy as a whole are somewhat in contrast with detailed simulations of inventory investment in the United States reported by Eisner and Bender (1982).

In conclusion, the survey in this section reveals the important role that tax factors play in the determination of the cost of capital and of the level of corporate investment. The literature has analyzed different dimensions of tax policy, such as incentives for investment, alternative depreciation rules, personal income tax, and taxation of dividends. Taxation also affects investment indirectly, as it affects the market value of the firm in the Tobin's q and Grunfeld model of investment, as well as the net rate of return on investment.

The empirical studies provide evidence on the importance of tax factors and support the conclusions reached in the theoretical literature. Although detailed empirical studies on the effects of taxation and inflation in countries other than the United States are not yet available, they constitute an important area for research.

II. Allocation of Investment

In Section I, the effects of inflation and taxation on the level of investment in the production sector were reviewed. In this section, the literature on the effects of inflation and taxation on the allocation of investment will be surveyed. In particular, this section focuses on the non-neutrality of inflation in two dimensions. First, in the financial market, inflation and taxation may influence the choice of financial assets--between bonds and stocks, for example. These two types of financial investments are different insofar as bonds represent a "right" to a given nominal stream of income, whereas stocks represent a "right" to an income derived from real assets. Second, inflation and taxation may affect the allocation of resources between investments in different real sectors--for example, in productive capital stock by business firms and in durable assets by consumers, in particular, housing. These two types of investment enjoy different tax treatments in most countries. (The income-in-kind in the form of housing services, for example, is often not taxable.) This section surveys the recent literature on these two aspects. The effects of inflation and taxation on the stock market are reviewed first, and the effects of inflation and taxation on the housing market next.

1. The stock market

It is commonly assumed that, in an efficient stock market, common stocks act as a hedge against expected and unexpected inflation. Common stocks represent a claim over real or productive assets of the corporation, so that the real return in the stock market is expected to remain constant in an inflationary period. Common stocks are assumed to be a hedge against unexpected inflation as well.

The assumption of the stock market, acting as a hedge against expected and unexpected inflation, was studied and tested by Bodie (1976) and Nelson (1976). Their results suggest that the slope of nominal return on common stock with respect to the expected inflation is one, following the Fisher hypothesis, whereas the slope of nominal return on common stock with respect to unexpected inflation is zero.

Empirical studies by Bodie (1976), Nelson (1976), and more recently, Schwert (1981), using the U.S. data but without direct reference to taxation, have all established the general invalidity of the assumption of stock market efficiency. Bodie (1976), using the mean-variance portfolio analysis, found that real return on equity, contrary to popular assumption, was "negatively related to both anticipated and unanticipated inflation" for 1953-73. Nelson (1976), using the framework of the Fisher hypothesis, also found that the stock market response was generally negative with respect to both observed and lagged rates of inflation as well as with respect to expected rates of inflation during the postwar period.

It was only for an extensive time period, 1870-1970, that a positive correlation between the return on stocks and the rate of inflation was found. A similar conclusion was reached by Schwert (1981), who, using daily data, found a weak negative relationship between stock market return and unexpected inflation in the consumer price index. In his conclusion, Schwert summarized the latest research on stock market and inflation: "The most puzzling result of all is still unexplained: why are aggregate stock returns negatively related to the level of expected inflation?".

The significant negative relationship between stock prices and rates of inflation established in these studies suggests that, at least for the short run, stock prices are not a good hedge against inflation and that a simple extension of Fisher's formulation to returns on the stock market is not supported by the U.S. data. In other words, these empirical studies reveal the existence of stock market inefficiency.

The negative correlation between inflation and stock prices in the United States was explained by Feldstein (1980), Arak (1981), and Summers (1981, 1982) in terms of the tax factors. They claimed that tax systems (such as that of the United States), which are not indexed to inflation, lead to excessive taxation of business income and as a result reduce the real earnings of corporations and the level of stock prices. They maintained that therefore a negative relationship exists between the level of stock prices and inflation, once the tax factors are taken into account. Hendershott and Sheng-Cheng Hu (1981 a) suggested two other explanations in support of this conclusion, namely, the increase in risk owing to inflation and the preferential tax treatment of housing (this is discussed below).

Based on the U.S. tax rules, Feldstein (1980 b) established that 8 per cent inflation reduces stock prices by a range of 9-19 per cent, depending on the initial condition. Following a similar approach, Summers (1981 b) found that 1 per cent inflation reduces real return on the stocks by 3.4 per cent. Similar estimates were also made by Hendershott and Sheng-Cheng Hu (1981 a). Arak (1981), in her survey article, concluded that there is probably no single factor that can plausibly explain the substantive fall in real stock value over the last 10 to 15 years in the United States and that the corporate tax system, as well as the tax treatment of housing, probably has played an important role.

For countries other than the United States, the empirical results are less conclusive. Firth (1979) estimated a regression for the United Kingdom between the monthly rate of return on the common stocks listed at the London Stock Exchange and the rate of inflation measured by the Index of Retail Prices for 1955-76. His results showed a positive association between the returns in the stock market and current inflation, with a coefficient that was larger than unity. It seems that the returns on common stocks in the United Kingdom fully adjusted to inflation, at least in 1955-76. Similar results were obtained by Saunders (1978).

In a recent study on Australia, Saunders and Tress (1981) found a negative relationship between inflation and stock market returns. This is consistent with the findings for the United States.

In a recent comprehensive study, Mandelker and Tandon (1981) tested the relationship between the return on common stocks and inflation for nine industrial countries, namely, the United States, the United Kingdom France, the Federal Republic of Germany, the Netherlands, Canada, Japan, Belgium, and Italy. They found a significant negative relationship between the rate of return on common stocks and inflation for six of the nine countries. These countries were France, Belgium, Canada, Japan, Italy, and the United States. For the United Kingdom they found, similar to Firth (1979), a significant positive relationship, whereas for Germany and the Netherlands, they did not observe a significant relationship.

