Inflation and Stock Values
Is Our Tax Structure the Villain?

At one time, investors regarded common stocks as a good inflation hedge. Because stocks represented the ownership of real capital, people thought that their value would rise roughly in proportion to the general price level, at least over periods of several years. For the last decade or so, however, stock prices have not kept pace with inflation. The Standard and Poor's index of stock prices, for example, stood at 133 in the fourth quarter of 1980, up only 26 percent from its 1968 fourth-quarter level. Yet, the price level more than doubled in that same period This meant that the real value of equity fell almost 50 percent

Why did this tremendous drop in real value of equity occur? Some observers have suggested that inflation itself may account for this phenomenon. One theory is that the tax structure in the United States, particularly that applicable to corporations, becomes more burdensome when the price level rises. As a consequence, a change in inflation can reduce a corporation's real aftertax earnings. This could, in turn, lower the value of owning equity.

This article explores the question of whether the tax system—along with the acceleration in inflation—could account for the poor performance of stock prices. Overall, the analysis indicates that the tax structure may well have played a sizable role in reducing real stock prices. At the same time, the analysis indicates that the tax structure cannot account for the whole decline.

This is a revised version of an article that is part of a forthcoming Federal Reserve System study of the Federal tax structure I would like to express my appreciation to Patrick Corcoran, Patric H Hendershott, Patrick Lawlor, Martha Scanlon, Thomas Simpson, and Helmut Wendel for useful comments and suggestions, and to Joseph Snailer for statistical assistance

A closer look at real stock prices

Stock price averages such as the Standard and Poor's index of 500 common stock prices moved up sharply in the early 1960s and then more slowly from 1966 to 1973 (Chart 1). Then, in 1974, prices plunged Although they recovered somewhat thereafter, stock prices until very recently remained below their 1973 peak

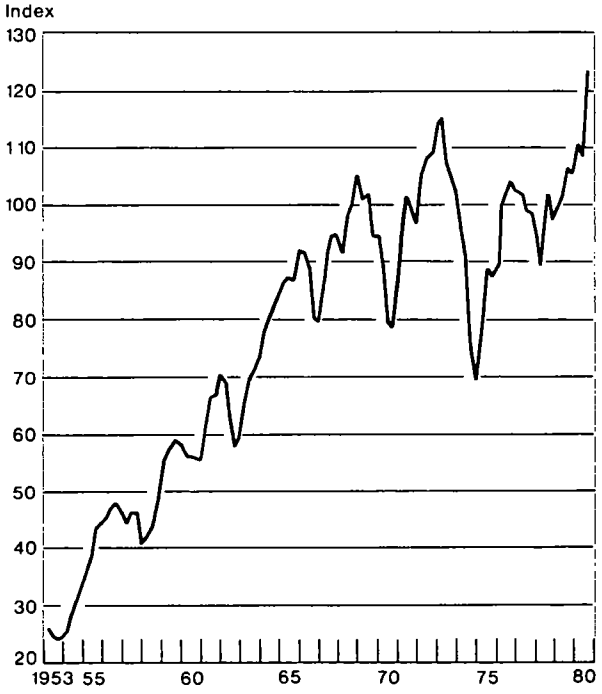
In constant dollars, stock price performance was much worse, falling dramatically since 1968 (Chart 2). Real stock prices peaked in the 1965-68 period and then declined through 1970 Although there was some recovery from 1971 through 1973, real stock prices did not regain their previous peak Then, in late 1973 and 1974, real stock prices dropped precipitously back to their 1954-55 level. They have not since recovered substantially.

How can one explain this phenomenal drop in real stock values? One simple hypothesis is that stockholders were paid dividends in excess of aftertax corporate earnings In this case, corporations would not have had sufficient funds to replace equipment or structures as they depreciated unless they borrowed. Whether corporations ran down their stock of fixed capital or borrowed to maintain it, the amount of fixed capital owned free and clear by stockholders would decline The data, however, do not support this hypothesis: in every year from 1967 to 1979, corporations paid dividends smaller than their aftertax "true"

Chart 1

Standard & Poor's Stock Price Index of 500 Stocks

1941-43=10

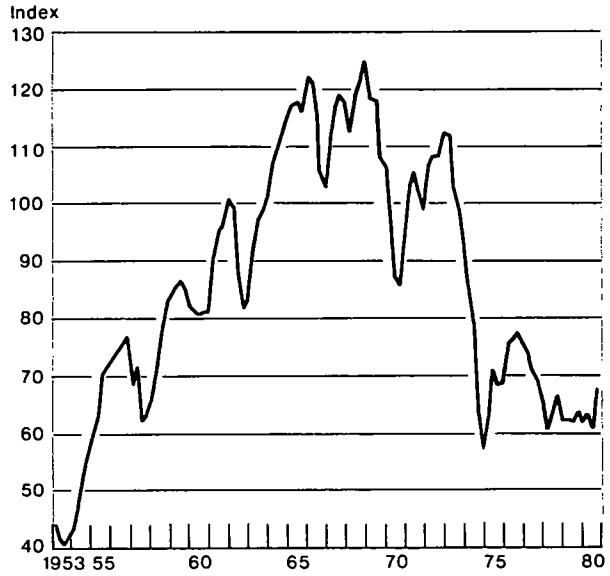


Source Standard & Poor's Corporation

Chart 2

"Real" Stock Prices

Standard & Poor's index deflated by the GNP price deflator



Sources Standard & Poor's index of 500 stocks Standard & Poor's Corporation, gross national product implicit price deflator United States Department of Commerce, Bureau of Economic Analysis

profits (see glossary) Thus, the stock price per dollar of equity investment, which includes retained earnings, declined even more sharply than the real stock prices shown in Chart 2

