

Stock Prices Under Inflation With Taxation of Nominal Gains

Uzi Yaari*, Dan Palmon** and Matityahu Marcus***

Excess taxation of capital gains is a by-product of inflation in a tax system which uses nominal values as its basis. Feldstein and Slemrod [9] have shown that in 1973 alone, individuals paid tax on more than \$4.5 billion of nominal capital gains on corporate stock in spite of their real loss of nearly \$1 billion. Feldstein *et al.* [8] have analyzed the effect of this phenomenon on the real return from common stock and recognized its potential importance in conjunction with other inflation-caused distortions produced by the present tax system. In a departure from previous studies, this paper uses a share valuation model to examine the interaction between inflation and capital gains tax. This analytical framework facilitates a fuller investigation of the roles played by real and nominal gains, including their deferral, in determining the impact of this tax.

To isolate the effect of inflation through this tax, the analysis is conducted under the assumption that other inflation-caused distortions have been removed. In particular, the following forms of indexation are assumed to be in effect: All dollar amounts in the tax tables reflect the consumer price index;¹ the used-up portion of producers' goods is deducted at replacement prices; and only real interest is taxed and recognized as an expense.

Our findings are consistent with the basic conclusion of Feldstein *et al.* regarding the significant effect of taxing nominal gains on the return from equity, but differ on specific results. Their economy-wide growth model virtually ignores tax implications of growth at the level of the firm, limiting the relevance of their numerical estimates to the special case of a stationary economy.² Use of a firm valuation model yields the following main conclusions. (a) Prevailing tax and inflation rates and realistic deferral practices cause the adverse effect of inflation on common equity values to be substantial. (b) The contribution of inflation to the overall tax burden is moderate. (c) The adverse effect of inflation on stock prices should increase with the real rate of growth, while its proportionate contribution to the overall tax burden should decrease with the growth rate. (d) The effect of deferral on the overall burden is likely to be small; its contribution to the (small) impact of capital gains tax and its effect on price may be significant, although smaller than predicted by Bailey [3] and Feldstein *et al.* [8]. (e) Under prevailing conditions, the distortive effect of inflation on the allocation of capital may be significant.

*Adelphi University

**New York University

***Rutgers University

The paper presents the issues under examination in the following sequence. The effect of inflation on stock prices is first analyzed under the simplifying assumptions of annual stock trading and no real growth. Next, the limiting assumption of annual trading is relaxed, followed by the suspension of the no-growth assumption. Finally, the effect of inflation on the allocation of capital is examined.

Non-Growth Stock With Annual Trading

Consider an all-equity firm in equilibrium, owning a fixed non-depreciable capital stock from which it is expected to generate a constant perpetual stream of earnings to be fully distributed as cash dividends at the end of every year.³ These earnings are subject to corporate and dividend taxes, both assumed to be at fixed marginal rates.⁴ Under these conditions, if any future trading by the marginal shareholder is at the ex-dividend price, no gains will be realized. It follows that this firm's value and share price will not be affected by a tax imposed on realized gains.

Consider now a similar firm operating in an environment of fully-anticipated fixed-rate inflation, where taxes are imposed on nominal income at fixed marginal rates. To the extent that equity claims are occasionally traded, taxation of nominal gains upon realization would involve a real impact of a magnitude dependent upon the expected time pattern of trading. To avoid indeterminacy in the effect of this tax, it is provisionally assumed that the marginal investor trades his marginal holding ex-distribution at the end of every year. This assumption (which results in a tax impact equivalent to that of taxation upon accrual) is subsequently relaxed, and the marginal holding period is treated as an exogenous variable which is allowed to assume values between one year and infinity.

Let:

P_0 = ex-dividend, current share price;

Y = first-year pre-tax earnings per share, expressed in prices prevailing at the beginning of the year;

t_C = marginal rate of corporate profit tax;

t_D = marginal rate of dividend tax;

t_G = marginal rate of capital gains tax (hereafter CGT) paid on realized nominal gains;

r = *real* rate of return net of all taxes sought by shareholders, assumed to be unaffected by tax or inflation rates;⁵

m = constant rate of inflation;

r^N = nominal rate of return net of all taxes sought by shareholders, fully reflecting the expected rate of inflation, such that $r^N = (1+r) \times (1+m) - 1$.

Since the price per share should escalate with earnings at the rate of inflation, the ex-distribution price would reflect the following cash flows

End of year	1	2	3	...
cash value of dividend	$Y(1-t^C)(1-t^D) \times (1+m)$	$Y(1-t^C)(1-t^D) \times (1+m)^2$	$Y(1-t^C)(1-t^D) \times (1+m)^3$	...
less CGT payment	$t^G P_0 m$	$t^G P_0 m (1+m)$	$t^G P_0 m (1+m)^2$	...

