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Inflation and Financial Markets

Inflation causes many severe problems, most obviously by reducing the living standards of individuals on fixed incomes. But not enough attention has been paid to the way in which inflation undermines financial markets, twisting out of shape the traditional relationships that make it possible for people to do business with one another. To call attention to this aspect of the question, we present four articles dealing with different aspects of how inflation affects the financial system.

Edward S. Shaw describes the "dirty" type of inflation that has beset our economy—especially by obstructing and distorting capital flows and capital accumulation—and discusses ways of cushioning or (better still) preventing such inflation. He emphasizes that inflation typically is not "clean"—that is, constant and perfectly foreseen—but rather that it operates at unstable rates on markets for output, factors and securities. "Financial markets are segmented; relative financial prices are distorted; financial stocks are destroyed; and financial adaptations to dirty inflation are costly and inefficient." Money and government securities are demoted from the category of "safe" assets, thus destroying portfolio balance, since the accumulation of safe assets is no longer complementary with the accumulation of productive or risky assets. Many other distorting effects of this type can be cited.

Shaw argues that we cannot very well live with inflation because "this disease of the price system becomes worse when treated with benign neglect." Thus, ways must be found of either "cleansing" or preventing this disease. One obvious correction for inflationary distortions is to turn old prices loose—removing price floors or ceilings—to find their "market" level. Because of the objections raised to this procedure, corrections are sometimes imposed by governments in the form of indexing, with individual wages, prices and interest rates linked with some market-basket index of free prices. But since indexing at best provides only a temporary solution for inflation, the search goes on for ways of actually curing the disease.

Joseph Bisignano, in his contribution, analyzes the effect of recent inflation (whether anticipated or unanticipated) on personal savings behavior. He shows that the attempt by consumers to maintain a desired relationship between real income and real wealth has brought about a rise in the personal savings rate in recent years. Helping to explain this development is the "surprise" nature of the inflation that has occurred during this period.

This type of inflation represents an unanticipated decline in the real purchasing power of income and wealth. Increased uncertainty causes consumers to retrench on their spending decisions and to increase their precautionary savings balances. Only when unanticipated inflation declines, as in 1972, do we encounter a significant decline in the savings rate. Thus, Bisignano concludes, the savings rate in the

future may remain high unless there is a prolonged decline in unanticipated inflation.

Rose McElhattan provides an analysis of term-structure theory, which explains why securities which are alike in all respects, except in their term to maturity, should provide different market yields. She reviews the "preferred habitat" model of the term structure, which hypothesizes that the long-term rate of interest is an average of expected future short-term rates plus a risk premium—and that expectations are primarily dependent upon the history of interest rates and rates of inflation over several past years. She then shows that this model can be significantly improved with the introduction of inflation uncertainty as an element determining the risk premium.

McElhattan concludes that inflation uncertainty has been a significant determinant of long-term interest rates for the last two decades. In the 1955-65 period, the term-structure risk premium could be explained by variables designed to measure the uncertainty surrounding expected future interest rates and inflation rates. But in the 1966-71 period, inflation uncertainty remained the only statistically significant determinant of the risk premium.

Kurt Dew considers an important current issue—to what extent deficit-inspired Treasury borrowing replaces or "crowds out" private borrowing in U.S. credit markets. In this analysis, he differentiates between long-run and short-run considerations. In the long term, given the assumption of a "neutral" fiscal-policy effect on private savings behavior, persistent deficits are seen to retard private capital accumulation, although this crowding-out effect is not reflected in higher interest rates. Government crowding out of private capital-market investment tends to be analogous to government crowding out of private expenditures in other markets.

In the short run, in contrast, fiscal policy's impact on capital markets and interest rates tends to be uncertain. Nonetheless, Dew's analysis suggests that no damage results from short-run fiscal stimulus, under certain carefully specified and limited conditions. In the depths of recession, fiscal stimulus is well advised. But to avoid long-term damage, we should reduce this stimulus as the economy recovers, balancing recessionary deficits with surpluses during better times.

Inflation, Finance and Capital Markets

Edward S. Shaw*

Simon Kuznets remarked in his *Capital in The American Economy,* " . . . extrapolation of inflationary pressures over the next thirty years raises a specter of intolerable consequences. . . . "[1] Fifteen of the thirty years are over, and inflation has accelerated. The central concern of this paper is whether Kuznets' prediction of "intolerable consequences" for capital markets and capital accumulation is on track or patently wrong.[2]

Monetary theory distinguishes between "immaculate" inflation, "clean" inflation, and "dirty" inflation. It is the last of these that Kuznets dreaded and that we have endured. The first section below deals very briefly with differences between the three styles of inflation. The second section is a catalogue of ways in which dirty inflation may obstruct and distort capital flows and capital accumulation. The third section considers some ways, including "indexing," to cleanse a dirty inflation and some ways to prevent it.

Styles of inflation

Immaculate inflation can be visualized most easily for a competitive economy that is firmly settled on a path of steady growth. Final outputs are produced by three forms of wealth. There is human wealth, growing at a constant rate. There is physical wealth, its ownership represented by an homogeneous financial asset in the form of common stock or "equity," and there is wealth in the form of real money balances. Accumulation of physical and monetary wealth derives from a constant rate of saving for the community. Inflation occurs because the growth rate of nominal money exceeds the growth rate of real money demanded.

The inflation is immaculate because its pace is constant and perfectly foreseen and because the inflation tax on real money balances is compensated precisely by a deposit-rate of interest on money. It is fully anticipated, and it does not impose a relative penalty on the money form of wealth. Money-wage rates rise faster than output prices in the degree that labor productivity is growing. The price of common stock rises in precise accord with the marginal reproduction cost of corporate capital goods, and the earnings-price ratio of corporations equals the real marginal productivity of physical capital. Stocks are a perfect hedge against inflation, and so is money whether the rate of inflation is positive or negative, high or low. It is evidently not immaculate inflation that bothered Kuznets.

Clean inflation is also constant and perfectly foreseen. However, money-holders are not compensated for the inflation tax, so that a rise in the rate of inflation makes money wealth a less attractive alternative, in the optimum portfolio, to human and physical wealth. Depend-

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ing upon the functions attributed to money and upon other considerations, the higher rate of clean inflation may lower the growth rate of output, the yield to human wealth, and the earnings-price ratio on equities or it may raise them. For example, if money is a consumer good, an uncompensated inflation tax can increase the community's savings-income ratio and accelerate growth of wealth and output. On the other hand, if money is a producer good, a negative yield or tax on it can reduce the productivities of complementary physical and human wealth. Then workers and stockholders suffer along with money-holders, and all of them should dread the "specter" of inflation. They should insist that the monetary system link growth of nominal money precisely with growth in real money demanded.

Immaculate and clean inflation are figments of monetary theory. The real world is not firmly settled on a stable growth path for output, human wealth, and physical wealth. Wealth is not riskless and homogeneous, its ownership represented by homogeneous common stock of gilt-edge quality. In particular, the growth paths of price levels for output and wealth are not straight lines into infinity. Inflation proceeds, instead, at unstable rates on markets for output, factors, and securities. Its variance defies foresight and can be regarded as a disease of capitalism's guidance mechanism, the price system. The inflation tax is not compensated. The inflations that we experience are dirty, and an increase in the inflation rate or its variance has real consequences that the simple models of immaculate and clean inflation do not comprehend.

Capital costs of inflation

We turn now to the obstacles that dirty inflation puts in the way of efficient wealth or capital accumulation. The list of obstacles below is not all-inclusive, and the costs they impose are not measured. It is not balanced against a list of social gains from inflation. One alleged gain is that inflation shifts income from low-saving sectors to high-saving sectors and accelerates capital growth. We pass this by, because inflation often reduces the social rate of saving and because more efficient devices to increase aggregate savings are available. Another alleged gain is that inflation demolishes a complex and awkward structure of claims against wealth and permits a purified financial system to concentrate on incremental growth of capital. This may be a benefit of once-and-for-all hyperinflation, but it is not the result of chronic inflation. Still another gain is said to be that inflation imposed as a tax to yield government revenues impedes efficient capital formation less than do alternative sources of revenue. This is true for some but not for all alternative taxes. To continue down our list, inflation of product prices is said to be an essential, though second-best, defense for full employment against autonomous inflation of factor prices. It must be not merely tolerated but validated by monetary expansion until there can be a "social contract" to inhibit monopoly practices in factor markets. We pass this by, partly on the grounds that monopoly in its various guises is characteristically laggard in adjusting its price demands to inflation: autonomous inflation tends to be catch-up inflation. Finally, there is Phillips-ism which tells us that inflation is the right way to reduce marginal real labor costs to employers and so to excite demand for labor to the full-employment level: unstable and unanticipated inflation clears the labor market. This allegation we put aside because we do not know the inflation-unemployment rate of exchange nor how often the rate of exchange may vary, and the evidence is strong that chronic unemployment responds less durably to inflation stimulus than to improvement in labor training and mobility.

The safety principle

Every segment of economic theory about finance emphasizes benefits that accrue to individuals and society from the existence of some safe asset or assets; that is, of assets bearing real yields of negligible unanticipated variance. The hypothesis here is that dirty inflation deals

brutally with safe assets and, as a consequence, with financial markets. Financial markets are segmented; relative financial prices are distorted; financial stocks are destroyed; and financial adaptations to dirty inflation are costly and inefficient.

The first principle of monetary theory is that society benefits if some asset has a fixed price in terms of the numeraire. That asset, with its zero variance in the numeraire price, is money. It is indispensable for the efficient organization of markets and for extension of their boundaries beyond limits that are feasible with barter. Monetary theory emphasizes also the welfare gains of creating a "common-currency area" in which two or more local monies are linked by an exchange rate of zero variance.

Monetary theory distinguishes a third price of money, the real deposit rate. This price is the algebraic sum of any nominal deposit rate of interest (d) and the rate of change in money's purchasing power (P) over a representative bundle of all other things. It is an interest rate, expressed as d. The mean of its expected value (d^*) and the expected variance (v) of (d) around (d^*) are significant for the public's choice to hold money rather than some other asset and to hold one money rather than another. If (d^*) is low, because of anticipated inflation, and (v) is high, because inflation is expected to be unstable, an investor " . . . will be beginning to look about for some new money asset—a foreign money, perhaps—with which to satisfy his requirement for a certain element in his portfolio."[3] The risk of money-holding is undervalued by (v) since dirty inflation is associated with increased dispersion in rates of change among individual prices; for example, consumer prices may move one way and equity prices another. Inflation and its variance tend to demonetize an economy.

Portfolio theory stresses the role of some safe asset or assets, not necessarily money, in raising the efficiency frontier of portfolio investment. Risk-averse investors may raise the utility index of their portfolios if they can substitute a safe asset for unsafe assets with both low yields and relatively low variance of yield. Risk-takers may supply the safe asset that risk-averters desire and invest the proceeds in unsafe assets with both high mean yields and high variance. Both classes of investor are "better-off," and society benefits because savings are diverted to capital accumulation at high mean yields. Accumulation of safe assets is complementary with accumulation of productive and risky assets, reducing the supply price of savings to riskier uses. The implication seems to be that, in so far as relatively low (d^*) and its relatively high (v) demote money and such other safe assets as government securities from the "safe" category, productive real investment is depressed by inflation.

The theory of financial intermediation is another exercise in the social complementarity of assets yielding low-safe rates of return and assets yielding high-risky rates of return. At a cost, an intermediary can divert savings of risk-averse asset-holders into "safe deposits" and pass them on to investors with the portfolio taste and technical capacities for investment at relatively high yield and high variance. When the deposits are rendered less safe by a decline of (d^*) and an increase in its (v), venturesome investment is crowded out by shrinkage of intermediation.

Inflation in the United States has dealt roughly with assets traditionally rated as safe. A long-term Treasury bond issued at the price of $100 in 1967 fell in real value, as measured by the consumer price index, to $59 in 1973. This depreciation, at an annual rate of approximately 9 percent, reflects both an increase in market rates of interest from 4.9 percent to 6.3 percent, the result of expected inflation, and realized inflation of the price index from 1.00 to 1.385. Part of the loss, to be sure, was compensated by interest payments at contract rate. During the same seven years, the average deviation of nominal bond rates, measured as annual averages, was 10 percent. The depreciation rate of 9 percent and the average deviation of 10 percent during 1967-1973 may be compared with a depreciation rate of 3 percent and

an average deviation of 4.5 percent during 1960-1966. In view of the deteriorating yield and quality of Treasury bonds in particular and of other Treasury issues in smaller degree, it is not surprising that private domestic investors made no net purchases of Treasury issues during 1967-1973 and elected to hold in their portfolios only $122 billion of Treasury debt, at values in 1967 prices, in 1973 as compared with $206 billion in 1967.

From the mid-1960's to the 1970's, dirty inflation has reduced the safety of money, claims on intermediaries, and government bonds. Complementary investments with high-risky returns have been affected as one expects. One particle of evidence comes from the market for venture capital, a principal source of finance for small, new enterprise. The flow of funds to this market is down to a trickle, and the terms have become more severe. The Department of Commerce is concerned that the effect may be to inhibit technological innovation as well as competition with relatively large, established enterprise.[4] We consider this "complement-shift" at greater length in the following section.

Complement - shift of Portfolios and the Stockmarket. Some assets that qualify as "safe" when inflation is negligible deteriorate along the risk scale when inflation is substantial and dirty. Asset portfolios are adjusted to this decay of safety in two ways. For one, there is a shift away from the assets with high-risky returns that are complementary with assets qualifying as safe when inflation is negligible. For the other, there is a shift to assets that are relatively inflation-proof. Disappearance of venture capital during the past few years in the United States may be one bit of evidence on the former or complement-shift. The behavior of stockmarket indices during inflation is another bit of evidence.

Many studies have made it clear that stocks are not a secure inflation hedge during dirty inflation. One study has regressed annual growth rates in stock-price indices, during 1953-1969, on growth rates of commodity prices and industrial production for twenty-two countries.[5] The pooled experience was that stock prices gained approximately one-half of one percent for each percentage point of inflation. Inflation reduced the real value of equities. James Tobin has reported a reduction from 1.62 to .995, during 1965-1973, in the ratio of aggregate market values for stocks and debt of American corporations to reproduction cost of corporate capital.[6] Data assembled by Henry Kaufman indicate that the ratio of market value to stated book value for Dow Jones industrials declined during 1965-1974 to its lowest level since World War II.[7] Michael Keran, exploring quarterly data for the United States during 1956-1970, found a negative and highly significant relationship between Standard and Poor's 500 index and the gross national product deflator lagged from one to sixteen quarters.[8] These and other studies leave little doubt that dirty inflation is not a happy context for bulls on stock exchanges.