A second hypothesis is that inflation was responsible for the decline in equity values Here the data do lend support For example, the acceleration of inflation in the seventies (Chart 3) does coincide roughly with the deterioration of real stock values Moreover, statistical analyses over long periods of time indicate that stock prices were negatively correlated with the rate of inflation.[1] Other statistical studies show that the returns to equity—which may have been reflected in equity values—were also negatively affected by inflation.[2] All this evidence suggests a negative correlation between inflation and stock values However, it does not explain the linkage One explanation of the linkage is that the structure of the tax system reduces equity returns when inflation accelerates

Tax nonneutrality as an explanation of stock prices

A tax is "neutral" with respect to inflation if it collects the same tax monies, in real terms, from a given amount of real income regardless of the price level. That is, the taxation ratio associated with a given real income does not change with inflation. Both the personal income tax and the corporate income tax codes in the United States contain features that are not neutral. For example, the marginal tax rate brackets of

[1] See Franco Modigliani and Richard A Cohn, "Inflation, Rational Valuation and the Market", *Financial Analysts Journal* (March/April 1979); Bruno Oudet, "The Variation of the Return on Stocks in Periods of Inflation", *Journal of Financial and Quantitative Analysis* (March 1973), and John Lintner, "Inflation and Security Returns", *Journal of Finance* (May 1975)

[2] See Eugene F Fama, "Stock Returns, Real Activity, Inflation and Money", Graduate School of Business, University of Chicago Working Paper (1979)

the personal income tax are based upon dollar income rather than real income. If tax rates are unchanged, a proportional rise in prices and nominal incomes will put taxpayers in higher marginal tax brackets and their taxes will rise more than in proportion to prices. As a result, a larger percentage of their income will be paid in taxes even though their real income is no higher. Also, the dollar value of realized capital gains is taxed even if the asset did not appreciate in real terms, *i.e.,* no additional purchasing power was achieved.

At the corporate level, the Federal tax code has two main features that cause an increase in the tax burden when prices accelerate: (1) "nominal" inventory profits are taxable[3] and (2) allowable depreciation is based upon the original, rather than the replacement, cost of equipment and structures.

Inventory profits

Corporations are taxed on total *nominal inventory profits.* Like capital gains, inventory profits are taxed even if the goods do not appreciate in real terms The value of inventories is typically computed by using one of two accounting methods: "first in-first out" (FIFO) or "last in-first out" (LIFO). For a corporation using FIFO, the oldest item in inventory is assumed to be the first sold. The value of a fixed volume of raw materials, say, will rise as "old" items are taken from inventory and new higher priced ones are added. In contrast, for corporations using the LIFO procedure, the item inventoried most recently is the one assumed to be removed from inventory and replaced with a newly produced item. The inventory profit calculated by this method is typically small, unless a firm liquidates an extensive portion of its inventory. As a consequence, firms have an incentive to switch to LIFO and some of them did switch, particularly in 1973-74 Many more, however, were reluctant to do so, perhaps because of costs entailed in making the switch or because they feared that their stock price would decline if they implemented an accounting change which reduced reported profits even though increasing true aftertax profits On balance, only a small proportion of the inventory profits are computed on a LIFO basis and, in aggregate, inventory profits are therefore substantial in an inflationary period For example, inventory profits soared in 1973-74 and again in 1979 when inflation accelerated (Chart 4). As a consequence of this link between inventory profits and inflation, the tax burden associated with inventories increases in real terms when inflation accelerates.

[3] There is no easy way to calculate true inventory profits

Depreciation allowances

Corporations are permitted to deduct allowances for depreciation of their fixed capital—structures and equipment—in computing their taxable income These allowances are based upon the "service life" of the capital good, as specified by the Internal Revenue Service (IRS), and the *original* cost of the capital good. The service lives set out by the IRS are generally shorter than the useful service lives of capital goods Thus, capital goods can be depreciated faster than they wear out. When prices are rising, however, the depreciation allowances that are permitted, based upon original cost, will understate the true cost of replacing capital goods. And the more rapidly the price level is projected to increase, the smaller is the anticipated present value of the depreciation allowances on a new capital good. For example, when the inflation rate is 8 percent, a corporation is permitted to deduct only 53 percent of the "true" depreciation on a thirty-year structure (Table 1).

Debt

While the Federal code taxes nominal capital gains, which may not represent an increase in the general purchasing power of the asset, some implicit real

Glossary

Cash flow is defined as profits before taxes plus capital consumption allowances plus net interest paid.

A *neutral tax* (in an inflationary sense) collects the same monies, in real terms, from a given amount of real income regardless of the price level

Reported profits (after taxes) are corporate taxable income less corporate tax liability.

Adjusted profits are reported profits minus (a) inventory profits and (b) a correction factor to put depreciation on a replacement-cost basis.

True profits are adjusted profits plus the reduction of the real value of net outstanding financial debt due to inflation.

True profitability is the ratio of true profits to capital, valued at replacement cost, less the market value of net debt.

