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THE DECLINE IN AGGREGATE SHARE VALUES: INFLATION AND TAXATION OF THE RETURNS FROM EQUITIES AND OWNER-OCCUPIED HOUSING

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ABSTRACT

With a neutral tax system an increase in observed and anticipated inflation would not be expected to alter either real after-tax yields on bonds and equities or the ratio of the market value of equities to the replacement cost of corporate real capital. In the real world, however, declines in real after-tax bond yields and the relative value of shares have been observed. Feldstein (1976, 1978) has attributed both of these phenomena to the use of **historic-cost depreciation and** the taxation of nominal capital gains. Our analysis supports his conjecture regarding the decline in real after-tax debt yields, but rejects his analysis of the cause of the decline in share values.

The decline in share values can be attributed to many factors, but the most important is probably the favorable taxation of income from owner-occupied housing (no taxation of either implicit rents nor real capital gains). As a result housing has become more attractive with the acceleration of inflation, and households have substituted housing for equity shares. Other possible sources of the decline in share values are reduced profitability of existing capital, owing to increased regulatory costs and real energy prices, and a greater perceived risk in business operations.

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THE DECLINE IN AGGREGATE SHARE VALUES: INFLATION AND TAXATION OF THE RETURNS FROM EQUITIES AND OWNER-OCCUPIED HOUSING*

The past dozen years have been disasterous for the value of common stocks in the United States. In spite of a near doubling of the price level, the aggregate value of publicly-traded equity shares was no greater at the end of 1977 than at the end of 1968; share values had fallen by 40 percent relative to the replacement cost of corporate real assets.[1] Little agreement exists regarding the cause of this collapse. Feldstein (1978) argues that biases in the tax law impair equity values during inflationary periods. Malkiel (1979) denies this and attributes the decline in valuation to an increase in the perceived riskiness of investment in equities vis-a-vis investment in bonds. Others might contend that a basic decline in the pretax profitability of the existing capital stock has occurred, but Feldstein and Malkiel would appear to disagree with this contention.

The analysis of the present paper suggests the following: While the use of historic-cost depreciation in the calculation of corporate tax liabilities and the taxation of nominal capital gains do tend to

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[1]The share value data are from U.S. Federal Reserve System (1978). Von Furstenberg's (1977, Table 1) measure of Tobin's q fell from 1.0 in 1967-1968 to 0.7 at the end of 1976. Because debt has been a roughly constant one-quarter of the replacement cost of real assets, this is tantamount to a 40 percent decline in the value of equities relative to the replacement cost of real assets [(1.0-0.7)/0.75]. Feldstein (1978) provides alternative data supporting the 40 percent decline.

reduce equity values during inflationary periods, these same factors cause real after-tax debt yields to fall in response to increases in expected inflation. This tends to raise actual equity returns (shareholders gain at the expense of debtors) and to lower required equity yields, the combination of which increases in share prices. On net, there is no reason to expect that share values should have been negatively affected. In contrast, there is evidence that equities have declined in attractiveness vis-a-vis bonds and that the pretax profitability of the existing capital stock has fallen. Each of these phenomena has contributed to the decline in share values.

Owing to the relationships among debt and equity yields and the market value of equities, a first step in deducing the impact of changes in anticipated inflation on share values is to determine the impact of inflation on debt and equity yields. This is the subject of Section I. The impact of increases in expected inflation on share prices, when historic cost depreciation is required and nominal capital gains are taxed, is examined in Section II. The merits of alternative explanations of the decline in share values are evaluated in Section III. A summary concludes the paper.

I. The Impact of Inflation on Debt and Equity Yields

Two fundamental relationships are involved in the determination of debt and equity yields. The first is an investment-equilibrium condition whereby the marginal product of capital equals an average of the real costs of debt and equity financing. The second is a portfolio balance condition in which the after-tax risk-adjusted returns to investors on debt and equity are equated. These relationships are the subjects of parts A and B of this section. The impact of changes in inflation is deduced and illustrated graphically in parts C and D.

A. Investment and the User Cost of Capital

As is well known, the decision to invest depends on whether the present value of the expected revenue from investment, net of direct operating expenses and indirect taxes, exceeds the supply price of capital, and on marginal investments the two will be equal. Assume that inflation is expected to cause net revenues to rise at rate π (profit margins are constant) and that the productivity of the investment and thus real net revenues are expected to decline at the output decay rate of δ per year. In the absense of taxes one can then write:

$$P_k = \sum_{t=1}^{\infty} \frac{(1+\pi-\delta)^{t-1}REV}{(1+r)^t}, \qquad (1.1)$$

where P_k = current supply price of capital

REV = current expected net revenue (operating income), and

r = financing rate (the average of interest rates on debt and equity)

Because $\sum_{t=1}^{\infty} \frac{(1+\pi-\delta)^{t-1}}{(1+r)^t} = \frac{1}{r - \pi + \delta}$,

$$\frac{REV}{P_k} = r - \pi + \delta \qquad (1.2)$$

The left side of equation (1.2) is the gross marginal product of capital required for a firm to purchase a new capital good.