Complement-shift is by no means the only explanation for the perverse response of stock prices to inflation. That it does count is suggested by varying degrees of response in price indices for stocks of different grades and qualities. If aversion to stocks arises from decay of safe assets, one would expect aversion to hit least the large, blue-chip issues, to hit hardest the issues of relatively new and small firms. This is what happens. From the end of 1972 to the end of 1974, for example, the Dow Jones index for thirty industrials declined by thirty-six percent, the NASDAQ index for over-counter stocks by fifty-two percent. Dirty inflation increases the cost of capital to extraordinarily, even infinitely high levels for industry on the safety fringes. It tends to close the door of this particular habitat to capital inflows.

Substitute-shift and The Term Structure of Interest Rates. If inflation were immaculate or clean, borrowers and lenders could not err in forecasts of nominal or real rates of interest. Information about forward rates of interest would be just as precise and reliable as information about spot rates. Differences in trading cost aside, short-term and long-term securities

would be perfect substitutes and occupants of the same habitat. Issues at various terms to maturity are not perfect substitutes in the real world. One reason is that inflation imposed in the past at random rates generates expectations of inflation at unpredictably variable rates in the future. Then nominal and real forward rates cannot be forecast precisely. This means, of course, that short-term securities provide a margin of safety for risk-averse investors over long-term securities. The latter lose gilt-edgeness, and dealings in them take place in a distinctive risk habitat.

When dirty inflation has done its mischief with such safe assets as, say, money or Treasury bonds or endowment life insurance, one can count on a substitute-shift by investors. One obvious way to retrieve an element of safety for portfolios is to substitute short-term claims for longer maturities. Security markets must respond to this shift with an increase in the liquidity premium on the longer maturities that can be explained, in part, by the variance of past and, hence, of expected inflation.

Especially since 1965, the liquidity premium on longer-term securities has increased in this country. Modigliani and Shiller have traced part of the increase, for the premium on AAA corporate bonds relative to prime commercial paper, to growth in the rate of inflation. They have traced part of the increase to growth in the standard deviation of the market rate of interest for commercial paper.[9] This short-term rate has become less stable because inflation has been dirtier, but there are other reasons including higher variability of the money supply. Whether and by how much inflation's variance affects the liquidity premium for long-term securities has yet to be determined, but exploratory work by Rose McElhattan indicates that the substitute-shift does occur along the maturity spectrum.[10]

The maturity shift poses hazards for economic welfare. Shorter mean maturity of business debt can result in difficult cash-flow problems for both borrowers and lenders, especially including banks. Even if financial crisis does not result, the risks of borrowing and lending short must put a damper on capital formation in the private business sector.

The lag principle

In immaculate or clean inflation, the future path of inflation can be foreseen precisely by participants in all markets. In dirty inflation, the mean inflation rate for some long period is approached by successive accelerations of inflation interspersed with slow-downs of price-level growth. Current and past short-run inflation rates are not an accurate guide to expectations of the mean rate: historic price behavior becomes unreliable information about prices in the future. On general principle, of course, any decline in the efficiency of the price mechanism as a device for disseminating information and for coordinating economic activities is bound to have its social costs in the capitalist system.[11] Some of these costs must be evident on capital markets where present prices of capital assets depend in complex ways upon both prices in the present and past and prices expected for the future. We turn now to three examples.

Relative Prices of Debt and Equity. Michael Keran has developed a subtle model, with strong empirical verification, in which unstable inflation generates changes in relative rates of return to corporate debt and corporate equity.[12] The market rate for corporate bonds of AAA quality, a measure of both return to savers and of capital's supply price to corporate investors, is determined by expected rates of change in the GNP deflator (with positive effect), by rates of change in real GNP (with positive effect), and by change in the real money stock (with negative effect). When inflation is unstable and accelerating, this interest rate rises sensitively in response to inflationary anticipations. The supply price of capital on the stock markets responds even more sharply. Security buyers there insist upon a rate of return that is competitive with bond rate. They bid prices on the stock exchanges to the low levels that will yield the competitive rate, given anticipated corporate earnings. However, they are relatively myopic

about the effect of inflation in raising future earnings: they are inflation-sensitive on the bond market, inflation-insensitive on the stock market. The result is that the supply price of equity capital, computed from earnings that are adjusted to inflation, is driven upward relative to bond rate. In due time, as the higher inflation rate is prolonged, the error in stock valuations is corrected and a "normal" relationship is restored between yields on bonds and yields on equities. Conversely, as inflation slows, market returns to equities diminish temporarily relative to bond rate, then rise as deflationary anticipations are applied to forecasts of corporate profits.

The Keran model dramatizes the uneven impact of inflation and inflationary expectations on different segments of the capital market. One suspects that this model can be augmented, to explain the impact of unstable growth rates in nominal money. When monetary growth is accelerated, there tends to be a "first" effect reducing corporate bond rate and raising stock prices. "Second" effects follow, including increases in real national product that tend to raise bond rate and increases in real corporate profits that tend to raise stock prices. Keran's model is concerned mainly with "third" effects, as inflation sets in, that tend to raise bond rate and to raise the supply price of equity capital even more.[13] Extended or not, the Keran model generates a clear account of fragmentation on capital markets during dirty inflation. Bond markets and stock markets become more distinctive habitats as the result of changing lag patterns in output, prices, profits, and inflationary anticipations.

With increased variance in yield, equities slip down the scale of safety relative to corporate bonds, and there must be a trend during dirty inflation toward the higher leveraging of corporate investment. In view of increases in the liquidity premium against long-term debt that develop during inflation, the higher leveraging must involve a rising ratio of short-term debt to equity. This trend involves obvious risks for corporate liquidity and solvency, particularly during periods when profits are depressed relative to interest payments.

Lags and Wealth Effects. Dirty inflation leaves a trail of wealth effects. For the moment, we are concerned only with those effects that can be attributed to imperfect foresight regarding inflation and to lags in anticipations regarding inflation's mean and variance. More wealth effects follow from other aspects of inflation, especially from governmental pricing and tax policies, and we turn to them later.

During economic growth, the private sector generates a stock of debt and financial assets. The public sector has become a chronic borrowing sector. Financial accumulation is the counterpart of private capital accumulation and expansion of the public domain. At low and stable rates of inflation, only a negligible share of the financial accumulation is explicitly "indexed." As inflation increases and becomes more variable, indexing is extended in various guises, but its costs are apparently so high that it lags behind inflation. It is discussed in a later section. Indexing is perfect, of course, in immaculate inflation.

Dirty inflation imposes a quadruple tax on holders of the bulk of financial assets. First, the real value of claims that promise a given flow of nominal returns is diminished by each increment of realized but unanticipated inflation. Second, the value of such claims is diminished by increases in market rates of interest that reflect anticipated inflation. Third, many varieties of claims slip down the scale of security ratings. Fourth, holders of equity claims are injured by the lag of stock prices behind inflation of labor and commodity prices. It may be noted in passing that claimants in such contingency contracts as insurance bear inflation taxes along with holders of financial assets. These penalties on contingency contracts should be expected to have effects on portfolio choice and substitution similar to effects of dirty inflation on "safe" assets.

No accurate and complete estimates of these costs to holders of financial assets have been

made. Bach and Stephenson have published estimates for the first tax on our list.[14] For the quarter-century 1946-1971, real capital losses from unanticipated inflation may have amounted to $600 billion. For each one-percentage point of inflation after 1971 in this country, the cost to creditors may amount annually to $35 billion at the 1971 level of commodity prices. Of course, this tax is objectionable on all canons of taxation. For one thing, who the beneficiaries are is not clear. They must include taxpayers who benefit from government's debt exposure or, when government does not pass on to taxpayers the benefits of its inflation windfall, users of public goods and purveyors of various services to government. They seem to include, too, stockholders of corporations with exceptional debt leverage. Recipients of low and high incomes are taxed for the benefit of middle-income households, and elderly people are taxed for the benefit of the young. The distribution of benefits and burdens is not random, but it is obscure and is not determined by explicit political choice or by efficient market choice. The tax is biased against savings, and it is biased for relative growth of the government sector.

The second, third, and fourth taxes on holders of financial assets have no beneficiaries. Their effect, it was argued earlier, is to distort capital markets, twisting the structure of interest rates against risky and long-term assets. In more general terms, they add to the risks and hazards of capital accumulation. The long-run result of augmented risk can be only to diminish economic productivity and growth.

Valuation Lags. Valuation of assets, liabilities, and net worth of both companies and individuals is based on the principle that "a dollar is a dollar is a dollar." They are afflicted with money-illusion. They are rarely adjusted to the fact that last year's dollar and this year's are quite different when price levels are unstable. The result is that levels of income and wealth and change in the levels are misrepresented. Fabricant estimates that corporate profits for 1973, reported as $118 billion before income tax, may be overstated by at least $30 billion. He suggests, too, that use of a constant dollar in measuring profits would reduce the reported increase from 40 percent to 10 percent in 1966-1973.[15] Terborgh reports that corporation profits during 1946-1970 were overstated by nearly 20 percent because of just one instance of money-illusion, underestimation of depreciation charges.[16] Bach and Stephenson note the remarkably diverse impact upon companies of correcting income statements for bias in the dollar as measuring rod.[17] Valuations of aggregates by the Department of Commerce have been no more immune to illusion-error than micro-valuations by accountants and tax collectors. The American Institute of Certified Public Accountants has nominated inflation-bias as the preeminent issue in reform of corporate accounting procedures.[18]

The economy travels through time with a slowly changing stock of "old" tangible wealth and "old" financial assets and debt. The stocks are substantial multiples of annual flows of incomes, cost, and debt service. The ages of the stock range from the new to the well-nigh infinitely old (land). One result is that, if assets and debt are measured in original values, reported net worth of individuals, firms, and the economy can vary substantially between periods just because the vintage of assets and debts changes. Reported income can be over-stated or under-stated just because the current price level differs from the weighted mean of price levels at which old assets and debt were acquired. All by itself, the calendar produces variance in net worth and income.

Instances of illusory valuation are familiar. There is original-cost depreciation, which is correct only partially when depreciation charges are accelerated. There is FIFO costing of inventory and costing of debt at contract instead of market rates of interest. These and other distortions in accounting information are the heritage of more or less prolonged dirty inflation.

Bach and Stephenson have made the essential point about the effect of these distortions on

capital markets. They sought but could not find evidence that stock markets discriminate successfully between business profits that are illusory, based on the age-pattern of old assets and debt, and profits that are corrected for money illusion.[19] Stock markets are not efficient enough, in valuing profits, to draw the line where illusion ends and efficiency begins. They cannot be as selective as we would like them to be in allocating scarce savings.

Inflation and government

Dirty inflation should be labeled, "Made in Government." Inflation is generated by excessive growth rates of nominal money, dirty inflation by excessive and unstable growth rates of nominal money, and the determination of these rates is government's prerogative. In this section, we sample other government actions that, by adding to the turmoil of inflation, distort capital markets. The hypothesis is proposed, in passing, that dirty inflation increases the economic size of government relative to private sectors: in particular, it increases governmental relative to private demands upon capital markets, governmental relative to private financial intermediation, and governmental manipulation of private financial choice. If government were motivated to self-aggrandizement, dirty inflation would be the instrument to use.

Tax Effects of Inflation. The list of tax effects of inflation is long, and we draw only a small sample from it. The most obvious, of course, is that unstable inflation imposes unpredictable rates of taxation upon private balances of government debt and high-powered money. These private balances are depreciated during inflation and, since income taxation is afflicted with money-illusion, the depreciation cannot be counted by the private sector as a tax-deductible loss or business expense. Government imposes the loss and declines to allow relief for it in explicit taxes, even declines to report it as a fiscal revenue. One result, as we have seen, is to take away from investors the haven of safe assets, and another is to reduce private savings, given constant savings-income ratios.

The second tax effect depends on the progressivity of tax schedules. Inflation drives nominal and real incomes along different paths. The United States is aware, from its experience of 1973-1975, that nominal and real incomes may move in different directions, the former rising and the latter declining. Progressive taxation pays no heed to the path of real incomes. It imposes higher tax rates as nominal incomes increase, and government seems not to be concerned that, because real incomes lag, the progression of taxes against them is steeper still. Real incomes, then, are subject to "double progression" as the result of dirty inflation.[20] The double progression is especially notable for the profit share of income since it is so sensitive to change in real national product. Of course, the impact of inflation *cum* progressive taxation on after-tax, distributed real profits and the stock markets' valuation of private capital formation must be adverse to private investment. Since the impact is variable, it increases the variance of real yield to capital, the risk of investment, and the aversion to investment at each mean rate of return. Dirty inflation *cum* progressive taxation makes safe assets risky, risky assets riskier still.

We observed earlier that business income varies with the vintage of business wealth when there is variable, unanticipated inflation. It is overstated by original-cost depreciation and FIFO accounting for inventory when prices are rising, under-stated when prices are falling. Business taxes are assessed on measured or "vintage" income, and so they are progressive to inflation at rates which vary from taxpayer to taxpayer according to the vintage of capital goods and inventory. After-tax incomes are not unbiased measures of firms' relative efficiencies. They are biased by the relative ages of business assets.

The vintages of debt also count in measurements of income and assessment of taxes during inflation. Any firm with debts that are not indexed, by the market or by contract, receives real income from the inflation tax on its creditors. The tax is higher as the debt is older. Of

course, this real income of private debtors is not counted as income subject to government tax, and the inflation costs of creditors are not deductible from income subject to government assessment. Since the corporate sector at large is a net debtor, this exemption of real income from assessment is a partial offset against the punitive tax effect of original-cost depreciation and FIFO accounting for inventory. Musgrave takes the position that, since there is offset in some degree, tax assessments should not be corrected for vintage of either assets or debts.[21]

Inter-Government Finance. Inflation affects in arbitrary and unexpected ways the relative flows of real revenues and savings for different levels of government and their relative ease of access to capital markets. For example, only central government collects the inflation tax by issue of nominal money to excess. This tax is one that state and local governments are precluded from using. However, there are more important differences.

In the main, lesser governmental units do not employ progressive taxation of private incomes or the rate progression is gentler than the federal progression. They do not enjoy automatic growth of real revenues from income taxation. Again, much of local government depends only to a slight degree on income taxation and relies instead on property taxation. Revenues from property taxes characteristically lag behind inflation because reassessments of property are infrequent and because collections are annual rather than quarterly or by withholding. Still again, local government bears first the brunt of taxpayers' resistance to automatic growth of total real tax burdens in inflation. In some degree, that is to say, growth of real federal tax revenues turns out to be at the expense of real local tax revenues.

