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INFLATION AND REAL INTEREST

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I. INADEQUACIES OF FISHER'S THEORY

THE theory of interest under inflation needs further investigation. Irving Fisher's analysis, which concluded that the money rate of interest rises by the anticipated rate of inflation or falls by the anticipated rate of deflation, was subjected to attack by Keynes: "The mistake lies in supposing that it is the rate of interest on which prospective changes in the value of money will directly react, instead of the marginal efficiency of a given stock of capital."[1] Fisher himself seems to have had misgivings about the *empirical* reliability of his explanation and presented evidence suggesting that the adjustment of money interest was only partial, concluding:

When the cost of living is not stable, the rate of interest takes the appreciation and depreciation into account to some extent, but only slightly, and, in general, indirectly. That is, when prices are rising, the rate of interest tends to be high but not so high as it should be to compensate for the rise; and when prices are falling, the rate of interest tends to be low, but not so low as it should be to compensate for the fall.[2]

Later he showed that the real rate of interest was much more variable than the money rate and conjectured that:

Men are unable or unwilling to adjust at all accurately and promptly the money interest rates to changed price levels. . . . The erratic behavior of real interest is evidently a trick played on the money market by the "money illusion" when contracts are made in unstable money.[3]

Thus Fisher found verification for a theory of *partial* adjustment of money interest to

[1] *General Theory*, p. 143.

[2] *The Theory of Interest* (New York, 1930), p. 43.

[3] *Ibid.*, p. 415.

inflation and deflation but none for his own theory of *complete* adjustment under foresight. And to attribute the discrepancy between theory and reality solely to lack of foresight is to raise doubts about the nature of the evidence that would be required to reject the theory.

The theory presented in this paper is more consistent with Fisher's empirical observations than his own theory, for it shows that anticipated inflation or deflation is likely to raise (lower) the money rate of interest by less than the rate of inflation (deflation) itself. It is also consistent with Keynes's theoretical criticism of Fisher, yet paradoxically retains the concept of an equilibrium interest rate uninfluenced by unanticipated once-for-all changes in the quantity of money.

II. INFLATION AND THE DISCREPANCY BETWEEN REAL AND MONEY INTEREST RATES

To analyze the problem I shall utilize the apparatus invented by Lloyd Metzler in his celebrated article, "Wealth, Saving, and the Rate of Interest."[4] It is assumed that wages and prices are flexible, that full employment is continuously maintained, and that the share of profits in full employment income is constant. Wealth is assumed to be held in money and shares, the real value of the latter being real profits capitalized at the going real interest rate. It is further assumed that real investment depends on the real interest rate and real saving on real balances and that wealth-holders divide their assets between money and securities in a proportion which depends on the money rate of interest.

Under these conditions the equilibrium

[4] *Journal of Political Economy*, LIX (April, 1951), 93–116.

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interest rate is determined by the intersection of two schedules, in some respect analogous to the Hicksian *LM* and *IS* curves (see Fig. 1). The *IS* schedule plots the locus of pairs of values of real interest rates and real money balances along which saving is equal to investment. Its slope is positive because an increase in the real interest rate lowers investment, causing a deflationary gap, while an increase in real balances lowers sav-

The *LM* schedule gives the locus of pairs of money interest rates and real money balances that is consistent with equilibrium in the money market. This schedule has a negative slope because asset-holders divide their wealth between money and securities in a proportion that depends on the opportunity cost of holding money, which is the *money* rate of interest. Thus at high money rates of interest the demand for real balances is low,
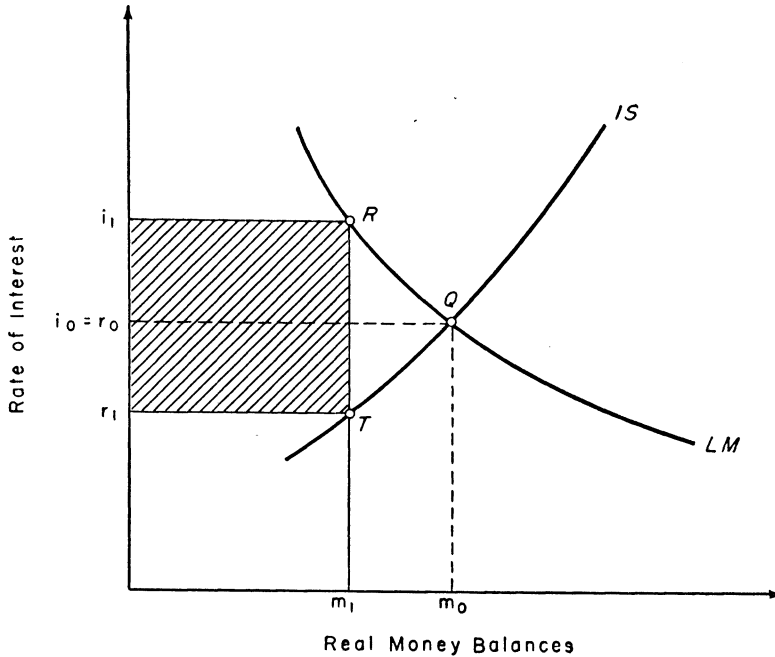