If one allows for the taxation of business income at rate τ and business capital at τ_p and for differences between tax and economic depreciation and if capital goods prices are expected to rise at the same rate as revenues, then the analogue to equation (1.2) is:

$$\rho = r_a - \pi + \tau(\delta-\delta^*), \qquad (1.3)$$

where $$\rho = (1-\tau)[\frac{REV}{P_k} - \delta - \tau_p] \qquad (1.4)$$

$$r_a = \alpha(1-\tau)i + (1-\alpha)e \qquad (1.5)$$

$$\delta^* = (r_a-\pi+\delta) \sum_{t=1}^{\infty} \frac{\delta x_t}{(1+r_a)^t} . \qquad (1.6)$$

ρ is the marginal product of capital net of both depreciation and taxes; r_a is an average of the after-tax debt, $(1-\tau)i$, and equity, e, rates, with α being the debt weight; and δ^* is the average annual geometric rate of tax depreciation when δx_t is the tax depreciation rate allowed in period t. If tax depreciation were equal to economic depreciation at replacement cost, then $\delta x_t = \delta(1+\pi-\delta)^{t-1}$. Substituting this expression into equation (1.6) yields $\delta^* = \delta$. However, under present tax law depreciation is based on historic cost,[2] i.e., $\delta x_t = \delta(1-\delta)^{t-1}$.

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[2]Present law allows the use of accelerated depreciation methods which reduces business tax liabilities. The impact of accelerated depreciation methods, the investment tax credit, and low tax rates on the first $100,000 of corporate profits will be captured by the assumption below that $\tau = 0.4$ rather than a higher number.

Substituting this expression into equation (1.6) yields:

$$\delta^* = \frac{r_a - \pi + \delta}{r_a + \delta}\,\delta. \tag{1.6a}$$

B. After-Tax Yields and Portfolio Equilibrium

It is assumed that dividend and interest income are taxed at rate y and capital gains income at rate c $(c<y)$. Specification of the return on equities after personal taxes thus requires an assumption regarding dividend policy. Before inflation accelerated in the second half of the 1960s, nonfinancial corporations paid out slightly less than half of their true earnings after taxes (recorded earnings with the IVA and capital consumption adjustments). In 1964 and 1965, for example, the payout ratio was 43 percent. In the 1970s, the payout ratio, so measured, jumped sharply. In 1976 and 1977, for example, the ratio was 64 percent. A plausible explanation for the higher payout is that firms view the real gains that accrue to shareholders when inflation erodes the real indebtedness of the firm as "distributable" earnings. To subtract debt payments based on an inflationary premium in interest rates in the calculation of earnings but not to add the reduction in real indebtedness is inappropriate [von Furstenberg and Malkiel (1977)]. When the reduction in real indebtedness, $\pi\alpha P_k K$ (where K is the real capital stock and the actual and expected inflation rates are equal), is added to true earnings to obtain distributable earnings, the payout ratios in 1964-65 and 1976-77 become, respectively, 41 percent and 43 percent.[3] A constant fraction γ of earnings so-calculated is assumed

[3] These calculations are based upon $\alpha = 0.25$, $\pi = 0.012$ in 1964-65 and 0.065 in 1976-77, and the values of real assets reported in von Furstenberg [1977, Table 1, column (2)]. Von Furstenberg's data also indicate that the ratio of the market value of debt to the value of real assets has remained close to 0.25 throughout the 1952-76 period.

to be paid out.

To see precisely what is involved, it is useful to rewrite equation (1.3), after substitution from equation (1.5), as

$$e = \frac{1}{1-\alpha}\,[\rho - \alpha(1-\tau)i - \tau(\delta-\delta^*) + \alpha\pi] + \pi. \tag{1.3'}$$

The first term is the expected real pretax return, inclusive of the real gains at the expense of debtors, to shareholders, γ of which is assumed to be paid out as dividends and taxed at rate y. The remainder plus π is taxed at rate c. Thus, the expected after-tax return to shareholders is:

$$\begin{aligned} e_a &= (1-y)\gamma(e-\pi) + (1-c)[(1-\gamma)(e-\pi) + \pi] \\ &= (1-y')(e-\pi) + (1-c)\pi, \end{aligned} \tag{1.7}$$

where $y' = y\gamma + c(1-\gamma)$ and equals y when all real earnings are fully taxed $(\gamma=1)$. A neutral tax system would tax all real equity earnings $(e-\pi)$ at rate y and would not tax inflationary gains at all. Thus the present system is biased in favor of equity returns when inflation is low and against these returns when inflation is high.[4]

The expected after-tax nominal return on equity equals the expected after-tax return on bonds plus a risk premium:

$$e_a = (1-y)i + \xi, \tag{1.8}$$

where $\xi > 0$ is the risk premium.

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[4]For $c = y/5$ and $\gamma = 0.4$, the system is biased in favor of equity returns as long as $\pi < 2.4\ (e-\pi)$ or about 12% when the real after-tax yield is 5%. For a discussion of why the concurrent equivalent capital gains tax rate would fall far short of the statutory rate, see Bailey (1969).