Discounted at $r^N = (1+r)(1+m) - 1$, these flows yield the relationship

$$P_0 = \frac{Y(1-t^C)(1-t^D)}{r} - P_0 \frac{t^G \left(\frac{m}{1+m} \right)}{r} \quad (1)$$

in which the first term represents the value of future distributions and the second the value of future CGT payments. When solved for P_0 , equation (1) yields the price formulas

$$P_0 = \frac{Y(1-t^C)(1-t^D)}{r + t^G \left(\frac{m}{1+m} \right)} \quad (2a)$$

$$= \frac{Y(1-t^C)(1-t^D)}{r} \cdot \frac{1}{1 + \frac{t^G \left(\frac{m}{1+m} \right)}{r}} \quad (2b)$$

both indicating the joint adverse effect of unindexed CGT and inflation, supplementing the combined effect of corporate and dividend taxes. It is apparent that the first effect depends on the presence of both CGT and inflation, since the elimination of either factor results in the disappearance of the effect of both. The partial effect is seen to increase in each of the two factors, achieving

Table 1

THE EFFECT OF INFLATION ON THE SHARE PRICE OF A FIRM
ADHERING TO ITS PRE-TAX INVESTMENT POLICY, GIVEN $Y = \$1$ and $r = .10$ †

Stock Prices Under Inflation With Taxation of Nominal Gains

Panel	Pre-tax rate of return π^*	Retention rate $\frac{a}{b}$ Growth rate (g)	Tax-free price	$t^D = .25; t^C = .50$				$t^D = .50; t^C = .50$					
				$t^G = 0$ and/or $i \rightarrow \infty$ ($m \geq 0$)	$t^G = .125$				$t^G = 0$ and/or $i \rightarrow \infty$ ($m \geq 0$)	$t^G = .25$			
					$i = 1$		10			$i = 1$		10	
					$m = 0$ §	.10	0§	.10		$m = 0$ §	.10	0§	.10
A	.10	0 (0)	\$10.0	\$3.75 (.38)	\$3.75 (.38)	\$3.37 (.34)	\$3.75 (.38)	\$3.58 (.36)	\$2.50 (.25)	\$2.50 (.25)	\$2.04 (.20)	\$2.50 (.25)	\$2.28 (.23)
B	.12	.15 (.018)	10.37	3.20 (.31)	3.12 (.30)	2.75 (.27)	3.15 (.30)	2.99 (.29)	2.13 (.21)	2.02 (.20)	1.60 (.16)	2.06 (.20)	1.86 (.18)
C		.30 (.036)	10.94	2.34 (.21)	2.19 (.20)	1.88 (.17)	2.24 (.21)	2.11 (.19)	1.56 (.14)	1.37 (.13)	1.04 (.10)	1.43 (.13)	1.28 (.12)
D	.24	.15 (.036)	13.28	4.10 (.31)	3.83 (.29)	3.29 (.25)	3.92 (.30)	3.69 (.28)	2.73 (.21)	2.40 (.18)	1.83 (.14)	2.51 (.19)	2.24 (.17)
E		.30 (.072)	25.0	5.36 (.21)	4.05 (.16)	3.10 (.12)	4.42 (.18)	3.99 (.16)	3.57 (.14)	2.17 (.09)	1.46 (.06)	2.50 (.10)	2.12 (.09)

† Numbers in parentheses give the actual price as a fraction of the respective hypothetical tax-free price.

§ Analogous to indexation of capital gains.

a maximum at a positive price under $t^G \rightarrow 1$ and $m \rightarrow \infty$. In (2b) the effect is stated in a multiplicative form, with the second term assuming values below unity for $t^G > 0$ and $m > 0$. The term $t^G/[1 + m)r]$ in its denominator appeared in (1) and may be interpreted as the discounted value of expected CGT payments per dollar of current price.

Significance of the tax effect of inflation in the absence of indexation of capital gains is reflected in numerical examples furnished in panel A of Table 1. For example, under assumptions of annual trading ($i = 1$) and $t^G = .25$, an increase in the rate of inflation from $m = 0$ to $m = .10$ causes a decrease in the price per share of about 18 percent. Given $t^C = .50$ and $t^D = .50$, this implies a decrease in the current price from \$2.50 to \$2.04. Considering the fact that the tax burden imposed by corporate and dividend taxes is \$7.50, the marginal burden attributed to inflation would cause a mere 6 percent increase in the overall tax burden.