Lags in revenue growth for local government relative to expenditure growth tend both to increase government bids for funds on capital markets and to lower the markets' valuation of the debt offerings. Of course, the markets do take into account the increasing value, during inflation, of tax-exemption clauses in issues of local government. Still, one notes that the mean ratio of market rates of interest on U.S. Treasury bonds to market rates on high-grade issues of local government declined from 1.15 on the average in 1960-1963 to 1.07 in 1970-1973. During the same period, quality ratings were reduced for numerous issues of local governments in response to lags in local revenues behind local interest obligations. It may be more important, from an efficiency standpoint, that the incidence of relative increases in cost of capital was uneven among local governments, depending in some substantial way on differences in styles of taxation and composition of tax bases. Demands for revenue-sharing by the Federal government must have arisen in part because of the differential impacts of inflation on different levels of public administration.

Price Controls. Government is nourished by inflation, then bites gently the hand that feeds it by imposing selective price ceilings. Whether the ceilings are numerous, as in Phases I-III during 1971-1973, or more selective, their effect is to differentiate the impact of inflation upon various kinds of wealth and upon the markets for wealth. In much the same way that old assets and old debt affect gains and losses from inflation, old prices stabilized by controls adjust the relative burdens of inflation on the processes of capital accumulation.

One expects two principal effects of specific price ceilings on capital markets. Wealth yielding services that are subject to effective price controls must yield declining real revenues during inflation and, at any discount rate, must decline in real market value. Probability that controls will be imposed must increase the risk of wealth ownership so that a higher discount rate is appropriate. Market values of wealth are diminished, relative to reproduction costs, by either the fact of control or by the prospect of control.

There are numerous illustrations of the impact of inflation, dirtied by price controls, on capital values. Private residential construction

has been damped in New York City since World War II, as in Paris and London and elsewhere, because of the lethal combination of rent ceilings and general inflation. Cattle herds in Argentina are destroyed as their effective rate of return relative to free market rates of interest is reduced by over-valuation of the peso on the foreign exchanges and by controls on export prices for beef and mutton. Cocoa plantings in Ghana recede when price ceilings discriminate against cocoa production during inflation and then expand when ceilings are raised or inflation reduced.[22]

Keran has demonstrated the impact of conventional "fair-return" pricing of services of public utilities, during inflation, by regulatory commissions.[23] The commissions have been charged with responsibility for thwarting the disposition of utility companies to price their services monopolistically and so to extract excessive returns for their stockholders as well as to supply smaller and poorer flows of services than might be expected in a competitive context. Of course, there is no perfectly competitive market for utility services that might generate standards of price and output quality for the non-competitive markets that commissions regulate. The regulators must look to competitive capital markets for their criteria.

The common regulatory rule is that a utility qualifies as competitive if the aggregate market value of its equity issues is in line with book value of net worth. Presumably then stockholders can realize, from the anticipated earnings of their company, the rate of return that accrues to stockholders of competitive and unregulated industry. The rule guarantees that inflation will reduce the market price of the utilities' stock issues relative to prices for equities of unregulated firms. The reason is, of course, that the equity market anticipates inflation in some degree—imperfectly in the short run, more adequately in the long run—and arrives at a rate of return for unregulated industry that tends to equate market value of equities with the reproduction cost, not the book value, of net worth. Regulation depends on book value as the right criterion for market value of utilities' net worth while the free capital market, adapting to inflationary experience and expectations, depends on reproduction cost. Here is another case in which an old price distorts capital markets during inflation.

Keran's results demonstrate that, during inflation, the market values of utilities' equity issues take the same path as the market prices of old bonds. Book value of net worth is comparable with the initial price of a bond, and "fair return" is comparable with the bond's contractual interest yield. When unanticipated inflation sets in, the market prices of utility issues and old bonds must decline, and the effective nominal rates of return to investors must rise so that the real rates of return do not decline. Regulatory commissions do not recognize the distinction between nominal "fair return," which seems to them the appropriate criterion of competitiveness, and real competitive return. The consequences of their money-illusion are an increase in the cost of new capital to utilities and retardation of growth in the utilities' productive capacity. It would be interesting to compare the relative effects, on growth of power production, of OPEC's pricing policies for petroleum and the commissions' "fair return" rule.

Disintermediation. Unanticipated inflation deals roughly with financial intermediation, shrinking its real and even its nominal volume of characteristic indirect debt. Variance of inflation necessarily increases the supply price of equity capital to intermediaries. Whether the sources of funds are indirect debt or equity issues, their stocks and flows tend to be reduced in volume, destabilized, and made more expensive. The impact upon savings and loan associations is familiar but not unique among classes of intermediary; for example, the real value of life insurance reserves declined during 1967-1974 as well as in the earlier inflationary periods of 1946-1948 and 1950-1951.

Some intermediaries are victimized along with taxpayers, public utilities, and others by the familiar burdens of old assets, old debt, and

governmental price-fixing. Their problems are not unique. Their portfolios are dominated by long-term bonds and mortgages, acquired at low contractual rates of interest, and by equities, acquired before inflation has had its first effect of depreciating equity prices. Unanticipated inflation generates capital losses for them, and it raises operating expenses other than interest costs relative to revenues of interest and dividends. Rates of interest on their debt are fixed, by contract in some cases, by ceiling in the style of Regulation Q in other cases. When free-market rates of interest are driven up by inflation, creditors of intermediaries demand liquidation of their claims in some substantial amounts at prices fixed by contract or regulation. Unless someone rides to the intermediaries' rescue, their plight can be serious indeed, caught as they are between constant revenues and rising expenses, depreciating assets and liquidation of debts.

The public eye has been caught by episodes of disintermediation. They disturb capital formation, at least in terms of its composition, but the trend of disintermediation during prolonged dirty inflation may be a source of more fundamental change. It reverses the secular increase over a century in intermediation relative to direct finance of investment and of government deficits.[24] For given aggregate ratios of savings to income, secular disintermediation implies that alternative modes of finance will develop. They may include greater reliance on private self-finance of investment from retained earnings, but that seems improbable while the trend in after-tax real corporate profits continues downward. They may include increasing substitution by consumers of durable goods for financial assets, but that will be damped by the rising price of energy. Of course, secular decay of traditional intermediation may stimulate innovation of modes of indirect finance: the Eurodollar market is a case in point. The certainty is that the government sector will substitute for private intermediation either by taxation and by issue of direct government debt to savers or by proliferation of government financial intermediaries. Inflation's effect on intermediation, like its effect on taxation, expands the public sector at the expense of the private. Even if ratios of savings and investment to income in the aggregate do not fall, the pattern of investment must change, with emphasis on the production of merit goods and public goods. Inflation and government constraints, such as Regulation Q, tend to shrink private intermediation, and government intermediaries are slipped into the financial gap, with at least qualitative effects upon capital accumulation.[25]

Decline in the real growth rate of their resources induces private intermediaries to innovate. Pension funds develop variable annuities; mutual funds proliferate in variety; savings and loan associations introduce long-term deposits and payments services. Then there is pursuit of these innovations by new government regulations. One may suggest the principle that government, imposing inflation, induces private financial innovation and pursues it with a net of new regulations. Dirty inflation is a stimulus both to growth of government finance and to government regulation of private finance.

Palliatives and remedies for dirty inflation

Three ways of dealing with dirty inflation come to mind: live with it, cleanse it, stop it. This disease of the price system might simply be endured or tolerated except for the probability, discussed first below, that it gets worse when treated with benign neglect. Alternatively, society might try to cleanse it and transform it to immaculate or clean inflation. We consider some cleansing techniques, such as indexing in the second section below. Then the discussion turns to methods and costs of stopping inflation. Convalescence can be expensive.

Dynamics of Inflation. Inflation in the United States is not damped, tending to wear itself out, nor does it tend toward a steady state. It is a rhythmic process, and the rhythm tends to become more violent. The driving force is fiscalized monetary policy. Fiscal deficits run in cycles of increasing amplitude, and the Federal Reserve, together with other central banks, fi-

nances the deficits by issue of high-powered money including currency and reserves of commercial banks. There is another, complementary force at work; namely, lags in the rate of inflation behind changes in unemployment rates and in real national product.

When growth in real national product is near its cyclical low point and unemployment is at its high, automatic fiscal processes increase federal deficits, and the Congress authorizes discretionary increases in spending and decreases in rates of taxation. The discretionary measures take effect, in the main, after recovery of output and employment has begun. The Federal Reserve applies downward pressure upon interest rates, as seems necessary for economic recovery, by taking Treasury issues into its own portfolio, and the volume of purchases increases well into the recovery. Low interest rates in this country and rising aggregate demand for goods and services including internationally traded items generate deficits in the official settlements account of the balance of payments. Then a share of fiscal deficits here is financed by central banks abroad.

Cyclical recovery, with its rising output and rising rate of inflation, eventually reduces fiscal deficits. As deficits decline and as the rate of inflation rises relative to growth of output, monetary policy becomes restrictive. It is most restrictive after the peak of the business cycle and, in pursuit of accelerating inflation, depresses output and employment. When inflation has been reduced and when unemployment has reached unacceptable levels, the cycle of fiscalized monetary policy is over, and a new one is ready to begin. Successive troughs of output and employment occur at higher price levels and rates of inflation, and the monetized deficits are larger for each percentage point of unemployment. Fiscalized monetary policy generates unstable inflation along with a rising trend of inflation. The remedy is not benign neglect.

Cleansing Techniques. Old assets, debts, contracts, prices, and tax schedules are the source of numerous inflationary distortions in both financial and non-financial sectors. It would seem that rejuvenation of these relics from the past could reduce inflation's costs substantially. In fact, there have been numerous experiments with rejuvenation since at least the early eighteenth century, and now it appears that their use is spreading.[26]

Rejuvenation of an old price simply by removing floors under it and ceilings over it is the simplest of "corrections." Foreign-exchange rates can be floated; usury and rental ceilings can be lifted and Regulation Q discarded; utility rates might be allowed to find their own levels, and union contracts might be renegotiated oftener. Some of these corrections do occur, at some times and places, but always in the face of strong resistance.

Objections to turning prices loose, for markets to determine, are familiar. One is that there are social costs. So frequent adjustments of labor contracts would waste resources on bargaining and negotiation. Release of utility rates from the control of regulatory commissions would permit producers to exercise monopoly power. Floating the dollar cleanly would disqualify it as a payments medium internationally and raise costs of trading. Another familiar objection is that increases in liberated prices would aggravate inflation of other prices. They would add cost-push to demand-pull as a source of inflation. A third objection is recurrent, that there would be unfortunate results in terms of equity: the poor would pay rents, interest rates, and utility rates that they can ill afford. Still another objection is that, without Regulation Q, financial institutions would compete themselves into insolvency and crisis. Good and bad, these objections and others have such strong appeal that this cleansing technique, turning old prices loose, is not used effectively.

When markets are not trusted to correct old prices, corrections are sometimes imposed by public authority. Rules are adopted for the linkage of controlled individual prices with market-basket indexes of free prices. The rules vary. For example, they may link single prices with cost-of-living indexes, indexes of wholesale

prices, or foreign-exchange rates. They may link single prices with experienced or anticipated change in general indexes. The linkage is sometimes complete, sometimes partial or fractional. Price adjustments may be frequent or infrequent, at regular or irregular intervals. There is opportunity for administrative discretion, and it is commonly used for a variety of purposes including production and export incentives for sellers at managed prices, income redistribution, and fiscal effects. It can be and usually is a technique of official intervention in real aspects of economic behavior.[27] Then, of course, it is not a cleansing technique.

Rejuvenation of old debts by indexing is familiar where inflation has been unstable along a rising trend. It is a way, perhaps, of reducing the liquidity premium on securities of longer terms and of preserving markets for them. It might be a way of limiting or preventing disintermediation when market rates of interest rise. It might give some protection to creditors against redistribution of income and wealth to debtors. The technique is to adjust each contractual payment on an old debt, for interest and principal, to change in some index, partly or completely, often or infrequently. There has been no consensus about the appropriate index: a short-term rate of interest, a foreign-exchange rate, an index of commodity prices, and other indexes have been tried.

Presumably the ideal correction for bonds would protect the proportion of the creditors' claims to the market value of wealth that they have helped to finance. It would adjust the market value of claims in the same degree as inflation changes the market value of underlying wealth. Any adjustment larger or smaller than this would redistribute wealth between creditors and equity-owners. However, there is no index of inflation's and only inflation's effect on market values of wealth. Furthermore, since dirty inflation tends to reduce market values of some large aggregates of wealth, such as corporations, the ideal correction could be punitive for creditors. The effect would be to increase the liquidity premium on long-term issues, not to reduce it, and to shrink the market for such issues, not broaden it.

Current yields on bonds and mortgages have been adjusted to such indicators as market rates of interest on short-term securities, including Treasury bills. This variety of correction is clearly defective. Change in the current or imminent rate of inflation is not the only component of change in bill rates. They can rise because the central bank is constraining growth of the money supply. They can rise, too, because the real national product is rising or because bill rates abroad are going up. Indexing to bill rates does not cleanse yields on bonds and mortgages and put them at levels which would prevail during immaculate or clean inflation.

Argentina, Brazil, Canada, Denmark, the Netherlands and other countries have developed various styles of correction for nominal assessment values in property taxation as well as for nominal exemptions, deductions, and income brackets in income taxation.[28] It is not uncommon, in business taxation, to permit indexing of depreciation charges, inventory valuations, and capital gains. Corrections are imposed or permitted for a variety of purposes; to protect the real value of tax collections, to manipulate the value of collections, to protect the poor against erosion of tax concessions, to prevent double progression, to encourage business capital formation. Choice of correction indexes has varied, from cost-of-living indexes to minimum wage rates and foreign-exchange rates. There can be no pretense that the corrections purge tax systems of distortion by inflation. The corrections change the impact of unstable inflation.

All prices, taxes, and contracts are indexed in a model of immaculate inflation. However, unstable inflation cannot be made immaculate by indexing. One reason is that unstable inflation involves different rates of response among individual prices to aggregate effective demand. Then there is no neutral index of change in money's purchasing power. Another reason is that initial costs of indexing are not small: some substantial investment is required in bargaining

about precise forms of insurance against the contingency of inflation. Again, unless all contracts are on short term, indexing can increase downward rigidity of prices and increase the cost, in terms of unemployment, of shifting from higher to lower inflation rates.[29] Finally, it appears that government simply cannot resist the temptation to manipulate indexing for social objectives. Indexing becomes another instrument for aggrandizement of the public sector.[30,31]

Damping. If one prefers cures to palliatives for unstable inflation, three severe treatments may be considered. They are damping, to stabilize the price level's growth path; financial deepening, to reduce the slope of the path; and formalized linkage of monetary with fiscal policy, to fix the locus of responsibility for inflation. These treatments work best in combination. In the following paragraphs, we describe the first two treatments in some detail, leaving discussion of the third treatment for another forum.

