SOME INDIRECT EVIDENCE ON EFFECTIVE CAPITAL GAINS TAX RATES

by

Aris Protopapadakis

Working Paper No. 16-81

RODNEY L. WHITE CENTER
FOR FINANCIAL RESEARCH

University of Pennsylvania
The Wharton School
Philadelphia, PA 19104

I would like to thank Ms. Leslie Forster for her able and patient assistance, without which this project would have never been completed. I would also like to thank Professors Marshall Blume and Mark Flannery for extensive comments which have improved the paper. Naturally, all remaining errors and shortcomings are my responsibility.

INTRODUCTION

This paper presents estimates of effective marginal tax rates on capital gains, excluding housing, between 1960 and 1978, in the U.S. concern that the inflation of the 1970s may have worked through the tax system to reduce incentives to produce and save has focused attention on the effective marginal tax rates that apply to various sources of income. Joines (1981) sheds light on this issue by calculating the historical effective marginal tax rates on factor incomes for the U.S.. Part of the recent debate, however, has focused specifically on capital gains taxes and the desirability of reducing them to spur incentives for saving and investment. The effective marginal tax rate on capital gains (henceforth EMTG) may be the most difficult to measure; in addition to the usual problems of how to attribute deductions, exclusions and tax credits, an adjustment must be made to take into account that these taxes are paid only when capital gains are realized by investors. The expected EMTG is an important determinant of the market price of assets that are likely to accrue capital gains, and may have an important impact on the desired level of the capital stock.[1]

The expected EMTG depends on the expected marginal income tax rate of the investor and the applicable exclusions, deductions and tax credits that additional capital gains will generate, and on the

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[1]Total capital gains in 1978 were computed at $93.4 billion (see data appendix), and, very roughly, amounted to as much as 20 percent of net income to capital.

time period over which the investment is likely to be held before the capital gains are realized. The length of the expected holding period is important because it is the present value of taxes expected to be paid on capital gains that is relevant to the investor. It is convenient to define the EMTG, $\hat{\tau}$, as the tax rate on capital gains that, if levied continuously, would leave the investor with the identical wealth as a capital gains tax, τ, levied when the capital gains are realized. Purchasing a $1 security that appreciates at the rate γ and realizing the capital gains at the end of N periods yields wealth

$$W = (1-\tau)(e^{\gamma N}-1) + 1. \tag{1a}$$

The EMTG ($\hat{\tau}$) can then be calculated as

$$W = e^{(1-\hat{\tau})\gamma N}, \quad \text{so that} \tag{1b}$$

$$\hat{\tau} = 1 - \frac{1}{\gamma N} \ell n[(1-\tau)e^{\gamma N} + \tau]. \tag{1c}$$

The EMTG falls as the holding period (N) increases, because the present value of the taxes falls the further into the future they have to be paid.

Though it is the expected EMTG that is theoretically relevant, this paper only attempts to calculate ex-post EMTGs over the sample period. The hope, as usual, is that the actual experience bears a sufficiently close relationship to what was expected so as to be of

use in assessing the impact of these taxes. Furthermore, though the actual distribution of EMTG's may be of some importance only the average EMTG is reported for each year.

The most simpleminded way of calculating EMTGs is to calculate the statutory average marginal tax rate on capital gains and adjust it according to (1c) by using an estimate of the average turnover of stock portfolios, periodically provided by the IRS.[2] The statutory average marginal tax rate on capital gains can be calculated by applying the standard deduction to each bracket of income to find the corresponding marginal tax rate, and averaging these rates by the capital gains reported in each bracket. These calculations are reported in figure 1 (columns 1 and 2). This approach seriously overstates EMTGs both because it ignores most of the tax law provisions concerning deductions, exclusions and credits painstakingly enacted by our lawmakers, and because it understates the average holding period since publicly traded shares are likely to have a higher turnover than ownership of other forms of capital.