The international comparisons yield such different results on the behavior of the stock market with respect to inflation in different countries that more specific country analyses, especially in which the tax variables that could play a significant role are incorporated, are called for. However, no such analyses are presented in Mandelker and Tandon.

2. The housing market

The differential tax treatment of different sources of income can affect the relative profitability of alternative investments. The tax treatment of business income and other specific tax rules on depreciation allowances, inventory valuation, business deductions, etc., may affect allocations within the production sector (see, for example, Cordes and Shefferin (1981)). However, tax treatment of the housing sector has led to an emphasis in the literature on the comparison between investment in housing (and homeownership) and investment in the productive sector (and stock ownership). In this section, we will briefly review the effects of inflation and tax factors on investment in housing, with some empirical estimates, mainly for the United States.

Following Hendershott and Sheng-Cheng Hu (1981), a few tax parameters relevant to evaluating investment in housing and, in particular, homeownership may be listed: (a) taxation of the income-in-kind provided as housing services; (b) taxation of capital gains from selling a house; (c) the tax deductibility of interest payments on mortgage; and (d) other special tax treatment, such as the tax treatment of depreciation and maintenance costs of enjoying the housing services, property taxes, etc. Preferential tax treatment for homeownership normally consists of preferential tax rates on income-in-kind from housing, low capital gains taxes on the sale of a home, and the tax deductibility of mortgage interest costs, property taxes, etc. Hendershott and Sheng-Cheng Hu (1981) compared the return on house ownership with the return on an

alternative tax-free investment. They found that, for owners with a marginal income tax rate of 0.45 and a 70 per cent mortgage, the return on homeownership increased considerably in the last 25 years. The excess of return on homeownership over alternative tax-free investment increased from about -7 per cent in 1956-63 to about +10 per cent in 1964-71 and 1972-79. They stressed that only a small part of this "excessive" return is accounted for by the low "real" mortgage interest rates of the past and that mostly it is due to the tax deductibility of the mortgage interest.

Poterba (1980) simulated the working of the U.S. housing market and showed that taking into account the preferential tax treatment of housing in the United States an increase in expected inflation during the 1970s, could account for the 30 per cent increase in real housing prices and could lead to an increase of 20 per cent in the stock of housing. The "excessive" return on housing, owing to inflation and preferential tax treatment, had a positive effect on the demand for housing and a negative one on the demand for common stock, reducing the real level of stock prices referred to earlier. A fall in stock prices, according to Tobin's q model, contributes to a reduction in corporate investment.

Summers (1981) claims that the taxation of housing tends to remain unaffected by inflation and that the real rate of return on housing has been relatively stable in the United States, about 4.5 per cent during 1965-79. He compared the return on housing and the return on corporate capital in the United States. While the former was constant during the last 15 years, the return on corporate capital declined considerably, by as much as 60 per cent. A large part of the decline was due to an increase in the "effective" tax rate on corporate incomes, owing mainly to historical cost depreciation and taxation of nominal capital gains. Furthermore, Summers found that an increase of 1 per cent in the expected rate of inflation reduced the return on the stock market by 7.6 per cent and increased the return on housing by 1.7 per cent.

Ben-Zion and Biger (1982) presented an analysis of the effect of inflation and taxation on the housing industry in Canada on the hypothetical assumption that interest payments by homeowners are not tax deductible, whereas interest payments for productive investment are tax deductible. In such a situation, the increase in nominal interest rates, attributable to inflation, raises the effective tax rates more on homeowners in Canada than on those in the United States and, given the integrated capital markets in the United States and Canada, reduces the relative profitability of the housing investment in Canada.

While most of the literature surveyed in this section relates to the United States, the framework has been applied to some countries with a different tax treatment of housing (e.g., see Charles (1979) for the United Kingdom).

In conclusion, taxation affects the return on common stock as well as the return on housing investment. A tax system that increases the tax burdens on corporations under inflationary conditions, owing to lack of inflation adjustment, tends to reduce the real return on common stocks, making them an inadequate hedge against inflation, as has been established in the case of the United States. The preferential tax treatment of housing, in one form or another, tends to result in "excessive" return on housing investment vis-à-vis other investments. For the United States, this seems to stem mainly from the deductibility of mortgage interest and the lower taxation of capital gains.

III. Financing of Investment

In maximizing their value, firms tend to optimize three types of policies: investment, financing, and dividend. This section of the paper focuses on corporate financial policies, especially debt-equity ratio and retention-dividend ratio.

1. Corporate financial policies: debt-equity ratio

The central problem dealt with in the literature on debt-equity ratio is the following. If two firms, that are identical in every respect, including their investment and dividend policies, are compared, will their stocks be selling at the same market values even if they employ different financing methods or debt-equity ratios? If they do, then clearly the financing policy is of no consequence whatsoever. If the value of the two firms is different, however, then the financing policy has an important effect on the value of the firm. It would then be important and interesting to examine the factors underlying the effects of the capital structure on the value of the firm and the implications for determining an optimal capital structure that maximizes the value of the firm, or equivalently, that minimizes the firm's cost of capital.

This section is based on the classic paper by MM (1958) on the cost-of-capital and the numerous theoretical and empirical studies that followed that paper.

a. Modigliani-Miller theory

The landmark paper on this subject is the one by MM (1958), hereinafter referred to as the MM paper.

(1) Perfect capital markets

In their original model, MM assumed that capital markets are perfect; namely, there are no taxes and no bankruptcy or transaction costs; both firms and individuals can borrow and lend at the same market interest rate; and all earnings are paid in dividends. Some of these assumptions are adjusted later (see below), and the resulting impacts are analyzed. Under this set of assumptions, MM proved that the capital

structure has no effect on the value of the firm or, in other words, that the value of an all-equity (unlevered) firm is equal to the value of a (levered) firm that has some debt in its capital structure but that otherwise, is identical in every other respect. This statement is known as MM no-tax proposition I. To prove this proposition I, MM employed the arbitrage-process mechanism. Arbitrage takes place in the capital market when assets are incorrectly valued, that is, when they are overvalued or undervalued.