The *rate of return on total capital* is calculated as the ratio of total adjusted capital income—interest plus aftertax profits, adjusted to eliminate inventory profits and to reflect depreciation on a replacement-cost basis —to the replacement cost of capital.

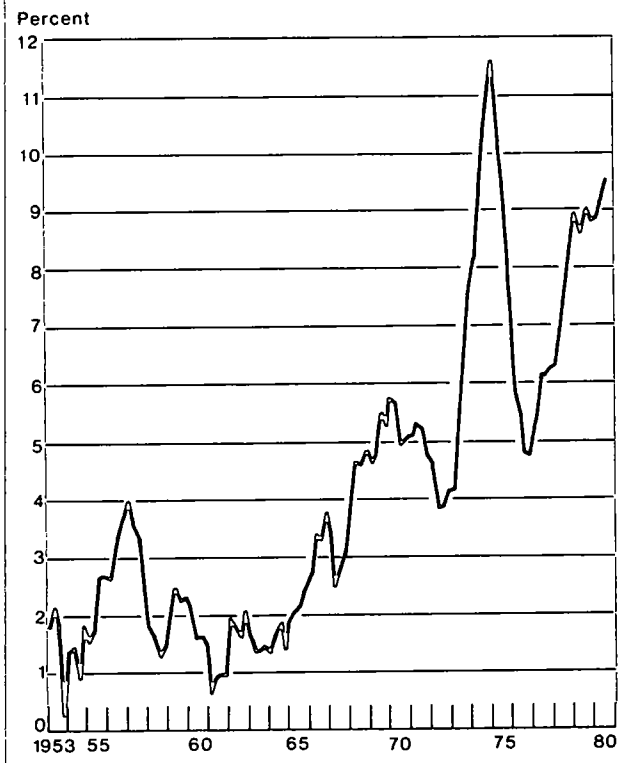
capital gains are not taxed Consider, for example, the real value of a corporation's financial debt Whenever the price level increases unexpectedly, the real value of the corporation's outstanding debt declines and the shareholders' real wealth increases Yet there is no tax on this real gain (Unexpected inflation would cause some wealth shift toward debtors even if part of it were taxed.)

Second, a change in the anticipated rate of inflation that affects nominal rates of interest may also benefit shareholders in a firm which has net debt outstanding[4] Suppose, for example, that the expected rate of inflation rose by 1 percentage point. To earn (or pay) the same real rate of interest, the *aftertax nominal yield* would have to rise by 1 percentage point in order to offset the inflation increase A creditor in a 25 percent marginal tax bracket would require an interest rate increase of 1⅓ percentage points to net 1 percent more after taxes [(1 − .25) (1⅓) = 1] The corporation in a 46 percent tax bracket, in contrast, would require a 1 85 percentage point increase in the nominal bond rate to pay 1 percentage point more after taxes [(1 − 46) (1 85) = 1] Any smaller increase in the nominal rate of interest would improve its real income Therefore, if the interest rate increased by 1⅓ percentage points, just enough to maintain the real aftertax earnings of the recipient of interest, the corporation's real aftertax cost would decline

Chart 3

Growth Rate of GNP Price Deflator

From four quarters earlier



Source GNP price deflator from United States Department of Commerce, Bureau of Economic Analysis

To summarize, inflation influences the aftertax real income of stockholders, reducing it through the generation of taxable nominal capital gains and nominal inventory profits, as well as through the reduction of the real value of depreciation allowances, and increasing it through the tax treatment of debt and debt servicing

Can we say on balance how large an effect inflation has had on the value of stockownership? First, let us define precisely what we mean by "inflation". For purposes of computing the impacts on real stock values, three different cases must be distinguished:

- the occurrence of inflation that was expected,
- the occurrence of more inflation than was expected, and
- an increase in the rate of inflation expected to prevail in the future

[4] There are two parts to this argument The first concerns the tax treatment of interest and the second the difference between the tax rates of the corporation that pays interest and the individual who receives it

In general, the real cost of borrowing after taxes and inflation is $r - p - T$, where r is the nominal interest rate, T is the reduction of taxes permitted because of the interest payment, and p is the expected annual percentage decline in the real value of the principal that is owed A tax which is neutral with respect to the rate of inflation would allow a deduction of the real interest cost $(r - p)$ per dollar of debt The aftertax cost would therefore be $(I - t_c)(r - p)$, where t_c is the corporate tax rate on marginal income One way of looking at this neutral tax system is that it allows all interest to be deducted but counts the reduction of the real value of the debt as taxable corporate income (That is, the aftertax real cost could be written as $r - rt_c - p + t_c p$, which is identical to the neutral tax formula shown a few lines above) In the United States tax system, however, nominal interest payments, rather than real interest payments are tax deductible The aftertax real cost of a dollar of debt to the corporation is therefore $(I - t_c) r - p$ From the viewpoint of the interest recipient, a neutral tax system would apply the marginal tax rate to the real interest earnings The recipient, under a neutral tax, would therefore be left with $(I - t_p)(r - p)$ after taxes and inflation, where t_p is the personal tax rate on marginal income But, under the United States Federal tax code, nominal interest is fully taxed, so that after taxes and inflation the earnings per dollar of principal are $(I - t_p) r - p$ If the inflation rate went up by 1 percentage point, the interest recipient would be at least as well off providing the nominal rate of interest increased by more than $1/(1 - t_p)$ while the corporation would be at least as well off providing the interest rate increased by less than $1/(1 - t_c)$