A far better approach is to estimate the actual marginal tax rates on investors reporting capital gains (henceforth the AMTG), such as those reported by Joines (1981) and Seater (1982), and to adjust them by estimating an average holding period, as attempted by Bailey (1970). Data necessary to estimate both the AMTG and an

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[2]The IRS has published such data for 1973 and 1962. In both cases, the average holding periods for corporate stock, weighed by reported net capital gains, is 17 years.

average holding period are readily available. The following section fully describes this approach. Figure 1 (columns 3 and 4) contain the results of these calculations. Implementing this approach necessarily involves several simplifying assumptions explained more fully below, so that the estimated EMTGs cannot be viewed as precise numbers. But the magnitude of the estimates leads to the conclusion that the EMTGs have been rather small and have been on average smaller in the 1970's than in the 1960's. This conclusion supports the Miller and Scholes (1978) contention that the U.S. tax system is evolving into a pure consumption tax by engineering sufficient elasticity in the tax code to allow savings to escape taxation altogether. It also suggests that any wedge between before and after-tax real rates of return which may be caused by capital gains taxes has not increased substantially with rising inflation.

It is, however, incorrect to infer that small EMTGs imply the distortions caused by the tax code are small as well. Distortions induced by taxes on capital gains are measured not only by their effect on net investment and the aggregate capital stock, but also by the misallocation of aggregate investment caused by differential tax treatment, and by the amount of resources devoted to the invention of tax minimizing strategies and to securing preferential tax treatment. For instance, the statutory average marginal tax rate for capital gains in 1978 is 21.5 percent, compared to an average of 5.7 percent reported in figure 1 (column 4). This indicates that taxpayers effectively circumvent statutory taxes by devising methods

to take advantage of the tax code, including purchasing tax favored investments which may be suboptimal in the absence of taxes, and perhaps holding capital gains longer than is optimal (see Green and Sheshinski (1978)).

AN ALTERNATIVE APPROACH TO ESTIMATING EMTGs

The alternative approach outlined in the previous section consists of two separate calculations since it is necessary to obtain estimates of AMTGs and an estimate of the average holding period to use for calculating EMTGs.

a. Actual Marginal Tax Rates on Capital Gains (AMTG). Since statutory marginal tax rates on income grossly overstate the actual marginal tax rates to which capital gains are subjected, one must turn to the tax experience reported by the IRS for further clues as to the value of the AMTGs. Joines (1981) and Seater (1982) have used similar methods to compute the actual marginal tax rate for each income bracket. Both authors have defined the marginal tax rate as the increase in taxes to a representative taxpayer moving from one bracket to the next, divided by his increase in income. To get the AMTG, these marginal tax rates are weighted by reported net capital gains for each bracket. This concept of the marginal tax rate is an "average" concept in more than one sense. Not only is it weighted by the ex-post distribution of reported capital gains, but it also assumes that additional income from whatever source carries with it an average amount of tax relief. In other words the marginal tax

rates reported here are averaged both over income groups and types of income.

Figure 1 (column 3) reports AMTGs that use the marginal tax rates for each bracket as calculated by Seater (1982). The reported tax rates have already been divided by $1/2$ to account for the 50 percent exclusion for capital gains. This series is not adjusted for capital gains taxes levied by states because treatment of capital gains is not uniform across states.

The AMTGs reported here move much the same way as the statutory rate series. The major tax code revision in 1963-64 is apparent in both series, and the two tax rates decline and rise together from 1972 through 1978. The level of the AMTGs is approximately 58% that of the statutory rates and reflects the impact of the tax code provisions and the way in which they are used by taxpayers. The ratio is higher in the second half of the sample period relative to the first (.56 and .60 respectively). This increase may be due to the various reforms and attempt to close "loopholes" in the tax code or to the impact of the higher inflation on tax shields.

b. Estimates of the Holding Period (N). The IRS makes available annual data on short term and long term reported capital gains and losses by individuals and fiduciaries and, periodically, data on estate taxes. (See data appendix)

The ratio of reported capital gains to capital gains generated during any year provides information about the average holding period. In an economy that generates capital gains rather than

losses on average, a small ratio of reported capital gains, R(t;N), to all capital gains generated during that year, CG(t), indicates a long holding period and vice versa.