C. Combining the Relationships

Solving (1.3') for i gives what might be labelled an investment-equilibrium (IE) relation:

$$i = \frac{\rho}{\alpha(1-\tau)} + \frac{1}{\alpha(1-\tau)}[\pi - \tau(\delta-\delta^*)] - \frac{1-\alpha}{\alpha(1-\tau)} e. \qquad \text{(IE)}$$

Substituting (1.7) into (1.8) and solving for i gives portfolio equilibrium (PE):

$$i = \frac{1-y'}{1-y} e + \frac{y'-c}{1-y} \pi - \frac{\xi}{1-y}. \qquad \text{(PE)}$$

Differentiating (PE) with respect to π,

$$\frac{di}{d\pi} = \frac{1-y'}{1-y}\frac{de}{d\pi} + \frac{y'-c}{1-y}. \qquad (1.9)$$

Differentiating (IE) with respect to π, allowing for the dependency of δ^* on π reflected in equation (1.6a),[5]

$$\frac{di}{d\pi} = \frac{\lambda}{\alpha(1-\tau)} - \frac{1-\alpha}{\alpha(1-\tau)}\frac{de}{d\pi}, \qquad (1.10)$$

where $\lambda = \frac{(r_a+\delta)[r_a + \delta(1-\tau)]}{(r_a+\delta)^2 - \delta\tau\pi}$ unless replacement-cost depreciation exists in which case $\lambda = 1$. Solving (1.9) for $de/d\pi$ and substituting in (1.10),[6]

$$\frac{di}{d\pi} = \frac{(1-y')\lambda + (1-\alpha)(y'-c)}{\alpha(1-\tau)(1-y') + (1-\alpha)(1-y)}. \qquad (1.10')$$

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[5] In these differentiations, both $\partial\rho/\partial\pi$ and $\partial\xi/\partial\pi$ are assumed to equal zero. See Section III.B for an argument that $\partial\xi/\partial\pi > 0$.

[6] If $\partial\xi/\partial\pi = \beta$, then the second term in the numerator of (1.10') becomes $(1-\alpha)(y'-c-\beta)$.

This expression reduces to $1/(1-\tau)$ a' la' Feldstein (1976) or $1/(1-y)$ as in Darby (1975) when

(i) $\lambda = 1$ (replacement-cost depreciation exists)

(ii) $\gamma = 1$ and thus $y' = y$ (all real earnings are fully taxed)

(iii) $c = 0$ (nominal capital gains are not taxed)

(iv) $y = \tau$ (interest is taxed and deducted at the same rate).

Under these conditions the real after-tax debt rate, $(1-y)i - \pi$, would be invarient with respect to π.

Equating (1.9) and (1.10) and solving

$$\frac{de}{d\pi} = \frac{(1-y)\lambda - \alpha(1-\tau)(y'-c)}{\alpha(1-\tau)(1-y') + (1-\alpha)(1-y)} . \qquad (1.9')$$

When conditions (i)-(iv) hold, this expression reduces to unity and the real after-tax equity yield, $(1-y)(e-\pi)$, would be invarient with respect to π.

Of course, conditions (i)-(iv) do not hold in the real world. Table 1 contains estimates of $di/d\pi$ and $de/d\pi$ for different values of y. The other assumed parameter values are also listed in the table; the r_a and π values necessary for calculating λ are approximate average values for the 1964-77 period, not current values [see Hendershott and Hu (1980)]. As can be seen, the hypothesized parameters yield derivatives that are well below those that would exist under a neutral tax system. To illustrate, with a neutral system and $y = 0.4$, $di/d\pi = 1.67$ and $de/d\pi = 1.0$. The calculated values are $di/d\pi = 1.28$ and $de/d\pi = 0.81$ or roughly 20 percent less.[7] These results support Feldstein's conjecture (1976, p. 816,

[7] If $\partial\xi/\partial\pi = 0.3$ (see Section III.B), then the calculated value of $di/d\pi$ would be 0.88 for $y = 0.4$ and 0.64 for $y = 0.0$. Data from the past decade and a half suggest that corporate bond rates have risen by slightly less than the increase in expected inflation.

Table 1: Calculated Changes in Debt and Equity Yields in Response to Changes in Expected Inflation

y	$di/d\pi$	$de/d\pi$
0.0	0.89	0.89
0.1	0.96	0.88
0.2	1.05	0.86
0.3	1.15	0.84
0.4	1.28	0.81

Underlying Assumed Parameter Values:

$r_a = 0.092$, $\delta = 0.085$, $\pi = 0.035$, $\tau = 0.4$ and thus $\lambda = 0.8$.

$\gamma = 0.4$, $c = 0.2y$, and thus $y' = 0.52y$. $\alpha = 0.25$.

note 15) that the taxation of nominal capital gains and the use of historic-cost depreciation are the cause of the decline in real after-tax debt yields during the last decade and a half. The results are not, however, compatible with the analysis of Feldstein, Green and Sheshinshi (FGS, 1978).[8]

D. A Graphical Illustration

The impact of an increase in expected inflation on nominal debt and equity yields under both a neutral tax system [as defined by conditions (i)-(iv)] and the present system is illustrated in Figure 1. The negatively-sloped solid schedule is the IE curve when the anticipated inflation rate is initially zero $(\pi^o = 0)$. The positively-sloped solid schedule is the corresponding PE curve. From the IE and PE equations, respectively, the slopes of these schedules can be seen to be $-(1-\alpha)/\alpha(1-\tau)$ and $(1-y')/(1-y)$. With no expected inflation (and thus $\delta=\delta^*$), the vertical intercepts are $\rho/\alpha(1-\tau)$ and $-\xi/(1-y)$, respectively. The intersection of the curves gives the initial yields of i^o and e^o.

