Inflation and the Rate of Interest*

As early as 1802 a theory about the connection between the rate of interest and inflation was developed by Henry Thornton. In his book entitled "An Enquiry into the Nature and Effects of the Paper Credit of Great Britain", he argued that, with an interest rate of 5 per cent, which the Bank of England was prevented from exceeding by the laws against usury, and supposing the borrower could expect to obtain a rate of profit higher than 5 per cent, the volume of credit would expand excessively. The note circulation, he said, would grow faster than was desirable, and the price level would rise. This price rise would by no means remove the incentive to further excessive borrowing. In Thornton's own words: "It seems clear that when the augmented quantity of paper shall have been for some time stationary, and shall have produced its full effect in raising the price of goods, the temptation to borrow at five per cent will be exactly the same as before... The amount of circulating medium alone will have altered, and it will have simply caused the same goods to pass for a larger quantity of paper".[1] It seems clear from Thornton's exposition that, in his opinion, inflation would continue so long as the interest rate lay below the profit rate.

Thornton perceived still another connection between the interest rate and inflation. In 1811 he spoke in the House of Commons on the report of the "Bullion Committee". According to an account which he gave of this speech, referring to himself in the third person, he said that a person who in 1800 had borrowed £1000 at 5 per cent and paid the loan back in 1810 would, on account of the price rise which in this period had amounted to between 20 and 30 per cent, have paid a real interest rate of two or three per cent.

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* This is the text of one of the author's Horowitz Lectures delivered in Israel in the spring of 1973.

1 Henry Thornton, *An Enquiry into the Nature and Effects of the Paper Credit of Great Britain*, 1802, ed. 1939, with an Introduction by F. A. v. Hayek, p. 255 f.

Hence the borrower made an extra profit which provided an additional incentive to borrow. "Accordingly, in countries in which the currency was in a rapid course of depreciation... the current rate of interest was often, as he believed, proportionably augmented. Thus, for example, at Petersburgh, at this time, the current rate was 20 or 25 per cent, which he conceived to be partly compensation for an expected increase of depreciation of the currency".[2]

Thornton was thus the originator of the two theories about the connection between inflation and the rate of interest, which are still discussed at the present time. The first theory, which concerns the effect of the interest rate level on inflation, is usually associated with the name of the Swedish economist Wicksell. And the second which deals with the converse relationship, i.e. with the effect of inflation on the level of the interest rate, is usually linked with the name of the American economist Irving Fisher. The main task I have set myself for this lecture is to merge these two theories into a single model.

I want, however, first to make some remarks about the results of certain empirical investigations concerning the second problem, i.e. the effect of inflation on the interest rate.

1. Empirical Investigations

A great deal of work has been done by econometricians in the attempt to determine empirically whether inflation influences interest rates and, if it does so, with what time lag. Irving Fisher had already made such an investigation. A more recent study, using highly sophisticated methods, is that published by Yohe and Karnosky in the Review of the Federal Reserve Bank of St. Louis.[3] The two authors have summarised the results of their investigation as follows: "The principal finding is that past price movements exert a major effect on nominal interest rates, with the effect largely manifested within two years. Consequently, most of the rise in the market interest rates since 1965 can be attributed to the current inflation".[4]

2 Henry Thornton, *loc. cit. Appendix*, p. 336.

3 William P. Yohe and Denis S. Karnosky, "Interest Rates and Price Level Changes, 1952-1969 », Federal Reserve Bank of St. Louis, *Review*, December 1969, pp. 18-38.

4 William P. Yohe and Denis S. Karnosky, *loc. cit.* p. 21.

The authors refer to a number of other studies that have been made. The results of these are widely different. According to one study inflation has no perceptible effect on interest rates, and according to some others it does have an effect but the time lag is exceedingly long. This last view seems to be that to which the majority of the studies lead. In this connection the authors of the article I have quoted mention an as yet unpublished result of an investigation undertaken, for the National Bureau of Economic Research, by Friedman and Schwartz. According to Yohe and Karnosky these investigations "found mean lags for short-term rates of about ten years and for long-term rates of 25 to 30 years, which they attributed to the 'slow and gradual adjustment of anticipations to the actual behaviour of prices'".