Appendix 1 describes a simple model used to derive an analytic expression for this ratio,[3]

$$(2) \qquad \rho(N) \equiv \frac{R(t;N)}{CG(t)} = \frac{e^{-\mu(N-1)}}{e^{\gamma}-1}\left\{(1-e^{-\alpha\delta})e^{\gamma N} + (e^{\gamma N}-1)\frac{e^{-\alpha\delta N}}{N} - \frac{\alpha\delta}{\mu}(1-e^{-\mu})\right\}.$$

Since this ratio can be calculated from available data, (2) can be used to estimate N. (2) is derived from a one-sector model, with a smooth growth of the capital stock and money prices. Firms retain some of their earnings and pay the rest out in dividends. Any additional financing is obtained by issuing new shares continuously, and all shares are unlevered equity. Investors hold shares for N periods (holding period) and then sell them at their market value and report the capital gains.

The model admits no uncertainty or fluctuation in the rate of growth of any of the magnitudes. Consequently, capital gains generated each year are calculated as if the nominal market price of the capital stock was growing smoothly every year.[4] An examination

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[3] δ is the real growth of the capital stock, α is the proportion of new investment financed by issuing new securities; $\mu = \delta + \pi$ and $\gamma = (1-\alpha)\delta + \pi$ where π is the growth rate of the nominal market price of capital.

[4] The data used are described fully in the data appendix.

of the nominal market price of capital, p(t), reveals that the series appears to be growing at a much higher rate up to about 1964 than in the subsequent period (see figure 2). Furthermore, after 1964 the series exhibits larger fluctuations than in the previous period. To obtain a better estimate of N, equations (1c) and (2) are adjusted to take account of the change in the average growth rate.[5] No attempt has been made, however, to take into account either the observed fluctuations or the impact of uncertainty. To do this would immensely complicate the task at hand. Furthermore, it is not at all clear, given the aggregate nature of the data and the approximations involved in the estimates, that the complications introduced by such a refinement will significantly increase precision.[6]

To use equation (2) it is also necessary to estimate the proportion of net investment financed through issues of new securities, α. α is calculated as one minus the average of the

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[5]The average annual growth rate before 1964 is $\pi_1 = .084$ while the rate after 1964 is $\pi_2 = .008$. By contrast, the growth of the physical capital stock is very steady throughout the period at $\delta = .039$. It turns out that incorporating the difference in growth rates increases the estimate of the average holding period by approximately 10 years.

[6]The net effect of taking into account the observed fluctuations is likely to be a reduction in the variance of $\rho(N)$ as calculated from the data. The reason is that assuming smooth growth understates the true $\rho(N)$ by overstating true capital gains when the price of capital is rising slowly or falling, and vice versa. An offsetting correction to (2) would result, however, because this formula overestimates reported capital gains arising from periods of small capital gains or capital losses. The absence of these corrections is less likely to cause serious bias on the average N calculated from (2).

yearly ratios of retained earnings (adjusted for capital consumption) to new business investment, including inventories. This estimate is rough at best, because retained earnings in any one period need not be used to pay for physical capital acquisitions in that period, and because cash flows can be generated or absorbed through changes in balance sheet items not included in retained earnings.[7] Holding period estimates are therefore reported for a range of α's.

Holding periods estimates from (2) range from 36 years (α = 0.05) to 24 years (α = 0.35).[8] Since it is highly unlikely that α = .05, the EMTGs reported in figure 1 (column 4) are for N=31 and 24. These holding period estimates are higher than the IRS estimate of 17 years for corporate stock portfolios.

There are two principal reasons why the economy-wide average holding period is bound to be larger than that for corporate shares. The first is that non-corporate capital is likely to have a much longer holding period than corporate capital. And within corporate capital, publicly traded shares are likely to have the lowest holding period. The second is that some realized capital gains are not reported because of tax evasion (see Bailey (1970) for

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[7]For instance, in addition to retain earnings, new investment can be financed through a decrease in accounts receivable or in the cash position, or an increase in accounts payable.

[8]The results were: (standard errors in parentheses)

α:	0.05	0.15	0.25	0.35
N:	36	31	27	24
	(1.7)	(1.7)	(1.9)	(2.0)

a discussion of the impact of tax evasion). BLS data shows that approximately 36 percent of the non-residential capital stock is non-corporate. Assuming the extreme case that non-corporate capital gains are never realized but that there is no tax evasion at all produces an estimate for corporate capital holding period of between 15 and 13 years, using the method above. This is slightly less than the IRS estimate of 17 years, suggesting that the holding period estimates reported above are reasonable and possibly underestimate the holding period.