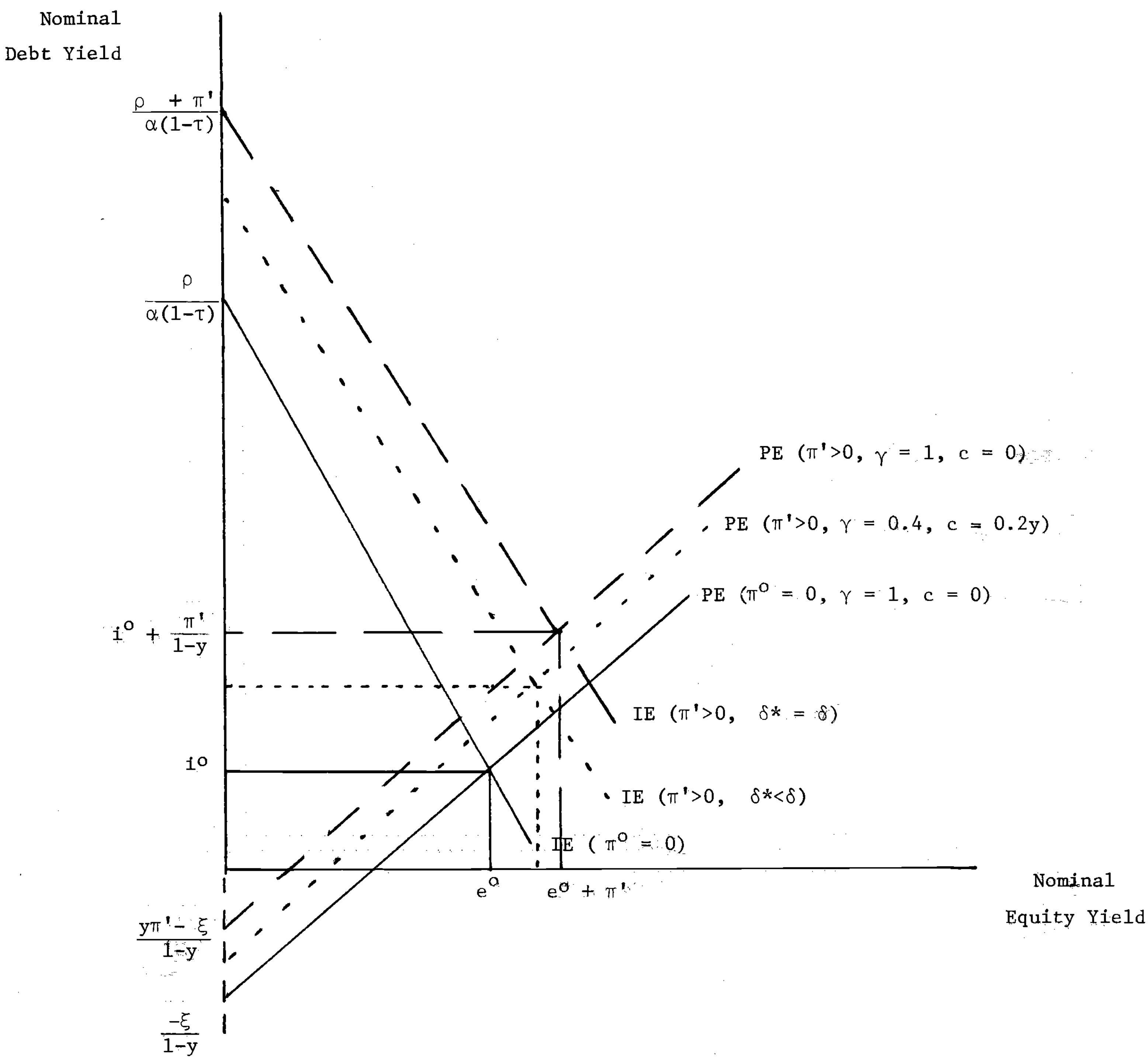
In a neutral system, an increase in π to π' would raise the IE schedule by $\pi'/\alpha(1-\tau)$ and the PE schedule by $y\pi'/(1-y)$. The new dashed schedules intersect at $i' = i^o + \pi'/(1-y)$ and $e' = e^o + \pi'$, and the real after-tax rates of return are unchanged. Firms can afford to pay these

[8] FGS deduce [equ (28) after correcting for an error in the substitution from equ (27)] that

$$\frac{di}{d\pi} = \frac{\tau - y + (1-y)(\lambda-\tau)}{(1-y)(1-\tau)}.$$

With $\lambda = 0.8$ and $\tau = 0.4$, the values for the derivative with $y = 0.0$, 0.2 and 0.4, respectively, are 1.33, 1.0 and 0.67. Note that the derivative increases, rather than decreases, with y. A major source of the difference in analysis, including the surprising absence of c from the expression for $di/d\pi$, is that FGS do not employ a portfolio equilibrium relationship.