I have difficulty in convincing myself that inflation has absolutely no effect on interest rates; and I find it equally difficult to believe that the effect appears only after 10 or even 25 to 30 years. In any case, given the many and largely conflicting findings of the econometric investigations, it seems to me that we have little choice but to disregard these findings and to rely on theoretical analysis.

Before embarking on this analysis I shall give the results of an enquiry into another aspect of my subject, namely the way in which the Fisherian real rate of interest has moved in recent years. In making such an enquiry we are confronted by a number of questions, about which we have to decide more or less arbitrarily. One of them concerns what price index should be used for "correcting" the money rate of interest. I have used the consumers' price (or cost of living) index, which means that the results of my calculations are most closely representative of the situation seen from the side of the creditor. It must be remarked that we should obtain very different results if we used the wholesale price index or the index of the prices of industrial products. The second question we have to decide is how we should calculate the nominal rate of interest or yield on fixed-interest securities which we are going to "correct" with the price index. It seems most appropriate to choose the rate on long-term securities. And I have taken for the various countries the long-term interest rate, or yield, at the beginning of each year as given in the official statistics and have "corrected" it with the rate of price increase during the year. The figure thus obtained represents the real rate of interest which is earned on the security during the year.

The most significant results of my statistical investigation are the following. In the United States the real rate of interest moved between a maximum of 3.33 per cent in 1961 and a minimum of —0.49 per cent in 1971 (this being the only negative figure). In five years out of twelve the rate was less than two per cent. In Switzerland, during the same twelve years, the real rate was negative in seven of them and in all but one lay below two per cent. In the Federal Republic of Germany the real rate was never negative in these twelve years, but it fluctuated between a maximum of 6.45 and a minimum of 2.10 per cent in 1971. But what seems to be particularly significant, is that the calculations for all three countries indicate that it is not so much the nominal interest rate which is affected by the rate of inflation as the real rate, which invariably falls when the rate of inflation increases and rises when it decreases.

Now, the real rate of interest calculated *ex post* does not govern the decisions either of the borrowers or of the lenders. What are important for the decisions about the purchase or sale of securities are the *expectations* about price changes (these expectations being of course influenced by passed experience) along with the nominal interest rate. What the figures I have mentioned do, however, go to show is that the expectations have been far from accurate. For, had they been accurate, we should surely have obtained a set of figures in which the real rate of interest rate was more stable than the nominal rate and not the other way round. That the actual relationship between the two rates took the form it did, does not of course imply that the expectation of inflation had absolutely no influence on the level of nominal interest rates. And certainly most economists are of the opinion that the high level of nominal interest rates in the second half of the sixties was largely due to what may be regarded as an inflationary component in those rates.

I turn now to my main object: that of trying to weld the Wicksellian and Fisherian theories into a single model.

2. Linking the two Theories: Wicksell's and Fisher's

The theory which Thornton had outlined was developed in much greater detail, almost a century later, by Wicksell. In his exposition a positive differential between the interest rate which would exist under conditions of price stability — i.e. what he called

the "natural" rate — and the rate actually charged by the banking system will lead to a cumulative inflationary process, which will come to an end when this differential disappears. And the Thornton-Wicksell theory has been further elaborated and refined in the subsequent literature. The Swedish economist Lindahl suggested that the profit rate which is relevant in this connection is Keynes' marginal efficiency of capital or what has alternatively been called the marginal internal rate of return. And Myrdal has sought to make the concept more precise in view of the fact that capital goods are not all of the same durability. But the basic proposition of the theory has remained unchallenged.

