Effect of Inflation on Saving, Investment And Capital Markets

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In discussing the effect of inflation on saving, investment and capital markets, it is desirable to review first the theoretical ways in which inflation might be expected to impact these other variables and then to examine briefly the relevant statistical evidence. For purposes of this review, it may be useful to highlight several major misconceptions which unfortunately permeate an important part of the economic program of the present administration in Washington.

Saving

Abstracting from socio-demographic effects, the main theoretical determinants of the overall propensity to save in the absence of inflation are presumably the discounted flow of expected future wage income or human wealth, initial non-human wealth, interest rates both on risk-free and risky assets, the uncertainty of future wage and property income and the distribution of human and non-human wealth among different groups in the population. Such groups would include households in different wealth classes, corporations and Government. Inflation could plausibly affect the overall propensity to save through any of these channels; i.e., through changes in the real national income, the real value of non-human wealth, the real return on nominally risk-free and risky assets, and the distribution of wealth. Before evaluating the evidence on the actual impact of inflation on saving behavior, it will be helpful to consider the ways in which the different determinants of saving are presumed to operate theoretically and the statistical evidence which has been adduced to test these theoretical presumptions.

The theoretical and empirical literature on the saving-income relationship is too well known to most economists to require much attention here. There is still

a significant difference of opinion on whether household saving is invariant to the level of "permanent" labor income. Though my personal judgement is that the saving-income ratio is positively related to any meaningful measure of "permanent" income, the relationship may not be so strong that a moderate redistribution of income would have an important effect on the aggregate household saving-income ratio. However, I have for some time been amused at the implicit change in position of some of the early proponents of permanent income hypotheses who relied on household saving (or consumption) and income data to confirm their theoretical preconceptions. They now seem to believe in complete substitutability between household and corporate saving without reexamining the implications of such substitutability for the earlier statistical tests on which they relied to support the permanent income hypothesis.

Similarly, there is a wide difference of opinion among economists on the substitutability between household and corporate saving and between household and government saving. I must confess that while the rationality and ultra-rationality theories which imply that an additional dollar of corporate or government saving would be offset by a dollar decrease in household saving make considerable theoretical sense for corporate saving at least in the long-run, they seem to me to make less sense for government saving where among other things they assume a strange type of inter-generational tax calculation. However, since the proof of the pudding is in the eating, I shall briefly discuss the empirical evidence. My evaluation of that evidence based on the published literature--which includes papers by Feldstein, Feldstein and Shane, David and Scadding, and more recently Howrey and Hymans, and Tanner[1]-- is that there is a moderate degree of substitutability between household and corporate

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[1]Martin S. Feldstein, "Tax Incentives, Corporate Saving and Capital Accumulation in the United States," Journal of Public Economics 2(1973); Martin Feldstein and George Fane, "Taxes, Corporate Dividend Policy and Personal Saving: The British Postwar Experience," Review of Economics and Statistics, Nov. 1973; Paul David and David Scadding, "Private Savings, Ultra-rationality, Aggregation and Denison's Law," Journal of Political Economy, Mar., Apr. 1974; Philip Howrey and Saul H. Hymans, "The Measurement and Determination of Loanable Funds Saving," Brookings Papers on Economic Activity, 3, 1978; and J. Ernest Tanner, "Fiscal Policy and Consumer Behavior," Review of Economics and Statistics, May 1979.

saving but at most only a modest degree of substitutability between household and government saving. The published tests which are based on time-series analysis alone seem to me quite deficient, especially as they apply to the relationship between household and government saving where I am not convinced there is any appreciable substitutability. Time-series analysis of the relationship between household and corporate saving is subject to the usual deficiency of the inadequacy of the number of independent observations for distinguishing among the effects of a large number of relevant serially correlated variables, while once government saving in addition to household and corporate saving is introduced into the usual time-series regression analysis substantial problems of specification arise. It seems to me essential under these circumstances to carry out cross-section tests both across countries and more important across households where possible. Even a casual inspection of cross-country data suggests no substitutability between household and Government saving but the number of independent observations still remains a problem. A much more definitive analysis of the relation between household and corporate saving is possible on the basis of available household survey data, but such an analysis has yet to be carried out.

Before leaving this subject of the substitutability between non-household and household saving, I should point out that net payments into the social security system, rather than a net increase in assets, are reflected in government saving. As stressed by Feldstein in a number of papers,[1] this system which is essentially on a pay-as-you-go basis can be considered a governmentally-imposed scheme of intergenerational transfers which he maintains has had a major effect in reducing household saving. Barro and, more importantly from an empirical viewpoint, Leimer and Lesnoy have demonstrated the great overstatement in Feldstein's estimated effects,[2] but I believe that a future claim on social security probably does have a moderate effect in reducing household saving.