Figure 1: The Impact of an Increase in Expected Inflation on Debt and Equity Yields Under Both Neutral and Biased Tax Systems (τ = y = 0.4)



higher nominal returns on the same quantities of debt and equity, and wealth-holders are willing to supply the same amount of debt and equity capital as before.

The existence of historic-cost depreciation in the face of inflation erodes some after-tax real earnings of firms by raising the effective corporate tax rate. Given ρ, firms cannot afford to pay $i^o + \pi^o/(1-y)$ to debtors and $e^o + \pi^o$ to shareholders. Thus the IE curve rises by only $[\pi' - \tau(\delta-\delta^*)]/\alpha(1-\tau)$ to the dotted schedule in Figure 1. The shift in the PE curve under present tax law is more complex. The taxation of nominal capital gains makes equities less attractive during an inflationary period, requiring higher relative before-tax yields on equities and thus tending to shift the dashed PE schedule rightward (to lower the vertical intercept). The only partial (γ) taxation of real gains, on the other hand, makes equities more attractive (with or without inflation), requiring higher relative before-tax rates. The net result of an increase in inflation is a slight bias against equities.[9] Thus current methods of taxing equity income at both the firm and personal levels act to mitigate the increase in debt yields that would otherwise occur in response to an increase in expected inflation.

[9] When $\lambda = 1.0$, the value of $de/d\pi$ for $y = \tau = 0.4$ is $1.11 > 1.0$, indicating that the PE curve shifts rightward along the dashed IE schedule (the value of $di/d\pi$ is $1.56 < 1.67$).

II. Inflation, Corporate Taxation and the Market Value of Equities

The after-tax expected rate of return on equity is the expected rate of return on a unit of real capital divided by the fraction of capital that is equity financed. For new capital, one solves equation (1.3') for $e-\pi$ and substitutes in equation (1.8):

$$e_a = \frac{(1-y')[\rho-\tau(\delta-\delta^*)-\alpha(1-\tau)i + \alpha\pi] + (1-c)(1-\alpha)\pi}{1-\alpha} . \qquad (2.1)$$

By definition, the market value of equity that finances marginal new investments is $1-\alpha$ times the value of the investment, and the value of new shares and debt equals the replacement cost of the new real capital. The determination of the market value of existing equity requires consideration of the average return on existing capital.

The expected rate of return on existing shares, which must equal the rate of return on new shares, can be expressed as the product of the after-tax average return on a unit of real capital and the value of real capital P_kK, divided by the value of existing shares, MV. That is,

$$e_a = \frac{\{(1-y')[\hat{\rho}-\tau(\delta-\hat{\delta}^*)-\alpha(1-\tau)\hat{i} + \alpha\pi] + (1-c)(1-\alpha)\pi\}P_kK}{MV} , \qquad (2.2)$$

where "hats" on the variables denote values pertaining to existing, rather than new, real capital (old and new capital are assumed to be taxed identically and financed with the same proportions of debt and equity). Substituting (2.2) into (1.8) and solving for $MV/P_kK = \Phi$,

$$\Phi = \frac{(1-y')[\hat{\rho} - \tau(\delta-\hat{\delta}^*) - \alpha(1-\tau)\hat{i} + \alpha\pi] + (1-c)(1-\alpha)\pi}{(1-y)i + \xi} . \qquad (2.3)$$

To deduce the impact of increases in observed and expected inflation on the value of equities relative to the replacement cost of real capital, one takes the derivative with respect to π:

$$\frac{d\Phi}{d\pi} = \frac{(1-y')\left[\tau\frac{d\hat{\delta}^*}{d\pi} - \alpha(1-\tau)\frac{\partial\hat{i}}{\partial i}\frac{di}{d\pi} + \alpha\right] + (1-c)(1-\alpha) - \Phi(1-y)\frac{di}{d\pi}}{(1-y)i + \xi} .$$

Assuming that Φ was initially equal to $1-\alpha$, as it was in the middle 1960s, for an increase in inflation to reduce relative share values $(d\Phi/d\pi < 0)$ it must be that

$$\frac{1-y'}{1-\alpha}\left[\tau\frac{d\hat{\delta}^*}{d\pi} - \alpha(1-\tau)\frac{\partial\hat{i}}{\partial i}\frac{di}{d\pi} + \alpha\right] < (1-y)\frac{di}{d\pi} - (1-c). \qquad (2.4)$$

Consideration of the values of $di/d\pi$ computed in Table 1, along with the y and c associated with them, establishes that the right side of (2.4) is negative. While somewhat more complicated to demonstrate, the left side is also positive. As a result, (2.4) does not hold and thus an increase in inflation should raise relative share values, not lower them.

Before establishing that the left side of (2.4) is positive, it should be noted that the left side would be negative in a model where firms are fully equity-financed $(\alpha=0)$ because $d\hat{\delta}/d\pi < 0$. It is the pure-equity assumption of Feldstein's analysis (1978) that allows him to reach the conclusion that inflation impairs equity values. When debt-financing is acknowledged, it is clear that the combination of increased inflation and the present taxation of corporate income will not, ceteris paribus, be detrimental to share values.