Fisher's theory appears to have no connection with Wicksell's. It holds simply that, provided there is perfect foresight, an increase in the price level by p per cent will cause the money rate of interest to rise to p per cent above the rate that would have prevailed had the price level been stable, so that the loss in purchasing power of money claims will be compensated for by the higher interest rate. More precisely, if the rate of inflation is p per cent, a rise in the interest rate by the same percentage will compensate fully for the loss of purchasing power only if interest is compounded continuously, and the rise in the price level also takes place in a similarly continuous fashion. If interest is added at discrete intervals and the price movements are similarly calculated, then full compensation requires that the interest rate go up by $p+pr$ per cent, where r stands for the interest rate that would prevail under conditions of price stability. I shall here, however, follow the customary practice of using the approximate formula, according to which a rise in the interest rate of p per cent provides adequate compensation. This means that if, for example, the interest rate with a stable price level would have been 5 per cent and the price level is rising annually by 3 per cent, the interest rate has to be 8 per cent. An acceleration in the rate of inflation will of course cause the interest rate to rise still further. If, for example, the rate of increase in the price level reached 5 per cent, the interest rate would have to rise to 10 per cent.

Fisher's theory, always supposing we retain the assumption of perfect foresight, leads up to the notion of what may be called an "inflationary equilibrium". In order to explain what is meant by this, I shall start out by assuming an economy which is in dynamic equilibrium and is growing at a constant rate. National income,

net investment, consumption, the factor supplies, and so on, are growing from period to period by a constant percentage which we will denote by k. The money supply also grows at this same rate, so that the price level is kept stable. If we now imagine this economy moving into a state of inflationary equilibrium, what will distinguish it from the stable price model just described is simply that all the monetary magnitudes, including prices and wages, will be higher by the rate of inflation, of let us again say p, and that the interest rate will likewise be higher by p than the rate which prevailed in that model.

It is of course possible to construct much more complicated models of an inflationary equilibrium. All that interests us in our present context, however, is that in all such models the nominal interest rate will contain an inflationary component which fully compensates for the loss of purchasing power due to the inflationary process.

In Wicksell's theory there is no place for any such inflationary equilibrium. For that equilibrium implies, that, despite continuous inflation, there is equality both between the nominal interest rate and the nominal marginal efficiency of capital, and between the real interest rate and the real marginal efficiency of capital. This is in sharp contrast to Wicksell's theory, according to which the inflation would cease once such an equality had been reached.

In practice we cannot, of course, tell just how high the interest rate would have been had the price level been stable. Nevertheless we can be sure that in the recent past the long-term money rate of interest has not, at least in the industrialised countries, been high enough to compensate for the rate of inflation. When our calculations show that, in the sixties, the real rates of interest were frequently below 3 per cent or even negative, and that they were subject to wide fluctuations, we can be certain that these rates are far from being those that would have prevailed under conditions of price stability. We certainly have nothing approaching an inflationary equilibrium.

We may argue that the reason why, during periods of inflation, reality diverges so markedly from the "ideal" situation represented by the "inflationary equilibrium" is simply that the economic subjects do not, in fact, have the perfect foresight which the theoretical model assumes. However, this explanation, though a

perfectly valid one, takes us very little of the way towards the solution of the major problem which is that of discovering the factors that determine how the money rate of interest, Wicksell's natural rate and Fisher's real rate will be related to one another. It is the search for the solution of this problem that necessitates the welding together of the two theories: Wicksell's and Fisher's.

I should start out with the warning that the analysis I am going to present is subject to two limitations. First of all, it takes account only of what seems to be the most important of the many factors which may conceivably be responsible for the fact that the inflation is not sufficiently reflected in the interest rates. Secondly, it is based on an assumption which is unrealistic but which can hardly be avoided, namely the assumption that all of the economic subjects have identical expectations about the future rate of inflation. Only under this assumption is it possible for us to speak of the actual rate of inflation as corresponding to "the" expected rate of inflation. And only under this assumption can we, for example, say that, in a period of inflation, the nominal demand curve for credit can be obtained by shifting the real demand curve to the right by an amount which reflects the expected rate of inflation. Using the more realistic hypothesis of non-identical expectations would make the problem extremely difficult to handle. In any case that hypothesis excludes the possibility of a Fisherian inflationary equilibrium being reached. Indeed the model of inflationary equilibrium is implicitly based on the assumption of identical expectations.