The Holding Period and the Impact of Capital Gains Tax

The assumption of annual trading in equity claims is now relaxed to facilitate assessment of the tax impact under any fixed holding period. Allowing the marginal holding period to assume values between one and an infinite number of years, the proposed valuation model avoids an element of arbitrariness present in previous attempts to determine the impact of capital gains tax (e.g., Stiglitz [17], Gordon and Gould [11], Auerbach [2], and Feldstein [6]). In addition, treating the holding period as a variable allows assessment of the benefit derived from deferred realization of capital gains, and therefore of the incentive to avoid tax through deferral of sale under different conditions of tax, inflation, and subsequently growth. Previous formulations of the effect of deferral have overstated the benefit from pursuing such a policy by ignoring its indirect effect on the tax basis (e.g., Bailey [3]; see footnote 10).

Let:

i = time interval measured in years; a fixed-cycle marginal holding period assumed to be exogenous to the firm; $i = 1, 2, \dots$;

r_i, m_i, r_i^N = i -year equivalents of the one-year r, m , and r^N , respectively, where $r_i = (1 + r)^i - 1$, etc.

Retaining the assumption that trading, however infrequent, takes place on ex-distribution dates,⁶ an i -year trading cycle entails the following flow of CGT payments

End of year	i	2i	3i	...
CGT payment	$t^G P_{0m_i}$	$t^G P_{0m_i} (1 + m_i)$	$t^G P_{0m_i} (1 + m_i)^2$	...

Under discount at r_i^N , this flow yields a negative present value of

$$P_0 \frac{t^G m_i}{r_i^N - m_i} = P_0 \frac{t^G \left(\frac{m_i}{1 + m_i} \right)}{r_i}$$

which should replace the respective term in (1), derived for the special case of $i = 1$. This substitution results in the generalized formula

$$P_0 = \frac{Y(1 - t^C)(1 - t^D)}{r} \cdot \frac{1}{1 + \frac{t^G \left(\frac{m_i}{1 + m_i} \right)}{r_i}} \tag{3}$$

in which the price is explicitly stated as a function of the marginal holding period. The second term of this expression (and therefore the price) is increasing in i at a diminishing rate; it has a theoretical maximum value of one, implying elimination of the effect of inflation under an infinite holding period, since

$$\frac{\frac{m_i}{1 + m_i}}{r_i} = \frac{\frac{(1 + m)^i - 1}{(1 + m)^i}}{(1 + r)^i - 1}$$

which approaches zero in the limit with increasing i . The price formula indicates an incentive to defer trading, the extent of which may be learned from numerical examples in Table 1. In the absence of real growth (panel A), given $t^D = t^C = .50$, $t^G = .25$ and $m = .10$, an increase in the holding period from $i = 1$ to $i = 10$ raises the price by 12 percent, from \$2.04 to \$2.28. An additional increase in i from $i = 10$ to $i \rightarrow \infty$ would raise the price by another 10 percent to the maximum of \$2.50. These price increases are again associated with a smaller proportionate decrease in the overall tax burden of about 3 percent in each case.

Growth Stock

Consider an all-equity firm undergoing constant perpetual growth.⁷

Let:

\hat{b} = year-end total investment in the firm, expressed as a fraction of its current *pre-tax* earnings;⁸

π^* = firm's *pre-tax* average *real* yield on new investments, assumed to be dependent on the amount invested ($\partial\pi^*/\partial\hat{b} < 0$);⁹

g = *real* growth rate of earnings and price per share, where $g = \hat{b}\pi^*$;

g_i = *i* - year equivalent of real growth rate g , where $g_i = (1 + g)^i - 1$;

g^N = *nominal* growth rate resulting from inflation at the rate of m and real growth at the rate of g , where $g^N = (1 + g)(1 + m) - 1$.

The all-equity corporation can finance its growth by retention of earnings or by issuance of new stock. Internal financing has the advantage of avoiding round-trip taxation at t^D on any distribution reinvested; but it has the disadvantage of greater exposure to t^G due to a higher rate of share price increase (Miller and Modigliani [13]). Since it can be shown that under the prevailing inequality $t^G < t^D$ the tax advantage of internal financing exceeds the disadvantage (e.g., Stiglitz [17]), it is assumed that the firm's growth is optimally financed by retention.