Defining k_U as the cost of capital for the unlevered firm, k_L as the weighted average of the levered firm's cost of debt (k_d) and its cost of equity (k_e), they derive the following relationships:

$$k_e = k_U + (k_U - k_d)B/S \text{ and} \tag{12}$$

$$k_L = k_d\ B/(B+S) + K_e\ S/(B+S) \tag{13}$$

where B and S are the market values of bonds and common stocks, respectively. Equation (12) is the so-called MM no-tax proposition II. According to this equation the cost of equity capital is equal to k_U (market interest rate reflecting time value of money and a premium for business risk, if any) and a premium for a financial risk, which is a direct function of the firm's debt-equity ratio, B/S. A more explicit expression which relates the risk associated with the stock of the levered firm in terms of that of the unlevered firm and the debt-equity ratio has been derived in the literature by Hamada (1969) and Rubinstein (1973), and has been extended for the cases of risky debt, personal income taxes, and bankruptcy costs by Yagil (1982).

In brief, the MM no-tax analysis of a firm's capital structure states that the value of a levered firm and its overall cost of capital are equal to those of the unlevered firm simply because, from the stockholders' (levered firm's) point of view, although the expected return is higher, the risk associated with it is higher, too.

MM's results for perfect capital markets were later derived by others, for example, Sharpe (1964), Mossin (1966), Diamond (1967), Hamada (1969), Stiglitz (1969), Hirshleifer (1970), Schall (1972), Rubinstein (1973 a), Black and Scholes (1973), Baron (1975), J. Scott (1976), Galai and Masulis (1976), and Fama (1978)--even though in their analyses these studies employed different models, such as a state-preference model, a capital-asset pricing model (CAPM), and an option pricing model.

Developing a state-preference model, Hirshleifer (1970) showed that, under "complete" markets, namely, those in which every recognized object of choice (time-state claim) can be exchanged, there is no unique optimum mode of financing. This is because, in complete markets and in the absence of external drains, such as taxes and transactions costs, all possible sets of claims to the firm's income stream have the same wealth value, so there is no financing optimum. The same result is also obtained under the CAPM.

Under the CAPM, developed by Sharpe (1964), all investors hold the "market portfolio," that is, all investors hold equal proportions of each firm's debt and equity. Consequently, shifts of wealth from one class of securities to another leave investors indifferent. Therefore, the financing policy of a firm is irrelevant.

In the option pricing model, the common stock of a firm is viewed as a call option. That is, although the bondholders have the first claim on the firm's assets, the stockholders can "buy back" the firm from the bondholders by calling the bonds. Developing this idea further, Black and Scholes (1973) and, later, Galai and Masulis (1976) demonstrated that, as long as the "me first" rule regarding the legal priority on assets was maintained, a financing policy--such as issuing more debt to finance a stock repurchase--would have no effect whatsoever on either the market value of existing debt or the remaining stock.

In conclusion, the irrelevance of financing policy, implied by the preceding models of corporate financial policy, relies heavily on the assumption of perfect capital markets. However, in reality, the markets are imperfect. The following sections, therefore, examine the capital structure decisions assuming imperfect capital markets.

(2) Imperfect capital markets

(a) Corporate income taxes. Assuming that corporate income taxes are the only type of market imperfection and that interest is fully deductible, corporate capital structure is likely to be affected as follows:

The after-tax net income to the shareholders of the unlevered firm (Y_U) will be

$$Y_U = \overline{X}(1-t_c) \tag{14}$$

where $\overline{X}$ is the pretax income of the unlevered firm, and t_c is the corporate income tax rate. Market value of the unlevered firm (V_u) will then be given by

$$V_U = \overline{X}(1-t_c)/k_U. \tag{15}$$

The after-tax net income to all security holders of the levered firm (Y_L) consists of the net income to the bondholders (Y_B) and the net income to the shareholders (Y_S), that is

$$Y_L = Y_B + Y_S = k_d B + [(\overline{X} - k_d B)(1-t_c)] \tag{16}$$

which can be rewritten as

$$Y_L = \overline{X}(1-t_c) + t_c k_d B. \tag{17}$$

The market value of the levered firm (V_L) will then be equal to the discounted values of two terms on the RHS of equation (15), each at the appropriate discount rate. That is,

$$V_L = \overline{X}(1-t_c)/k_U + t_c k_d B/k_d \tag{18}$$

which, using equation (12) above, reduces to

$$V_L = V_U + t_c B. \tag{19}$$

Equation (19) demonstrates that $V_L > V_U$ by an amount equal to what is called the tax shield of debt. Clearly, the higher value of the levered firm also implies that its cost of capital (k_L) is lower than that of the unlevered firm (k_U).

The MM analysis of the no-tax case yields the following corresponding expressions for K_e and K_L in the tax case:

$$k_e = k_U + (1-t_c)(k_U-k_d)B/S \tag{20}$$

$$k_L = (1-t_c)k_d B/(B+S) + k_e S/(B+S) \tag{21}$$

These expressions are identical to equations (12) and (13) above in the no-tax case, except for the tax factor. They indicate that, if corporate income taxes were the only type of market imperfection, companies should employ debt as much as possible. That is, the optimal debt equity ratio that maximizes the value of the firm or, equivalently, that minimizes the cost of capital approaches infinity. This obviously represents a corner solution and clearly does not reflect reality. Other factors causing capital market imperfections and affecting the value of the firm must, therefore, be considered. Two such factors, analyzed in the literature, are personal income taxes and bankruptcy costs, and these are discussed below.