Our task, then, is to show what determines by how much the money rate of interest will diverge from the "natural" rate (and from the real rate) when all the economic subjects have identical expectations about the rate of inflation. I shall again use for the sake of simplicity the model, mentioned earlier, of an economy which is growing at a constant rate of k per cent per unit period. And I shall suppose that, at a given date, the Central Bank of the country concerned decides to raise the rate of increase in the volume of cash placed at the disposal of the commercial banks from k per cent to $k+p$ per cent per unit period, so that the banks are henceforth enabled to expand the nominal volume of credit at a correspondingly higher rate.

I am now going to follow Wicksell in his assumption that the total volume of bank credit equals the money supply, an assum-

ption which is approximately true if we define the money supply as including time deposits. However, all that is strictly necessary for my argument is that the money supply should always expand at the same rate as the volume of bank credit.

I am going to treat four cases.

The *first* case is one where the borrowers do not expect any inflation at all. The volume of credit expands in this, as in all my other cases, by p per cent more than the k per cent which corresponds to the real rate of growth of the economy. As a result the rate of inflation that emerges is, in this and in the other cases, p per cent.

This first case is illustrated in Figure 1. MM is the supply curve for credit prior to the inflationary increase in the rate of credit expansion. It is (as is also the credit supply curve in each of the other diagrams) drawn as a vertical straight line, reflecting the assumption that the banks are always fully loaned up. (Our conclusions would, however, be essentially the same, had we assumed a curve that sloped upwards to the right). The supply of credit expands in the unit period by p per cent more than the k per cent which would be required in order to keep the price level unchanged. The new supply curve is M′M′. $\frac{MM'}{OM}$ is equal to p. LK is the

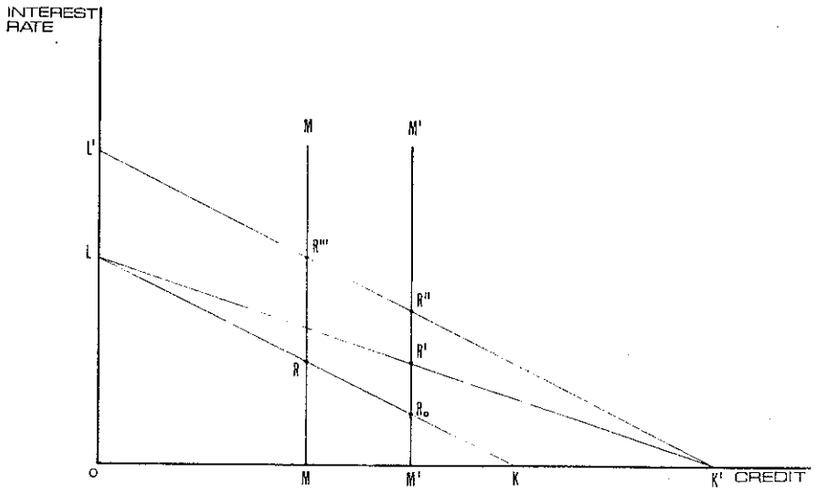

Figure 1

demand curve for credit. It is at all points k per cent to the right of the curve relating to the previous period. It does not shift further to the right than this since the borrowers are not expecting any inflation of the price level. The interest rate will fall to M′R₀. MR is the "natural" rate which would exist if there were in fact no inflation. The new money rate M′R₀ is below the natural rate. The "real" rate, calculated *ex post,* is lower by p than this new money rate; and it may be negative.