Corporate and Dividend Taxes. As in the absence of corporate and dividend taxes, fully anticipated inflation with partial indexation should leave unaffected the present cash value of future dividends. For an illustration of this point, consider the following. Year-end reinvestment of a constant fraction \hat{b} of *pre-tax* nominal earnings in projects yielding the above-normal *pre-tax* rate π^* , entails the following streams per share (subject to $1 - \hat{b} - t^C > 0$)

End of year	1	2	...
(1) <i>pre-tax</i> earnings	$Y(1 + m)$	$Y(1 + \hat{b}\pi^*)(1 + m)^2$	...
(2) <i>post-tax</i> earnings	$Y(1 - t^C)(1 + m)$	$Y(1 - t^C)(1 + \hat{b}\pi^*)(1 + m)^2$	...
(3) reinvestment	$\hat{b}Y(1 + m)$	$\hat{b}Y(1 + \hat{b}\pi^*)(1 + m)^2$	...
(4) dividend [(2) - (3)]	$Y(1 - \hat{b} - t^C)(1 + m)$	$Y(1 - \hat{b} - t^C)(1 + \hat{b}\pi^*)$ $\times (1 + m)^2$	...

$$(5) \text{ post-tax dividend } \quad Y(1 - \hat{b} - t^C)(1 - t^D) \quad Y(1 - \hat{b} - t^C)(1 - t^D) \quad \dots$$

$$\quad \quad \quad \times (1 + m) \quad \quad \quad \times (1 + \hat{b} \pi^*)(1 + m)^2$$

The stream of post-tax dividends indicates an annual growth rate of $g^N = (1 + \hat{b} \pi^*)(1 + m) - 1 = (1 + g)(1 + m) - 1$, yielding under discount at $r^N = (1 + r)(1 + m) - 1$ a post-dividend-tax value of

$$\frac{Y(1 - \hat{b} - t^C)(1 - t^D)(1 + m)}{r^N - g^N} = \frac{Y(1 - \hat{b} - t^C)(1 - t^D)}{r - g}$$

in which the effect of inflation on earnings is fully offset by its effect on the rate of discount.

This value may be recast as a difference between two terms

$$\frac{Y(1 - \hat{b} - t^C)(1 - t^D)}{r - g} = \frac{Y(1 - \hat{b})(1 - t^C)(1 - t^D)}{r - g} - \frac{Y\hat{b}t^C(1 - t^D)}{r - g} \quad (4)$$

The first term contains the primary tax burden $Y(1 - \hat{b})(t^C + t^D - t^C t^D) / (r - g)$, resulting from taxing *once*, at the effective rate $t^C + t^D - t^C t^D$, every dollar of distributed earnings. The second term represents an *additional* burden due to double-taxation of savings at the composite rate $t^C - t^C t^D$, a consequence of repeated taxation of retained earnings ([10] pp. 46-74). The latter effect is clearly increasing in the rates of retention (\hat{b}), growth (g), and corporate tax (t^C), and decreasing in the dividend tax rate (t^D).

Capital Gains Tax. Returning temporarily to the simplifying assumption of annual trading in the presence of both nominal and real growth, ex-dividend price would reflect the following flow of CGT payments¹⁰

End of year	1	2	3	...
CGT payment	$t^G P_0 g^N$	$t^G P_0 g^N (1 + g^N)$	$t^G P_0 g^N (1 + g^N)^2$	...

and, under discount at r^N , an ex-trading negative value of

$$P_0 \frac{t^G g^N}{r^N - g^N} = P_0 \left[\frac{t^G g}{r - g} + \frac{t^G \left(\frac{m}{1 + m} \right)}{r - g} \right], \quad r > g$$

The expression on the right indicates that the CGT impact combines two effects jointly traced to two sources: real growth and inflation. The first term in brackets gives the CGT-growth effect per dollar price, which is independent of the rate of inflation; the second term gives the adverse effect created by the interaction of CGT and inflation without indexation of capital gains, under conditions of growth. The second term is increasing in the rate of inflation as well as the rate of growth, having a minimum of a positive value under $g = 0$ [equation (1)] for any given $m > 0$.

All Taxes Combined. The current share price is the algebraic sum of the post-dividend-tax value of future distributions and the discounted stream of CGT payments

$$P_0 = \frac{Y(1 - \hat{b} - t^C)(1 - t^D)}{r - g} - P_0 \left[\frac{t^G g}{r - g} + \frac{t^G \left(\frac{m}{1 + m} \right)}{r - g} \right] \quad (5)$$

This equation is solved for P_0 to provide the price formulas

$$P_0 = \frac{Y(1 - \hat{b} - t^C)(1 - t^D)}{r - g + t^G g + t^G \left(\frac{m}{1 + m} \right)}, \quad 1 - \hat{b} - t > 0, r > g^{11} \quad (6a)$$

$$= \frac{Y(1 - \hat{b} - t^C)(1 - t^D)}{r - g} \cdot \frac{1}{1 + \frac{t^G g}{r - g} + \frac{t^G \left(\frac{m}{1 + m} \right)}{r - g}} \quad (6b)$$