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[1] E.g., see Martin Feldstein, "Social Security, Induced Retirement, and Aggregate Capital Accumulation," Journal of Political Economy, September-December 1974.

[2] Robert Barro, The Impact of Social Security on Private Saving, American Enterprise Institute, 1978 and Dean Leimer and Selig Lesnoy, "Social Security

To summarize my views on the effect of a redistribution of income among the household, corporate and Government sectors, I believe that a rise in the corporate saving-income ratio will probably be partly offset by a decline in the household saving-income ratio reflecting lower direct saving by stockholders but, except perhaps in the long-run as higher corporate saving is associated with higher household wealth, it is unlikely that the offset will be anywhere near complete. Corporations have a substantially higher propensity to save than individuals so that a shift in after-tax income from households to corporations, which might be accomplished for example by lowering the relative burden of taxes on the corporate sector, would tend to raise the overall propensity to save. Similarly, Government (at least in the U.S.A. and in other non-centrally-planned economies) has a substantially smaller propensity to save than households, so that in view of the low level of substitutability between household and Government saving a shift of after-tax income from Government to the private sector should markedly raise the overall propensity to save.

The effect on saving of changes in interest rates or more precisely after-tax rates of return on assets, for many years a subject of interest and controversy to economists, has in recent months been the focus of special attention by Government officials concerned with the need to stimulate economic growth. The reason of course is that if it is assumed that the totals of Government taxes and expenditures are held constant, the primary way changes in policy may affect saving and investment is through their influence on the after-tax rates of return and cost of capital, which also may affect the market value of net worth . However, while the direction of the effect on investment of an increase in the after-tax rates of return or a reduction in the cost of capital to business which might be brought about through appropriate policy is unambiguous, this is not true of the effect on saving of a change in after-tax rates of return on assets, abstracting from their effect on net worth.

While it has been realized for many years that the effect of a change in real interest rates on saving and consumption depends not only on a "substitution" effect (which is positive for saving and negative for consumption) but also on an offsetting "income" effect, it has only been in the past decade or so that the relative importance of these two effects has been rigorously related to measurable characteristics of households' utility functions. Since there is fairly strong evidence that the assumption of constant relative risk aversion is as a first approximation a fairly accurate description of the utility function of a representative household or of the market place, with a Pratt-Arrow measure of relative risk aversion well in excess of one (Friend and Blume 1975),[1] the implications of such a utility function for the total impact of a change in interest rates on saving, (i.e., the combined "substitution" and "income" effects) are of particular interest.

It has been shown under certain simplifying assumptions by Merton, Losq, Jones and others that with constant relative risk aversion the relative size of the "substitution" vs. "income" effects of changes in interest rates on saving will depend on the magnitude of the Pratt-Arrow measure of relative risk aversion.[2] If it is higher than one, the total or combined effect is negative; if less than one, the effect is positive; and if equal to one, there is no effect.

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[1] Irwin Friend and Marshall E. Blume, "The Demand for Risky Assets," American Economic Review, December 1975. The Pratt-Arrow measure of relative risk aversion is estimated in that paper to be in the neighborhood of two, using a model in which investment decisions are not affected by human wealth. Incorporating human wealth the measure of risk aversion is estimated to be about six.

[2] E.g., see Robert C. Merton, "Lifetime Portfolio Substitution and Uncertainty," Review of Economics and Statistics, August 1969 which assume all resources come from non-human capital or wealth; and Etienne Losq, "A Note on Consumption, Human Wealth and Uncertainty," Essays on the Theory of Finance, Ph.D. Dissertation, University of Pennsylvania 1979, which allows for stochastic wages as well as stochastic returns from non-human wealth. See also Emerson Philip Jones, Jr., Intertemporal Financial and Monetary Equilibrium, Ph.D. Dissertation, Massuchesetts Institute of Technology, 1980 and David M. Modest, "Uncertainty and Optimal Consumption: Theory and Evidence," Massachusetts Institute of Technology, January 1981, Mimeo.

Since the empirical evidence points to an overall measure of relative risk aversion substantially more than one, theory might seem to indicate that saving is negatively related to changes in real after-tax interest rates, with consumption therefore positively related--a result opposite to that implied by classical economics. However, when taxes are introduced into the analysis, the theoretically expected effect on household saving of changes in real after-tax interest rates associated with changes in personal income taxes will depend not only on the magnitude of relative risk aversion but also, among other things, on the differential impact of taxation on income from different sources and on whether households consider as part of their wealth the capitalized value of future transfers from the Government. Moreover, a change in personal taxes affects personal disposable income and therefore is likely to affect both personal consumption and saving in the same direction so that the relevant question from the viewpoint of the personal sector is how the change in taxes would affect the allocation of personal disposable income between saving and consumption. The nature of this allocation again depends on the magnitude of relative risk aversion and other factors. Thus the results implied by theory depend on a number of assumptions, and these may or may not be warranted.[1] The underlying theory is referred to here mainly to emphasize that there is no theoretical presumption in favor of the classical result.[2]

Empirical studies of either household or private saving (i.e. household and corporate saving combined) have been inconclusive as to the direct effect of real after-tax interest rates or rates of return on the propensity to save, when labor income and initial non-human wealth are held constant. Some studies point to statistically significant negative effects, some to statistically positive effects, and still others to no discernible

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[1]A number of important considerations not included in these theoretical papers are discussed in Crockett and Friend.