Table 1

The Present Value of Statutory Depreciation Allowances Relative to the Present Value of Price-Level-Adjusted Depreciation Allowances

In percent

Inflation rate	Ten-year equipment* Sum-of-years digits	Ten-year equipment* Straight-line	Thirty-year structure* Straight-line
0	102	108	111
2	95	100	88
4	88	93	73
6	83	87	61
8	77	82	53

* Statutory lifetimes

Statutory depreciation allowances are based on the sum-of-years digits formula for equipment and the 150 percent declining-balance formula for structures (For structures, a switch is made to the straight-line formula in the eleventh year, so that the present value of statutory allowances is as large as possible) The statutory allowances for both equipment and structures use the stated lifetimes The alternative sum-of-years digits and straight-line allowances for equipment and the straight-line allowances for structures are based on price-level-adjusted depreciation formulas extending over lifetimes 25 percent longer than the statutory lifetimes

The entries in the table are ratios of the present value of the statutory allowances and their price-level-adjusted alternatives The real aftertax discount rate is 3 percent

Source Taken from Richard Kopcke, "Are Stocks a Bargain?", *New England Economic Review* (May/June 1979)

Each of these events should in principle have a different effect on stock prices. When expected inflation occurs, the real valuation of the firm should not be affected; any effect on anticipated real earnings should have altered equity valuation when the anticipation was formulated.[5]

Unexpected inflation, in contrast, can alter the real value of the firm's equity when it occurs since its impact on real tax liability was not anticipated. For example, this inflation would give rise to a once-and-for-all nominal inventory profit on which corporate tax must be paid In addition, it would cause a loss in the real value of the depreciation allowance on capital purchased prior to the unexpected price rise. Tending to offset these negative effects is the unexpected reduction of the real value of the firm's outstanding debt.

A change in the expected rate of inflation affects real tax liabilities in ways similar to those from unexpected inflation—through the creation of inventory gain and the understatement of depreciation. However, in this case, both of these effects are ongoing. (Note that, in the case of an unexpected price rise, there is a one-time loss on existing fixed capital only. New equipment, purchased at the higher price level, would have a depreciation allowance that is the same percentage of replacement cost as was typical prior to the unexpected price level rise.) In addition, stockholders can anticipate that the accrued nominal capital gain between any two future points of time will be larger if the price level is expected to rise more rapidly. Should they sell, the realized capital gain and their personal tax liability would be larger in the higher inflation case.

It is possible to obtain a rough idea of the maximum effect of a change in the expected rate of inflation by examining the formula for the rate of return and figuring how much it would be affected by inflation working through each tax feature.[6] For example, the present value of depreciation allowances can be expressed as a function of the rate of inflation. How much a change in the rate of inflation impacts the present value of depreciation allowances can therefore be calculated. The effect on depreciation allowances can then be translated into the effect on taxes and into the effect on aftertax income.

The percentage impact on stockholder returns is an upper limit of the possible percentage impact on real stock prices. If there are other assets whose real returns are unaffected and these assets were available in unlimited supply, then stock prices would have to fall enough to produce the same real return on equity as prevailed before the inflation increase. That is, stock prices would have to fall as much as the real return. Suppose, on the other hand, there were few alternative assets. At the same time, the public wanted to maintain the same stock of accumulated wealth despite the lower returns. In this case, there could be no attempted shift out of equities and the public would simply end up accepting a lower return on stocks. In addition, my estimates overstate the impact because:

[5] The real value of equity equals the present discounted value of expected future real earnings To the extent that actual dividends are less than the permanent level of dividends (where permanent dividends are defined as that constant level which has the same present value as the stream of aftertax corporate profits), the real value of the firm will rise over time In the case where dividends are equal to permanent aftertax profits, the real value of the firm should remain constant

[6] These calculations assume no change in the capital intensity of production and no change in the firm's debt/equity ratio

(1) The investment tax credit, which has been greatly increased since its inception, is not figured into my calculations. This would offset part of the negative effects on stock values.
(2) Taxes have been reduced on average partly in response to inflation-caused rises in revenues. Therefore, figuring the impact while holding the tax structure constant will overstate the net effect.
(3) There has been a shift away from straight-line depreciation to accelerated depreciation, a reduction of permissible service lives for the calculation of depreciation deductions, and a shift from FIFO and LIFO. All these changes tend to reduce the impact of inflation on stock values.

The results of the calculations for a change in the expected rate of inflation are displayed in Table 2, first column My estimates show that the prescribed rules for depreciation allowances are the tax element with the largest impact. Indeed, a 4 percentage point rise in the expected rate of inflation could lower stock values by 11 percent through this one tax feature. The taxation of inventory profits and the taxation of capital gains at the individual level each account for about a 5 percent fall. Working in the opposite direction, the real interest rate effect could raise the return by about 5 percent, offsetting about one quarter of the negative effects of the other three tax features.

The effects of a once-and-for-all bout of unexpected inflation are shown in Table 2, last column Because unexpected inflation is not reflected in the interest rate, the gain to the firm from the reduction of the real value of outstanding debt is not offset by higher interest payments on that old debt. (In the case of a change in inflationary *expectations,* the interest rates would be higher, limiting the gain to the firm.) This large positive benefit from inflation washes out almost all negative effects of inflation on inventory profits and the understatement of depreciation allowances.