FIG. 1

ing, causing a compensating inflationary gap. Thus, an increase in the real interest rate would have to be associated with an increase in real balances[5] in order to maintain equality between real saving and real investment. Points above and to the left of *IS* would be points of deflationary pressure and points below and to the right of *IS* would be points of inflationary pressure.

[5] Wealth changes along *IS* by less than the change in real money balances since the real value of equities moves in inverse proportion to the real rate of interest; the *wealth* effect along *IS* is therefore less than the *real balance* effect, though it is still in the same direction.

and at low money interest rates the demand for real balances is high. Only along *LM* are people content to hold the existing stock of real money balances. Above *LM* there is excess liquidity and below *LM* there is deficient liquidity.

The *IS* and *LM* schedules intersect at Q, which determines the equilibrium interest rate, $r_o = i_o$, and the equilibrium stock of real money balances, m_o. Only at Q is the desire to save equal to the incentive to invest, the demand for shares equal to the supply of shares, and the desire for real money balances equal to the existing stock of real

money balances. Q is the equilibrium at which the price level is constant and, therefore, the equilibrium at which real and money interest rates are the same.

III. THE FALL IN REAL INTEREST UNDER INFLATION

Let us now consider the effects of anticipated inflation on the equilibrium. Inflation creates a discrepancy between money interest rates and real interest rates equal to the rate of inflation. This discrepancy widens the difference between the nominal earnings of shares and the return on money because the rate of depreciation of money (the inflation rate) must be added to the real return on shares to get the total cost of holding money.[6] Since the LM schedule is derived on the basis of a *money* rate of interest (as that measures the true cost of holding money), it follows that the LM schedule, as a function of the *real* rate of interest, shifts downward, at any given level of real balances, by the rate of the inflation. In the figure, for example, at the inflation rate RT the community would wish to hold the stock of real money balances m_1 only if the real interest rate were r_1 and the nominal interest rate were i_1, the difference being the rate of inflation RT. Thus, the entire schedule LM, which is fixed as a function of the *money* rate of interest, shifts downward, as a function of the *real* interest rate, by the rate of inflation.

Consider now the IS schedule. From any given point on the schedule an expected inflation, at a given nominal rate of interest, will create a divergence between the productivity of investment and the return on saving equal to the inflation rate, for a dollar borrowed at a given money rate of interest will yield a normal real return plus the rate of appreciation in value of goods, which corresponds to the rate of inflation itself. To

maintain equality between saving and investment at any given rate of inflation, the nominal interest rate must therefore rise by the rate of inflation. In the figure, for example, the point T on the IS schedule gives a pair of values of real interest rates and real money balances at which saving is equal to investment at a zero rate of inflation. But if the expected inflation rate were RT, a *money* interest rate of only r_1 would create a discrepancy between investment and saving. Only if the nominal interest rate were increased to i_1 would investment and saving be equal at the level of real balances, m_1. The IS schedule therefore remains fixed, as a function of the *real* rate of interest, but is raised by the amount RT, as a function of the *money* rate of interest.

The ingredients of the solution are now established. If we interpret the ordinate of the figure as the *real* rate of interest it becomes necessary to shift the LM schedule downward by the anticipated rate of the inflation, while the IS curve is unaltered. If, on the other hand, the ordinate is taken to refer to the *money* rate of interest, the IS schedule must be shifted upward by the rate of the inflation, while the LM curve remains fixed. More simply, it is sufficient to take account of the discrepancy between the real rate of interest (for which the existing IS curve applies) and the money rate of interest (for which the existing LM schedule is appropriate), the discrepancy being the rate of the inflation.