The rhythm of the American economy in the past decade has consisted of an up-beat, driven by fiscal and monetary ease, to correct unemployment at the cost of some inflation, and a down-beat, driven by fiscal and especially monetary tightness, to correct inflation at the cost of some unemployment. The rhythm appears to be anti-damped so that successive rounds of fiscal-monetary measures generate more inflation, in the process of reducing unemployment, and more unemployment in the process of reducing inflation. One damping technique is sheer sadism. It maintains monetary restraint, at high levels of resource unemployment, long enough to erase memories and expectations of inflation. Experiments with this technique in countries where anti-damped cycles have continued for a decade and more have been painful indeed. The technique is applied at high risk of social discord.

A preferable damping program would have two elements, one fiscal and one monetary. On the fiscal side, longer-term government debt would be indexed, its yields linked to an index of its market rates of interest. There would be indexing, too, of bases for federal taxation including especially brackets for progressive income taxation. The preferred index would include only prices for a basket of government purchases. Furthermore, the federal budget would include estimates of revenues from the inflation tax. Finally, on the fiscal side, the Federal Reserve would be required to pay interest, at a rate indexed to Treasury bill rate, on members' reserve balances. The purpose of these measures is to impose new constraints on government expenditure in later phases of cyclical recovery and to provide new incentives for shifting the expenditure to recession and early recovery. If the central bank were addicted to even-keeling, protecting interest rates against disturbance from government financing, its interventions would perhaps be cyclically stabilizing, accelerating monetary growth in recession and early recovery, decelerating monetary growth in later phases of recovery. Even-keeling, to stabilize market rates of interest, may stabilize more important things, such as output and employment, *if* it happens at the right time.

However, the second element of the damping program would preclude even-keeling in the money markets. It would impose, by legislative prescription, a rule for steady growth of the monetary base in the range of 6 to 8 percent quarterly. Evidently, it sounds the melancholy notes of "taps" over six decades of experimentation in the United States with flexible, discretionary monetary policy. It takes the case as proved by experience with monetary policy in, for example, 1920, 1931, 1937, 1957, 1966, 1969, and 1972-1974 that contrived discontinuity of monetary growth is destabilizing. The case for steady growth does not deny that control theory can design some superior rule of money management in an hypothesized economy. It denies simply that monetary management will find and apply a superior rule before public patience is exhausted.

The 6-8 rule, in combination with any reasonable trend of high-powered money's income velocity, is compatible with an attainable growth

rate of real national output and growth rate of the price level that does not offend public taste and tolerance. Its purpose is to take advantage of the long-run neutrality of money that seems to characterize the American economy, permitting the growth path of real output to cling more closely than in the past to the path of resource supplies and technology. Any inflation that results would at least be clean.

Deepening. When variance of fiscal deficits and monetary growth rates, price levels and output levels, interest rates and foreign-exchange rates has been increasing for a decade, damping can hardly be expected to reduce it quickly. Even before damping has been effective in straightening the paths of inflation and output, deepening can be put to work in reducing the mean growth rate of inflation and raising the mean growth rate of output. First straighten the paths and then tilt them.

It is difficult not to be pessimistic about prospective relative changes in the price component (P) and the output component (T) of growth in nominal national income. The probability is not small that, without effective "real" policies, growth in nominal expenditure at the rate permitted by the 6-8 rule (M) and by the trend in velocity of high-powered money (V) will raise (P) relative to (T) as the years go by. Each determinant of (T) is cause for worry. For one, the cost of capital, which was falling from World War II to the nineteen-seventies, seems to be rising.[32] Again, the cost of labor inputs is under upward pressure by, for example, minimum wage laws and labor oligopoly. Still again, the outlook is not bright with regard to terms of trade for imported raw materials. There appears, moreover, to be retardation in technological change that economizes factor inputs. Costs of intermediated inputs by government do not decline. While all of these determinants of (T) and some others are worrisome, only the cost of capital and, marginally, the efficiency of capital allocation concern us here.

Growth of capital relative to labor, or capital deepening, obviously is inhibited by the cost of capital. There are some things to do about deepening. Of course, damping inflation is one of them. It would reduce the risk component of the supply price of capital, invigorate financial intermediation, and draw capital away from uses that dirty inflation makes attractive. Another deepening technique is a shift in the balance of government budgets from the deficit to the surplus side, in the manner of Germany, Japan, and other countries. A third technique is equilibrium pricing of the dollar in foreign-exchange markets, avoiding the over-valuation that induces capital flight. The American economy, one knows, resists pressures to increase the national ratio of savings to income, but incentives to reduce the ratio can be eliminated. Since the United States has used inflation to force savings from holders of dollars here and abroad, one knows there is excess demand for savings at full employment of resources and at a modest rate of growth in output. Deepening is an essential substitute for the inflation tax.

FOOTNOTES

1. Page 460.

2. Nordhaus, for one, seems to say that Kuznets was wrong: "There is, however, no evidence that the allocational effects of the mild inflations observed in advanced countries are significant." William D. Nordhaus, "The Effects of Inflation on the Distribution of Economic Welfare," *Journal of Money, Credit and Banking,* 1973, p. 465.

3. John Hicks, *Critical Essays in Monetary Theory,* p. 28.

4. *The Wall Street Journal,* December 4, 1974, pp. 1, 24.

5. Ben Branch, "Common Stock Performance and Inflation: An International Comparison," *The Journal of Business,* January 1974, pp. 48-52.

6. James Tobin, "Monetary Policy in 1974 and Beyond," *Brookings Papers on Economic Activity,* I, 1974, pp. 223-227.

7. Henry Kaufman, "Financial Roadblocks to a New Economic Recovery," *Hearings,* Subcommittee on International Finance, Committee on Banking and Currency, House of Representatives, December 3, 1974, pp. 26-37.

8. Michael Keran, "Expectations, Money, and The Stock Market," *Review,* Federal Reserve Bank of St. Louis, January 1971, p. 25.

9. Franco Modigliani and Robert J. Shiller, "Inflation, Rational Expectations and the Term Structure of Interest Rates," *Economica,* February 1973, pp. 12-43.

10. See Rose McElhattan's article in this issue.

11. Harry G. Johnson, *Inflation and The Monetarist Controversy,* pp. 26-35.

12. Michael W. Keran, "Forecasting Stock Prices," October 1974.

13. For conclusions compatible with Keran's, see Bruno A. Oudet, "The Variation of the Return on Stocks in Periods of Inflation," *Journal of Financial and Quantitative Analysis,* March 1973, pp. 247-258.

14. G. L. Bach and James B. Stephenson, "Inflation and the Redistribution of Wealth," *The Review of Economics and Statistics,* February 1974, pp. 1-13.

15. Solomon Fabricant, "Inflation Accounting: Issues for Research," National Bureau of Economic Research, *54th Annual Report,* pp. 10-15.

16. George Terbough, *Essays in Inflation,* pp. 53-54.

17. G. L. Bach and James B. Stephenson, *op. cit.,* pp. 11-12.

18. Frank T. Weston, "Adjust Your Accounting for Inflation," *Harvard Business Review,* January-February 1975, pp. 22-29.

19. G. L. Bach and James B. Stephenson, *op. cit.,* pp. 12-13. See also Eric Schiff, *Inflation and the Earning Power of Depreciable Assets,* American Enterprise Institute for Public Policy Research, 1974, p. 28.

20. The impact of double progression on capital values of income-producing assets is analyzed in Eric Schiff, *op. cit.*

21. Richard A. Musgrave and Peggy B. Musgrave, *Public Finance in Theory and Practice,* pp. 288-289.

22. According to Friedman, "The great German economic miracle of 1948 was produced simply by the elimination of price controls. Ludwig Erhard, then the economics minister, removed all the price controls one Sunday afternoon. He did it on Sunday, because the offices of the American, British, and French occupation authorities were closed on Sunday, and he was sure that they would have countermanded his order if they had been open." Milton Friedman, "Monetary Policy in Developing Countries," *Nations and Households in Economic Growth* (Essays in Honor of Moses Abramovitz: David and Reder, eds.) p. 274.

23. Michael W. Keran, "Inflation, Regulation and Utility Stock Prices," Bell Journal of Economics, (forthcoming, Spring 1976).

24. Simon Kuznets, *op. cit.,* pp. 421-423.

25. Joint Economic Committee, *Achieving Price Stability Through Economic Growth,* December 1974, pp. 56-74.

26. For discussions and for references to a large literature, see: Robert P. Collier, *Purchasing Power Bonds and Other Escalated Contracts,* Utah University Press, 1969; Albert Fishlow, "Indexing Brazilian Style: Inflation without Tears?" *Brookings Papers on Economic Activity,* I, 1974, pp. 261-282; Edward Foster, "Costs and Benefits of Inflation." *Studies in Monetary Economics,* Federal Reserve Bank of Minneapolis, 1972; Milton Friedman, "Using Escalators to Help Fight Inflation," *Fortune,* July 1974, pp. 94-97, 174-176; Herbert Giersch *et al., Essays on Inflation and Indexation,* American Enterprise Institute, 1974; Jai-Hoon Yang, "The Case for and Against Indexation," *Review,* Federal Reserve Bank of St. Louis, October 1975, pp. 2-11.

27. Albert Fishlow, *op. cit.,* p. 268.

28. Amalio Humberto Petrei, "Inflation and Personal Income Tax," *Finance and Development,* September 1974, pp. 38-41.

29. William Fellner, "The Controversial Issue of Comprehensive Indexation," in Herbert Giersch *et. al., op. cit.,* pp. 64-68.

30. Albert Goltz and Desmond Lachman, "Monetary Correction and Colombia's Savings and Loan System," *Finance and Development,* September 1974, pp. 24-26.

31. This paragraph comes very close (inadvertently!) to plagiarism of Ludwig von Mises, in his *The Theory of Money and Credit,* English edition, 1935, pp. 406-407. The criticism of indexing had appeared in the German edition of 1924.

32. William D. Nordhaus, "The Falling Share of Profits," *Brookings Papers on Economic Activity,* 1974, I, pp. 200, 212, 215.

The Effect of Inflation on Savings Behavior

Joseph Bisignano

The period of the early 1970's was unprecedented in 20th century economic history in the amplitude and variability of the behavior of consumer prices. The U.S. economy experienced a rapid rate of inflation which sent shock waves through real disposable personal income and consequent ripples through savings and expenditure decisions. From the fourth quarter of 1973 to the first quarter of 1975, constant (1958) dollar disposable personal income fell from $622.9 billion to $591.0 billion. In per capita terms, real personal disposable income declined by 6 percent over this period.

The intent of this paper is to analyze the effect of the recent inflation on personal savings behavior. We begin by presenting a simple graphical analysis of a consumer's response to inflation where it is assumed that consumers have a preferred real wealth - real income relationship which they attempt to restore whenever actual behavior departs from desired wealth-income behavior. We also view evidence of the effect of inflation on the real value of financial asset holdings of the public. The distinction is made between anticipated and unanticipated inflation and the effects of each on personal savings behavior. A crude measure of these two types of inflation indicates that a large portion of inflation in recent years has been unanticipated by the public.

A framework for analysis

To begin our analysis let us consider an economy where there are two types of financial assets, money and government bonds. If we assume, for convenience, that all bonds are perpetuities paying $1 coupons, then the price of a bond will simply equal the inverse of the current market interest rate. The nominal value of aggregate wealth will be given by

$$W = M + B/r \qquad (1)$$

where W is aggregate nominal wealth, M the nominal value of money, B the total number of bonds (each paying a one dollar coupon) and B/r the nominal market value of bonds held by the private sector. Deflating aggregate wealth by a measure of the "general price level" we obtain a measure of "real financial wealth," or

$$\frac{W}{P} = \frac{M}{P} + \frac{B}{rP} \qquad (2)$$

The accumulation of wealth by an individual or a society is not a random process. Individuals have different savings behavior over their lifetimes and over business cycles. The rate of savings is greatly dependent on the level of wealth and the relationship of wealth to income. Since the value of wealth changes with changes in aggregate prices, it would be expected that savings behavior would respond to changes in real wealth induced by changes in prices.

If we broaden our definition of financial assets to include financial claims on real capital, such as equity securities, we obtain a definition of nominal wealth as follows:

$$W = M + \frac{B}{r} + \frac{E}{\rho} \qquad (3)$$

where we have added E, the expected earning stream from capital discounted by a market determined "discount rate." The discounted earning stream is the value of privately held shares of stock. The deflated version of (3) would yield a measure of real financial wealth.

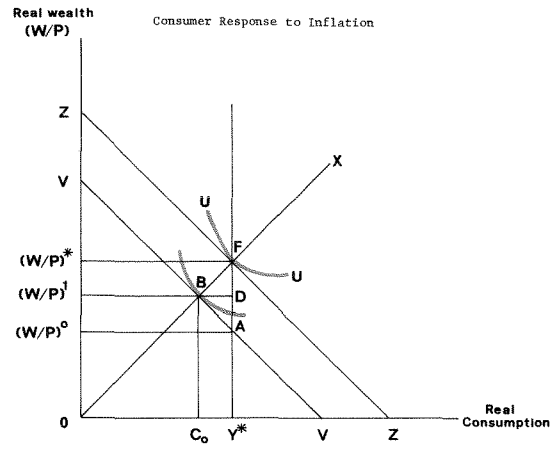
The desired money-income concept can be

broadened to include other forms of financial wealth, resulting in a desired wealth-income relationship. The economic foundations underlying desired wealth-income behavior are quite complex and will not be investigated here.[1] What will be undertaken is to define in very simple terms a consumer's "equilibrium" wealth-income ratio and a description of the mechanics by which the consumer restores his desired ratio after he is displaced from it by some exogenous force, such as inflation.

How do we envision the wealth accumulation process taking place? A simple illustrative answer can be given by considering an individual's behavior, where it is assumed that the individual receives a flow of constant real income each period. He begins the period with a given stock of real wealth (W/P). Let us picture the individual initially in "equilibrium"; that is, his ratio of real wealth to real income is at its desired value.

In Chart I is shown an individual's preference curves for real consumption and real wealth, along which the individual is equally well off. (These preference curves are shown in blue.) His income each pay period is OY* and initially we assume that his real wealth is (W/P)* and he consumes all of his real income, OY*. The consumer's objective is to reach the highest preference curve possible, given his real income and real wealth. The individual may move along the line ZZ, consuming more than his real income, OY*, only by drawing down his real wealth. Notice that the sum of an individual's weekly income and his initial wealth gives us the total amount of possible consumption, OZ. His preference function for consumption and wealth, UU, places him in "equilibrium" at F. He is said to be in "equilibrium" at F because at this point he is maximizing his utility; any other point on the line ZZ would place him on a lower preference curve. At any other point on line ZZ there would be the incentive to move towards F created by the consumer's attempt to attain the highest utility. The line OX is made up of the series of tangencies of all his preference functions with "unit budget-wealth lines,"

Chart I



parallel to ZZ. That is, lines parallel to ZZ permit $1 of real financial wealth to trade for $1 of real goods.