Altogether, a 4 percentage point increase in the expected rate of inflation could lower real stock prices by as much as 17 percent. The expected rate of inflation has probably risen by 6 percent over the past decade. According to my calculations, the increase in the expected rate of inflation coupled with our tax system could have caused a 25 percent decline in real stock prices. Therefore, of the 50 percent decline in real stock prices in the past decade or so, the tax structure could account for as much as half. Although this suggests that the tax structure may have had a significant effect on stock values, clearly it is not a full explanation. Indeed, at least half of the decline in stock values remains to be explained by other factors.

Kopcke and Feldstein, Green, and Sheshinski (FGS) also evaluated the impact of inflation on stockholders' returns.[7] Kopcke calculated the effect of the same four tax elements that I examined, obtaining estimates

[7] Richard Kopcke, "Are Stocks a Bargain?", *New England Economic Review* (May/June 1979), Martin Feldstein, Jerry Green, and Eytan Sheshinski, "Inflation and Taxes in a Growing Economy with Debt and Equity Finance", *Journal of Political Economy* (April 1978), Part 2

Table 2

Inflation's Effect via the Tax System

Component of tax system	Percentage change in equity value due to a 4 percentage point rise in the expected inflation rate*	Percentage change in equity value due to an unexpected once-and-for-all rise in the price level of 4 percent
Tax on inventory profits	— 5 4	—0 6
Tax on understated depreciation allowances	—10 9	—0 9
Effect on nominal debt and debt servicing	4 8†	1.1
Capital gains tax (in personal income tax code)	— 5 3	0
Total	—16 8	—0 4

* Upper limits of the impacts.

† Assumes that real rate of interest earned by bondholders remains constant, the corporation reaping the entire gain from the tax treatment of interest payments (Refer to discussion in the text)

Source Marcelle Arak, "Can the Performance of the Stock Market Be Explained by Inflation Coupled with Our Tax System?", Federal Reserve Bank of New York Research Paper Number 7820.

about 50 percent larger than mine In a different approach, FGS compared two situations with different rates of inflation According to their model, a 6 percent inflation differential leads to a 21 percent differential in the rate of return on equity, a bit less than my calculations indicate. All in all, the different methodologies indicate that the tax system could be an important factor in the performance of the stock market but it cannot explain the entire decline in real stock prices.

Criticism of the corporate taxation argument

Although taxes appear to be a plausible explanation of at least part of the stock price decline, several researchers have argued that the historical data are inconsistent with this explanation

One piece of evidence cited is the ratio of taxes to before-tax cash flow (see glossary) This tax ratio *declined* from the fifties to the sixties to the seventies, whereas the tax structure hypothesis suggests an increase in the ratio of taxes to capital income [8]

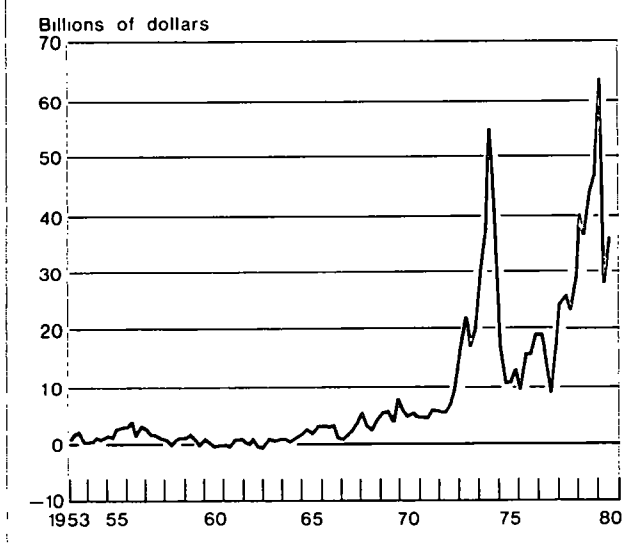
Although the movement of the ratio of taxes to cash flow is suggestive, it is not necessarily an accurate measure of the tax burden on *stockholders* First, it uses all capital income rather than income earned by stockholders If a larger fraction of funds is raised through debt, the relative tax burden will fall because interest is deductible in computing taxable corporate income Second, the ratio of taxes to corporate income reflects *current* taxes But a change in the expected inflation rate will affect anticipated *future* taxes and their ratio to cash flow The ratio of current taxes to current cash flow could be affected very little

Another piece of evidence cited is the rate of return on total capital (see glossary) This rate of return shows no trend in the postwar period as a whole, although it was somewhat lower in the midseventies than in the midsixties, when it was particularly high

In this case also, it is not accurate to interpret the total return to capital as a measure of the return to stockholders. From the sixties to the seventies, there was a shift toward debt finance which has a more advantageous tax treatment Because interest payments create a tax deduction for the corporation while dividend payments do not, the increased use of debt will raise total capital income, other things being constant. (Of course, it also raises leverage and riskiness) For example, a corporation which raised the proportion of capital financed with debt by 10 percentage points could raise its *total* return on capital by about ½ percentage point [9]

Chart 4

Inventory Profits



Source United States Department of Commerce, Bureau of Economic Analysis

Let us look more closely at the income of stockholders and their return on capital To obtain the income of stockholders, reported aftertax corporate profits (see glossary) must be adjusted to eliminate inventory profits and to reflect depreciation on a replacement-cost basis, both of these adjustments reduce aftertax profits. Then, to this adjusted profits (see glossary) figure must be added the gain to stockholders from the reduction of the real value of their net financial liabilities Inflation lowers stockholders' real debt to bondholders, banks, etc , so that the corporation could issue more nominal debt without raising the future real burden of its debt, the funds from the new bond issues could be used to increase stockholder dividends without reducing the corporation's