In our *second* case, the borrowers expect a price rise of p per cent or, that is, precisely the rise which actually comes about. This case, too, can be illustrated by Figure 1. As the result of the expectation on the part of the borrowers of a price rise of p per cent, their demand curve for credit shifts to the right by a corresponding percentage, giving the curve LK′. Here the interest rate M′R′ will be the same as the rate MR which would rule if there had been no inflationary expansion of credit. If the capital value of all loans were indexed in terms of the price level this interest rate of M′R′ (or MR) would in fact prevail. However, in the absence of indexing, the borrowers may expect to gain at the expense of the lenders (i.e. the holders of the bank deposits). As a consequence of the prospect of this special source of profit, the borrowers' demand curve for funds is raised all along by p per cent. We thus obtain

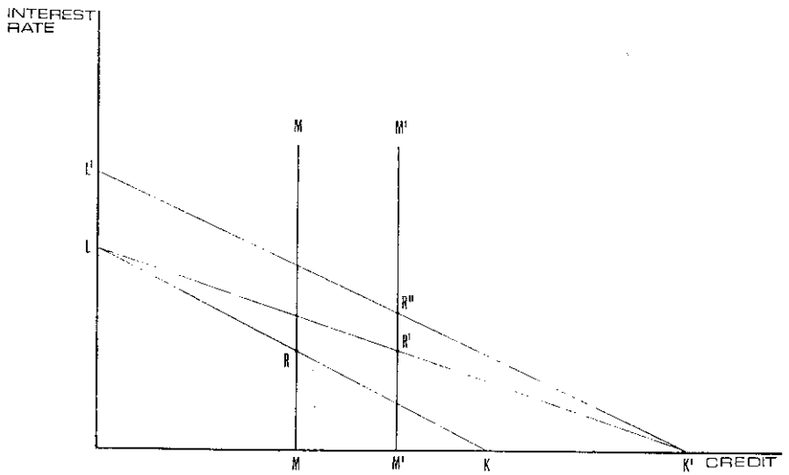

Figure 2

the demand curve L′K′. And the interest rate which finally emerges, the rate M′R″, will be exactly *p* per cent higher than the rate which would prevail in the absence of inflation. The real rate of interest, calculated *ex post,* is here equal to the natural rate. This case is that of "inflationary equilibrium". Here the borrowers do not make any profit out of the inflation.

Our *third* case is based on the assumption that borrowers expect a rate of price inflation of less than *p,* say *p-a,* per cent. This case is illustrated by Figure 2. The demand curve for credit shifts to the right by *p-a* per cent; and it also shifts upwards by *p-a* per cent owing to the borrowers' expectation that they will make a special gain, at the expense of the creditors, of *p-a* per cent. The new demand curve is thus L′K′. The money rate of interest which results from the situation here depicted can be below the natural rate or it can be above it but never by as much as *p* per cent. The real rate of interest, calculated *ex post,* will, just as in our first case, lie below the natural rate, and may even be negative. The debtors draw an advantage from an inflation that has proceeded at a rate higher than they expected.

The *fourth* case, where the expected rate of inflation is above the rate which actually occurs, does not need to be treated in detail. It is depicted in Figure 3. In this case the money rate of

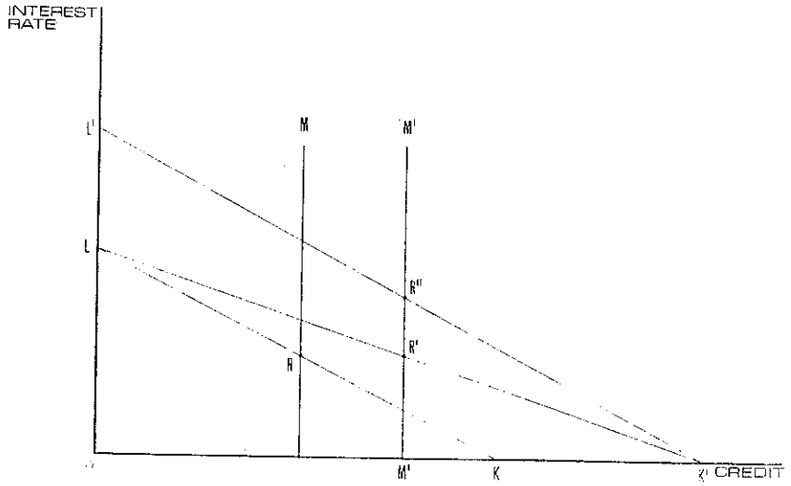

Figure 3

interest rises above the natural rate by more than the rate of price inflation. The debtors do not gain from the inflation, but lose. Such a situation can arise if, at a given date, the monetary authorities decide to follow a restrictive credit policy, so that the supply curve for credit, in the unit period concerned, shifts to the right by a smaller amount than in the preceding unit period, but for the time being the expectations of rising prices still persist.