Having defined the consumer's equilibrium we need to explore now the dynamics of his behavior. How will the consumer react if he is moved away from point F? These simple dynamics create the incentive for the consumer to change his savings behavior in an attempt to return to equilibrium at point F. At F the individual consumes all of his income. Now let us shock the system and describe his behavior.

Let the "shock" be an unanticipated increase in the general price level. The immediate impact is to decrease the value of the individual's total financial wealth, for example, reducing it from (W/P) to $(W/P)^{\circ}$. The consumer moves from equilibrium point F to point A. The consumer's new budget line is now VV, equal to his reduced wealth $(W/P)^{\circ}$ plus his income, OY*. The maximization of utility will lead the consumer to choose a consumption point on OX, moving from A to B, where he will consume OC_0 and save BD, thereby increasing his wealth by the amount of his savings. In the next period he will again receive OY* in real income (which is assumed constant) and now his opportunities are such that he may consume anywhere on a new line parallel to VV and going through the point D. The act of saving will continue to shift the budget-wealth line outward and allow the indi-

vidual to increase his satisfaction, until he arrives at his equilibrium point at F. At F he will remain there, now consuming all of his income, unless a price rise or fall should displace him. This example illustrates that the consumer will temporarily increase his savings rate in order to reestablish his desired real wealth-income relationship at point F.

While the above illustration is admittedly lacking somewhat in reality, because of the assumption of constant real income, it does illustrate a simple conceptual framework within which to picture individual wealth adjustments to price changes. Very simply, individuals respond to short-term changes in the real value of their financial assets by increasing or decreasing their level of real consumption. This gives rise to the notion of "wealth effects in consumption," where here we have considered the effect on consumption of changes in real financial wealth.

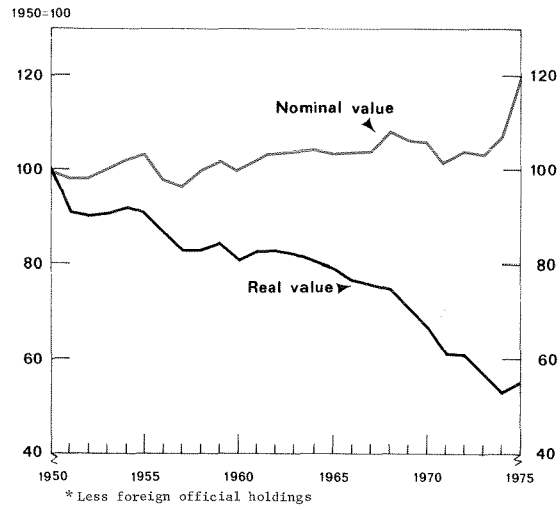
Some recent evidence of the wealth effect

A common economic adage tossed out when discussing the effect of inflation on the value of financial assets is that debtors gain and creditors lose. Considering the nominal and real (deflated) value of the federal government's outstanding debt to the private sector, this adage appears to have held painfully true in recent years. If we consider the par value of all privately held public debt, that is, public debt held outside of the Federal Reserve and government agencies, less the portion of public debt held by foreign official institutions, we see that federal government indebtedness to the private sector has increased by 20 percent from 1950 to mid-1975 in nominal (par value) terms but declined by 45 percent in real terms. (See Chart II.) To obtain the real value of privately held public debt we have deflated the nominal par value series by the consumer price index. In real terms this measure of privately held government debt fell from $271 billion in 1950 to $147 billion in 1975.

Although a series on the market value of privately held public debt is not available, we can readily argue that our observation on the decline in real value is understated by way of the fact that interest rates have risen significantly since the 1960's, reducing the market value of privately held public debt. In the early to mid-1960's the long-term U.S. Government bond rate moved between 4 and 5 percent, but moved up to 7 percent in the first half of the 1970's.

Chart II

Real and Nominal (Par) Value of Privately Held Public Debt*



*Less foreign official holdings

The losses suffered by the private sector in the government securities market found little solace in the activities in the equities market. Between 1965 and 1974 the Standard and Poor's Combined Index of 500 stocks fell by 6 percent, but when deflated by the consumer price index fell by 41 percent.

Rises and falls in the general price level should be viewed as the consequence of the attempts of the private sector to adjust their holdings of *real* money balances. If real money balances are greater than desired the private sector can only restore real money balance equilibrium by pushing up prices, reflected in their excess demand for real goods. While short-run changes in the prive level may be influenced by exogenous forces, such as a rise in imported oil prices, the long-run trend in prices is closely related to the long-run trend in money growth.

If we consider the aggregate wealth portfolio

of the private sector in this light we notice that the monetary authorities greatly influence the quantity of nominal money balances held. Through their influence on the holdings of nominal money balances they cause the private sector to respond to deviations between desired and actual *real* money balances by bidding up or down prices. These actions in turn cause changes in the value of real private financial wealth and the savings behavior of the private sector.

Personal savings and inflation

A cursory look at the data would suggest that there is a positive although not always contemporaneous relationship between the personal savings rate and the rate of inflation. As inflation accelerated in the 1970's over the 1960's, the personal savings rate out of disposable personal income rose from about 6 percent to around 7¾ percent. Personal savings as measured as a percent of gross national product similarly increased from 4.1 percent in the Sixties to 5.4 percent in the Seventies. During these two periods the average annual rate of growth in the CPI went from 2.5 percent to 6.7 percent.

The acknowledgment that the personal savings rate is sensitive to inflation is reflected in the recent statement by Federal Reserve Governor Henry Wallich.

> Personal savings in recent years have amounted to about one-third of total savings. They have varied with the business cycle but have otherwise been fairly stable at about 5% of GNP. At the present time, personal savings have tended to rise above these long-term savings rates, probably reflecting concern of savers about the stability of their jobs, inflation-induced uncertainty about future living standards, and an effort to make up for the loss in the purchasing power of past savings. As inflation abates and the economy recovers, personal savings, if precedent is a guide, are likely to move back to their long-term rate.[2]

In order to more clearly understand the relationship between inflation and savings behavior we must make the distinction between anticipated and unanticipated inflation. Perfectly anticipated price inflation to which people have had time to adjust should be reflected in the current allocation of disposable income and have no effect on future allocations. For example, a perfectly anticipated price inflation is a tax on real money balances which would cause us to reduce real money demand and increase goods demand. However, this perfectly anticipated inflation would have no effect on future allocations because the anticipated inflation is already reflected in current spending decisions and market interest rates.

Unanticipated inflation, or "surprise inflation" may, on the other hand, have a significant short-run effect on spending decisions. Unanticipated inflation represents an unanticipated decline in the real purchasing power of personal disposable income and in real wealth. This increased uncertainty in the value of personal income and wealth causes consumers to retrench on their spending decisions and increase their precautionary savings balances. This argument would lead one to conclude that the larger the unanticipated inflation, the greater the personal savings rate, while the larger the anticipated inflation the lower the saving rate.

In order to obtain rough estimates of anticipated and unanticipated inflation we have relied on Irving Fisher's theory of the relationship between nominal (market) interest rates and anticipated inflation. Simply stated this relationship is

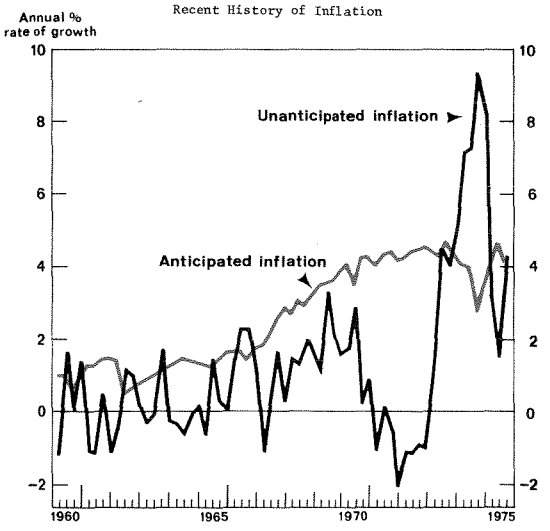
$$r_t = rr_t + \left(\frac{\dot{p}}{p}\right)^e_t \qquad (4)$$

where r_t is the observed market rate of interest, rr_t the "real rate of interest," and i.e. $(\dot{p}/p)^e_t$ the expected or perfectly anticipated rate of inflation. The observed rate of interest will equal the real rate only when prices are not expected to change.

In order to obtain an estimate of anticipated inflation equation (4) was used. The nominal market interest rate estimate was provided by using Standard and Poor's high grade bond yield. Standard and Poor's composite dividend yield was used as an estimate of the real interest rate. Subtracting the dividend yield from the high grade bond yield provides us with a crude approximation of anticipated inflation.[3]. This estimate of anticipated inflation was then subtracted from the actual rate of inflation, our

Chart III

Recent History of Inflation



measure being the CPI, thereby obtaining an estimate of the unanticipated rate of inflation.

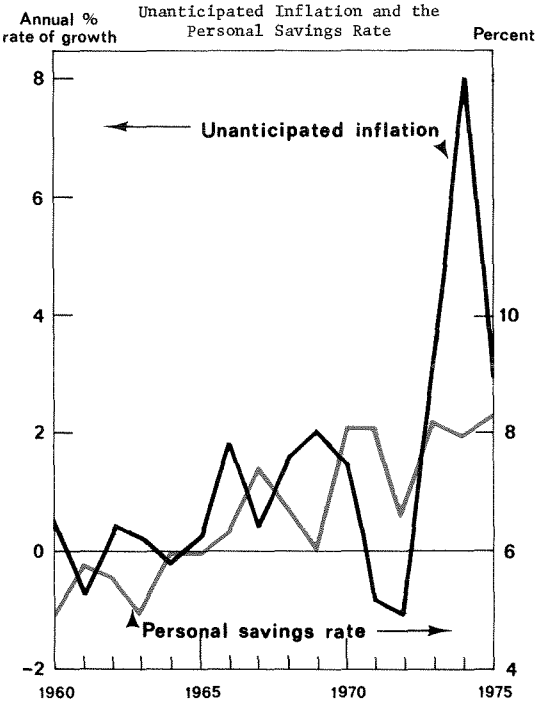
Chart III plots our measures of anticipated and unanticipated inflation. During the first half of the 1960's anticipated inflation went from about one to two percent. In mid-1967 anticipated inflation grew rapidly and reached four percent by 1970, after which it appeared to stabilize between 4 and 5 percent.

A look at the unanticipated inflation component displays how the public gradually learned to adjust to price rises. From 1960 to 1967 unanticipated inflation averaged less than one-half percent and then rose to an average 2.2 percent from 1968 to the third quarter of 1975, indicating that a large element of the recent inflationary experience was unanticipated. During the early 1970's people began to anticipate price changes with some degree of accuracy and unanticipated inflation fell, actually becoming negative in 1971 and 1972 during the period of wage and price control. After that, however, actual and unanticipated inflation sky-rocketed, the latter exceeding 9 percent in 1974. This rise in unanticipated inflation is a major reason for the average personal savings rate in excess of 8 percent from 1973 to 1975.

There is also some solid statistical evidence to support the positive savings effect of unanticipated inflation and the negative savings effect of fully anticipated inflation. Juster and Wachtel have found that for the period mid-1954 to mid-1971 a one percent rise in unanticipated inflation would increase real ($1958) savings per household by $21.50.[4] A one percent increase in fully anticipated inflation, on the contrary, decreased real savings by $15.10 per household. Chart IV displays the movements in the savings rate and unanticipated inflation since 1960. While these two series do not always move together contemporaneously, the average personal savings rate has moved up significantly during the 1970's as the average rate of unanticipated inflation has increased. These results suggest that there is an important empirical as well as theoretical distinction to be made between fully anticipated and unanticipated inflation when discussing the effects of inflation on personal savings.

Chart IV

Unanticipated Inflation and the Personal Savings Rate



Summary

The attempt by consumers to maintain a desired relationship between real income and real wealth has resulted in a rise in the personal savings rate in the 1970's. The rise in unanticipated inflation from the mid-1960's is one reason for the rise in the personal savings rate. The only period in the 1970's which saw a significant decline in the personal savings rate was the same year, 1972, in which unanticipated inflation fell. The personal savings rate in 1975 will average in excess of 8%. This savings rate can only be expected to decline when there is a prolonged decline in unanticipated inflation.

FOOTNOTES

1. The article by Kurt Dew in this issue explores in more detail the economic arguments lying behind a desired income-wealth relationship.

2. Statement by Henry C. Wallich, Member, Board of Governors of the Federal Reserve System, before the Joint Economic Committee and the Senate Select Committee on Small Business, Washington, D.C., November 21, 1975.

3. For a more detailed discussion of this use of the Fisher equation see Michael Keran, "Inflation, Regulation and Utility Stock Prices"; *Bell Journal of Economics* (forthcoming, Spring 1976) and S. B. Gupta, "The Portfolio Balance Theory of the Expected Rate of Change of Prices," *Review of Economic Studies,* April 1970.

4. "Inflation and the Consumer," F. Thomas Juster and Paul Wachtel, *Brookings Papers on Economic Activity,* No. 1, 1972.

The Term Structure of Interest Rates and Inflation Uncertainty

Rose McElhattan

Term structure is the name applied to the pattern of yields on securities which differ only in their term to maturity. There are rather obvious reasons why market yields on different securities should not be the same, aside from maturity dates. Among the more important factors would be default risk, tax considerations, differences in coupon rates and marketability. Very simply, term-structure theory concentrates upon why securities which are alike in all respects, except in their term to maturity, should provide different market yields.

Term-structure theory can be used to explain the spread between long- and short-term interest rates or to explain the determinants of a long-term rate of interest. In this paper, we focus upon the latter application. Our analysis concentrates upon the functional specification and estimation of a long-term interest rate, specifically the new-issue corporate bond rate.

The term-structure theory used in this paper is the preferred-habitat model first proposed by Modigliani and Sutch in 1966.[1] More recently, Modigliani and Shiller have shown that the measurement of the term structure, based upon this theory, can be significantly improved when explicit allowance is made in the original Modigliani-Sutch equation for two additional factors, designed to measure the expected value of future inflation and the market's uncertainty about the future course of interest rates. The purpose of this paper is to make an addition to the Modigliani-Shiller equation which is in keeping with the preferred-habitat theory. We introduce into the term structure model a factor designed to measure the impact of changes in uncertainty about the future course of price inflation on the risk premium.