(b) Personal income taxes. The effect of personal income taxes, including those on capital gains, on the value of the firm has been examined in studies by Farrar and Selwyn (1967), Stapleton (1972), Stiglitz (1973), Miller (1977), and Arditti, Levy, and Sarnat (1977). With both corporate and personal taxes, the relationship between the value of a levered firm and that of an unlevered firm has been shown in the literature to be

$$V_L = V_U + B[1 - (1-t_c)(1-t_s)/(1-t_b)] \tag{22}$$

where t_s and t_b are the personal income tax rates applicable to the shareholders and bondholders, respectively. Since capital gains are generally taxed at a lower rate than ordinary income, and since the capital gain component of income is higher for stocks than for bonds, t_s will be lower than t_b. Equation (22) demonstrates that, if only personal (but not corporate) income taxes exist, V_L will be lower than

V_U because the firm has to pay the bondholders a higher rate of interest to compensate them for the higher tax rate they pay compared to the shareholders. But if, in addition to personal taxes, corporate taxes exist, debt will have a corporate income tax advantage and a personal income tax disadvantage, and therefore, depending on the specific values of the tax rates (t_c, t_s, and t_b), there will be three distinct possible solutions that maximize the value of the levered firm: (1) the MM "corner solution," (2) the "zero-debt" solution, and (3) the "undetermined" debt-equity ratio solution.

These solutions again are not consistent with the existence of a single and finite debt-equity ratio which maximizes the value of the firm. The literature has, therefore, focused on bankruptcy costs, in addition to taxes, to see if they can explain the existence of a finite optimal capital structure.

(c) Bankruptcy costs. So far, the analysis has been based on the assumption that, although the risk of default increases with an increase in the debt-equity ratio, it is costless to go bankrupt. In reality, however, there are various direct costs associated with the state of bankruptcy, such as the payments to the court, lawyers, accountants, trustees, and others who handle the bankruptcy proceedings. In addition to the direct type of costs, there are indirect costs of bankruptcy, such as the loss of potential future profits owing to the liquidation of the assets. Therefore, a firm attempting to maximize its value will attempt to reduce the expected value of these types of costs. This would imply that, if corporate taxes did not exist, levered firms would not exist, because in this case debt would only have a net tax disadvantage and V_L would always be lower than V_U. But with the corporate income tax advantage of debt, V_L can be higher than V_U. This trade-off between the tax advantage of debt and the bankruptcy costs disadvantage of debt has been examined in numerous studies, such as Baxter (1967), Kraus and Litzenberger (1973), Warner (1977), J. Scott (1976), Miller (1977), Kim (1978), and Haugen and Senbet (1978).

Combining the CAPM with the MM theory of capital structure, extended to the case of bankruptcy costs, Kim has derived the following relationship between the value of a levered firm (V_L) and that of an unlevered firm (V_U) in the context of a one-period model:

$$V_L = V_U + t_c B R_f/(1+R_f) - t_c(A-B)\tilde{V}(b) - (1-t_c)\tilde{V}(c), \qquad (23)$$

where
- A = the cost of acquiring physical assets for investment,
- B = the market value of debt, as before,
- t_c = the corporate tax rate, as before,
- R_f = the rate of return on risk-free asset,
- c = bankruptcy costs, and
- b = the bankruptcy operator, or the probability of the occurrence of bankruptcy, which takes the values of 0 and 1 for solvency and bankruptcy, respectively.

The terms $V(\tilde{b})$ and $V(\tilde{c})$ are given as follows:

$$V(\tilde{b}) = \{(E(\tilde{b})-[E(\tilde{R}_m)-R_f]/\sigma_m^2) \cdot \text{cov}\ (\tilde{b},R_m)\}/(1+R_f) \qquad (24)$$

and

$$V(\tilde{c}) = \{(E(\tilde{B})-[E(\tilde{R}_m)-R_f]/\sigma_m^2) \cdot \text{cov}\ (\tilde{B},\tilde{R}_m)\}/(1+R_f) \qquad (25)$$

where R_m and σ_m^2 are the return on the market portfolio, its variance, E and cov., are the expected value and covariance operators, and tilde ($\sim$) denotes a random variable. $V(\tilde{b})$ is the risk-adjusted present value of one dollar associated with the occurrence of bankruptcy, and $V(\tilde{c})$ is the risk-adjusted present value of the bankruptcy costs. (An expression similar to equation (23) which incorporates personal taxes as well can be found in Gordon and Yagil (1981).)

Expression (23) demonstrates that, in the absence of taxes and bankruptcy costs (i.e., $t_c = 0$ and $\tilde{B} = 0$) but with a positive probability of bankruptcy, equation (23) reduces to $V_L = V_U$, that is, the market value of the firm is independent of its capital structure. With the introduction of corporate taxes and bankruptcy costs, the ex ante market value of the assets is divided among four parties: stockholders, debtholders, the government, and bankruptcy costs. Since $V(\tilde{B})$ increases as the probability of bankruptcy increases (which depends on the financial leverage), $V(\tilde{B})$ will also increase as financial leverage increases. On the other hand, debtholders have claims to the future earnings of the firm that are prior to the government claim, and hence the portion of the assets accruing to the government in a form of taxes, V(G), decreases with increased financial leverage. Therefore, as the firm's financial leverage increases, the increase in $V(\tilde{B})$ will be offset by a decrease in V(G), and the sum of $V(\tilde{B})$ and V(G) will either increase or decrease, depending on the particular degree of financial leverage. Therefore, the financial structure that minimizes the sum of V(G) and $V(\tilde{B})$ will maximize V_L in equation (23).