[8] According to Fama (1979), the decline in the tax ratio resulted from improved depreciation allowances—shorter service lives and accelerated depreciation—and the deductibility of interest payments In the seventies, the larger investment tax credit was important

[9] Let K be the capital stock, D the corporation's debt, r the interest rate, and G gross earnings after labor and depreciation costs Total capital income is aftertax corporate profits $(1 - t)(G - rD)$ plus interest payments rD If the fraction "b" of capital is financed by debt, income per dollar of capital is

$$\frac{(1 - t)(G - rbK) + rbK}{K} \text{ or } (1 - t)\frac{G}{K} + trb$$

A change in "b" alters the return by $tr(\Delta b)$ If "t" is 0 46 and r is 0 12, then Δb of 0 1 produces a change in the rate of return of 0 55 percent

Table 3
Views on Inflation and Stock Values

Author	Major reason why inflation harms stock value	Is the corporate tax structure relevant?	Are other tax elements important?
Arak	Taxation of equity a partial explanation	Yes	Yes, capital gains
Fama	No true connection	No	No
Hendershott	Favored tax treatment of housing	No (Equity values should be helped by inflation)	Yes, treatment of housing
Kopcke	Taxation of equity explains a large portion	Yes	Yes, capital gains
Modigliani-Cohn	Use of a nominal interest rate to discount profit streams, plus error in calculating profits	No	No

Sources See text

ability to maintain the same level of future real dividends. Thus, according to standard economic definitions of "income", such gains on outstanding liabilities should be included in income

Reported profits and true profits have been very different in recent years (Chart 5). The divergence between the measures in the fifties and early sixties reflected primarily the relatively long service lives specified by the IRS. These kept depreciation allowances below true depreciation. As service lives were liberalized, this situation changed When inflation accelerated in 1973, however, it became the predominant influence on the relationship between profit measures True profits began to fall very far short of the standard profits For example, in the fourth quarter of 1979, true profits were running at a $90 billion annual rate, 23 percent below reported profits.

The adjusted profits measure—used by many analysts—fell even more relative to standard profits. But it is apparent that this measure substantially overstates the effect of inflation on stockholder income The adjusted profits measure involves subtractions from reported corporate profits for inventory profits and true depreciation but does not add in the gain to stockholders from their reduced bond obligations.

The true profits figures can be used to calculate the tax rate of, and rate of return to, stockholders. The tax burden on stockholders (as measured by taxes relative to before-tax true profits) declined from the fifties to the sixties (Chart 6). Since the 1960s, however, the tax burden on profits increased, in contrast to the tax burden on total capital income cited above.

The rate of return to capital owned by stockholders —the stockholder analogue to the rate of return to total capital—was computed using true profits in the numerator. The denominator was the replacement cost of capital minus the market value of (net) financial debt, as calculated by George Von Furstenberg.[10] The decline in the stockholder returns from the high levels of the sixties to the seventies was enormous (Chart 7), whereas the total capital return did not decline much.

The data therefore support the view that the tax burden on stockholders increased since the sixties. The data also suggest that there was a very substantial decline in the aftertax return to equity capital, a decline only partly attributable to the higher effective tax rate.

Alternative explanations of the fall in real stock prices

Economists have put forth several alternative explanations of the decline in real stock prices (Table 3). One cogent argument begins with the observation that our

[10] George Von Furstenberg, "Corporate Investment Does Market Valuation Matter in the Aggregate?", *Brookings Papers on Economic Activity* (1972 2)

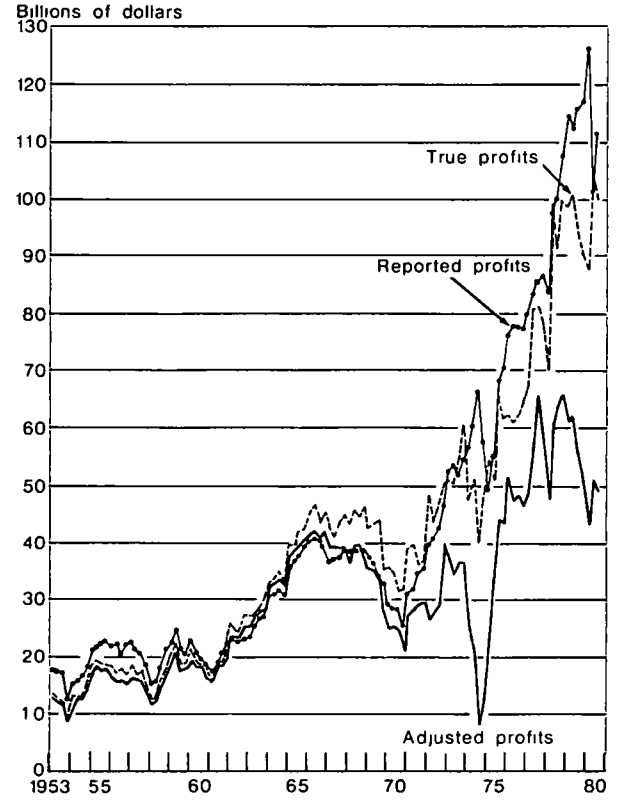
tax system treats owner-occupied dwellings in a special way In an inflationary environment, homeowners expect the value of their houses to appreciate; at the same time, interest rates will be high, reflecting the expectation of price rise Homeowners can deduct their interest payments in figuring their taxable income. However, the services rendered by owner-occupied dwellings, that is, the implicit rental value, is not taxed, and the capital gains are taxed only when a home is sold and then only in some circumstances [11] In effect, if an owner lives in his own house, the "dividends"—the current rental services—are not taxed as they would be if provided by a third party Also, the capital gains on owner-occupied housing are effectively taxed less heavily than capital gains on other assets because home-sale capital gains taxes often can be postponed by reinvestment or completely avoided by selling after age 55 When inflation accelerates, both interest costs and expected capital gains increase and the asymmetry in tax treatment becomes more valuable This asymmetry in the tax treatment of owner-occupied housing has caused the user cost of housing to decline substantially For example, if a person is in a 45 percent tax bracket, the decline has been about 4 percentage points according to Hendershott (1979) [12]