[2]Theory does, however, provide a theoretical presumption that saving in specific forms is positively related to relative interest rates.

effect.[1] In unpublished research which I have carried out, I experimented with a number of real after-tax interest rate series, different periods, different saving specifications, and instrumental variable as well as simple least-square solutions, and found that the estimated interest rate effect was at least as likely to be negative as positive. The result obtained depended particularly on the interest rate series used, with no legitimate basis for choosing among them.

Thus, neither theory nor the available data provide a satisfactory basis for determining the sign or magnitude of the direct effect on saving of an increase in after-tax real interest rates, which might stem from a decrease in personal income taxes applicable to property income.[2] Yet, it is my judgement, on the basis of all the evidence, that the effect is likely to be small. Similarly, in a theoretically rigorous uncertainty model, it is not possible to state with any confidence what effect such a decrease in taxes, and the associated change in

[1] See Warren E. Weber, "The Effect of Interest Rates on Aggregate Consumption," American Economic Review, September 1970, and "Interest Rates, Inflation and Consumer Expenditures," American Economic Review, December 1975; Michael Boskin, "Taxation, Saving and the Rate of Interest," Journal of Political Economy, April 1980, No. 2, Part 2; E. Philip Howrey and Saul H. Hymans, "The Measurement and Determination of Loanable-Funds Saving," Brooking Papers in Economic Activity, 3, 1978; Charles E. McLure, "Taxes, Saving, and Welfare: Theory and Evidence, Working Paper No. 504, National Bureau of Economic Research, July 1980; and David M. Modest, op. cit. A recent paper by Thoraldur Gylfason ("Interest Rates, Inflation and the Aggregate Consumption Function," Review of Economics and Statistics, May 1981) finds a significant negative relation between quarterly consumption and nominal interest rates, holding expected inflation constant for the period 1952-78. However, when the years 1965-78, the period of most variation in interest and inflation rates, are analyzed separately, this relation disappears. Tests for serial correlation suggest that the results for this period are more reliable than those for 1952-65. Moreover, the adaptive expectations model used, where expected inflation is determined by inflation of the current and previous quarters, is highly questionable as a basis for inferring the relevant long-run interest rate.

[2] As noted earlier, the theoretical effect on personal saving of an increase in after-tax real interest rates resulting from a decrease in personal income taxes may be somewhat different from the effect of an increase in real interest rates in the absence of taxation. One reason is that reduction in tax rates on property income increases the variance as well as the expected value of after-tax return on risky assets held by investors. Another is that the two types of interest rate

real interest rates and after-tax real rates of return, would have on the market value of assets which directly affect savings.[1] On the other hand, while there is no strong reason for anticipating that higher real after-tax interest rates would generate much additional savings, a reduction in personal income taxes might be associated with a positive effect on the cost of equity and therefore a negative effect on the propensity to invest and hence perhaps on realized saving and investment.[2]

The effect of changes in non-human wealth or net worth on saving is relatively straight-forward. Both theoretically and empirically it has been shown that increases in net worth should be expected to and do depress current saving, though the magnitude of the effect would depend on the reason for the change in net worth. A set of simulations by Tobin and Dolde suggests that under the relevant parameter measures they assume, changes in interest rates and net worth brought about by monetary policy can have fairly substantial effects on saving.[3]

The empirical evidence on the negative relation between saving and net worth is fairly strong since it consists not only of time-series analysis such as that contained in the MPS model but also of household cross-section analysis carried out by Lieberman and myself.[4] However, in view of the current prospect for substantial reduction in personal income taxes, especially on

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[1] See Irwin Friend and Joel Hasbrouck, "Comment on Inflation and the Stock Market," American Economic Review, forthcoming, March 1982. Under certain assumptions, notably symmetry of tax effects on property income including capital gains and losses, theory would imply that a reduction in personal tax rates on property income might decrease the market value of assets and hence increase saving if the real before-tax risk-free rate is higher than .019 with the reverse effect if the risk-free rate is below .019 (using reasonable parameter values for the other variables involved). Estimates of the risk-free rate have ranged between .01 and .03. For a brief discussion of different views of how a decrease in the market value of wealth, distinct from any change in the total future income stream, would increase saving, see Marshall E. Blume, Irwin Friend, and Jean Crockett, Financial Effects of Capital Tax Reforms, Monograph Series in Finance and Economics, 1978-4, New York University, pp. 36-37.