In other words, if one considers both corporate taxes and bankruptcy costs, there exists a finite optimal capital structure, or debt-equity ratio, which maximizes the value of the firm. This is so because, at low debt-equity ratios, the tax advantage exceeds the bankruptcy costs disadvantage, whereas the opposite holds true at high debt-equity ratios. However, when the risk of default is high, and the company is in financial distress, the shareholders, according to Myers (1977), may well make suboptimal investment decisions.

Miller (1977), Warner (1977), and Haugen and Senbet (1978) claim that, compared to the corporate tax advantage of debt, the effect of bankruptcy costs is very small. In addition, Miller (1977) continues, the personal income tax disadvantage of debt is sufficient to negate the corporate income tax advantage of debt. Therefore, he concludes, although there may exist an optimal capital structure, the value of a firm can still be independent of its capital structure or debt-equity ratio.

b. Other theories

The preceding analysis suggests that, in a world of taxes and bankruptcy costs, firms will employ an optimal debt-equity ratio that maximizes their value. However, additional market factors have also been found in the literature to influence the observed capital structure of corporations. These have been suggested in studies by Baumol (1959), Gordon (1964 and 1969), Williamson (1964), Stiglitz (1972), Rubinstein (1973 b), Jensen and Meckling (1976), Lintner (1977), Ross (1977), and Levy (1978). At least four hypotheses have been suggested:

(1) the "imperfections in the borrowing market" hypothesis;
(2) the "segmented securities markets" hypothesis;
(3) the "target risk level" hypothesis; and
(4) the "managerial interests" hypothesis.

As this section of the paper focuses on the role of taxation in the determination of corporate financial policy and as the above-mentioned theories do not emphasize tax factors, they are mentioned only briefly here.

(1) Imperfections in the borrowing market hypothesis

One of the crucial assumptions underlying MM no-tax proposition I has been that personal leverage is a perfect substitute for corporate leverage. Gordon (1969) challenged this assumption and argued that "homemade" leverage cannot be considered as a perfect substitute for corporate leverage; consequently, the so-called "arbitrage process" will not take place in the exact form presented by MM. Therefore, he concluded, the value of a firm may be affected by its capital structure. In his study, Gordon developed this argument and supported it with empirical evidence. He claimed that individual "limited liabilities arrangements" or "buying on margin" possibilities are very limited in practice; one reason is that in margin purchasing, when the value of the investment falls below the value of the individual's equity, he is wiped out. In contrast to individual investors, corporations do not necessarily go bankrupt when they experience financial distress.

(2) Segmented securities markets hypothesis

Most financial theories assume (implicitly or explicitly) that markets are not segmented. However, in reality, capital market is segmented, that is, different subsets of investors hold different subsets of securities. It has been argued that the adoption of the segmented securities markets assumption can explain the existence of an optimal capital structure of a firm.

The "separation theorem," in the context of the CAPM, will hold only if every investor can invest in every security available in the market. In reality, this investment pattern may not be attainable. Lintner (1971) shows that, when this requirement is not satisfied and capital markets are segmented, the price of risk for any stock varies inversely with the summation of the risk-tolerance (reciprocals of risk-averse coefficients) of the investors who have the stock in their portfolios.

While Stiglitz (1972) assumed "risk neutrality," Rubinstein (1973 b) included "risk aversion" in his general equilibrium model. He showed that with positive covariances with other market assets, when there are net tax advantages from debt and when the market price of risk is higher in the debt than in the equity market, there will be an optimal capital structure for the firm even if the expectations of participants in the capital markets are homogeneous. A stronger result was obtained by Lintner (1977), who showed that an optimal debt-equity ratio in partially segmented markets exists even when the market prices of risk are the same and when there are no tax effects. More specifically, he showed that, before allowing for tax effects, all firms whose securities are traded in partially segmented markets will have a finite value-maximizing debt-equity ratio, provided that the securities are not highly correlated with the rest of the market. If, in addition, the expectations of investors are heterogeneous, the optimal financial leverage will vary inversely with the relative pessimism of creditors regarding the company's prospects.

Levy (1978) modified the Sharpe (1964) CAPM by assuming that investors "do not hold the market portfolio," an assumption that is realistic. In this type of market segmentation, Levy shows that the variance of a security plays a crucial role in the risk measure of each stock. This theoretical result is supported by Levy's empirical findings, from which he concludes that the price behavior of most securities, which are not widely held, can be explained better by the security's total risk (variance) than by its systematic risk (beta).

The persuasiveness of the "segmented securities market" hypothesis depends largely on the type and degree of segmentation that exists in the capital markets and the degree to which investors' expectations with regard to risk and returns of firms are heterogeneous.

(3) The target risk level hypothesis

Gordon (1964) provided a theory of capital structure whose central hypothesis holds that a firm maximizes its expected future income subject to the constraint that a satisfactory level of safety is maintained or achieved. Since the safety of a firm varies inversely with its debt-equity ratio, the latter can be used as a measure of risk. The specific level of acceptable risk depends on, among other factors, the personality of management and on the firm's line of business.

(4) The managerial interest hypothesis

The current literature on the theory of the firm contains a number of studies in which it is argued that the investment and financing decisions of a firm are affected by managerial self-interest. Baumol (1959), for example, hypothesized that sale maximization is the management objective in the long run as well as in the short run. Williamson (1964) replaced Baumol's "sale maximization hypothesis" by the "expected utility maximization" hypothesis. Underlying both the "sales" and the "utility" hypotheses is the belief that managers pursue personal goals and that both management's pecuniary and nonpecuniary rewards are dependent on the firm's asset size rather than on its profits. The manager's benefits include bonuses, stock options, salary, security, status, power, prestige, and recognition for professional excellence. Jensen and Meckling (1976) also recognized the potential for divergence between the goals of managers (self-interest) and the goals of shareholders (wealth maximization). By integrating elements from the theory of agency costs and the theory of property rights, they argued that an owner can curb these divergences by establishing appropriate incentives for a manager and by incurring monitoring costs designed to limit those activities of the manager that might harm the owner.