Our findings support the contention that the determinants of the risk premium, at least the systematic part of the risk premium estimated in the term-structure equation, can be explained by factors designed to measure inflation uncertainty and the uncertainty with which market participants foresee future interest rates. We conclude that inflation uncertainty has been a significant determinant of the term-structure risk premium—at least since the latter part of 1954 when our estimation period begins. A corollary is that changes in inflation uncertainty have changed the cost of capital investment, and that monetary authorities should begin to consider the influence of their policy actions on inflation uncertainty. The rest of this paper is devoted to a brief review of term-structure theory, the findings of Modigliani and Shiller, the extension of the model to cover inflation uncertainty, and our empirical results.

Theories of the term structure

The theory of the term structure is not a settled matter, as is seen from the principal models advanced to explain the relationship. Major models of the term structure include the pure-expectations, the liquidity-premium and the market-segmentation theories. Modigliani

and Sutch combined major elements of each of these to provide a theory of the term structure which they refer to as the preferred-habitat version of the expectations model, or simply the preferred-habitat theory. We will briefly review these several theories, since the term-structure equations in this paper are based upon the basic postulates of these models.

Pure Expectations Theory. The pure-expectations theory begins with the assumption of a perfect or free market in securities—that is a market in which there are no default risks and no transaction costs, and in which securities are free of all other features which would lead one investment to be preferred to another, such as tax and call features, different coupons or marketability. In short, securities will be alike in all particulars except in their maturity dates. In this market, it is assumed that the behavior of each participant is motivated by the desire to maximize profits. The theory also asserts that although market participants do not know what actual interest rates will materialize in the future, they do form expectations of what future short-term rates will be, and they hold to these expectations with complete confidence. In such a market, an investor will be able to obtain the same yield, for a given holding period,[2] regardless of whether he purchases a security with a maturity date equal to the desired holding period, or any combination of maturities which he may hold over the same period. It follows that under such circumstances, the structure of yields on different securities can be explained by a very simple relationship—the current yield on a long-term bond of a given maturity is an average of the current short-term rate and all future expected short rates over the term to maturity.

The Liquidity Premium Theory. The liquidity premium theory modifies the above assumption of complete confidence in one's forecasts of future rates. This theory asserts that market participants form expectations of future rates but are uncertain about what actual rates will materialize, believing that future rates actually may turn out to be above or below their current expectations of these rates. Once uncertainty of future interest rates is introduced in the model, purchases of a long-term security will involve a risk of capital gain or loss over the holding period of the bond. The model further asserts that market participants are risk averters—that is, investors prefer to assume less risk rather than the chance of greater risk for a given expected return. Or, put another way, investors will assume more risk only if they anticipate greater expected returns. The twin assumptions of uncertainty and risk aversion imply that lenders of funds will prefer to purchase short-term investments in order to avoid the risk of capital loss associated with holding longer-term securities. Borrowers, on the other hand, generally have a strong preference for borrowing long, since borrowing is typically undertaken to finance long-term projects and borrowers wish to hedge against risk of fluctuations in interest costs. The theory concludes that if investors are to hold long-term securities, they must be compensated for the risk of capital loss which they assume. Under this theory, long-term rates will be greater than that implied by the pure-expectations theory by this risk or liquidity premium.

Market Segmentation Theory. The market-segmentation theory criticizes the above assertion that risk-aversion produces only a positive compensation for risk which must be paid to holders of long-term securities. This theory emphasizes that investors have different maturity preferences, and that some lenders prefer long-term rather than short-term investments. Investors, such as life-insurance companies or pension funds, are concerned with guaranteed certainty of income over the long run, and risk aversion on their part would lead to a preference for long-term securities. Other investors such as commercial banks would prefer to protect themselves against the risk of capital loss on securities, and would thus prefer to invest in short-term securities. In its extreme form, this model holds that regardless of the relative interest rate, investors will never shift out of their preferred markets. Accordingly, the yield struc-

ture is determined by the pressure of supply and demand within each of the segmented markets, since securities of different maturities constitute noncompeting groups.

Preferred Habitat Theory. The preferred-habitat model combines elements of all of the above theories. The current yield on a long-term bond of a given maturity is considered an average of the current short-term rate and all future expected short-term rates over the term to maturity. However, risk premiums must be taken into account. Different transactors are assumed to have different maturity preferences, with risk aversion leading a market participant to stay in his maturity habitat, unless other maturities offer an expected premium sufficient to compensate for the risk and cost of moving out of one's preferred maturity. According to this theory, the long term rate is expressed as an average of current and expected short term rates plus a risk premium, which may be positive or negative and which can vary with different maturities.

Modigliani-Shiller formulation

The securities whose yields are described in the term structure should be alike in all respects except in term to maturity. Accordingly, Modigliani and Shiller (MS) considered the relationship between the AAA corporate bond rate and the 4-6 month prime commercial-paper rate. The preferred-habitat theory leads one to express the AAA corporate bond rate as an average of current and expected future commercial-paper rates and a factor expressing a risk premium. Since expected nominal rates of interest can be expressed as equal to expected real rates of return plus the expected rate of inflation, MS express the expected commercial paper rate as the sum of the expected real rate and the expected rate of inflation. In their model of the formation of expectations, MS contend that market expectations of future values are based on the history of past values of the variable in question. Therefore, expected values in the term structure model can be replaced with weighted functions of current and past actual values. Specifically, the relationship implied by the preferred-habitat model can be written as:

$$R_t = \sum_{j=0}^{N} w_j I_{t-j} + \sum_{j=0}^{N} v_j P_{t-j} + K_t \qquad (I)$$

R = long term bond rate

I = real interest rate

P = rate of change in prices

K = risk premium factor

The model implies that the sum of the price weight (Σ v) should be unity, since if past rates of inflation remained constant over a sufficiently long time, the expected future rate should tend to coincide with it. By the same reasoning, the sum of the real interest rate weights (Σ w) will be unity. However, Modigliani and Shiller assert that the sum of the weights, w, may fall somewhat short of unity if the short term rate is expected eventually to regress toward some long-run normal level. In this latter case, the sum of the weights on the real interest term would be less than unity, and a constant positive value would be added to the equation.

Since the real rate of interest in equation I is not directly observable, MS eliminate the real rate from the equation by replacing it with the nominal rate less the rate of inflation (r − P), which leads to the following equation:

$$R_t = \sum_{j=0}^{N} w_j r_{t-j} + \sum_{j=0}^{N} v^*_j P_{t-j} + K_t \qquad (II)$$

where: r = nominal short term interest rate

$v^* = v - w$

The value of the sum of the newly defined inflation weights (Σ v*) should be zero if the sum of the weights w is unity, or should be close to zero in the case where the sum of these weights implies an expectation of a return to a long-run normal rate of interest.

Next, MS represent the risk factor, K, by a constant term and by a measure of the variation of the short-term interest rate over the recent past. The variation in the short-term rate is considered a reasonable measure of uncertainty

regarding expected future rates. That is, the greater the variation observed in the short-term interest rate in the recent past, the greater is the probability that the actual future rate may differ from the expected rate. The variation in the short-term rate was measured by MS by an 8-quarter moving standard deviation of the commercial-paper rate. Finally, for estimation purposes, we are able to express the MS equation in the following manner:

$$RCB_t = c + \sum_{j=0}^{N} w_j RCP_{t-j} + \sum_{j=0}^{N} v^*P_{j\ t-j} + RCPSD_t + u_t \quad \text{(III)}$$

where: RCB = AAA corporate-bond rate

c = constant term

RCP = 4-6 months commercial-paper rate

P = rate of change in the price deflator for consumption in the MIT-Penn-SSRC (MPS) quarterly econometric model of the U.S. The deflator differs from the Implicit Price Deflator for consumption in the NIA accounts in that consumption in the MPS model includes depreciation and net imputed rent on consumer durable goods which are excluded from the NIA calculation.

RCPSD = 8-quarter moving standard deviation of RCP

u = stochastic error term

N = 18 quarters

The length of the distributed lag is 18 quarters for both the commercial paper rate and the rate of inflation. The coefficients of the 17 lagged values are estimated by Almon's polynomial technique, while the current value of each variable is estimated separately. This method was used by MS, since this appeared the best way to capture the shape of the lag distribution implied by a combination of extrapolative and regressive elements in the formation of expectations, as suggested by deLeeuw. We continue this method in all the equations in this paper, unless otherwise stated.

Modigliani and Shiller's estimation results are reported in equation 1, Table 1. MS found a good fit for their equation over the period 1955.3-1971.2, with a standard error of 12.7 basis points. The equation was able to account for 99 percent of the variation in the long rate, and the form and the sum of the weights of the lag structures conformed to the MS model of the formation of expectations. However, the Durbin Watson statistic for this equation is quite low (1.01), which indicates the presence of positive serial correlation in the error term and suggests the exclusion from the equation of an explanatory variable in determining the spread between the short and long interest rates.

Removing serial correlation

One factor which may affect the AAA corporate bond rate and which is excluded from equation I is the favorable tax status of seasoned bonds represented in the AAA corporate bond rate. Because coupon-seasoned issues sell at a discount below par, the holder has a proportion of his interest income taxed as a capital gain. With tax rates on capital gains considerably below those on ordinary income, bondholders should prefer seasoned issues to new issues of corporate bonds. The favorable tax status of seasoned bonds, therefore, might be an added influence on the yield spread. For this reason, we re-estimated the basic MS equation, using for the long-term rate the new issue corporate-bond rate—rather than the AAA corporate-bond rate—in the hopes of reducing if not removing the serial correlation. The results are presented as equation 2 in Table 1.

First, the Durbin Watson statistic of 1.83 implies the absence of serial correlation, which supports our contention that the favorable tax status of seasoned bonds is a factor affecting the term structure estimation. Next, the remaining estimation results are consistent with the original MS findings, and support the preferred-habitat model description of the term structure. Specifically, the equation is able to account for

Table 1

Estimated Term Structure Equations

Eq. No.	Period of fit	Dependent Variable	Constant	RCPSD	PSD	RCP Current	RCP Sum of* Lagged Coeff.	P Current	P Sum of* Lagged Coeff.	$\bar{R}^2$	D.W.	S.E.
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1	1955.3—	RCB	.726	.24	—	.265	.691	.022	.137	.993	1.01	.127
	71.2		9.68	2.00		8.28	15.02	1.16	2.21			
2	1954.4—	RCBNI	.724	.529	—	.304	.553	.069	.271	.987	1.83	.175
	71.2		7.52	3.75		10.02	11.06	2.91	4.30			
3	1954.4—	RCBNI	.513	.391	.258	.316	.583	.045	.264	.987	1.84	.169
	71.2		3.93	2.62	2.30	10.63	11.66	1.78	4.33			
4	1954.4—	RCBNI	.793	.666	—	.313	.553	.042	.193	.899	1.88	.160
	65.4		2.62	3.92		6.44	6.91	1.18	2.38			
5	1954.4—	RCBNI	—.172	.323	.625	.332	.769	.014	.180	.928	2.38	.136
	65.4		—.479	1.91	3.85	8.02	8.74	.383	2.65			
6	1954.4—	RCBNI	—	.338	.571	.328	.733	.012	.175	.929	2.33	.134
	65.4			2.05	4.96	8.23	16.29	.383	2.61			
7	1966.1—	RCBNI	—4.28	.822	—	.170	2.98	.123	—1.62	.982	2.88	.168
	71.2		—.88	1.40		1.02	1.44	1.65	—1.00			
8	1966.1—	RCBNI	—2.82	.743	.605	.190	2.18	.147	—.946	.987	3.51	.145
	71.2		—.664	1.46	2.26	1.32	1.20	2.25	—0.665			
9	1966.1—	RCBNI	—	.717	.632	.168	1.02	.176	—.241	.987	3.41	.141
	71.2			1.45	2.44	1.23	2.18	3.71	—.747			

Definition of Variables and Sources

RCB = AAA Corporate Bond Rate

RCBNI = New issue rate, AAA Utility Bond. *Federal Reserve Bulletin,* Table A36. Data begins in 1960. Before 1960 the series was extended backward using an unpublished new issue series for all corporations compiled by the Federal Reserve.

RCP = Commercial Paper rate. *Federal Reserve Bulletin,* "Money Market Rates, Prime Commercial Paper 4-6 Months." Quarterly averages of monthly figures.

RCPSD = 8-quarter moving standard deviation of RCP.

P = Annual rate of change in the price deflator for consumption in the MIT-Penn-SSRC Econometric Model of the U.S.

PSD = 8-quarter moving standard deviation for PSD.

*Method of estimation = Almon Third Degree Polynomial Distributed Lags, constrained to be zero at the left-hand tail of the distribution, 17 quarters.

S.E. = Standard error of the equation.

D.W. = Durbin Watson statistic.

R^2 = Adjusted Correlation Coefficient.

The first line of numbers represents estimated coefficients; the second line represents the t-statistic of the coefficients.

about 99 percent of the variation in the long rate and, considering the greater variation in the new-issue rate as compared to the seasoned-bond rate, the fit is very close. The equation predicts the new-issue rate with a standard error of only 17.5 basis points for the entire sample period. The sum of the coefficient of the commercial-paper rate is less than unity, and the sum of the coefficients (v), which represents the weights in the formation of price expectations, is 1.20 (the sum of the coefficients in columns 3 through 10)—slightly higher than the 1.12 estimated by MS.

The estimated lag distributions for both the commercial-paper rate and the inflation rate also conform to the MS model of expectations; both indicate that there is a combination of extrapolative and regressive elements in the formation of expectations of future rates. That is, extrapolative elements form expectations when a rise in current rates leads to an expectation of a further rise and vice versa. Regressive expectations hold when the market expects the interest rate to regress toward a "normal" level based on past experience. The relatively high weight on the current values of the commercial-paper rate and inflation rate, followed immediately by lower weights, implies that the market expected some continuation of recent trends followed by a return towards prevailing past levels. In light of these results, we will use the yield on newly issued securities rather than the AAA seasoned corporate-bond rate to represent the long-term rate in the rest of this paper.

Introduction of inflation uncertainty

As noted earlier, the determinants of the risk premium in the basic MS equation are represented by the standard deviation of the commercial-paper rate, while other factors which may be important in determining the risk premium are captured in the constant term or the error term. However, in the spirit of the model, which considers changes in interest and inflation rates separately, we introduce the standard deviation of the rate of inflation over the recent past.