The left side of (2.4) will be positive if

$$1 + \frac{\tau}{\alpha}\frac{d\hat{\delta}*}{d\pi} - (1-\tau)\frac{\partial\hat{i}}{\partial i}\frac{di}{d\pi} > 0. \qquad (2.4')$$

The derivatives $\partial\hat{i}/\partial i$ and $d\hat{\delta}*/d\pi$ are average "concurrent equivalents" because their values depend on the time elasped from the change in π and it is the average changes in $\hat{i}$ and $\hat{\delta}*$, in present value terms, that are relevant to the current value of shares. To illustrate, in 1977 only 14 percent of net interest-bearing debt of nonfinancial corporations was short-term.[10] Thus an increase in interest rates would apply initially to less than a fifth of outstanding debt (in the short run $\partial\hat{i}/\partial i < 0.2$). Over time more debt would roll over at the higher interest rate and eventually $\partial\hat{i}/\partial i$ would approach unity. In the calculations reported in the next session, the average concurrent equivalent $\partial\hat{i}/\partial i$ will assumed to be 0.4. This would make the last term on the left of (2.4') equal to -0.3 for the maximum value of $di/d\pi$ of 1.28 and $\tau = 0.4$.

The expost understatement of depreciation allowances in any period due to inflation and the use of historic-cost depreciation, $UN = (\delta-\hat{\delta}*)(P_kK)_{-1}$, can be approximated by

$$UN = (P_k-P_{k_{-1}})\delta GINV_{-1} + (P_k-P_{k_{-2}})\delta(1-\delta)GINV_{-2} + (P_k-P_{k_{-3}})\delta(1-\delta)^2GINV_{-3} + \ldots,$$

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[10] Total net interest-bearing debt is defined as credit market instruments outstanding plus trade debt less nonmonetary liquid assets and consumer and trade credit holdings. Net short-term interest-bearing debt is defined as total net interest-bearing debt less bonds and mortgages outstanding. Total net debt equalled $577.1 billion at the end of 1977 and net short-term debt was $81.7 billion; the ratio of the latter to the former was 0.138, up from 0.106 at the end of 1967. [The data are from U. S. Federal Reserve System (1978)].

where GINV is real gross investment. Multiplying UN_{-1} by $1-\delta$ and subtracting,

$$UN - (1-\delta)UN_{-1} = (P_k - P_{k_{-1}})\delta \sum_{i=0}^{\infty} (1-\delta)^i GINV_{-i-1} = \delta K_{-1} \Delta P_k. \qquad (2.5)$$

Multiplying the right side by $P_{k_{-1}}/P_{k_{-1}}$, substituting the definition of UN and letting $\Delta P_k / P_{k_{-1}}$ equal π, this expression can be written as

$$\hat{\delta}* = \delta - \delta\pi - (1-\delta)(\frac{UN}{P_k K})_{-1},$$

and the one-period response of $\hat{\delta}*$ to π is simply $-\delta$.

Over time, the understatement of depreciation allowances will increase as the price level continues to rise. The long-run impact of an increase in inflation on $\hat{\delta}*$ is obtained by using the steady-state relationship that $UN = (1+\pi+g)UN_{-1}$, where g is the rate of growth in real capital. Substituting in (2.5) and solving,

$$\hat{\delta}* = \delta - (\frac{1+\pi+g}{\pi+g+\delta})\delta\pi.$$

Taking the derivative,

$$\frac{d\hat{\delta}*}{d\pi} = - \frac{\delta}{\pi + g + \delta} [1 + \pi + g - \frac{(1-\delta)\pi}{\pi + g + \delta}] = - 0.483$$

for $\pi = 0.035$, $g = 0.03$ and $\delta = 0.085$. The average concurrent equivalent value of $d\hat{\delta}*/d\pi$ is taken to be -0.3. With $\delta = 0.085$ and $\tau = 0.4$, the second term on the left of (2.4') is thus -0.48. The inequality is thus satisfied, and an increase in inflation, ceteris paribus, should raise the relative value of shares.

III. Other Causes of the Decline in Share Values

The question still remains as to why share prices have fallen. Only two possible sources exist within the framework developed: a decline in the pretax net return on capital, ρ, and an increase in the risk premium required to induce investors to hold equities, ξ. Significant evidence exists that each of these changes has occurred; whether the changes are large enough to explain the observed decline in share values is another matter.

A. Some Empirical Evidence

Malkiel (1979) is most closely identified with the position that ξ has increased. In support of his hypothesis, he computes a series on the expected return on stocks and compares it with the return on riskless long-term treasury securities. The expected return series is an imaginative use of expected growth rates of earnings per share, obtained from the Value Line Investment Survey, for each of the companies in the Dow Jones Industrial average. According to Malkiel's calculations, the premium rose from under roughly 3½ percent in the 1964-65 period to 6 percent in the 1975-77 period.[11] Independent equity returns calculated by Hendershott and Hu (1980) show a roughly 3½ percentage point rise from 4 to 7½ in this premium.

There is also evidence that the pretax return on capital has fallen in the 1970s. Feldstein and Summers (1977) compute cyclically-adjusted pretax series [$\rho/(1-\tau)$] based on two different capital stock measures. The declines in the pretax series between 1964-65 and 1975-76 are 3 and 2 percentage points. Moreover, the 1975-76 data were adjusted upward on the basis of the potential GNP gap as measured in 1976. Two downward revisions in potential GNP have been made since then [Council of Economic Advisors (1979, pp. 72-76)]. As a result, the gap in 1975-76 is now calculated to be only 70 percent of the gap employed in the Feldstein-Summer's adjustment. Using the lower gap reduces the adjusted values of the series in 1975-76 by one half to a full percentage point. This would constitute 4 and 2½ percentage point declines in the two series between 1964-65 and 1975-76.