Ross (1977) and Leland and Pyle (1977) attempted to explain observed capital structure by the existence of asymmetric information between insiders (corporate managers) and outsiders. According to them, the managers convey to investors information about the firm through financial signals. Increasing the financial leverage, or equity of the firm, for example, provides positive signals about the firm's future profitability and might be welcome by the shareholders, but this may also increase the firm's risk of default, which is a major determinant of the manager's own risk. Therefore, a conflict between the interest of the shareholders and that of the managers could arise.

c. Inflation and taxation

A simple theoretical analysis of the effect of inflation and taxation on debt-equity ratio was presented, in a general equilibrium framework, by Feldstein, Green, and Sheshinsky (1978). Their study dealt with debt-equity ratio at the economy-wide level rather than at the level of individual firms.

In the first stage, Feldstein, Green, and Sheshinsky considered a three-equation model in a growing economy: (1) a production function; (2) a demand-for-money function; and (3) an equilibrium equation for saving and investment. They assumed that the government deficit is a constant share of the national income, that the tax rules are similar to those of the U.S. tax system, and that there are no retained earnings (i.e., the firm payout ratio is 1). The firm chooses the optimal debt-equity ratio that minimizes the average cost of capital. This optimal ratio depends positively on the difference between the required real net return on equity and bonds.

Under some arbitrary (but reasonable) assumptions, Feldstein, Green, and Sheshinsky concluded that inflation affects the debt-equity ratio, depending on the difference between the rates of the corporate income tax and the personal income tax. Assuming that the former is higher, they claimed that inflation, in a tax system such as the one used in the United States, is not neutral with regard to the debt-equity ratio. More specifically, inflation tends to increase the debt-equity ratio.

Feldstein, Green, and Sheshinsky (1979) suggested the indexation of the tax system by (a) the elimination of capital gains taxes; (b) allowing replacement cost depreciation; (c) taxing individuals on the real (rather than the nominal) interest rate; and (d) allowing corporations to deduct the real (rather than nominal) interest rate. It is only in such a system that inflation will have no effect on the capital structure.

Subsequently, Feldstein, Green, and Sheshinsky (1979) extended their analysis to a more realistic model in which the payout ratio is also a decision variable. However, the latter model does not deal with inflation. Auerbach (1981) also claimed that the likely effect of inflation is to make debt a cheaper source of finance and equity more expensive, encouraging greater use of the former.

The above conclusions of Feldstein, Green, and Sheshinsky and Auerbach assume that the after-tax real return to holders of equity and debt (or the required return on stocks and bonds in the financial markets) remains constant. If, however, inflation affects the risk and the risk premium of the two differently, this conclusion is no longer valid. Also, since in the financial market one observes market segmentation for bonds and stocks (according to the marginal personal tax rate and the subjective expectation), it seems that the theoretical analysis of the effect of inflation on debt-equity ratio is substantially more complicated. Auerbach (1981 and 1982) also reached this conclusion.

d. Empirical studies

Some evidence on the nontax and tax determinants of observed capital structures and whether a firm's financing policies are consistent with the existence of an optimal capital structure is presented below.

(1) Nontax factors

Several empirical studies such as Baxter and Cragg (1970), Martin and Scott (1974), and Taub (1975) concentrated on the debt/equity choices of firms. They all found that small firms with high price-earnings ratios tend more to issue equity. Martin and Scott found that high payout, low profitability, and high proportion of fixed assets all tended to be associated with higher debts.

Several other studies provide evidence on the timing of market issues and whether companies try to maintain target debt ratios. Brealy, Hodges, and Capron (1976) and Taggart (1977), for the United States, and Marsh (1979), for the United Kingdom, all indicate that equity issues tend to follow market upturns. In addition, Scholes (1972), for the United States, and Marsh (1979), for the United Kingdom, indicate that equity issues also tend to follow periods of unusually high (positive) residual returns on the company's common stock. For debt issues, White (1974), Taggart (1977), and Solnik and Grall (1975), all provide evidence that both the level and structure of interest rates are important determinants of the level of long-term debt issues. There is also some evidence that firms tend to maintain a target debt ratio, as Gordon (1962) had hypothesized. This is indicated in Bosworth (1971), Taggart (1977), Ang (1976), Lev (1969), Lev and Pekelman (1975), and Marsh (1982). Other studies found that the main determinants of debt ratios are operating risk, company size, and asset composition. These include studies for the United States, by Gupta (1969), Lev (1969), Scott (1972), Carleton and Silberman (1977), and Ferri and Jones (1979); for the United Kingdom by Brealy, Hodges, and Capron (1976) and Marsh (1982); for the Federal Republic of Germany by Schmidt (1976); and for a cross-section of countries by Stonehill, and others (1973) and Toy and others (1974). Some of these studies also found a significant industry effect on debt-equity ratios. Remmers and others (1975) claimed, however, that neither size nor industry is a determinant of a firm's debt-equity ratio.

A recent paper by Scott and Johnson (1982) provides additional insight into financing policies of large American corporations. Their data were generated from a detailed questionnaire sent to chief financial officers of each of the 1979 "Fortune 1000" firms. They found that firms use "target" financial leverage ratios as an input for making financing decisions. The most important influence on these targets is the firm's own management group and analysts. Several ratios are used by corporations to measure leverage, especially (1) long-term debt to

total capitalization, (2) interest earned, and (3) long-term debt to net worth. For computing (1) and (3), book values, rather than market values, are frequently used. It was evident that the firms' executives subscribed to the concept of an "optimal" capital structure and believed that the prudent use of debt could lower the firm's overall cost of capital as well as affect the common stock price. In practice, this means that long-term debt to total capitalization ratios fall predominantly into the 26-40 per cent range. (The most popular reported range for this ratio was 26-30 per cent.) It should be noted that the above results were based on a relatively low response rate of 21 per cent.