These formulas bear unmistakable similarity to (2), with (6b) giving the overall price effect of CGT in multiplicative form. This effect is determined by the second term, which is inversely related to m , g , and t^G , and may assume positive values up to unity. The effect on price of combining inflation at the rate of .10 with various reinvestment, growth, and tax rates, under the assumption of a one-year holding period ($i = 1$) is illustrated in panels B through E of Table 1. This effect proves to be substantial. An increase in the rate of inflation from $m = 0$ to $m = .10$ under $b = .30$, $g = .072$, and $t^G = .25$, causes a price decrease of about 33 percent, from \$2.17 to \$1.46 (panel E). The decrease is about half this size under $m = .05$ and about double the size under $m = .20$.¹²

Equation (6b) and Table 1 reveal an interesting feature in the behavior of the tax system under inflation: the adverse effect of inflation on price is in-

creasing in the rate of growth. For example, given $t^G = .25$ (and $i = 1$), an increase in the rate of inflation from $m = 0$ to $m = .10$ is seen to cause a price decrease of 18 percent under $g = 0$ (panel A), compared with a decrease of 33 percent under $g = .072$ (panel E). In view of its effect on price, it is surprising to find that the proportionate effect of inflation on the overall tax burden is *decreasing* in the rate of growth. This example, with the added assumption of $t^D = t^C = .50$, shows that the increase in the rate of inflation increases the overall burden by 6 percent under $g = 0$ (panel A), compared with only 3 percent increase under $g = .072$. This phenomenon is explained by the effect of growth on the relative weight of two forms of double-taxation, at the composite rate $t^C - t^C t^D$ [equation (4)], and at t^G [equation (6b)]. Given the value $t^C = .50$ and the relationship $t^G \leq \frac{1}{2} t^D$, an increase in g shows a greater effect on the first form of double-taxation. Price figures in Table 1 and the associated price ratios (in parentheses) indicate that the destructive effect of double-taxing investment on economic growth may be substantial, lending strong support to findings of Irving Fisher [10, pp. 56-74, 220-22].

The Effect of the Holding Period. Since the holding period has no bearing on the discounted cash value of dividends, the i -year-holding-period price may be derived directly from (6b) by substituting in its second term r_i , m_i , and g_i for r , m , and g , respectively

$$P_o = \frac{Y(1 - \hat{b} - t^C)(1 - t^D)}{r - g} \cdot \frac{1}{1 + \frac{t^G g_i}{r_i - g_i} + \frac{t^G \left(\frac{m_i}{1 + m_i}\right)}{r_i - g_i}} \quad (7)$$

This formula generalizes (3) for $g \geq 0$, and (6) for $i \geq 1$. The impact of CGT is monotone increasing in t^G , m , and g , while decreasing in i . Based on the inequality $r > g$, it is vanishing under $i \rightarrow \infty$, since

$$\frac{g_i}{r_i - g_i} = \frac{\frac{(1 + g)^i - 1}{(1 + r)^i - 1}}{1 - \frac{(1 + g)^i - 1}{(1 + r)^i - 1}}$$

and

$$\frac{m_i}{1 + m_i} = \frac{1}{(1+r)^i} - \frac{1}{(1+r)^i (1+m)^i}$$

$$r_i - g_i = 1 - \frac{(1+g)^i}{(1+r)^i}$$

both approach zero in the limit with increasing i . The moderating effect on the tax impact of a given increase in i is increasing in t^G and m (as in the absence of growth), as well as in g , indicating that the incentive to defer realization of capital gains is increasing in all three variables.

The effect of the holding period on the impact of CGT under the special cases of $i = 1$, $i = 10$, and $i \rightarrow \infty$ (equivalent to that under $t^G = 0$) is reported in Table 1. Given $m = .10$, $\hat{b} = .30$, $g = .072$, and $t^G = .25$ ($t^C = t^D = .50$), an increase in the holding period from $i = 1$ to $i = 10$ is seen to increase price by 31 percent, from \$1.46 to \$2.12 (panel E). This significant proportionate increase involves a 31 percent decrease in the impact of CGT, but less than 3 percent decrease in the overall tax burden (from \$23.54 to \$22.88). The apparent conflict between these magnitudes referred to above is caused by the small marginal contribution of CGT to the overall tax burden. This phenomenon is further indicated by the small effect of inflation on that burden; thus an increase from $m = 0$ to $m = .10$ under similar tax rates and $i = 10$ is seen to cause a price decrease of 15 percent (from \$2.50 to \$2.12), representing less than 2 percent increase in the overall tax burden (panel E).