In fact, the method described here is likely to underestimate the holding period. This is because the value of shares includes the value of all firm assets, but the measure of the capital stock used here does not include accounts receivable, cash and the value of brand names, patents and other proprietary technological knowhow. Thus the measure here understates total capital gains because it underestimates the total value of firms (basis) on which capital gains are computed.[9] This in turn overstates the ratio, $\rho(N)$, which results in an underestimate of the holding period.

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[9]An alternative way to measure the basis for capital gains is to use the value of the stock market together with an estimate of the proportion of total gains generated by the stock market. This measure, however, overestimates the basis, because it double counts shares held by other corporations. Bailey (1970), in a study covering 1925 thru 1961, uses a 1959 IRS estimate that 48.8 percent of all capital gains are from corporate shares and finds the average holding period to be in excess of 100 years. To assess the impact of the different methods of determining the basis, I estimated the holding period from 1952-61 using the methodology of this study but Bailey's data. The holding period estimates range from 81 to 111 years, somewhat smaller than his. Using both the methodology and the data of this study, the holding period estimates for 1952-61 range from 29 to 37 years. This indicates that holding periods in 1952-61 were somewhat longer than in 1960-78, but that the major difference in the results is due to the different methods of determining the basis.

Figure 1 (column 4) lists the range of EMTG's using the holding period estimates of 31 to 24 years and the AMTG's as calculated by Seater. These numbers are much lower than the statutory rates and the difference is evenly divided between the effect of the tax code on the marginal tax rates applicable to realized capital gains (column 3) and the effect of the holding period. The EMTG's reported are small, suggesting that capital gains are not heavily taxed. This implies that capital gains taxes have not contributed much to any inflation induced increase in the tax wedge between before and after tax real rates. The hypothetical example in figure 3 illustrates this point.

FIGURE 3

Tax Rate	Before tax real rate	Inflation	Capital Gains	After tax real return
.20	.02	0	.02	.016
.20	.02	.10	.12	-.004
.05	.02	0	.02	.019
.05	.02	.10	.12	.014

Futhermore since the effective marginal tax rate depends in part on the inflation rate (through the implied discount factor Y in 1c) the

effect of inflation on the after tax real rate of return will be even smaller than shown in figure 3.

As discussed in the introduction, the low EMTG's calculated in figure 1 are not evidence that the capital gains tax law provisions cause small distortions. They are only evidence that the tax code allows one to choose labour supply, consumption and investment strategies which effectively reduce capital gains taxes. To take an extremely simple example, consider an economy with only one type of investment available and with inelastic supplies of savings and labour. Output and the capital stock would be unaffected by the magnitude of the capital gains tax is such an economy. If an alternative investment opportunity, which is tax exempt but yields less than the current pretax return becomes available, the economy will become less productive because new resources will be diverted to the less productive investment, at the same time that the effective capital gains tax falls. If, on the other hand, the alternative investment opportunity was equally productive, the effective capital gains tax would fall but without a decrease in productivity. Estimating the effective marginal tax rate on capital gains is only a first step in assessing the distortionary impact of capital gains taxes.

APPENDIX

Let $k(t)$ be the real capital stock and δ its growth rate, $p(t)$ the money price of capital and π its growth rate, $s(t)$ the number of shares outstanding and β their growth rate and $\sigma(t)$ the price per share. The economy is in steady state.

(A-1a) $p(t)k(t) = p_o k_o e^{\mu t}$, where $\mu \equiv \delta + \pi$

(A-1b) $s(t) = s_o e^{\beta t}$

(A-1c) $\sigma(t) = \sigma_o e^{(\mu-\beta)t}$

If α is the proportion of new investment financed by issuing new shares, then

(A-2) $s(t) = s_o e^{\alpha\delta t}$, and $\sigma(t) = \sigma_o e^{\gamma t}$

where $\gamma \equiv (1-\alpha)\delta + \pi$, and $p_o k_o = \sigma_o s_o$. (2) can be derived by equating the market value of the new investment to be financed through security.issues to the market value of the new securities, $p(t)k(t) = \delta(t)s(t)$, which shows that necessarily $\beta = \alpha\delta$.