In summary, when choosing between debt and equity, companies appear to maintain long-term target debt levels, although they may deviate from these in the short run in response to timing considerations and capital market conditions. Furthermore, the evidence is consistent with the notion that these long-term targets are functions of the variables that "theory" suggests should be important, such as operating risk, company size, and asset composition.

(2) Tax factors

A test of the "optimal" capital structure hypothesis, taking tax factors into account, was conducted by Flath and Knoeber (1980). They attempted to determine empirically if taxes, on the one hand, and bankruptcy costs, on the other hand, explain cross-sectional and temporal variations in industry capital structures. They first measured the size of the tax advantage of debt and the costs of failure. Taking account of both corporate and personal taxes, they found that on the margin the annual net tax advantage of incurring $1 of interest generally ranged cross-sectionally from $0.14 to $0.16 during 1957-1964 and from $0.23 to $0.26 during 1965-1972. The marked increase in tax advantage between the two periods, they noted, was due to the decrease in personal tax rates occurring in 1964. With respect to the bankruptcy costs, they found approximately unitary elasticity between the costs (both direct and indirect) of failure and the firm's income (before interest and taxes). For their cross-sectional regressions they found that variation in capital structure, or debt-equity ratios, was best explained by differences in operational risks and not by interindustry differences in the tax advantage to interest, which were quite small.

An empirical test of the effects of taxation and inflation on debt-equity ratios was carried out by Feldstein and Summers (1979), who showed that corporations tend to have significant capital gains on their debt obligations, which decline in real terms in inflationary times. Since this capital gain is not taxed, it reduces the "excessive" taxation on corporations, which otherwise results from historic cost depreciation and which encourages debt financing. However, this saving is important only in the case of unexpected inflation; in the case of expected inflation, it is only when the tax rate on individuals is lower than the corporate tax rate that the saving becomes important.

Empirical studies on debt-equity ratio by Gordon and Malkiel (1981) show that the debt-equity ratio in the United States increased significantly between 1957 and 1970 but has been relatively constant between 1970 and 1978. This does not support the view that inflation causes firms to increase debt-equity ratio, owing to a decline in the real after-tax cost of debt. As suggested by Gordon and Malkiel, these findings reflect the effect of a change in the degree of uncertainty in the economy. Uncertainty declined during the 1950s and early 1960s, leading to an increase in debt-equity ratio, while the increase of uncertainty during the 1970s reduced the debt-equity ratio (in the opposite direction of the reduction in the net real rate of interest on debt).

2. Corporate financial policy: retentions vs. dividends

So far, we have concentrated on the determinants of debt-equity ratios, but a major source of financing for many firms tends to be retained earnings. The decision of how much to retain is linked to the decision of how much to pay out as dividends. In this respect, the dividend policy can be viewed as a relevant policy, determined by the corporate financing policy or the debt-equity ratio.

Does the dividend policy, per se, have an impact on the value of the firm? In other words, will two given firms, identical in every respect, except for their earning retention rates, be selling for different market values? The effect of dividend policy on the value of the firm has been closely studied.

a. Theory

Under conditions of certainty, dividend policy clearly cannot affect the value of the firm, because both the stream of future taxes and the rate at which this stream is discounted are completely known. The net present value (NPV) of the income stream to the stockholder and the market value of the firms must, therefore, be the same whether the firm has a high or a low earnings retention rate.

Under conditions of uncertainty, the effect of dividend policy will depend on whether or not capital market imperfections, such as the taxes and transactions costs referred to earlier, exist. If no market imperfections are present, then also, according to the MM school of thought, dividend policy will not have any impact on the value of the firm. This view is, however, challenged by Lintner (1956) and Gordon (1959), who argued that the current dividend policy resolves part of the uncertainty in the mind of investors. Gordon (1962) hypothesized that this uncertainty increases with the distance in the future of expected dividends. Therefore, he concluded that, if a firm increases the retention, the rate at which the expected stream of dividends is discounted also increases, with the result that the current stock price will fall.

Two factors that make a firm's dividend policy relevant to the valuation of the firm are the information content and the clientele effect of the policy. Studies that emphasize these factors include those of Walter (1963), Friend and Puckett (1964), Elton and Gruber (1970), Watts (1973), Charest (1978), Bhattacharya (1979), and Kalay (1983).

Since corporations follow a relatively stable policy and are reluctant to reduce dividends, an announcement of an increase in dividend tends to have a positive effect on the stock price since it communicates information to investors about the company's profitability.

The clientele effect of dividend policy is based on the assumption that different investors have different preferences for dividend vis-à-vis capital gains because of their personal tax situations and that investors will choose firms that fit their preferences. Alternatively, firms will tailor their dividend policies according to their investors' preferences. Since dividends are generally taxed at a rate higher than that applicable to capital gains, stocks with low dividend payouts will attract investors in a high income tax bracket, whereas stocks with high dividend payouts will attract investors in a low income tax bracket. Companies will need to consider these factors when they prepare their dividend policies (see Gordon and Bradford (1983)).

Other factors affecting dividend policy are flotation cost and brokerage fees. Other things being equal, the first factor will favor a cut in dividends in order to increase the financing components of retained earnings, whereas the second factor will favor an increase in cash dividends. Some studies, such as Gordon and Malkiel (1981), incorporate the combined effects of personal income taxes and flotation cost on the cost of new equity as opposed to the cost of retained earnings.

Other considerations affecting dividend policy that are discussed in the financial literature are the following:

(1) Stability: Investors' desire for stability in income may dictate a constant level of dividend rather than a constant payout rate, because the latter policy will make dividends fluctuate with earnings.

(2) Liquidity: Since the payment of cash dividends affects the firm's liquidity, the payout rate will reflect the firm's own liquidity requirements.