[2] Friend and Hasbrouck, 3-82, op. cit.

[3] James Tobin and Walter Dolde, "Wealth, Liquidity and Consumption," Consumer Spending and Monetary Policy: The Linkages, The Federal Reserve Bank of Boston, June 1971.

[4] Irwin Friend and Charles Lieberman, "

property income, it should be reiterated that we do not know what effect such a decrease in taxes, and the associated change in real interest rates and after-tax real rates of return, would have on the market value of assets and hence on saving.

Finally, most economists have seemed to believe that uncertainty of labor or non-labor income acts as a stimulant to saving. From the viewpoint of pure theory, a number of theoretical analyses starting with Merton (op. cit.) have shown that added uncertainty in the return on non-human wealth would be expected to lower consumption and raise saving if the Pratt-Arrow measure of relative risk aversion is greater than one, which as noted earlier seems to be the case. However, as shown by Losq (op. cit.) uncertainty in labor income as well as in return on non-human wealth greatly complicates the theoretical analysis and the effect of uncertainty in labor and non-labor income on saving is more difficult to predict. A recent unpublished time-series analysis by Modest (op. cit.) finds a negative correlation between saving and price level or real wealth uncertainty, which as he points out is contrary to the prediction of his theoretical model. On the other hand, the higher marginal propensities to save out of transitory than out of permanent income found in most empirical studies could be interpreted as statistical evidence supporting the expectations of a positive correlation between saving and uncertainty of income. Given the predictive deficiencies of existing theory and the relatively weak statistical evidence available, no conclusive judgements on the effect of uncertainty of both labor and non-labor income on saving seem possible, though I think it is more likely ordinarily to increase than to decrease saving. However, the effect is likely to depend on the nature of the

uncertainty and the non-financial components of saving would be expected to be affected differently from the financial components.

To ascertain how inflation affects the propensity to save, I shall first examine how inflation affects the major determinants of saving and then summarize the findings of the empirical studies which have studied the statistical relationships between saving and inflation. Some evidence has been provided by Fama and by Friend and Hasbrouck that the real national income and inflation are negatively correlated[1] and by Friend and Hasbrouck that the real value of household net worth and inflation are similarly negatively related.[2] The income effect would lower real saving particularly in the public sector and probably also the aggregate saving-income ratio while the wealth effect would raise both saving and the saving-income ratio.

It is not clear how the distribution of income among different economic groups has been affected by inflation in the U.S.A. It could be argued that inflation has made it easier for the Government to increase effective tax rates and therefore to hold down the Government deficit, but the record on the expenditure side raises questions about any such conclusion. A more plausible argument might be that inflation facilitated the transfer of resources from the private sector which has a higher propensity to save to the Government sector and thus served to depress the overall saving-income ratio. There is no evidence of substantial re-distribution of income between households and businesses or between lower and higher income groups as a result of inflation so that any such re-distribution is not likely to have had an important effect on total private real saving.

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[1] Eugene Fama, "Stock Returns, Real Activity, Inflation and Money," American Economic Review, forthcoming. Fama questions whether this represents a causal relationship.

[2] Irwin Friend and Joel Hasbrouck, "Effect of Inflation on the Profitability and Valuation of U.S. Corporations," Working Paper No. 3-81, Rodney L. White Center

In view of the absence of any strong theoretical or empirical reason to believe that changes in real after-tax rates of return significantly affect the propensity to save, it might be considered superfluous to examine the evidence on the relationship between inflation and real after-tax rates of return. However, for the sake of completeness, I shall note that evidence to be summarized in the discussion of the effect of inflation on capital markets suggests either no change or some decrease in the expected real before-personal-tax rate of return on nominally risk-free assets and either no change or some increase in the expected real before-tax rate of return on other assets. On an after-tax basis the expected rate on the risk-free asset was probably negatively related to the rate of inflation while the sign of the corresponding effect on risky assets was indeterminate.

The reason for the apparent rise induced by inflation in the risk differential required to hold risky as against nominally risk-free assets seems to reflect the increased uncertainty of returns associated with inflation. Higher expected inflation is also probably associated with greater uncertainty of real labor income. However, as noted earlier, there is no very strong basis for assuming that such increased uncertainty will have any substantial effect on saving.

Special features of the U.S. tax laws have also been cited as contributing to the impact of inflation on saving. Any such tax effects would presumably operate through the determinants of saving discussed earlier, but in any case it is my judgement that inflation-induced tax effects on saving propensities have been exaggerated.