The inflation itself is generated by monetary expansion in excess of growth. The rate of excess monetary expansion is equal to the rate of inflation, RT. The real rate of interest falls[7] from r_o to r_1, while the money rate

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[6] The following discussion of the demand for money under inflationary conditions has been helped by the works of Philip Cagan, "Monetary Dynamics of Hyperinflation," in *Studies in the Quantity Theory of Money*, ed. M. Friedman (Chicago, 1956), pp. 25–117; and Martin Bailey, "Welfare Cost of Inflationary Finance," *Journal of Political Economy*, LXVI (1956).

[7] The change in the rate of interest that results from the anticipation of inflation is a "permanent" change in the sense defined in my "Public Debt, Corporate Income Taxes and the Rate of Interest," *Journal of Political Economy*, LXVIII (December, 1960), 625 n. Recently Metzler's model has been subjected to further investigation, extension, and criticism (see George Horwich, "Real Assets and the Theory of Interest," *Journal of Political Economy*, LXX [April, 1962], 157–70; for references and a criticism of the monetary dynamics inherent in the sys-

of interest rises from i_o to i_1. Real money balances are reduced from m_o to m_1 as a consequence of the shift in expectations, and real investment and real saving are both higher than in the inflationless equilibrium. The shaded area measures the depreciation of existing money balances.[8]

IV. CONCLUSION

I have argued that the money rate of interest rises by less than the rate of inflation and therefore that the real rate of interest falls during inflation.[9] The conclusion is

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tem), but despite objections it seems to me that Metzler's system retains its essential utility, especially for "comparative statics" purposes.

[8] If the new money issued were spent by the government on goods, the *IS* schedule would shift upward, whereas if it were spent on securities the *LM* schedule would shift downward: the rise in money interest will be greater than that shown in the diagram in the former case and smaller in the latter instance. The textual treatment has avoided these complications by postulating (implicitly) changes in the money supply unaccompanied by any physical *quid pro quo* to the government, a procedure that is probably justifiable for purposes of isolating the theoretical effects of pure inflation, even though it be lacking in institutional foundation.

[9] Charles Kennedy, in his "Inflation and the Bond Rate" *Oxford Economic Papers* (October, 1960), pp. 269–74, interprets the "Keynesian" solution as an unchanged bond price, an interpretation that does not seem to me to take account of the word "directly" in the passage I have quoted in the introduction. I have tried to show that the change in money interest can be interpreted as being due to a shift in the marginal efficiency schedule as a function of *money* interest, or as a shift in liquidity preference as a function of *real* interest, the former being the solution Keynes presumably had in mind.

based on the fact that inflation reduces real money balances and that the resulting decline in wealth stimulates increased saving.[10] Real conditions in the economy are altered by the purely monetary phenomenon. The evils or benefits of inflation cannot be attributed solely to the failure of the community to anticipate it.[11]

Foreseeable fluctuations in the rate of inflation can thus have very real effects on economic activity. When prices are expected to rise, the money rate of interest rises by less than the rate of inflation giving impetus to an investment boom and an acceleration of growth. Conversely, when a rise in prices is expected to end, there occurs a stock market slump, a rise in the real rate of interest, and a deceleration of growth.

[10] Although the analysis has concentrated on the division of wealth between money and equities, it can also be expected to apply to an economy in which wealth is held in other forms. Arbitrage will bring relative earnings of bonds in line with the money rate of interest (under the conditions of certainty implied in the theoretical analysis) and "cost-of-living" bonds (an instrument used in many countries accustomed to inflation) will yield a nominal return equal to the real rate of interest plus the rate of inflation. Similarly, foreign exchange will yield a return equal to the rate of inflation, as the domestic exchange rate depreciates, though the initial stock adjustment is complicated by the highly liquid attributes of foreign exchange, which imply that the flight from domestic money will be partly into foreign exchange.

[11] Cf. A. P. Lerner, "The Inflationary Process— Some Theoretical Aspects," *Review of Economics and Statistics*, August, 1949; reprinted in *Essays in Economic Analysis* (London, 1953): "What is harmful about inflation is not the rise in prices but the failure to anticipate and offset them" (*Essays*, p. 330).