The capital gains generated between $\hat{t} - 1$ and $\hat{t}$ are

(A-3)
$$CG(\hat{t}) = s(\hat{t}-1)\,[\sigma(\hat{t}) - \sigma(\hat{t}-1)]$$
$$CG(\hat{t}) = \sigma_o s_o e^{\mu(\hat{t}-1)}[e^{\gamma}-1]$$

To calculate <u>reported</u> capital gains at t_o, assume that an individual in the economy holds assets for N periods. At t_o+N, she sells the assets purchased at t_o and realizes her capital gains over the whole period. At time t_o assets available for purchase, $s(t_o)$, are the newly floated securities over the previous year plus those assets for which capital gains are being realized

(one N'th of the assets that existed N period ago, $\frac{1}{N} k_o e^{\alpha\delta(t_o-N)}$).

The newly issued securities between t_o-1 to t_o are

$$\int_{t_o-1}^{t_o} \dot{s}(t)dt = [1 - e^{-\alpha\delta}]s_o e^{\alpha\delta t_o},$$

and the total number of securities purchased by investors at t_o are,

$$\tilde{s}(t_o) = [1 - e^{-\alpha\delta}]s_o e^{\alpha\delta t_o} + \frac{1}{N}s_o e^{\alpha\delta(t_o-N)}$$

(A-4)

$$\tilde{s}(t_o) = [1 - e^{-\alpha\delta} + \frac{1}{N}e^{-\alpha\delta N}]s_o e^{\alpha\delta t_o}.$$

The aggregate capital gains on these assets over N (N > 1 year) periods are given by the change in the market value of the securities purchased at t_o and sold at t_o+N. In addition, since the new securities are issued continuously, these is a small capital gain that accrues only to the new securities and is the gain that accrues to them between the time they are issued and t_o, $\Delta(t_o)$.

$$\text{(i)} \quad \Delta(t_o) = \int_{t_o-1}^{t_o} \dot{s}(t)dt\ \sigma(t_o) - \int_{t_o-1}^{t_o} \dot{s}(t)\sigma(t)dt$$

$$\text{(ii)} \quad \Delta(t_o) = \sigma_o s_o e^{\mu t_o}[1 - e^{-\alpha\delta}] - \sigma_o s_o e^{\mu t_o}[1 - e^{-\mu}]\ \frac{\alpha\delta}{\mu}$$

$$\text{(iii)} \quad \Delta(t_o) = \sigma_o s_o e^{\mu t_o}[1 - e^{-\alpha\delta} - \frac{\alpha\delta}{\mu}\ (1 - e^{-\mu})]$$

Capital gains reported at t_o+N then are,

$$R(t_o+N) = \hat{s}(t_o)[\sigma(t_o+N) - \sigma(t_o)] + \Delta(t_o),$$

(A-5)

$$R(t_o+N) = \sigma_o s_o e^{\mu t_o}\{(1 - e^{-\alpha\delta})e^{\gamma N} + (e^{\gamma N}-1)\frac{e^{-\alpha\delta N}}{N} - \frac{\alpha\delta}{\mu}(1 - e^{-\mu})\}.$$

The ratio of capital gains reported at $\hat{t}$ (5) to capital gains generated between t-1 and t (3) can be found by substituting $t = t_o+N$ and taking the ratio of (3) to (5).

$$\rho(N) = \frac{R(t_o+N)}{\hat{C}G(t)}$$

(A-6)

$$= \frac{e^{-\mu(N-1)}}{e^{\gamma}-1}\left\{(1 - e^{-\alpha\delta})e^{\gamma N} + (e^{\gamma N}-1)\frac{e^{-\alpha\sigma N}}{N} - \frac{\alpha\delta}{\mu}(1-e^{-\mu})\right\}$$

which is equation (2) in the text, used to estimate N.

adding inventories. Inventories were added both because share prices reflect the value of inventories, and because the real price of capital has been computed including all corporate assets except cash.