What effect would the reduction of the cost of housing have on stock prices? Lower housing costs will influence people to buy rather than rent and to buy larger and/or higher quality houses The shift of funds toward housing and away from other investments would tend to push down equity prices Profits relative to stock prices would then be higher, comparable to the attractive yield on homeownership This argument is both logical and consistent with most of the facts including the rapid increases in the prices of homes The one fact that does not quite fit is that bond yields have increased about as much as the rate of inflation, so that the real return on bonds has not risen along with the return on houses and corporate equity

A different argument is that inflation causes people to make mistakes in evaluating investment opportunities Modigliani and Cohn, for example, hypothesize that investors use a nominal interest rate in calculations which should be done with a real interest rate During an inflationary period when the nominal rate is substantially higher than the real rate, this error means that they are discounting future earnings too heavily and therefore undervaluating equity ownership. Suppose, for example, that current dividends per share of a particular corporation are $2, the real return on risky investments is 7 percent, and the expected inflation rate is 8 percent. The nominal return to risky investments is therefore 15 percent (=7+8). With an inflation rate of 8 percent, dividends will probably be 2(1.08) next year, $2(1.08)^2$ the following year, etc The value of a share of stock is the present discounted value of that flow of dividends Discounting this stream of nominal earnings by the nominal rate of interest,

Chart 5

Alternative Measures of Aftertax Corporate Profits of Nonfinancial Corporations



Source Reported and adjusted profits United States Department of Commerce, Bureau of Economic Analysis True profits calculated by the author as described in the text

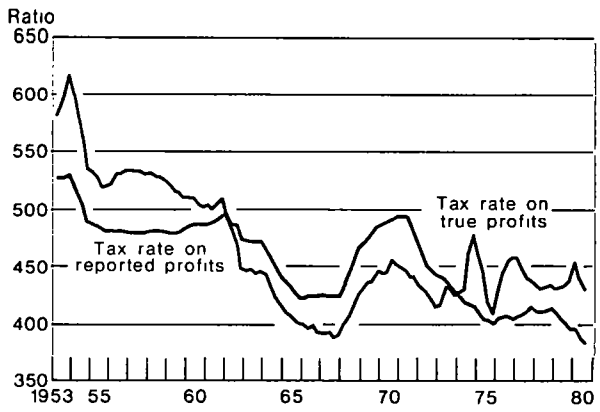
[11] For those under age 55, gains from sale of a principal residence which are reinvested in a new principal residence are not taxed at the time of receipt For those over 55, $100,000 of the capital gain may be excluded from taxation, subject to certain conditions

[12] Patric H Hendershott, "The Decline in Aggregate Share Values Inflation, Taxation, Risk and Profitability", Conference on the Taxation of Capital (November 16-18, 1979)

Chart 6

Taxation of Alternative Measures of Corporate Profits of Nonfinancial Corporations

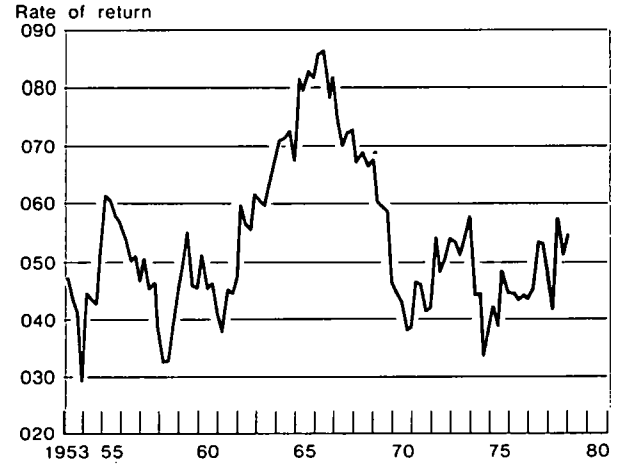
Four-quarter moving average



Source Tax payments and reported profits United States Department of Commerce, Bureau of Economic Analysis True profits calculated by the author as described in the text

Chart 7

Aftertax Profitability of Corporate Capital



Numerator is true profits, denominator is capital valued at replacement cost less the market value of net financial debt See text for a description of the calculations and the data sources

the value of the share of stock is

(a) $2 + 2(1\ 08)/1\ 15 + 2(1\ 08)^2/(1\ 15)^2 + \ . + .$, or roughly

(b) $2 + 2/1\ 07 + 2/(1\ 07)^2 + \ . \ +$

which amounts to about $30 Note that, according to (b), the current dividend should be discounted at the *real rate of interest*, not the nominal rate of interest (This is true for other returns and inflation rates as well) If the current dividends were discounted by the nominal return of 15 percent, the stock would be mistakenly valued at only $13[1]

