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INFLATION, THE STOCK MARKET AND OWNER OCCUPIED HOUSING

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ABSTRACT

This paper offers an explanation for the sharp decline in the value of the stock market and increase in the price of owner occupied housing over the last decade. Both result from the interaction of increases in the rate of expected inflation and the U.S. tax system. Increases in inflation raise substantially the tax burden on corporate capital because of historic cost depreciation, FIFO inventory accounting, and the taxation of nominal capital gains. This increase in the effective tax rate is capitalized into an immediate decline in the price of corporate capital, and an increase in the price of its substitute-housing capital.

The results in the paper indicate that tax effects are large enough to account for almost the entire relative price shift which has been observed. Some preliminary empirical evidence on the relation between inflation and asset prices supports the theoretical predictions. This suggests that in the long run inflation may have a very large impact on the composition of the capital stock.

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The past decade has witnessed major revaluations of the principal forms of capital held in the American economy. The real market price of corporate capital as reflected in the stock market declined by 45 percent between 1965 and 1980. During the same period, the real price of owner occupied housing increased by 34 percent.[1] These capital gains and losses have had a substantial impact on the composition of wealth. In 1965, the market value of corporate capital exceeded that of owner occupied housing by nearly 30 percent, yet by the end of 1979, the value of owner occupied housing was almost twice the value of corporate capital. Since the market valuation of existing capital assets is a key signal guiding investment decisions, these revaluations also have important implications for economic performance.

This paper suggests that to a large extent, the increases in the value of housing, and decreases in the value of corporate capital may have a common explanation, the interaction of inflation and a non-indexed tax system. The acceleration of inflation has sharply increased the effective rate of taxation of corporate capital income, while reducing the effective taxation of owner occupied housing. These changes have been capitalized in the form of changing asset prices. In the long run, they will lead to significant changes in the size and composition of the capital stock.

The first section of the paper describes in more detail the non-neutralities caused by inflation. A simple model showing how inflation and taxation interact to determine asset prices is presented in the second section. The third section presents some crude empirical tests suggesting that increases in the expected rate of inflation may account for a significant part of the asset price changes which have been observed. A final section concludes the paper by commenting on some implications of the results.

three-quarters of the capital income generated in the non-financial corporate sector. In contrast, property taxes impose only about a thirty percent burden on owner occupied housing.

The Table also demonstrates that inflation has a large impact on the relative taxation of corporate capital and owner occupied housing. Despite the liberalization of depreciation allowances, increases in the investment tax credit and reduction in the corporate tax rate which have occurred since 1965, inflation has increased the effective tax rate on corporate capital from 55.1 percent to 74.5 percent. Since taxes capture the bulk of the return to corporate capital, increases in the tax rate have a very pronounced effect on after tax profits. If the tax rate in 1979 had been the same as it was in 1965, after tax returns to the owners of corporate capital would have been almost twice as great.

Because the tax treatment of housing is inflation neutral, the effective tax rate has been almost constant between 1965 and the present. Thus, the interaction of inflation and taxation has very substantially altered the relative return on these assets. The next section develops a simple model of how these large changes affect the valuation and accumulation of corporate capital and housing.

II. The Determinants of Capital Market Equilibrium

It is useful to begin by assuming that inflation does not affect the real net of tax return required by investors. The determination of the required real rate of return is considered below. In treating the corporate sector it is assumed that all new investment is financed through new equity issues, and that labor is supplied inelastically. We summarize the complex provisions of the tax code by assuming that the total tax rate on corporate capital depends linearly on the rate of inflation. These assumptions imply that dividends are given by:

$$(1) \qquad Div = F_k(1-\tau)\,K - \lambda\pi K$$

where F_k is the net marginal product of capital, τ is the tax rate on real corporate income and λ reflects the non-indexation of the tax system.[3]

In order to induce investors to hold equity, it is necessary that the dividend yield plus the expected capital gain equal the required return on corporate assets. That is:

$$(2) \qquad \frac{Div}{qK} + \frac{\dot{q}}{q} = \rho$$

where q is the market price of a unit of capital and ρ is the required rate of return. For simplicity, we assume below that investors have myopic expectations so that there are no expected capital gains or losses.[4] In this case, (2) implies that:

$$(3) \qquad q = \frac{F_k(1-\tau) - \lambda\pi}{\rho}$$

The evolution of the system depends on movements in the capital stock. These are assumed to be governed by a "Tobin's q" investment equation of the form:

$$(4) \qquad \dot{K} = I(q) \qquad I(1) = 0$$

This equation indicates that the rate of net investment depends on the ratio of the market value of capital to its replacement cost. Equations (3) and (4) are sufficient to analyze the response of the corporate sector to a change in the rate of inflation. The VV schedule in Figure 1, based on (3), indicates that given the value of ρ, the market price of capital is a decreasing function of its quantity. The KK line indicates the steady state value of q. Above the KK schedule, net investment is positive, while it is negative for q less than one.