To get the market value of capital, the replacement value including inventories is multiplied by the real price of capital, Tobin's q. The estimates of q used here are from Ciccolo (1980) and are calculated from the ratio of the market value to the replacement value of 237 firms listed in the COMPUSTAT tapes. The Economic Report of the President publishes an alternative series which gives essentially the same results. To get the nominal market price of capital, p(t) in the model, the market value of the capital stock is divided by the physical stock of capital.

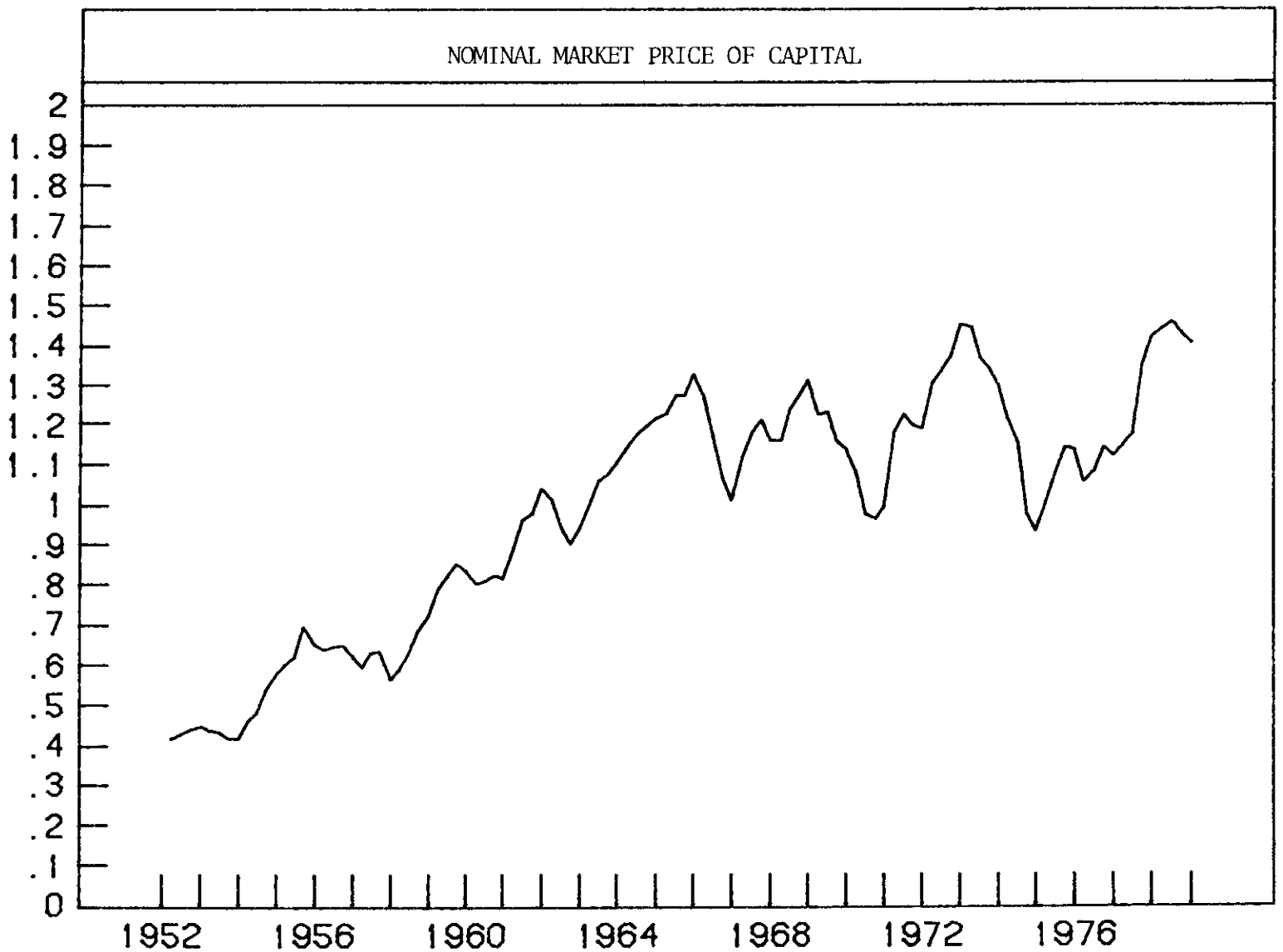
FIGURE 1

Year	(1) Statutory Average Marginal Tax Rates on Capital Gains	(2) EMTG range for Column (1). N = 17 years+	(3) Actual Average Marginal Tax Rate on Capital Gains (AMTG)	(4) EMTG range for Column (3). N = 31-24 years*
1960	26.1	12.8 - 13.4	14.6	4.3 - 5.6
1961	26.3	13.0 - 13.6	14.9	4.4 - 5.7
1962	27.1	13.4 - 14.0	15.0	4.4 - 5.7
1963	25.9	12.8 - 13.3	14.6	4.3 - 5.5
1964	24.3	11.8 - 12.4	11.8	3.4 - 4.4
1965	22.7	11.3 - 11.8	11.8	3.5 - 4.5
1966	22.1	11.2 - 11.7	13.1	3.9 - 5.2
1967	22.7	11.8 - 12.4	13.0	4.0 - 5.3
1968	25.2	13.7 - 14.3	15.2	4.8 - 6.4
1969	26.9	15.0 - 15.7	15.8	5.1 - 6.8
1970	22.7	12.8 - 13.4	13.7	4.5 - 6.0
1971	21.5	12.4 - 13.0	13.3	4.4 - 5.9
1972	22.3	13.3 - 13.9	13.3	4.5 - 6.1
1973	21.4	13.0 - 13.6	12.6	4.4 - 5.9
1974	20.1	12.5 - 13.1	12.1	4.3 - 5.8
1975	20.2	12.9 - 13.5	11.9	4.3 - 5.8
1976	18.1	11.8 - 12.4	11.1	4.1 - 5.6
1977	21.2	14.4 - 15.1	12.4	4.7 - 6.4
1978	21.5	15.0 - 15.8	12.3	4.8 - 6.6

+ = the range reported is for $\alpha = .15$, $\alpha = .35$ used to calculate γ, defined in footnote 3, in (1c).

*$\alpha = .15$, N = 31 gives the lower tax rate, while $\alpha = .35$, N = 24 gives the highest.

FIGURE 2