In addition to the effect of inflation on the inflation-free determinants of saving, economists have historically regarded the incentive to beat price rises, resulting in an intertemporal substitution of current for future consumption, as a major depressant influence of inflation on saving. However, if net investment in consumer durables is considered as saving, it is not clear how the total combined saving in tangible and financial forms would be affected.

On the whole, the sum total of these theoretically expected effects of inflation on the household propensity to save seems quite small. Empirical studies by Juster and Wachtel and by Howard,[1] based on time-series analysis for the U.S.A. and four other countries, present mixed evidence on the effect of expected and unexpected inflation on real personal saving, holding constant the real value of permanent and transitory income, unemployment and the real value of liquid assets. However, for unexpected inflation they provide more evidence of a stimulating than depressant effect, while for expected inflation the evidence is more supportive of a depressant effect. The ratio of personal saving to personal disposible income in the 1970's was modestly higher than in the 1960's, when inflation was substantially lower. On the other hand, the evidence is not strong and the weak performance of personal saving in the past couple of years during a period of especially intense inflationary pressures suggests that a prolonged high inflation associated presumably with substantially higher expected inflation does not raise the saving rate and might act perversely.

For the corporate sector also, there is no strong evidence of a substantial effect of inflation on the saving-income ratio. The ratio of dividends to book earnings after taxes did decline appreciably from the 1960's to the 1970's, but the corresponding ratio for economic earnings did not show any significant change.

Investment

In this section of the paper, I shall discuss the impact of inflation on the demand for real investment goods with the focus of attention on plant and equipment. The main theoretical determinants of investment in the absence of inflation are the anticipated rate of return on new investment and the cost of capital. The optimal level of investment would be expected to be positively related to changes in the level of real output and the price of output and negatively related to the user cost of capital. The user cost of capital is of course the product of the price of capital goods and the difference between the tax-adjusted gross cost of capital (i.e., including depreciation) and any capital gains arising from changes in the prices of capital goods.

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[1] Thomas Juster and Paul Wachtel, "Inflation and the

The main channels through which inflation might be expected to affect real investment are mainly through changes in real output, changes in the ratio of capital goods to other prices, changes in the cost of capital, and capital gains from changes in capital goods prices. I have pointed out in the preceding part of this paper that there is some evidence that the real national income is somewhat depressed by inflation which, if true, would lower the rate of investment and probably also the investment-income or product ratio. The ratio of plant and equipment costs to other prices as measured by the published indexes has increased modestly in the period of aggravated inflation starting in 1973-74, which would tend to lower investment in plant and equipment somewhat. The corresponding ratio of housing construction costs to other prices has also increased. However, probably much more important for housing investment has been the substantial rate of capital gains on the housing stock which has had an important stimulating effect on the demand for new housing.

For investment unlike saving it would be expected that changes in the cost of capital would significantly affect demand with an unambiguously negative relation between investment and the real cost of capital. Virtually all the empirical evidence is consistent with this theoretical expectation for plant and equipment expenditures. Thus, econometric models generally show a negative relationship between plant and equipment expenditures and the cost of capital. Similarly, a recent survey of non-financial corporations listed on the New York Stock Exchange conducted by the Wharton School's Rodney White Center for Financial Research in early 1980 indicated that the respondents considered the high cost and unavailability of external financing as one of the major impediments to business fixed capital formation.[1]

Further light on the effect of inflation on both the real cost of capital and the expected profitability or real after-tax cash flow is shed by a recent paper by Hasbrouck and myself on the "Effect of Inflation on the Profitability and Valuation of U.S. Corporations".[2] That study concludes that inflation

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[1]Marshall Blume, Irwin Friend and Randolph Westerfield, Impediments to Capital Formation, Rodney L. White Center for Financial

has depressed not only stock prices and realized real market rates of returns on stock prices, a finding common to many studies, but also real dividends and earnings per share. However, while the decline in real dividends and in real book earnings per share associated with a one percentage point increase in sustained inflation appears to be of the same general order of magnitude, roughly about 5%, the decline seems to be somewhat more than double for real, economic earnings per share. The study also provides strong evidence, although it is not conclusive, that inflation increases the uncertainty of real return on stock investment. This increased uncertainty would be expected to be associated with a significant increase in the risk premium, i.e., the difference between the required real return on stock and on a nominally risk-free asset. Somewhat different findings in other relevant studies will be summarized in the concluding section of this paper dealing specifically with the effect of inflation on the capital markets.