In addition, Modigliani and Cohn hypothesize that investors make a second mistake· they fail to include the reduction of the real value of outstanding debt caused by price increases as part of profits

They test these hypotheses by analyzing the factors that influenced share prices in the past. Specifically, the authors estimate an equation for share prices which includes among other items (a) the nominal rate of interest and (b) a weighted average of past inflation rates that was assumed to represent expected inflation Since the real rate of interest can be represented as a nominal interest rate *less* the expected rate of inflation, (b) ought to get a coefficient of opposite sign to (a). As it turns out, however, both the interest rate and the inflation rate variable get negative coefficients[1] The negative coefficient on the price variable is not significantly different from zero in a statistical sense However, even zero is much too low a coefficient.[13]

The authors interpret this result as evidence that investors are making two valuation errors—misusing a nominal rate as a real rate and failing to include the fall in the real value of outstanding debt as part of equity earnings

How strong is their argument? Hendershott pointed out that it is difficult to reconcile such a misvaluation with the fact that the nominal bond rates have risen about one for one with the increase in inflation By his model, investor shifts from stocks into bonds cause the real aftertax returns, adjusted for risk, to be equal Therefore, if investors did not properly account for inflation, bond returns would have stayed low, in tandem with real returns on stocks.

[13] Expected inflation should have an equal and opposite sign from the nominal rate of interest—to convert the nominal rate to a real rate—plus a coefficient reflecting the anticipated future inflation-produced capital gains on the outstanding debt

Moreover, there are other ways to explain the empirical results obtained by Modigliani and Cohn. For example, a weighted average of past inflation rates could be a poor estimate of the inflation rate expected to prevail over the long term On the other hand, because nominal bond rates incorporate price expectations, changes in bond rates could be a good proxy for changes in expected inflation. Indeed, if variations in the real rate of interest tend to be small, then most of the changes in the bond yield will reflect changes in price expectations. In this case, the bond rate would be proxying for expected inflation and its coefficient would represent the effect of expected inflation on equity values rather than the effect of real interest rates on equity values. By this interpretation, the coefficient of −0.059 obtained in one of their regressions indicates that each 1 percentage point increase in the expected rate of inflation would reduce stock values by 5.9 percent; a 6 percentage point increase in the rate of inflation would therefore reduce real stock prices by about 35 percent Interestingly enough, this is within the range of the Arak-Kopcke stock price impact calculated from the tax structure.

While many explanations of stock price behavior are related to inflation in some way, others are not. For example, some economists argue that equity prices have declined for the simple reason that corporate profitability before taxes has dropped sharply. Charts 6 and 7 lend support to this view; they show that stockholders' (aftertax) return dropped substantially while the tax rate on stockholders increased only moderately. Another factor may be that the growth prospects during the 1960s were much brighter than during the 1970s. Since stock values are based upon expected dividend growth, the outlook could well be an important element.

Conclusions and implications

There is no single factor that can plausibly explain the substantial fall in real stock values over the past ten to fifteen years. However, the tax system—the corporate and capital gains tax as well as the tax treatment of housing—probably has played a significant role.

Besides lowering real stock values, the current tax system may impair productivity by lowering desired capital investment and encouraging shorter lived capital than is optimal from an economy-wide vantage point Moreover, the tax system gives firms a large incentive to leverage themselves. Taken together, there would be important gains from reforming the corporate tax system to get rid of the features which cause nonneutrality with respect to inflation.

Of the features considered above, the depreciation-allowance rules are the single most important in terms of the impact on real stock values. Moreover, the depreciation allowances probably were important in inducing business to build less durable capital than is desirable from society's viewpoint [14] The ideal solution is to base allowances on replacement cost, rather than on original cost, while using write-off schemes that approximate the true depreciation of each piece of capital. *Ad hoc* schemes to improve depreciation allowances, such as shortening the permissible service lives or widening the scope for use of accelerated depreciation, work imperfectly. Only at one particular inflation rate and with one particular technological mix will they exactly offset the shortfall in the true depreciation generated by the use of original cost. If the inflation rate were to fall, such schemes would lead to higher profits and longer lived equipment than is economically efficient. According to the Bureau of Economic Analysis, Department of Commerce, the understatement of depreciation was about $17 billion in 1979. If this were added to the depreciation write-offs currently allowed, it would have cost the United States Treasury less than $8 billion in 1979, far less than some of the other schemes that have been proposed to improve depreciation write-offs.

Another issue is whether the United States wants to retain tax provisions that allow the full deduction of nominal interest payments by both business and homeowners, and the full taxability of interest receipts. For the corporation, the deduction of nominal interest payments about offsets the taxability of nominal inventory profits However, for the homeowner there is no similar offset; the homeowner clearly benefits. Although this country wants to encourage homeownership, inflation undoubtedly has widened the encouragement far beyond the original plan. Some tax change that would alter this situation without greatly hurting current homeowners would be desirable

[14] Patrick Corcoran, "Inflation, Taxes, and the Composition of Business Investment", this *Quarterly Review* (Autumn 1979), pages 13-24

Marcelle Arak