NOMINAL MARKET PRICE OF CAPITAL
2
1.9
1.8
1.7
1.6
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1.4
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1
.9
.8
.7
.6
.5
.4
.3
.2
.1
0
1952
1956
1960
1964
1968
1972
1976

REFERENCES

Bailey, Martin J. (1970), "Capital Gains and Income Taxation," in Taxation of Income From Capital, edited by A. Harberger and M. Bailey. Washington: The Brookings Institution.

Ciccolo, John and Fromm, Gary (1980), "'q', Corporate Investment, and Balance Sheet Behavior," Journal of Money, Credit and Banking 12 (M16), pp. 294-307.

Green, Jerry and Sheshinski, Eytan (1978), "Optimal Capital-Gains Taxation Under Limited Information," Journal of Political Economy 86, 6 (December), pp. 1143-1158.

Joines, Douglas H. (1981), "Estimates of Effective Marginal Tax Rates on Factor Incomes," Journal of Business 54, 2 (April), pp. 191-226.

Miller, Merton H. and Scholes, Myron S. (1978), "Dividends and Taxes," Journal of Financial Economics 6 (December), pp. 333-364.

Musgrave, John C. (1976), "Fixed Nonresidential Business and Residential Capital in the United States, 1925-75," Survey of Current Business 56, 4 (April), pp. 46-52.

Seater, John J. (1982), " Marginal Federal Personal and Corporate Income Tax Rates in the U.S., 1909-1975," Journal of Monetary Economics, (forthcoming).

U.S. Department of the Treasury (1960-1978), Statistics of Income, Individual Income Tax Returns.

U.S. Department of the Treasury (1960, 1965, 1970, 1974) Statistics of Income, Fiduciary Income Tax Returns.

U.S. Department of the Treasury (1973), Statistics of Income, Supplemental Report, Sales of Capital Assets Reported on Individual Income Tax Returns.

U.S. President, (1979) Economic Report of the President Transmitted to Congress.