Assuming now that the Friend-Hasbrouck results are correct, inflation has been associated with a decline in expected profitability of investment and probably with an increase in the expected risk premium. To translate the increase in risk premium to its effect on the real cost of capital to corporations would require information on the effect of inflation on the required rate of return on bonds and stocks and on the relative importance of equity in the capital structure. Empirical studies by Fama, Gibson and Levy and Makin[1] suggest that

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[1]Eugene Fama, "Short-Term Interest Rates as Predictors of Inflation," American Economic Review, July 1975; William Gibson, "Price Expectations Effect on Interest Rates," Journal of Finance, March 1970 and "Interest Rates and Inflationary Expectations: New Evidence," American Economic Review, December 1972; and Maurice Levy and John Makin, "Fisher, Philips, and the Measured Impact of Inflation on Interest," Journal of Finance, March 1979.

the expected real before-tax rate of return on nominally risk-free assets is either unaffected by inflation, which seems to me most likely, or somewhat depressed. Thus the real cost of equity has probably either been increased or been relatively unaffected by inflation. Since it might be assumed that the expected real return on bonds would be intermediate between stocks and risk-free assets, and some evidence to that effect has been provided by Jaffe and Mandelker,[1] the real required rate of return on bonds has probably not been appreciably affected by inflation.

With fixed weights in the capital structure, the preceding evidence might lead us to expect either a moderate increase or very little change in the real overall cost of capital resulting from accelerated inflation. However, with an apparent increase in the short-term and long-term debt components of the capital structure, reflecting the effect of inflation both on their before-tax cost relative to equity and on the value of their tax deductability, there has probably been little overall change in the weighted real overall cost of capital. This is true in spite of the increased risk to corporations associated with a high and uncertain rate of inflation. As a result of some apparent decline in the real profitability of business investment associated with increased inflation and little change in the real cost of capital, higher inflation would be expected to result in lower investment other things equal.

Unfortunately, there does not appear to be any satisfactory statistical evidence on the effect of inflation on investment as a whole or on plant and equipment expenditures. Econometric models have generally not found it useful to incorporate inflation as an additional explanatory variable in their investment functions. On the other hand, the recent survey of non-financial corporations conducted by the Rodney White Center indicated that respondents considered inflation as one of the key factors depressing real plant and equipment expenditures. It is interesting to note that of the respondents stating that inflation had an appreciable depressant effect on real investment, about the same number attributed this effect to the impact of inflation on uncertainty of sales, prices, wages and profits as to its impact on

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[1] Jeffrey Jaffe and Gershon Mandelker, "Inflation and the Holding Period Returns on

the cost of financing.

My own assessment is consistent with the belief by the business community that investment has been depressed by inflation. I believe this effect is due to the uncertainties associated with inflation and probably also to an increase in the real cost of equity financing which businessmen were increasingly reluctant to replace with debt. Another possible depressant effect of inflation on investment via the cost of financing is that a number of businessmen may not have appropriately distinguished between the nominal and real cost of financing. This is a point similar to that stressed by Modigliani and Cohn in attempting to explain the impact of inflation on stock prices, and discussed at greater length in the concluding section of this paper.[1]

While I am not aware of any satisfactory econometric analysis which has explored the impact of inflation on investment, I should point out that the ratio of business gross fixed investment to gross national product (in either current or constant dollars) did not show any clear trend in the USA over the period of pronounced inflationary pressures beginning with 1973-74. An initial decline in this ratio from 1974 to 1976 was largely offset by a subsequent rise from 1976 to 1979. However, the corresponding ratio for business net fixed investment did exhibit a moderate decline over this period as a whole. The decline is more marked if we exclude government-mandated expenditures, not all of which would have been replaced by non-mandated expenditures in the absence of the relevant EPA and OSHA regulations.

When real plant and equipment expenditures are combined with other real investment, the ratio of investment to real gross national product shows no trend over the 1970's. The apparent absence of an inflation-induced effect on total investment probably reflects a stimulating effect of inflation on investment in housing (except for brief periods of credit stringency) offsetting a depressant effect on plant and equipment expenditures. The moderate increase in the private saving ratio over the 1970's as a whole presumably served to finance an increase in government dissaving rather than an increase in private investment.

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[1] Franco Modigliani and Richard Cohn, "Inflation, Rational Valuation and the Market," Financial Analysts Journal, March-April 1979.

Capital Markets

Probably the most striking effect of high inflation on the capital markets has been the much discussed, and to most economists surprising, negative correlation between the rate of inflation and stock prices. This negative correlation was found not only in the U.S.A. but in most other countries as well.[1] The apparent depressant effect on stock prices, as against the theoretically expected stimulating effect, was found to be associated not only with unexpected inflation, including changes in the rate of expected inflation, but also by some authors with expected inflation.

An analysis by Hasbrouck and myself referred to earlier[2] attributes the apparently adverse impact of inflation on stock prices to a depressant effect on dividends, book earnings and especially economic earnings and perhaps also to a stimulating effect on the real required market rates of return on equity. The effect of inflation on the real required rate of return on equity in turn seems to be attributable to an increase in the uncertainty of real return on stock investment associated with inflation. In the Friend-Hasbrouck study, such uncertainty is measured by deviations in real realized stock returns or in real earnings per share from their expected values both for the market as a whole and for individual stocks.