The variation in past inflation rates is intended to account for that portion of the risk premium due to the uncertainty with which market participants view the future course of inflation. We have measured this variation by an 8-quarter moving standard deviation of the rate of change in prices. As noted above, this is the same function used to estimate the uncertainty surrounding the commercial-paper rate. This variable was introduced into the basic model and the results are presented as equation 3, Table 1.

This measure of inflation uncertainty is statistically significant, with a t-statistic of 2.3. The introduction of this determinant of the risk premium reduces the standard error of the equation by a small but statistically significant amount. The inclusion of the inflation uncertainty variable also reduces the value of the constant term, which as we noted above captures some of the risk elements not specifically mentioned in the equation. Once we explicitly introduce the standard deviation of the rate of inflation into the equation, we reduce the importance of the constant term. In addition, some of the risk premium due to inflation uncertainty had been captured by the standard deviation of the commercial-paper rate, and the coefficient of this latter term decreases once inflation uncertainty is expressly considered in the estimation. This was to be expected since changes in the standard deviation of the commercial paper rate had captured changes in the uncertainty with which the market foresees both future real rates of return and rates of inflation. When we introduce the standard deviation of the rate of inflation as a separate determinant, changes in the variation of the commercial paper rate are left to reflect only changes in uncertainty about future real rates of interest. There are only minor differences in the other estimated coefficients.

Inflation uncertainty as risk element?

The significance of the variation in inflation might reflect our economic experience since the mid '60's. Prices and the variation in the rate of inflation have been advancing rapidly since

then, which suggests that changes in inflation uncertainty have been only a relatively recent phenomenon in the term-structure risk premium. The model was therefore tested over the shorter time span from 1954.4-1965.4, before the recent rapid advance in prices began.

The term structure equation was estimated without including the standard deviation of the inflation rate as seen in equation 4 in Table 1—and then by including that measure (equation 5). In this earlier period, the fit of the equation is significantly improved when the variation in the inflation rate is included in the explanation of the term structure. The correlation coefficient increases from .90 to .93, and the standard error over the sample period is reduced from 16.0 basis points to 13.6 basis points. Also, the coefficient of the inflation standard-deviation variable is very significant, having a t-statistic of 3.85. Once this inflation risk factor is included, the constant term becomes insignificant. Apparently, during this period, the risk premium in the term structure can be explained basically by two factors—the uncertainty surrounding the future expected course of interest rates and the uncertainty surrounding the future expected rate of inflation.

When we drop the constant term from equation 5, the significance of the two standard-deviation variables increases, as shown in equation 6. The t-statistic for the standard deviation of the commercial-paper rate increases from 1.91 to 2.05, and the significance of the standard deviation of the inflation rate increases from 3.85 to 4.96. These results indicate that, far from being a recent and novel phenomenon, the uncertainty with which the market foresees future expected inflation has been an important determinant of the term structure in the past.

Stability in the term structure equation

Some interesting comparisons are evident between the two overlapping periods. Comparing equations 3 and 5, we note that the coefficient of the standard deviation of the commercial-paper rate shows little change, unlike the standard deviation of the inflation rate. A given change in the standard deviation of the inflation rate commands a higher risk premium during the 1954.4-1965.4 period than over the period as a whole. The constant term also behaves quite differently in the two equations. It is significant over the entire sample period, but insignificant over the shorter period.

This behavior suggests that we may have improperly identified the determinants of the term structure for the 1954.4-1971.2 period with equation 3. Important differences may arise concerning the contribution of some or all of the determinants between the earlier period (1954.4-1965.4) and the later time span (1966.1-1971.2). In testing this hypothesis, we found that a statistically significant difference had occurred between these periods, and that equation 3 failed to portray the changing relationship between the long rate of interest and its determinants.[3]

We also tested equation 2, the basic MS type equation, and found that it failed to pass the statistical test for structural stability for subsets of its coefficients. In particular, for equation 2, we could not accept the hypothesis (at the 5 percent level of significance) that the estimated Almon-distributed lag coefficients for both the commercial-paper rate and the inflation rate remained unchanged over the two periods 1954.4-65.4 and 1966.1-71.2. Hence, neither representation of the term structure—the MS type function (equation 2) or the extended version with an added inflation-uncertainty term (equation 3)—remained unchanged over the full sample period.[4] In short, when one functional relationship is estimated over a span of time, in this case from 1954.4-71.2, it is assumed that the estimated specification remains unchanged in different sub-periods within the entire time span. If this assumption is put in the form of a statistically testable hypothesis, which is then rejected, we can only infer that significant changes have taken place in the estimated relationship between the sub-periods which are not captured in our estimates. We would therefore be misled by the estimated relationship if we used its results to interpret the importance of particular

variables in the determination of long-term interest rates for the entire period.

Term structure estimates for 1966.1-71.2

Since statistical tests indicated a significant change had occurred in the term-structure equation between the two periods, 1954.4-65.4 and 1966.1-71.2, we report the term structure estimates for the latter period, also. The results are shown in equations 7, 8 and 9 in Table 1.

First, as mentioned above, the statistical test applied to the MS type equation 2 revealed that a significant difference had occurred between the two sub-periods in the estimates of the distributed-lag coefficients for both the commercial-paper rate and the inflation rate. These differences can be observed by comparing equations 4 and 7. In equation 7, the sum of the weights for the commercial-paper rate is 3.15, while we would expect them to sum to unity, or close to unity, as they did in the earlier period (equation 4). Also in equation 7, the sum of the coefficients for the rate of inflation is –1.5, rather than close to zero as expected. However, none of the estimated coefficients in equation 7 are statistically significant. It appears, therefore, that during the period from 1966.1-71.2, the MS-type specification of the term structure does not support the preferred-habitat model or the MS model of the formation of expectations, although the opposite is true for the earlier estimation period.[5]

Equation 8 reports the results of adding the standard deviation of the inflation rate to the basic MS type equation. We find that the addition of the inflation uncertainty measure adds significantly to the determination of the new-issue corporate-bond rate; the t-statistic of the estimated coefficient is 2.26. The addition of this term has also changed the significance of the current rate of inflation (column 9). The coefficient of the current inflation rate is .147 and its t-statistic is 2.25. Along with the standard deviation of the inflation rate, this is the only other variable which is statistically significant in the determination of the long rate.

We concluded above that the standard deviation of the commercial-paper rate and inflation rate appear to account for the entire term-structure risk premium in the 1954.4-65.4 period. We therefore estimated the term structure model over the 1966.1-71.2 period without the constant term, which was statistically insignificant. The results are reported in equation 9, Table 1. Dropping the constant term leads to an estimated regression more in line with what we would expect. For example, the sum of the lagged coefficients of the commercial-paper rate is closer to unity (1.19) and the sum of the lagged coefficients of the inflation rate closer to zero (–.065) than in the previous two equations. However, the standard deviation of the commercial paper rate remains statistically insignificant in determining the risk premium during this time. These results imply that the term-structure risk premium over the 1966.1-71.2 period was basically due to inflation uncertainty.[6]

Finally, the sample period was ended in 1971.2 because wage and price controls went into effect in 1971.3 and remained in effect until the spring of 1974. Thereafter, prices were materially affected by the oil crisis. One would expect that, after 1971.3, other factors in addition to past history would be material in the determination of prices. Our preliminary results with later quarters included in the sample substantiate this inference. Since we are interested in testing the preferred-habitat model and the model of the formation of expectations, we chose to end the sample period in the second quarter of 1971, as did Modigliani and Shiller.

Conclusions

In this paper, we have reviewed the preferred-habitat model of the term structure. This theory is based upon the hypothesis that the long-term rate of interest is an average of expected future short-term rates plus a risk premium—and that expectations are primarily dependent upon the history of interest rates and rates of inflation over several past years. The major conclusion is that the Modigliani-Shiller specification of this term-structure model can be significantly

improved with the introduction of inflation uncertainty as an element determining the risk premium.

We further found that a significant change had occurred in the term-structure equations between the two periods, 1954.4-1965.4 and 1966.1-1971.2. In the earlier period, 1954.4-1965.4, the term-structure risk premium could be accounted for by variables designed to measure the uncertainty surrounding expected future interest rates and inflation rates. However, in the latter period, 1966.1-1971.2, inflation uncertainty remained the only statistically significant determinant of the risk premium. Overall, it appears that uncertainty costs with respect to inflation have been a significant factor in the determination of long-term interest rates since 1954.4.

FOOTNOTES

1. Bibliography given in accompanying column.

2. Holding period refers to the length of time between purchase and sale of a security by an investor, regardless of the maturity.

3. In a recent paper referenced in the bibliography Benjamin Klein addressed the question of whether price changes have been more predictable since the mid-1950's than previously. Klein's data extended back to the 1880's. He concluded that, "although variability in the annual rate of price change is now relatively low, long-term price unpredictability is significant and the uncertainty costs associated with the current inflation no longer seem to be trivial." Our regression estimates are consistent with this conclusion at least as far as we have attempted to measure the impact of changes in inflation uncertainty upon the term structure risk premium.

4. The MS equation 1 was also tested for structural stability over the two periods, 1955.3-65.4 and 1966.1-71.2 and the hypothesis of overall structural stability (Chow test) was rejected at both the 5 and 1 percent levels of significance.

5. Equation 1, the MS equation using the AAA seasoned corporate bond rate as the long rate, was estimated over the 1966.1-71.2 period and only the constant term was statistically significant, with other results similar to those reported in equation 7.

6. Reestimation of equations 7, 8 and 9 to correct for negative serial correlation did not change our conclusions.

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The Capital Market Crowding Out Problem in Perspective

Kurt Dew

The large Federal deficit of 1975-76 has inspired a critical debate. The issue—to what extent does deficit-inspired Treasury borrowing replace or "crowd out" private borrowing in U.S. credit markets? Private borrowing is crowded out in one sense whenever an increased Federal deficit inspires the Treasury to raise an additional dollar in the market for private savings. For that matter, when *any* borrower enters this market with an increased need for funds, other borrowers must compete more keenly, and pay more for available savings. In this way, credit is rationed and savings increased. The presence of the Treasury in the credit markets is the direct effect of fiscal policy upon interest rates, but there are indirect effects of fiscal policy upon interest rates as well.

This paper, like other discussions of crowding out, attempts to consider the totality of the Federal Government impact upon capital markets. To do this we analyze two time periods over which government policies may have distinct effects upon capital markets—the short run and the long run. By short run effects, we mean the temporary effects of government policies to reduce the impact of a recession—policies whose effects would be neutralized by other policies at other stages of the business cycle. An example would be a recessionary Federal deficit, which would be offset by a surplus at the peak of the business cycle. Long run policies, on the other hand, are at work through all stages of the business cycle. Examples would include the average rate of growth in the money supply over a decade, or the tendency of the Federal budget to be in deficit throughout the business cycle.

In the first part of the paper we analyze the long-run effects of fiscal policy upon capital markets. From these conclusions, we move to a discussion of the effects of short run fiscal stimulus upon an economy in the depths of a recession. The strength of the short-run impact of fiscal stimulus upon economic growth is still a matter of debate among economists. We therefore present two extreme positions—first the argument that fiscal policy has no impact upon economic growth, then the argument that fiscal stimulus is essential to promote recovery from a recession. In each of these two cases, we consider the implications of the assumed behavior of the economy for capital markets and for the central issue—the question of crowding out. This leads to some interesting conclusions about the use of fiscal policy.

The long run fiscal policy effects

To analyze the long run effects of fiscal policy upon capital markets we consider a permanent increase in the average level of government borrowing. In our analysis, we draw an extended analogy, comparing the long run effects of increased government demand upon the market for capital to the long run effects of increased government demand upon the market for current production.

What is the long term effect of government entry into the marketplace? Economists are generally agreed that if the government increases its expenditures, the long term rate of real economic growth remains unaffected. That is, fiscal policy cannot permanently raise the aggregate demand for goods and services in

either real or nominal terms. If government expenditures increase permanently, the eventual effect will be that government expenditures will replace, or "crowd out" an equal quantity of private expenditures, leaving the rate of growth in GNP unchanged. The basis for this proposition is that over the long term, GNP growth depends upon things more fundamental than fiscal and monetary policy, such as technology, individual tastes, and the supply of factors of production. The long-run neutrality of fiscal policy effects upon GNP growth also has implications for the effects of fiscal policy upon inflation. Since fiscal policy cannot increase aggregate demand over the long term, it also cannot increase the rate of inflation.

If fiscal policy has a neutral effect upon GNP, it also has a neutral long-run effect upon capital markets. That is, a permanent increase in government borrowing may not permanently increase the rate of growth in private saving. Private saving will remain unchanged from its long-term trend regardless of the extent of government borrowing. When increases in government borrowing are neutral, in the sense that they have no effect upon the rate of increase in private saving, a permanent increase in government borrowing will necessarily create an equal reduction in private investment. Interest rates must therefore play a long term role similar to prices. An increase in government borrowing has no long term effect upon interest rates because it is offset by an equal reduction in private investment, leaving the long term net demand for savings unchanged.

Unlike the government expenditure effect, a long-term increase in the rate of monetary expansion does have an effect upon prices. Prices go up, bringing the real value of money balances in line with long term trends in GNP growth. Since money growth determines the long term growth in prices, monetary policy alone can increase nominal GNP. Similarly, while a permanent increase in government borrowing does not raise interest rates over the long term, a permanent increase in the rate of monetary expansion does raise interest rates permanently. This is a result of the well-known Fisher effect. A permanent increase in the rate of money growth leads to a permanent increase in the expected rate of inflation and therefore to an increase in interest rates, so that savers may retain the purchasing power implicit in their interest payments.

This analysis leads to some reasonable conclusions about the long-term realities of crowding out in capital markets. First, a permanent increase in government borrowing does not permanently increase interest rates. Instead, there is a permanent decrease in the level of private investment at old rates of interest. In other words, although increased government borrowing in the long run crowds out an equal amount of private investment, this crowding out does not result in higher rates of interest, although the government share of private saving is permanently increased. On the other hand, a permanent increase in the rate of monetary expansion does increase interest rates via the Fisher effect.

These conclusions appear to fly in the face of much of the current analysis of the crowding-out question. Often in these analyses—where the focus is on the short rather than the long run —responsibility for increases in interest rates, and therefore for crowding-out, is laid at the feet of tight monetary policy rather than easy fiscal policy. The argument is that with sufficient monetary expansion, increased government borrowing need not lead to increases in interest rates and therefore need not create crowding out in capital markets.

Indeed, analysts of the crowding out question frequently base their arguments on one of two options: (1) assume the Federal Reserve will decide to create sufficient credit through monetary expansion to hold short-term interest rates low, so that crowding out *will not* occur; or (2) assume the Fed, out of concern for inflation, will stick to a money growth path insufficient to hold interest rates down, so that crowding out *will* occur.