I want now to call attention to three important differences between the assumptions underlying my four cases and those which Wicksell adopted in his analysis of an inflationary process.

First, Wicksell assumes that in each unit period the supply curve for credit is perfectly elastic, and that the money rate of interest is kept constant throughout the inflationary process. My assumption is that in each unit period the supply curve is perfectly inelastic, but that it always shifts to the right as we move from one unit period to the next, and by an amount which is excessive in the sense that it is incompatible with the maintenance of price stability. Wicksell's assumption of a perfectly elastic supply curve for credit allows him to proceed as if the money rate of interest were an exogenous variable, whereas in my presentation the supply of credit, or of money, is the exogenous variable, and the money rate of interest is one of the dependent variables of which the value has to be determined.

Secondly, Wicksell's analysis starts from the hypothesis that the money rate of interest lies below the natural rate, or, that is to say, below the marginal efficiency of capital or the expected marginal internal rate of return. I have taken the expected marginal internal rate of return as being always equal to the money rate of interest, in conformity with the procedure usually followed in modern economic theory. In my model it is only *ex post,* and only under certain conditions, that the marginal internal rate may turn out to be higher than the money rate of interest.

Thirdly, in Wicksell's model the entrepreneurs always expect that the current price level is going to continue indefinitely into the future. In other words, his model makes no allowance for the expectation of inflation. This case, where in the presence of incipient inflation the expectation of a price rise is zero, corresponds to the first of the four cases which I have listed. My first case does indeed represent the conditions in which an inflationary process of the Wicksellian type will be initiated. It does not, of

course, show how that type of process develops in cumulative fashion as Wicksell supposed it would.

I am now going to try, with the aid of the distinction I have drawn between four different cases, to describe the way in which the money rate of interest will move during successive phases of the inflationary process.

An expansion of the credit or money supply at a rate which exceeds the real rate of growth of the economy may be accompanied by either a fall or a rise in the money rate of interest, depending on the expectations of the economic subjects. In the absence of any expectation of price inflation, the money rate of interest will fall; and since at the outset of the inflationary process there will not yet exist any expectation of a price inflation, this first phase of the process will be characterised by a fall in the money rate. And Fisher's real rate of interest will be below Wicksell's natural rate and may even be negative. If the "excessive" expansion of the money supply continues at a constant pace, the expectation of a certain rate of price inflation will eventually set in, and, with it, there will be a rise in the money rate of interest. At the beginning the rate of price inflation is likely to be underestimated. And as long as this is so, the money rate of interest will not rise sufficiently to compensate completely for the rate of price inflation. Thus Fisher's real rate of interest will still be below the natural rate. As the expected rate of price rise catches up with the actual rate, the money rate of interest, which has previously lagged behind the rate of price inflation, will reach a level at which it fully compensates for the price rise. In this situation Fisher's real rate of interest *calculated ex post* comes to equality with Wicksell's natural rate: and equality has also been reached between the marginal internal rate of return and the money rate of interest. Nevertheless the reaching of this equality does not bring the inflation to an end as Wicksell had supposed it would.

It must be added that if the actual rate of price inflation increases over time, it is very likely that the expected rate of price increase will lag behind the actual rate, and that the money rate of interest will hence fail to keep pace with the latter for a long time. In these circumstances the real rate of interest calculated *ex post* would turn out to be extremely low and perhaps negative. They are the circumstances in which many countries have found themselves in recent years.