However, two quite different explanations of the negative correlation between stock prices and inflation have been advanced by Fama (op. cit.) and by Modigliani and Cohn (op. cit.). The Fama explanation is that the correlation is for the most part spurious, with inflation acting as a proxy for economic activity. However, he does not adequately explain the negative correlation between stock prices

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[1] N. Bulent Gultekin, "Stock Market Returns and Inflation: Evidence from Other Countries," Working Paper No. 48, Center for Research in Security Prices, University of Chicago, September 1980.

[2] Friend and Hasbrouck, Working Paper No. 3-81, op. cit.

and unexpected inflation, and it is only when he introduces the monetary base as well as real gross national product that the negative correlation between stock prices and expected inflation becomes statistically insignificant. He considers that the monetary base is acting as a proxy for prospective economic activity which he cannot measure directly but which the stock market does anticipate. It is not clear to me that the monetary base may not act as a better proxy for expected inflation than for prospective real activity and may not be a better proxy for expected long-run inflation than the Treasury bill rate he uses for that purpose. In any case, as Fama acknowledges, his analysis does not provide "an economic explanation for at least part of the documented decline in expected real stock returns during the post 1953 period."

In contrast to the explanation of the negative inflation-stock price correlation suggested by Fama and Friend-Hasbrouck, Modigliani and Cohn conclude that this relation is due to irrational behavior by investors. Their estimates of real economic earnings per share do not appear to be affected by inflation, unlike the downward trend in such earnings found by Hasbrouck and myself to be associated with the rise in the rate of inflation. With their finding of no significant relationship between inflation and real economic earnings, they conclude that the downturn in stock prices during the recent inflationary period is attributable either to an understatement of real economic earnings or the mistaken use of the nominal required rate of return to discount real earnings. The understatement of real economic earnings in their view reflected investors' lack of understanding of the favorable implications of inflation on the real burden of long-term debt.

Since Hasbrouck and I find a significant decrease in real economic earnings, we do not need to interject irrationality to explain a downturn in stock prices, even without an increase in the real required rate of return or investor confusion between real and nominal rates. While like most economists, I prefer to attempt to explain observed economic phenomena without recourse to assumptions of irrationality, I should

point out that I would not find it implausible if investors took a very prolonged period of time to appropriately assess and respond to the effect of inflation on real economic earnings and the relevant discount factor. To the large number of colleagues who find such economically "irrational" behavior extremely implausible, I suggest that they attempt to explain the incredibly slow pace of the transition from FIFO to LIFO inventory valuation on the basis of the usual stockholder optimization model. However, though I don't consider the Modigliani-Cohn thesis as beyond the pale, there does not appear to be need to introduce major irrationalility to explain the depressed stock market in recent years.

The increase in risk which appeared to be associated with inflation in the post-World War II period is a tenable basis for explaining an increase in the real required risk differential between common stock and nominally riskless assets, and probably for explaining an increase in the real required rate of return on stock,which would in turn be associated with a depressant effect on stock prices. Nevertheless, a similar explanation cannot be used to explain the negative relation between real economic earnings and inflation found by Hasbrouck and myself to have a substantial depressant effect on stock prices. Part of this earnings impact seems to be caused by a negative effect of inflation on real economic activity. The negative effect of inflation on real economic activity may reflect the adverse effect of increased uncertainty on business planning and productivity,on the level of resource utilization, and on the effectiveness of fiscal and monetary policy, but over the past decade may also reflect the consequences of the high tax imposed on the American economy by foreign oil producers.

However, the substantial residual negative effect of inflation on real economic earnings has yet to be explained satisfactorily. I believe that part of this effect is attributable to an inflation-induced increase in the effective corporate tax rates as a result of the difference between the book and replacement cost of fixed capital and inventories used up in the production process. On the other hand,

I do not believe that this tax effect is nearly as strong as that hypothesized by Feldstein (op. cit.). Fama and Modigliani and Cohn both consider it insignificant on the basis of the observed trends in the effective tax rate paid by corporations on their economic income (including interest). Some calculations which Hasbrouck has carried out that suggest that only part of the depressant effect of inflation on economic earnings was attributable to the manner in which inflation affects corporate taxes.[1]

A significant part of the depressant effect of inflation on economic earnings, therefore, remains to be explained. There is some evidence that the share of compensation of employees in total cost and profit of nonfinancial corporate business increased slightly in the inflationary period of the 1970's[2] but again this does not seem to account for a major share of the inflation effect. I suspect that another part of the explanation over the past decade is attributable to a higher rise in the costs of goods which are purchased abroad, such as petroleum and other raw material costs, than in those purchased domestically, which if true would imply that part of the inflation effect is attributable to the source of inflationary pressure during this period. Of course much of these effects operating through the cost of goods might, like tax effects, ultimately be expected to be reflected in selling price.