Misallocation of Capital

Price comparisons based on Table 1 do not reflect the extent of inflation-induced capital misallocation since prices themselves were calculated under the assumption that growth is optimally financed from internal sources. Consistent with this assumption, misallocation would be caused by distortive tax effects on the real pre-tax marginal return on capital of *existing* firms. In equilibrium, this rate of return would equal the investment cutoff rate, which can be derived from price equations presented in previous sections. The main weakness of this approach is that it ignores the unique role played by new enterprises in the process of economic growth. It is noted that distortive effects of the tax system must be assessed with reference to investment opportunities within the same system. Although full assessment of this sort can be accomplished only in the context of general equilibrium, it would have to begin with specification of tax effects in individual sectors. The analysis below provides such specification for the subsector of corporate equity. It shows that inflation is likely to have a significant effect on the equilibrium return in this section of the capital market.

Let:

π = pre-tax minimum acceptable real *average* yield on new investments, the threshold value of π^* ;

π' = pre-tax cutoff *marginal* yield on new investments (the pre-tax counterpart of the cost of capital), where by definition $\pi' = d(\hat{b}\pi^*)/d\hat{b} = \pi^* + \hat{b}(\partial\pi^*/\partial\hat{b})$ at $\pi^* = \pi$.

Under the simplifying assumption of $i = 1$ the marginal pre-tax cutoff rate is derived from (6a) after substituting $\hat{b}\pi^*$ for g . This is accomplished by totally differentiating the price with respect to \hat{b} , equating the derivative to zero, and then solving for $\pi' = \pi^* + \hat{b}(\partial\pi^*/\partial\hat{b})$ at $\pi^* = \pi$. In view of the possible dependence of π^* on \hat{b} (in the vicinity of equilibrium $\partial\pi^*/\partial\hat{b} < 0$), the derivation takes the form $dP_O/d\hat{b} = \partial P_O/\partial\hat{b} + (\partial P_O/\partial\pi^*)(\partial\pi^*/\partial\hat{b}) = 0$, yielding

$$\pi' = \frac{r}{(1-t^C)(1-t^G)} + \frac{t^G \left(\frac{m}{1+m} \right)}{(1-t^C)(1-t^G)} + \frac{\hat{b}^2 \left(\frac{\partial\pi}{\partial\hat{b}} \right)}{1-t^C} \quad (8)$$

Consistent with results obtained under a zero inflation rate by Bradford [4], Gordon and Gould [11], and Auerbach [2], this rate shows no effect of dividend tax. It is greater than $\pi' = r + \hat{b}^2(\partial\pi/\partial\hat{b})$, the cutoff rate in a tax-free world, and monotone increasing in t^C and t^G . The contribution of inflation in the presence of $t^C > 0$ and $t^G > 0$ is given by the second term, which is increasing in m at a decreasing rate, reaching a maximum of $t^G/[(1-t^C) \times (1-t^G)]$ under $m \rightarrow \infty$.

In principle, the procedure just used to derive π' from (6a) under $i = 1$ can be used to derive it from (7) under $1 \leq i \leq \infty$. Although a general closed-form solution does not exist, the cutoff rate can be calculated with the desired degree of accuracy for any given combination of i , r , \hat{b} , $\partial\pi^*/\partial\hat{b}$, t^C , t^G , and m .

Further insight into the effect of inflation on the cutoff rate may be gained by comparing analytical solutions for π' under the extreme values of $i = 1$ and $i \rightarrow \infty$. Since the second term in (7) is monotone increasing in i , the effect of t^G and thus π' are at their maximum values under $i = 1$, as in (8). The effect of t^G would vanish and the cutoff rate would reach a minimum under $i \rightarrow \infty$, as indicated by (7) when its second term approaches the value of unity

$$\pi' = \frac{r}{1-t^C} + \frac{\hat{b}^2}{1-t^C} \cdot \frac{\partial\pi}{\partial\hat{b}}$$

THE EFFECT OF INFLATION ON THE FIRM'S PRE-TAX INVESTMENT CUTOFF RATE π^i
 (EQUILIBRIUM MARGINAL RATE OF RETURN), GIVEN $r = .10^\dagger$

Retention rate \hat{b}	$t^C = .50$									
	$t^G = 0$ and/or $i \rightarrow \infty$ ($m \geq 0$)	$t^G = .125$				$t^G = 0$ and/or $i \rightarrow \infty$ ($m \geq 0$)	$t^G = .25$			
		$i = 1$		10			$i = 1$		10	
		$m = 0^{\S}$	.10	0^{\S}	.10		$m = 0^{\S}$	.10	0^{\S}	.10
.00	.200	.229	.255	.217	.223	.200	.267	.327	.237	.250
.15	"	"	"	.218	.224	"	"	"	.239	.253
.30	"	"	"	.218	.225	"	"	"	.241	.255

† The tax-free cutoff rate is $\pi^i = .10$

§ Analogous to indexation of capital gains.