The model I have presented is admittedly a highly simplified one. It leaves out a number of factors which are important in reality. One of these is the probable effect of the inflation in causing the velocity of circulation of money to increase, so that the rate of price inflation is not determined by the rate of increase in the money supply alone. Another factor which a more detailed model would need to allow for is the effect of a lowering of the real value of the debt burden of firms, allowing them to finance a larger volume of investment, with the result that the natural rate of interest falls. In a more complete analysis it would also be necessary to examine the way in which the money rate of interest charged by the banks for loans affects the long-term rate on debentures or bonds, or more generally, to examine the effect of inflation on the whole structure of interest rates. However, I still believe that the model, in spite of its seeming somewhat rudimentary, provides us with an explanation of the most fundamental relationships between inflation and interest rates.

The model also allows us to draw some conclusions concerning monetary policy. A restrictive monetary policy, aimed at bringing the inflation to an end, will need to *impose a money rate of interest which is more than sufficient to compensate for the rate of price inflation currently expected.* This means that if the economy has been in a state of "inflationary equilibrium", where the money rate of interest was exactly in line with the correctly foreseen rate of price inflation, the money rate will have to be raised higher than if the economy had failed to reach this state, so that the expected rate of price increase had lagged behind the actual rate and the interest rate had been too low to compensate for the latter. Another conclusion is this: Supposing that the monetary authorities decide to raise the rate of increase of the money supply, and supposing that, as is likely, the expectations concerning the rate of price inflation do not immediately adapt themselves, the money rate of interest rate will not rise but fall. But this fall will only be temporary; and once the expectations have caught up with the actual rate of inflation, the money rate of interest will rise to an even higher level than had existed before the authorities decided to embark on a still looser monetary policy.

3. Influences from Abroad

The theoretical model which I have presented relates to a closed economy. It requires substantial modifications if it is to be applicable to an economy which is subject to influences coming from the rest of the world. In my present context what needs to be particularly examined is the way in which influences from abroad may prevent the fear of price inflation on the part of the economic subjects in the country concerned from exerting its full influence, or perhaps any influence at all, on the level of money interest rates in that country.

I shall illustrate this point for two different situations regarding the foreign exchange system prevailing between the country with which we are concerned, and which I shall call Europa, on the one side, and the rest of the world, which I shall call America, on the other. One is that of a fixed exchange rate with no band at all within which the rate may fluctuate. The other is that where the exchange rate may fluctuate within a fairly wide band. (I shall not deal with the case of a perfectly flexible rate).

Suppose that initially the interest rate is the same in both countries, but that it rises now in Europa, owing to justified fears of price inflation, while the rate in America, where there are no such fears, remains at the old level. The higher nominal rate of interest in Europa, which for the Europeans does not mean any increase in the real rate, does mean for the Americans an exactly corresponding increase. Consequently capital will flow from America to Europa.

I must digress here for a moment to point out that there has been no change in the real economic quantities in either of the two countries such as to justify a capital movement from one to the other. Capital is not here moving in response to the attraction of a higher real marginal efficiency of capital in the receiving country. And it is even conceivable that it will move although the real marginal efficiency of capital in the country to which it goes is lower than in the country from which it comes. In short, there may occur a distortion in the international distribution of capital, a distortion, which is, in last analysis, due to differences between the rates of inflation in different countries.

I return now to my main argument. Unless the monetary authorities can and do adopt an offsetting policy, the purchase of dollars by the European Central Bank will make the commercial banks more liquid, thus counteracting the tendency for the money rate of interest in Europa to rise. The rate in America which would have risen under the gold standard will not do so in present circumstances, despite the outflow of dollars. For the European Central Bank, by investing at short-term the dollars it has purchased, will simply take the place of those Americans who have liquidated short-term money assets in order to invest their money in Europa.

For some time it may be possible for the European monetary authorities to offset the effects of the dollar inflow in increasing the supply of funds on the European money market. They may do this by raising the reserve requirements of the banks, by open market operations or by various other less orthodox means. But, in face of a large and continuous inflow of funds, they will sooner or later be compelled to give way. In that situation there is no chance of avoiding the equalisation of the interest rate levels between the two countries. In spite of the continuing fear of price inflation the interest rate in Europa will drop to the old level. The prize of this failure to maintain the rate at a higher level will be more inflation.