Our analysis suggests that interest rate increases are, over the long term, a poor measure

of the effect of government borrowing on private borrowers' share of the market for private savings. Government borrowing does not create crowding out at higher interest rates; rather, government borrowing leads to a reduction in the private share of national savings at the old rates of interest. Therefore, those authors who consider deficits as placing upward pressure upon interest rates and monetary policy as placing downward pressure upon rates refer to short-run phenomena, rather than long-run phenomena.

Short term crowding out

While the long-term effects of government borrowing upon capital markets may be clear, the short-term effects are not. Private savings and investment depend upon three basic variables: (1) the current level of income, (2) wealth, or the present value of the flow of future consumption, and (3) interest rates, a cost to investors, but a return to savers. Roughly speaking, interest rates are the relative prices that bring about the desired balance between present income and wealth to be used in the future, while investment measures the amount of present expenditure for the purpose of increasing wealth.

Short run crowding out depends upon the relative levels of savings and investment—and ultimately upon the underlying economic variables that affect savings and investment.

We consider first the effects of the variables income and wealth upon savings and investment, and also their effects upon interest rates. We consider two cases (1) a temporary decline in income with wealth unchanged, and (2) a decline in wealth with income unchanged.

If income should decline unexpectedly, due to some outside "shock" that did not affect wealth, what would happen to capital markets? Without some additional assumptions, we are not sure. Savings will decline and so will investment, but without knowledge of the relative magnitude of these declines, we cannot be certain of the effect upon interest rates. In this circumstance, it is reasonable to suppose income and wealth to be "normal" goods. That is, when income declines, individuals attempt to maintain their current consumption, at the expense of investment, thereby depressing interest rates. Savings will decline as well, due to the combined effects of falling interest rates and falling income.

The effect of an unexpected decline in wealth with income unchanged is in some respects similar to the effect of a decline in income. Both savings and investment will decline. But again, because income and wealth are normal goods, the decline in investment will not be sufficient to return the relative price of income to its old level. The rate of interest must increase.

Capital markets are simply the place where people trade to adjust their claims between income and wealth. If the resources of an economy are reduced, either through a reduction in present production or through a reduction in capacity to produce in the future, individuals will reduce their holdings of both present and future income. The source of the initial reduction, be it income or wealth, will become relatively more expensive thereafter, until income and wealth are returned to their old balance. In sum, an unexpected decline in income tends to reduce interest rates, while an unexpected decline in wealth increases interest rates.

This construction gives us a framework for determining the short term effects of fiscal policy upon capital markets, and helps lay bare the different views of economic behavior that lead economists to disagree upon the question of crowding-out. But the analysis skirts some critical questions. For example: (1) Is a recession simply a decline in income, or does wealth decline as well? (2) What are the effects of monetary and fiscal policy upon the levels of income and wealth?

It would be easier to discuss the relevance of crowding out if we could be sure of the role of wealth in the U.S. economy and the effect of government policies upon it. Unfortunately, it would also be presumptuous to do so. We will consider crowding out within the context of two poles of current opinion, but will find that these

two extremes have an unfortunate property—one cannot look at the data and tell which is the correct point of view. We shall suppose that the economy is separated into three entities: the household, which earns, spends and saves; the firm, which organizes production and distributes capital; and the government, which spends, taxes and borrows.

Alternative 1: *"Deficits do not spur economic growth"* In a world so defined, consumers and producers behave rationally given the information at their disposal. Their desires are communicated easily and efficiently through signals transmitted in various markets. Through the prices they accept and the quantities they trade, market participants express their accurate judgment of the amounts of each item they wish to buy and sell, given limitations on their various resources. A summary measure of the availability of future resources to the consumer is his wealth, the capitalized value of the income he expects to receive in the future. Wealth plays an important role in consumer behavior in this world where deficits do not "work." It contributes stability to the economy. When income declines temporarily in a recession, individuals react by cutting their spending less than they would if the decline in income were permanent. They cut spending relatively little because the wealth upon which the spending decision is based depends upon future income as well as present income. The recession is not expected to affect income permanently. Since consumers base their spending decisions upon wealth, consumption declines less than income and helps to increase demand for present goods and services.

This phenomena is the primary force that accounts for the economy's natural tendency to *bring itself* out of a recession. In this world, a federal deficit cannot help the recovery because deficits do not increase total wealth. A deficit is government borrowing to be paid out of future taxes. That is, the government borrows, gives the proceeds to taxpayers, and pays for the debt incurred out of future tax revenues. As a result, lower present taxes are purchased at the expense of higher future taxes, leaving the taxpayer with more income during the deficit, but less income as the deficit is repaid. Over the long haul, the taxpayer breaks even, so that a deficit does not increase wealth.

Example of an impotent deficit

Consider the case of a consumer who expects a disposable income (income after taxes and transfer payments) of $200 per year in perpetuity. Out of this income, he consumes $180 and saves $20. Now, as a result of a recession, he experiences a one year decline in income, say to $150. Since this decline is temporary, he nonetheless expects to receive $200 in succeeding years. Our consumer realizes he is going to be worse off, but sees no reason to bear the entire brunt of his misfortune in the present. He therefore decides to borrow $29 from past savings and consumes his entire income (now $179) in the present, reducing his future consumption by enough to replace his savings. Assuming his repayment schedule is to be $1 per year in perpetuity, he will consume $179 henceforth out of an income, net of interest payments, of $199. His consumption expenditures in the present have risen from $150 to $179, a natural force for recovery from the recession. However a tax cut would *not* affect this consumer's current consumption expenditures. Suppose he received an extra $29 tax cut at this point. He knows the government borrowed to pay him this $29, so that he will owe $1 more in taxes each year to repay the government loan. This $29 tax cut enables him to pay off his previous loan and to replace his $1 interest payment with a $1 increase in taxes. His reduced private borrowing is replaced by government borrowing in the same amount. He still spends $179 per year now and in the future. Crowding out has occurred because his private demand for savings has been replaced by an equal amount of government demand for savings. Interest rates would remain unchanged, however, since total net borrowing is unchanged.

In this example, the consumer has already expressed his preference for present and future income in the marketplace for savings and investment. In fact, in this example the consumer, in effect, "saves" his entire tax reduction. But if the consumer saves the entire proceeds of the deficit, the deficit will have no effect upon spending—and it was to increase spending that the deficit was incurred in the first place! The deficit is impotent.

In this world larger government deficits do nothing except perhaps ease the lot of elected officials. Consumer spending decisions are unaffected. It is worth noting, however, that while government borrowing replaces private borrowing in this world, there is no effect upon interest rates. For every dollar the Treasury borrows, consumers save an extra dollar. The amount of savings available to private borrow-

ers is the same as it would have been without a deficit.

Crowding out is important in this scenario. Crowding out definitely occurs in the sense that for every dollar borrowed by the government, the private sector reduces its net borrowing by a dollar. But interest rates are unaffected. In essence, the private sector simply replaces a net loan from itself with a loan from the government. This loan takes the form of reduced taxes, and is repaid in the form of higher future taxes. In sum, this short-run analysis has the same implication about a deficit's neutral effect upon GNP and interest rates as the long-run analysis does.

Alternative 2: *"Deficits are important"* There is another way to look at the world—a way that views fiscal stimulus as very important. This cosmology has been framed by Axel Leijonhufvud.[1] He posits a crucial role for government deficits in the smooth running of an economy, based on the view that a recession is a communications failure. In this world, the firm is a creature of the moment. During a recession the firm tends to ignore the possibility of future pressure upon capacity in deciding upon current capital expenditures. When use of capacity is low, this myopic firm does not take advantage of low interest rates to borrow ahead for future expansion needs. It waits until its sales approach its productive capacity before entering bond and equity markets to fund capital outlays. If the recession is not a permanent condition, this decision is irrational, since it increases the eventual cost of capital to the firm.

The consumer, according to Leinjonhufvud, may be guilty of this same sort of myopia. He does not reduce wage demands as rapidly as the firm reduces its desires for labor, because he is not aware that reduced desires for labor are a prevalent condition, rather than simply a phenomenon peculiar to his own employer. Furthermore in contrast to the consumer of the first cosmology, he believes the recession-induced decline in income to be permanent. The result of this myopia is disastrous. Because producer and consumer see the recession as permanent, they lower their expectations of future income or wealth and make spending decisions accordingly. As a result of this lowering of planned spending, the recession becomes permanent!

This permanent decline in income has an interesting property. If consumers and producers could be persuaded that a decline in income and spending is temporary, it would in fact be temporary. Thus they need some outside force to increase their incomes. In the right circumstances, an increase in income will be seen as permanent and therefore *will* be permanent, since the economy has the ability to sustain such an increase once it is set upon the right track. This is the critical role of the deficit. When a tax cut increases income temporarily, the effects of the added future taxes are not important, because the consumer expects his income to rise to a greater extent than his tax bill, thereby making him better off despite the extra tax payments. An example of the behavior of a consumer in Leijonhufvud's world helps to clarify this notion.

Example of an effective deficit

Consider the consumer of example 1. He expects to make $200 per year in perpetuity. A recession reduces his income to $150. Because he views this reduction as permanent, he considers himself to be permanently poorer. He therefore reduces spending. His new level of spending is consistent with lower total wealth and lower income. There is no reason to expect this economy ever to return to the old level of income. At this point we suppose the government introduces a $50 tax cut, raising the consumer's disposable income to its old $200 level. Since the myopic consumer views this increased income as permanent, he revises his plans and assumes a permanent flow of income of $200. He will be slightly disappointed since his taxes will go up to some extent to repay the government borrowing—his future disposable income will actually be about $199 per year, the same as the consumer in the first example—but he will be far better off than he would have been, had there been no tax cut.

Crowding-out is more a problem in the Leijonhufvud cosmology than in the world of impotent deficits. The deficit in our second example is a large one, sufficient to restore the consumer to his old level of disposable income, but $20 of this increase in disposable income is saved, so that only $30 of the deficit is required in additional savings to support it. Interest rates will therefore rise to induce the additional savings.

In the world where deficits matter, crowding-out in the form of higher interest rates is a serious possibility. Indeed, a tax cut serves to increase present income, but it has no direct effect upon wealth. As indicated earlier, in the case of increased income with wealth unchanged, interest rates will rise, bringing a recovery to a premature halt. In this circumstance it is necessary to induce an increase in wealth as well, to convince the consumer that his increased income is permanent. This goal may be accomplished through expansion in the money supply, since money is part of total wealth. For this reason Leijonhufvud gives monetary policy an important role in government anti-recession policy. As the quantity of money expands, wealth increases and future taxes decline because of reduced government borrowing from the private sector. As wealth increases relative to income, interest rates fall, and the recovery is under way.

Who is right?

With differences of opinion of this magnitude, one would expect that by looking at the behavior of the economy during a recession, we could draw some broad conclusions about the comparative strength of the two opposing positions. Unfortunately this is not an easy matter. First, fiscal policy is "automatically" stimulative during a recovery. Indeed, a large part of the increased deficit during a recession has little to do with the policy maker's intent to stimulate the economy, but is rather a consequence of the structure of pre-recession legislation governing Federal payments and receipts. This "automatic" portion of the deficit occurs largely because of the decline in tax receipts associated with the recessionary decline in income, and because of increased expenditures associated with various measures intended to reduce the burden of unemployment. In our first world, where this stimulus does not matter, it also does not harm the recovery. The damage done is long term—the government share of private saving is permanently increased. In other words, the recovery behaves *as though* it occurred as a result of fiscal stimulus (which actually had no effect) and monetary stimulus (which does affect income indirectly through its effect upon wealth).

In the second world, where income increases *because of* fiscal and monetary stimulus, government's share of savings is increased through a deficit-financed tax cut, but the level of private investment is actually higher than it would otherwise be. Fiscal and monetary policy have permanently increased both income and wealth, and have therefore increased private saving enough to leave plenty of added savings for the private sector. Although the government slice of the savings pie is greater, the pie itself has grown through fiscal and monetary stimulus.

What's a policy-maker to do?

This picture of the uncertain effects of fiscal stimulus seems to leave the policy-maker very much at sea. To leave this impression would be unjust. In fact, the choice of policy at any given time is less doubtful than the above analysis suggests because the risks involved in being "wrong" about the effects of fiscal stimulus are far from symmetrical. If the Alternative 1 is correct—i.e., deficits are not stimulative—and we choose Alternative 2, no important adverse effects will occur. Households will simply reduce private borrowings by an amount equal to the Government deficit. However, if Alternative 2 is correct—i.e., deficits are stimulative—and we choose Alternative 1, there will be a more severe recession than otherwise. In this circumstance the sensible policy response is to assume deficits are stimulative and reduce taxes in a recession. What is needed is a balanced government budget or surplus at the peak of the business cycle to reduce the long-term government demand for private savings to its prerecession level.

Furthermore one important assumption underlying the theory that fiscal policy does not stimulate recovery is actually mistaken. Government borrowing implicit in fiscal policy is not a perfect substitute for private borrowing. The risks involved in a loan from one private citizen to another are greater than the risk of

lending to the U.S. Government. As a result, private lending is accomplished only at a higher rate of interest than public borrowing. The substitution of fiscal policy for private borrowing works to reduce the interest cost of transferring funds from saver to spender.

Summary and conclusion

We have considered the issue of crowding out in both the long term and the short term. In the long term, we adopt the common assumption of a "neutral" effect of fiscal policy upon private savings behavior. Given this assumption, we have found that persistent deficits would indeed retard private capital accumulation. However, this crowding out would not be reflected in higher interest rates. Thus deficit crowding out of private investment in capital markets is entirely analogous to the crowding out of private expenditures by those of the government.

In contrast, our analysis suggests that the short-term effects of fiscal policy upon capital markets and interest rates are uncertain. We examine two polar cases: (1) where the deficit provides no assistance in speeding an economic recovery and (2) where without a deficit there is no momentum provided by the economy itself to recover. We discover the unfortunate fact that, given the policy decisions of fiscal and monetary policy to be stimulative, it is impossible to tell which of these two possibilities is correct. Nonetheless, our analysis suggests that under the worst circumstances (fiscal policy impotent) there is no damage in short-run fiscal stimulus) while under the best circumstances there is much to be gained. In the depths of a recession, fiscal stimulus is well advised. But to avoid long-term damage, it is equally necessary to reduce this stimulus as the economy recovers, balancing recessionary deficits with surpluses during periods of economic health.

FOOTNOTES

1. Leijonhufvud, Axel, *On Keynesian Economics and the Economics of Keynes.* New York: Oxford University Press, 1968. Clower, R., and Leijonhufvud, A., "The Coordination of Economic Activities: A Keynesian Perspective, *American Economic Review, Papers and Proceedings,* May 1975.