This rate, which may be obtained directly from (8) by substituting $t^G = 0$, is independent of the rate of capital gains tax, and therefore unaffected by the presence of inflation. It is also the cutoff rate that would prevail under $t^G = 0$, given $g \geq 0$, $m \geq 0$, and $i \geq 1$.

Pre-tax cutoff rates commensurate with retention and tax rates used in Table 1 are reported in Table 2. Calculated under the assumption of $\partial \pi^* / \partial \hat{b} = 0$ and $r = .10$, these rates should be contrasted with the tax-free cutoff rate $\pi^1 = .10$. Given $t^C = .50$, $t^G = .25$, and $i = 1$, an increase in the rate of inflation from $m = 0$ to $m = .10$ substantially increases the equilibrium marginal rate of return from .267 to .327. As the effect of t^G itself on the cutoff rate, the effect of inflation via t^G is diminishing in i . A similar increase in the rate of inflation in the presence of $i = 10$ causes a smaller increase in π^1 from .237 to .250 under $\hat{b} = 0$, or from .241 to .255 under $\hat{b} = .30$.

Conclusion

Under the U.S. tax system inflation-produced capital gains are taxed as real gains. This study examined the effect of taxing purely nominal gains on stock prices and on the real rate of return from equity capital. It was shown that due to the taxation of such gains stock prices are likely to fall and the pre-tax rate of return rise, and that under prevailing tax rates both effects may be substantial, even with moderate inflation. It was further shown that the first effect would increase with the firm's growth rate, a phenomenon which is likely to hinder growth by its selective impact upon new entrants and other firms seeking external funds. As such, the taxation of purely nominal gains adds to the list of penalties imposed by our tax system on economic growth.

Footnotes

¹Somewhat similar results are achieved by discretionary tax cuts enacted periodically by Congress (Aaron [1]).

²There are fundamental differences in the assumptions underlying the model presented by Feldstein *et al.* and the one offered here. (a) They assume that the impact of dividend tax is avoided on earnings retained, even though eventual distribution is in the form of cash dividends. Here it is assumed that the impact of this tax is not avoided by retention. Justification for the second approach may be found in Fisher [10, p. 56] and in recent papers by Bradford [4], Auerbach [2], and Palmon and Yaari [15]. (b) Consistent with the first assumption, they assume that the impact of capital gains tax *substitutes* that of dividend tax with respect to retained earnings. It is shown here that the impact of

both taxes should apply to undistributed earnings. (c) They assume that real capital gains earned in (annual) trading are taxed at the same rate as dividends. [In terms of the present model, their assumptions (a) through (c) represent the special case of no retention and no real growth.] Here it is assumed that capital gains - real or nominal - are taxed at the special rate accorded such gains. (d) Unlike real gains, assumed to be taxed at the ordinary rate, they assume that nominal gains are taxed at an effective rate which, due to deferral in realization, is below the special rate. Their effective rate originates from Bailey [3] whose estimate is shown below (n. 10) to overstate the effect of an undeferred tax and therefore the effect of deferral. This effect is assessed here directly, by applying the statutory rate to expected price changes. (e) They ignore the effect of double-taxation of savings (undistributed earnings) by corporate income tax, thereby introducing to their model another feature which is inconsistent with conditions of retention and growth. This effect is explicitly dealt with here.

³The unresolved issue of the optimal debt-equity ratio is conveniently avoided under the assumption (adopted above) that only real interest receipts and payments would count for tax purposes.

⁴Being of secondary order of magnitude, unconventional distribution methods are ignored throughout the paper. Also ignored are opportunities for tax arbitrage on the part of shareholders. Simons [16, pp. 61-68] and Miller and Scholes [14] have shown that such opportunities may exist, without assessing the extent to which they are in fact taken advantage of. The law facilitating the loophole described by Miller and Scholes was introduced only in 1969 and, as pointed out by Feldstein and Green [7], even since that time could not have affected more than one-tenth of one percent of all taxpayers receiving dividends.