One other possible explanation which might be adduced to rationalize the observed decline in real economic corporate earnings associated with increased inflation does not appear to be consistent with the empirical evidence. Thus, the effect of real interest payments in reducing real economic earnings of equity was

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[1] These calculations also suggest that with a sustained rate of inflation well in excess of 20%, i.e., above the rate we have been experiencing in recent years, economic earnings would have been raised rather than lowered for U.S. corporations as a whole (assuming other things remained equal), since the stimulating effect of inflation in reducing the real burden of the debt would exceed its depressant effect associated with the use of historical cost depreciation and FIFO inventory valuation.

not increased by inflation and may very well have been reduced.

Before leaving this subject of inflation-induced tax effects on stock prices, corporate earnings and the rate of return required by investors, I should point out that much of this literature seems to me both to greatly exaggerate such effects attributable to personal taxes, i.e., income and capital gains taxes, and to unduly minimize the margin of error involved in the estimates made. As noted in a paper by Hasbrouck and myself (3-81), the estimated inflation-induced increase between 1950 and 1978 in the effective rate of personal tax is only about 3%. More important, in view of the effect of this increase on the variance as well as expected value of after-tax income, this rise in tax rates might induce a modest decrease rather than increase in the required return on stocks (holding constant the real before-tax riskless rate of return). The large inflation-induced effect on stock prices attributed to capital gains taxes may similarly be questioned. Thus, Hasbrouck and I (3-82) have recently shown that the use of more reasonable parameter values in conjunction with a model developed by Feldstein[1] to incorporate tax effects could be interpreted as implying that a 8% rise in inflation is associated with a 12% increase in stock prices instead of the 14% decline his parameters would imply. I would treat both estimates with a high degree of skepticism.

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[1]Martin Feldstein, "Inflation and the Stock Market," American Economic Review, December 1980.

Because of time limitations I shall touch only briefly on the effect of inflation on financial assets other than common stock. In view of the poor performance of common stock, it is not surprising to find that no other long-term financial asset was a reasonably satisfactory hedge against inflation. The best financial asset hedge against inflation was short-term fixed-interest-bearing instruments, notably Treasury bills, though even here the hedge for a taxable investor was far from adequate. The longer the term to maturity of a debt instrument, the worse was the inflation experience. Fluctuations in the long-term bond markets were so severe, apparently as a result of changes in inflationary expectations, that at times those markets appeared completely disorganized with daily movements in yields the largest over the past half century and occasionally a virtual disappearance of bids and offers for a high proportion of the bond issues traded.

It is rather puzzling that in a relatively prolonged period of high and accelerating inflation, such as the U.S.A. has been experiencing for many years, that there has not been more aggressive development and growth of new financial instruments as a more adequate hedge against inflation. Thus, since homes have been the best inflation hedge among the more commonly held household assets, one might have expected to find the widespread use of financial instruments based on equities in a diversified portfolio of houses or on securities based on a diversified portfolio of variable rate mortgages.

Similarly, a more widespread use of at least partly indexed long-term bonds by corporations and government units might have been anticipated. It is interesting to note that the very small number of bond issues which did incorporate some indexing features had an extremely favorable market reception. A small part of the explanation for the relatively slow development of long-term inflation hedges may be that short-term debt instruments and the

accelerated growth of financial futures have served to reduce some of the financial risks associated with inflation. However, I suspect that a more important part of the explanation is that it takes a substantial period of time for potential issuers to assess appropriately the opportunities as well as risks associated with financial innovations in a radically changed economic environment.

In closing, in view of the difference in the implications of past empirical studies mentioned earlier in this paper for the effect of inflation on the expected real before-tax rate of return on common stock, I should mention a new study by Gultekin which has just come to my attention.[1] On the basis of forecasts of prices of goods and services and stock market prices six months and twelve months into the future based on the Livingston data, the study relates ex ante measures of expected nominal stock returns to ex ante measures of expected inflation for the period 1946 through 1979. It concludes that a 1 percentage point increase in the inflation rate was associated with about a 1 percentage point increase in the rate of return on common stock, though the results presented suggest that expected nominal returns may rise more than expected inflation. The study also concludes that unanticipated inflation as estimated from these ex ante data were significantly negatively correlated with ex post nominal stock returns and that its findings do not support the views of Modigliani and Cohn that "in inflationary periods investors capitalize equity earnings at a rate that parallels the nominal interest rate, rather than the economically correct real rate." Finally, the study concludes "that since the 1950's, expected real rates and expected inflation are positively related." Not surprisingly, I conclude that the study provides support for the Friend-Hasbrouck over either the Modigliani-Cohn or Fama position.

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