(3) Control: Control, and no dilution, of ownership will dictate a reliance on retention financing to avoid a new issue of common stock.

In conclusion, corporations seem, in practice, to adopt a dividend policy of a stable dollar amount per share, which increases moderately over time. This dollar amount is related to a long-run target payout ratio that reflects the company's dividend policy and takes into account all of the above-mentioned considerations. Because corporate managers are reluctant to cut dividends and because of the information associated with the announcement of an increase in dividends, companies tend to pay out "extra dividends" when earnings are relatively high. Some firms, particularly those with volatile earnings, tend to incorporate extra dividends as a regular feature of their dividend policy.

The preceding analysis has described various factors that may affect the dividend policy of corporations. Companies with common characteristics, that is, growth, risk, size, etc., tend to have similar dividend policies. Moreover, firms tend to maintain their dividend policies over time. This may imply that dividend policies do have an effect on the value of the firm and that both corporate managers and individual investors behave as if dividend policy matters.

b. Empirical studies

In recent studies, Poterba and Summers (1981) discussed the effect of taxes on dividend payments. Using the traditional approach, they showed that:

(1) an increase (decrease) in the rate of dividend tax will reduce (increase) the dividend payout ratio; and

(2) an increase in the rate of dividend tax will reduce the capital intensity of the firm.

Using the approach developed by Auerbach (1979 a and 1979 b) and Bradford (1981), Poterba and Summers (1981) suggested that a dollar invested by the firm is expected to increase the market value of the firm and the stockholders' wealth by the same amount but, owing to dividend taxes, a dollar of dividend increases the latter's wealth by less than one dollar.

Traditional literature assumed implicitly that the Tobin's q is equal to unity. However, Poterba and Summers found that the observed value of q was normally less than 1, at least in the post-World War II period in both the United States and the United Kingdom. This clearly indicates that dividend taxes discouraged corporate investment in both these countries. This result implies that, even though only a negligible fraction of investment is financed through the issue of new shares, dividend taxes (which affect the cost of capital of new equity) have had a significant effect on the cost of capital. This finding confirms the conclusions of earlier works, such as Feldstein (1970, 1972) and King (1979), on the importance of the effects of corporate and dividend taxation on decisions made by firms.

In conclusion, there are various theories on the determinants of corporate financial policies. Personal and corporate income taxes, tax deductibility of interest payments, and taxes on capital gains appear to constitute one--and only one--set of the many factors influencing decisions on debt-equity ratio as well as retentions versus dividends. Briefly stated, the following conclusions emerge:

1. In perfect capital markets, the value of a levered firm and its cost of capital are independent of the firm's capital structure, whether debt is risky or risk-free, because a higher financial leverage involves both higher return and higher risk to the owners of the firm.

2. When either bankruptcy costs and/or personal income taxes are the only type of market imperfection, debt is never employed, because in this situation debt involves only disadvantages.

3. When debt is risk-free and corporate income taxes are the only market imperfections, the debt-equity ratio that maximizes the value of the firm approaches infinity.

4. When debt is risk-free and there exist both corporate and personal income taxes, then--depending on the tax rates--there are three distinct optimal debt-equity ratios: zero, infinity, and undetermined.

5. When both taxes and bankruptcy costs exist, there is a finite optimal debt-equity ratio that maximizes the value of the firm because, at a low level of debt-equity ratio, the tax advantage exceeds the disadvantage of bankruptcy costs, whereas the opposite holds true at a high level of debt-equity ratio.

6. Additional factors that may explain observed capital structure of corporations include imperfections in the borrowing markets, segmentation in the securities market, and the existence of managerial interests. The latter relates to issues such as the target-risk level, agency costs, and financial signaling.

7. Empirical studies on corporate financial policies suggest that, when choosing between debt and equity, companies try to maintain long-term debt levels, even though they may deviate from these in the short run in response to timing considerations and capital market conditions. Moreover, the evidence supports the contention that capital structure is a function of variables such as operating risk, company size, and asset composition. Further direct tests on the optimal capital structure hypothesis give empirical support to theoretical claims that taxes and bankruptcy costs do imply optimal capital structure, at least for industries.

8. Various factors influence corporate dividend policies; the most important of these is the long-run target payout ratio. Taxation of dividends affects both the dividend payout ratio and the capital intensity of the firm. It also affects the value of Tobin's q, shareholders' wealth, and the cost of capital to the firm.

IV. Guidelines for Future Research

Studies of the effects of taxation and inflation on investment decisions (level, allocation, and financing of investment) that use realistic models, are few and rarely country specific. In addition, they suffer from certain limitations.

First, the studies emphasize the effect of inflation and taxation on the cost of capital. This is not sufficient because inflation can have effects on the economy and corporate investment decisions, depending on the nature of its origin and its effects on aggregate demand and, in turn, on the profitability of and returns on investment.

Second, although Jörgenson's (1971) survey emphasized the important effects of uncertainty on investment, few studies have addressed this question or examined the impact of inflation on investment decisions through its effect on risks and uncertainty. Such studies will need to take into account the tax treatment of losses and of carry-over privileges enjoyed by taxpayers.

Third, with respect to the effects of inflation on the stock market, it would be useful to compare the results of empirical studies of different countries--with different tax systems--to understand how taxation and inflation influence the stock market. Also, it is still not clear why the stock market is inefficient in the presence of inflation, although this phenomenon has been documented in several studies.

Fourth, studies of the effects of taxation on housing investment during inflationary periods have relied on U.S. data. Studies for other countries, which have different tax policies with respect to housing, are of great importance. Also, the recent recession in the housing market, despite the continued inflation and preferential tax treatment of housing, deserves some explanation.

Finally, studies of the financial decisions by firms emphasize some role for taxes in these decisions, but only a limited number of them deal with the combined effect of inflation and taxes. Additional theoretical studies, followed by empirical work, are needed in this area.

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