These two equations can be used to analyze the dynamics of housing prices and investment in a manner parallel to that described for corporate investment in Figure 1. Note that unless inflation affects ρ, the required rate of return, it has no effect on the real price or accumulation of housing capital. If account were taken of the "leverage effects" focused on by Poterba, increases in inflation would raise the real price of housing, even if ρ remained constant.

So far, the analysis has been partial equilibrium in that ρ, the required real rate of return on capital has been determined exogenously. In order to examine the impact of inflation on asset prices, it is necessary to model explicitly its impact on ρ. This is done by imposing the requirement that at every instant, aggregate demand and supply are equal. That is:

$$C(YL,\ qK + p_H H) + I(q)K + p_H h(p_H) + G = F(K,L) + R(H)H \tag{7}$$

where $C(YL,\ qK + p_H H)$ is a life cycle consumption function depending on labor income and wealth, and the right hand side is aggregate supply which equals the sum of housing services and other produced output. Using (3) and (5) equation (7) can be written for given values of the exogenous variables as:

$$AD(K,\ H,\ \rho) = AS(K,\ H) \tag{8}$$

The model can be solved in two different ways. The short run effect of inflation on asset valuation is calculated by first solving (8) treating K and H as predetermined, and then using (3) and (5) to find the asset prices. It is easy to verify that $\frac{\partial \rho}{\partial \pi} < 0$. This is because the required rate of return must fall to restore equilibrium after inflation reduces corporate investment. It is through this decline in ρ that an inflation shock is transmitted to the housing sector. Thus it is also clear that $\frac{\partial q}{\partial \pi} < 0$ and $\frac{\partial p_H}{\partial \pi} > 0$. These price changes spur changes in the

The predictions of this simple model accord with the realities of recent years. A variety of explanations of the decline in stock prices and increases in the value of housing have been listed. Most account for one phenomenon or the other. Indeed, consideration of both results together tends to discredit several popular explanations. For example, the Modigliani-Cohn (1979) interest illusion view would predict that housing prices should also have fallen. Presumably, middle-income mortgage borrowers are more likely to be duped by high nominal interest rates than the more financially sophisticated investors who dominate the stock market. The theory advanced here has the substantial virtue of providing a unified explanation of these phenomena. The next section presents some empirical evidence tending to support the hypothesis that increases in expected inflation account for a large fraction of the change in the relative values of corporate and housing capital.

III. Empirical Estimates

The model developed in the preceeding section has the clear implication that in the short run an increase in the permanent expected rate of inflation should increase the market price of housing and reduce the value of the stock market. This proposition is tested by regressing the excess return on the stock market and on houses against the change in the permanent expected rate of inflation. That is, the equations estimated are of the form:

$$R_t = \alpha + \beta \Delta \pi^e_t + u_t \tag{9}$$

The excess return on the stock market is defined as the sum of capital gains and dividends as a percent of beginning of period market value less the beginning of period Treasury bill rate. Since imputed rents are difficult to measure, they are ignored in calculating the excess return on owner occupied housing. The return

It also suggests the importance of unexpected inflation, though the effects are much smaller than in the stock market. This may be due to the numerous financial market imperfections which have made the housing market illiquid during periods of high inflation. During such periods transactions prices may not reflect real values since investors are constrained. When the equation was re-estimated omitting credit crunch periods the result was:

$$R_t = .003 + 3.12\ \Delta\pi^e \qquad R^2 = .09$$
$$\qquad\qquad (1.21) \qquad\quad DW = 1.7$$

This suggests that recent financial market innovations, including the introduction of variable rate mortgages and the relaxation of regulation Q, are likely to increase the sensitivity of housing returns to inflation.

Future research will attempt to decompose movements in asset prices into fractions due to innovations in inflation, tax laws, and other variables. Until this is done, the results here must be viewed as indicative, but not demonstrative, of the inference of the inflation-tax interactions described. Most other hypotheses, which have been advanced for the changes in capital asset prices, do not have the implication that changes in the expected rate of inflation should have systematic effects.

IV. Conclusions

This paper shows that the non-neutral effect of inflation on our tax system can account for much of the increase in the value of owner occupied housing and reduction in the value of the stock market which has occurred in recent years. The theory suggests that in the long run high rates of inflation are likely to shift substantially the composition of the capital stock. Movements in this direction have already been observed. The share of net business fixed investment in GNP has fallen from 3.1 percent in the 1960's to 2.4 percent in the 1970's. The share of net housing investment has declined only slightly from 2.5 percent to 2.4 percent. These changes are likely to have significant implications for long term economic growth.

[6]The ARMA process is assumed to be first order autoregressive, first order moving average. The rate of inflation is calculated from the consumption price deflator. In calculating the long term rate of inflation, an 8 percent discount rate is used.

[7]Credit crunch periods were identified based on the crunch dummy in the MPS model. The include 60:1-60:3, 66:3-67:2, 69:2-70:1 and 73:3-75:1.

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