Some calculations are presented in Table 2 to indicate the impact of changes in inflation, pretax profitability, and the risk premium on the market value of equities. The assumed parameter values common to all calculations are listed below the table. The values that vary [$\pi, \rho/(1-\tau)$, and ξ], the calculated ratio of share values to the replacement cost of real capital

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[11]Malkiel computes risk premia for both equities and bonds by subtracting a risk-free treasury yield series. Unfortunately, the treasury yield series employed was the infamous average yield on all treasury securities with maturity over 10 years. Because this series contains primarily deep discount and "flower" bonds, the quoted before-tax yield was consistently between 3/4 and 1½ percentage points less than a new-issue equivalent yield throughout the 1968-76 period [Cook and Hendershott (1978)].

Table 2: The Impact of an Increase in Inflation, a Decline in the Pretax Return on Capital, and an Increase in the Risk Premium[a]

	π	$\rho/(1-\tau)$	ξ	Φ	$\%\Delta\Phi$	
(1)	0.00	0.11	0.0446[b]	0.75	0	
(2)	0.07	0.11	0.0446	0.824	+10	
(3)	0.07	0.11	0.0796	0.651	-13	(-21)[c]
(4)	0.07	0.075	0.0446	0.682	- 9	(-17)
(5)	0.07	0.075	0.0796	0.539	-28	(-35)
(6)	0.00	0.075	0.0796	0.331	-56	

a/ $y = 0.2$, $\underset{\wedge}{c} = 0.2y$, $\gamma = 0.4$ and thus $y' = 0.104$. Also, $\alpha = 0.25$, $\tau = 0.4$, $\hat{i} = 0.035 + 0.4\ (1.05)\ \pi$, and $\delta - \hat{\delta}^* = 0.3\pi$, where $0.4 = \partial\hat{i}/\partial i$, $1.05 = d\hat{i}/d\pi$ (from Table 1 when $y = 0.2$), and $0.3 = -d\hat{\delta}^*/d\pi$.

b/ Obtained by solving equation (2.3) assuming $i = 0.035$ when $\pi = 0$ and $\Phi = 1 - \alpha = 0.75$.

c/ The numbers in parentheses are calculated as $(\Phi - 0.824)/0.824$. Thus these calculations refer to the <u>ceteris paribus</u> impact of an increase in ξ or decline in $\rho/(1-\tau)$, given a 7% inflation rate.

(Φ), and the percentage change in share prices (%$\Delta\Phi$) are listed in the table. All calculations are obtained by solving equation (2.3). Row (1) indicates the value of ξ in a noninflationary world given $\rho/(1-\tau) = 0.11$.[12] Row (2) illustrates the positive ceteris paribus impact that an increase in inflation should have on share prices. An increase in π from zero to 7 percent should raise share prices by 10 percent relative to the replacement cost of real capital.[13] Row (3) shows that a 3½ percentage point increase in the risk premium from 0.0446 to 0.0796, in conjunction with the increase in inflation to 7 percent, lowers share values by 13 percent. Row (4) indicates that a decline in the pretax return on capital from 0.11 to 0.075, again in conjunction with the rise in inflation, reduces share values by 9 percent. When these changes are combined, row (5), the reduction in share values is 28 percent, or over two-thirds of the 40 percent observed decline. Row (6) measures the impact of an increase in the risk premium and a decline in pretax profitability in the absence of inflation. The 56 percentage point decline in share values reemphasizes the earlier point that biases in the tax code against corporate income have not caused the decline in equity values. Given the increase in the risk premium and decline in pretax profitability, share values would have fallen even more if inflation had not accelerated.

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[12] This is consistent with Feldstein and Summers (1977), after allowing for property taxes, and Hendershott and Hu (1980).

[13] This estimate is not sensitive to the assumed values of the personal tax rate. For example, with y = 0.0, Φ would be 0.823 rather than 0.824. If the actual inflation rate exceeded the expected rate during the adjustment, then $d\hat{\delta}^*/d\pi$ could exceed its long-run value. This appears to have been the case in the United States [Hendershott and Hu (1980)]. With the average concurrent equivalent value of $d\hat{\delta}^*/d\pi$ set at -0.5 rather than -0.3, Φ in rows (2) and (5), respectively, would be 0.786 and 0.509.

B. Causes of the Increase in ξ and Decline in ρ

Malkiel (1979) cites three reasons for the increase in the relative risk premium required on equities: (1) the recessions of 1969-70 and especially 1973-75, after eight years of continuous prosperity, (2) the greater variability in prices associated with a higher level of inflation, and (3) escalating uncertain business regulation. One might question the importance of (1), it depending on a questionable naivete of investors, and possibly (2). While uncertain inflation obviously creates uncertainty regarding the real after-tax return on equity investments, such returns are at least partially hedged by the underlying real assets. The real after-tax return on investments in long-term debt instruments, in contrast, is not hedged at all [Gordon and Halpern (1976)]. While uncertainties regarding business regulations have undoubtedly increased, it seems unlikely that they could explain the remarkably large increase in ξ.