⁵Recent evidence for the independence of the real rate of interest on the rate of inflation is found in Fama [5] and Levi and Makin [12]. Regardless of its empirical content, the assumption of independence with respect to inflation and taxes on corporate-source income is conducive to exploring consequences of tax policy changes aimed at the corporate sector.

⁶It can be shown that if the rate of capital loss credit is below the rate of capital gains tax, trading at other points in the dividend cycle may impose an additional penalty on investors. The assumption in the text is non-restrictive in view of the prevailing practice of quarterly distribution.

⁷The artificial setting of constant growth is used solely for expositional simplicity.

⁸The symbol \hat{b} is adopted to avoid confusion with the symbol b , commonly used to denote reinvestment as a fraction of post-tax earnings. The use of a pre-tax fraction facilitates derivation of the pre-tax cutoff rate below

⁹All derivations will assume that new investment opportunities are in the same risk class.

¹⁰The traditional formulation (e.g., Bailey [3, eq. 3]), adopted by Feldstein *et al.* [8, eq. 9] with respect to inflationary gains, implies a different flow of CGT payments: $t^G Y b (1+m)(1+g^N)^0, t^G Y b (1+m)(1+g^N), \dots$ [where b is defined as $b = \hat{b}(1-t^C)$ in terms of \hat{b} used in this paper]. Such treatment overstates the impact of an undeferred tax and the effect of deferral by ignoring the fact that the relationship between Y and P_0 should in itself be a function of this impact.

¹¹As indicated by equation (6a), the condition $r > g$ is sufficient but not necessary to ensure convergence under $t^G > 0$. Nevertheless, the condition is set due to its appealing economic content in the context of a perpetual growth model.

¹²Note that in some cases a higher \hat{b} with a given π^* (imply a higher g) show a lower price under given tax rates. In those cases π^* is below the relevant threshold average rate of return. Table 1 is constructed under the assumption of a given investment policy that would be optimal in a tax-free world.

References

- [1] Aaron, H., "Inflation and the Income Tax" *American Economic Review*, (May 1976), 193-99.
- [2] Auerbach, A.J., "Wealth Maximization and the Cost of Capital," *Quarterly Journal of Economics* (August 1979), 433-46.
- [3] Bailey, M.J., "Capital Gains and Income Taxation," in A.C. Harberger and M.J. Bailey (eds.) *Taxation of Income from Capital*, The Brookings Institution, Washington, D.C., 1969.
- [4] Bradford, D.F., "The Incidence and Allocation Effects of a Tax on Corporate Distributions," mimeograph, 1977. Reprinted as NBER Working Paper No. 349.
- [5] Fama, E.F., "Short Term Interest Rates as Predictors of Inflation," *American Economic Review* (June 1975), 269-82.
- [6] Feldstein, M., "Inflation and the Stock Market," NBER Working Paper No. 276, 1978.
- [7] Feldstein, M., and J. Green. "Why Do Companies Pay Dividends?" NBER Working Paper No. 413, 1979.
- [8] Feldstein, M., J. Green, and E. Sheshinski. "Inflation and Taxes in a Growing Economy with Debt and Equity Finance," *Journal of Political Economy* (April 1978), S53-S70.
- [9] Feldstein, M., and J. Slemrod. "Inflation and Excess Taxation of Capital Gains on Corporate Stock," NBER Working Paper No. 234, 1978.
- [10] Fisher, I., *Constructive Income Taxation*, Harper and Brothers Publishers, New York, 1942.
- [11] Gordon, M.J., and L.I. Gould. "The Cost of Equity Capital with Personal Income Taxes and Flotation Costs," *The Journal of Finance* (September 1978), 1201-12.
- [12] Levi, M.D., and J.H. Makin. "Fisher, Phillips, Friedman and the Measured Impact of Inflation on Interest," *Journal of Finance* (March 1979), 35-52.
- [13] Miller, M.H., and F. Modigliani. "Dividend Policy, Growth and the Valuation of Shares," *Journal of Business* (October 1961), 411-33.
- [14] Miller, M.H., and M.S. Scholes. "Dividends and Taxes," *Journal of Financial Economics* (December 1978), 333-64.

- [15] Palmon, D., and U. Yaari. "Distribution of Earnings as a Tax-Saving Policy," New York University, Graduate School of Business Administration, Working Paper No. 78-137, 1978.
- [16] Simons, H.C., *Federal Tax Reform*, The University of Chicago Press, Chicago, 1950.
- [17] Stiglitz, J., "Taxation, Corporate Financial Policy, and the Cost of Capital," *Journal of Public Economics* (February 1973), 1-34.