Another argument against Malkiel's explanation is the failure of other market measures of corporate risk to increase dramatically. Malkiel reports a spread between yields on BAA corporate bonds and long-term treasury securities, and the spread rises sharply from 1 percentage points or less in the first half of the 1960s to 2 to 3½ percentage points in the 1970-76 period (although it falls below 2 percent in 1977). However, this increase is largely attributable to the inclusion of deep-discount bonds in the issues underlying the average treasury yield series (see footnote 11). When a new-issue-equivalent treasury yield series is substituted for the deep-discount series, the yield spread exceeds 2 percent in only the severe 1974-75 recession years and barely exceeds 1 percent in 1973 and 1977.

A better explanation for the increase in ξ is the impact of increases in inflation on the attractiveness of investment in owner-occupied housing [Hendershott and Hu (1979)]. During the past decade and a half, leveraged homeowners have earned expost real rates of return on the equity invested in their homes averaging 5 percentage points greater than expected. Moreover, neither the implicit rents nor the real capital gains on housing are taxed, while returns on financial assets are and interest payments are deductible in computing the personal income tax base. As a result of this tax treatment, the increase in expected inflation has lowered substantially the user cost of capital for owner-occupied housing for those in higher tax brackets. The decline between 1964 and 1978 has been estimated to be 2½ percentage points for those in the 30 percent marginal tax bracket and 4 percentage points for those in the 45 percent bracket.

Because investment in owner-occupied housing is more favored by tax law during inflationary periods, it is not surprising that households have substituted housing investment for purchases of equities. Rather than channelling current income into equity mutual funds, this income is being used to make mortgage payments. In order to maintain a balance in portfolios between "real" (shares and real estate) and debt investments, bond holdings have been maintained. The result is the observed increase in the premium required to hold shares vis-a-vis debt.

Turning to the causes of the decline in the pretax profitability of the existing capital stock, two seem relevant. First is the sharp increase in regulatory costs. These include those generated by environmental standards, health and safety programs, and affirmative action programs.[14]

[14] See Crandell (1978, pp. 417-426) for estimates of some of these costs.

Unless these costs can be fully passed onto consumers, i.e., labor absorbs the full costs via reduced real wages, the return on existing capital would decline. Second is the sharp rise in energy prices in the 1970s relative to that expected when the capital was put into place. This has required expenditures to render production processes more energy efficient and the resultant processes are probably still inferior relative to those associated with new capital.

C. Implications for Empirical Investigation of Investment Behavior

Tobin's "q" theory makes the ratio of the market value of the firm to the replacement cost of its real assets a central determinant of investment behavior [Tobin and Brainard (1977)]. When $q > 1.0$, net investment will raise the value of shares; when $q < 1.0$, investment will lower the value of shares. The relevant q is a nonobservable anticipated marginal ratio: the increase in the market value of the firm owing to investment in real assets divided by the value of the additional real assets. However, if marginal and average q's move together, the latter equalling $\Phi + \alpha$ in the symbolism of this paper, then the observed $\Phi + \alpha$ is an adequate proxy for the marginal q and can successfully be employed in empirical work.

As long as deviations of $\Phi + \alpha$ from unity are largely caused by the business cycle, q and $\Phi + \alpha$ are likely to move together. During recessions, when excess capacity exists and $\Phi + \alpha < 1.0$, new investment is unlikely to be profitable $(q < 1.0)$; the reverse is true during expansions. Of course, if this is the case, then capacity utilization rates would provide as accurate an explanation of investment behavior as would $\Phi + \alpha$

[von Furstenberg (1977)]. However when $\Phi + \alpha$ falls owing to a decline in cyclically-adjusted $\rho/(1 - \tau)$, $\Phi + \alpha$ and q could diverge substantially. New capital will be more productive than old capital because only the former will be energy and environment efficient. In this case, capacity utilization rates would be preferred, empirically, to $\Phi + \alpha$. On the other hand, when $\Phi + \alpha$ falls owing to an increase in ξ, then $\Phi + \alpha$ would be preferred empirically to capacity utilization rates.

IV. Summary

With a neutral tax system an increase in observed and anticipated inflation would not be expected to alter either real after-tax yields on bonds and equities or the ratio of the market value of equities to the replacement cost of corporate real capital. In the real world, however, declines in real after-tax bond yields and the relative value of shares have been observed. Feldstein (1976) (1978) has attributed both of these phenomenon to the use of replacement-cost depreciation and the taxation of nominal capital gains. Our analysis supports his conjecture regarding the decline in real after-tax debt yields, but rejects his analysis of the cause of the decline in share values.

The decline in share values can be attributed to many factors, but the most important is probably the favorable taxation of income from owner-occupied housing rather than the unfavorable taxation of corporate income. Neither implicit rents nor real capital gains on housing are taxed, and mortgage interest is deductible in computing the personal income tax base. As a result housing has become more attractive with the acceleration of inflation, and households have substituted housing for equity shares. Other possible sources of the decline in share values are reduced profitability of existing capital, owing to increased regulatory costs and real energy prices, and a greater perceived risk in business operations.

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