The picture is considerably altered if the foreign exchange system is one where the rate of exchange is not absolutely fixed but can fluctuate within a fairly wide band of, say, three per cent on either side of parity or of the central value. We may again suppose that the interest rate in Europa rises as the result of the fear of price inflation and that short-term money flows from America to Europa. And let us assume for the time being: that all those who invest money in Europa protect themselves in the forward exchange market against the exchange risk; that all investments are in three-month's paper; and that the forward exchange contracts are also for three months. The flow of dollars to Europa lowers the spot rate for the dollar to the lower intervention point. At the same time, however, the repurchase of dollars in the forward market tends to raise the forward rate for the dollar above the spot rate. According to the generally accepted theory, the forward dollar will rise to a premium which will bring the "net" short-term interest rate, i.e. the short-term interest rate in Europa minus the premium on the dollar, to equality with the short-term

interest rate in America.[5] Thus, if the interest rate differential is two per cent, the three months' forward rate for the dollar will be one half of one per cent above the spot rate.

The question which now arises is whether, here too, the inflow of dollars, and the resulting increase in liquidity of the banking system in Europa, will reduce the short-term interest rate in Europa to equality with the rate in America or, that is, whether in this case too it will be impossible for the authorities to keep the interest rate at the higher level to which it rose initially in reponse to the expectation of price inflation.

I assume here as before that in an initial phase the European Central Bank offsets the effect of the dollar inflow in increasing the liquidity of the banking system, so that the inflow has no immediate influence on the level of the short-term interest rate in Europa. After an interval of three months, the demand of those who have sold dollars forward and must now deliver them will begin to make itself felt on the spot market for dollars. Indeed, in any unit period henceforth this demand will in principle be just as big as the supply deriving from the current flow of short-term money to Europa. The *net* flow of dollars to Europa on capital account will tend to zero. The spot rate for dollars will rise again. And the Central Bank will no longer need to intervene in the foreign exchange market. We see then that, provided the Central Bank succeeds in keeping the interest rate up during the first three months, it will be able to do so also later, since after those three months have passed the pressure from foreign funds will cease. Of course there are still limits to the extent to which the short-term interest rates in different countries can move out of line with one another. The limits are set by the width of the band. Generally speaking, however, the existence of a band of as much as three per cent, or even somewhat less, on either side of parity or of the central value should be sufficient to enable the Central Bank of an individual country to follow an autonomous interest rate policy.

The conclusions which I have reached are subject to certain

5 The forward rate for the dollar can be calculated from the (simplified) formula:

$$T = K\left(1 + \frac{r_e - r_a}{4}\right)$$

where T represents the forward rate, K the spot rate, r_e the interest rate in Europa, and r_a the interest rate in America.

qualifications, owing to three assumptions which underlie my presentation. Two of these have already been mentioned.

The *first* was that all those who shift money to Europa fully cover themselves on the forward market against possible exchange losses. In reality of course there will be people who do not behave in this way, among them especially those who invest in fixed-interest securities with the intention of holding them for an indefinitely long period. So far as these people are concerned, there will not be any such automatic reflux of funds after a pre-determined period as occurred in our simplified case.

The *second* assumption was that forward exchange contracts always cover a period of three months, and that there is only one short-term interest rate, that on three months' paper. In reality forward exchange contracts can be and are made, not only for shorter, but also for longer periods than three months and there is a similar range of periods for which short-term investments may run. In these circumstances the demand for spot dollars can of course go on growing over a longer period than the three months' which I took in my example. And the European Central Bank, if it follows a policy of offsetting the effect of the inflow of dollars in making the banking system more liquid, will have to intervene over a longer period.

Finally, there is a third assumption which I have not yet mentioned. This is that there is no general expectation among those who shift funds to Europa, on account of the higher interest rate, that the currency of Europa will be revalued upwards in terms of that of America. So long as the cause of the inflow of dollars is an interest rate differential, it is obvious that an upward revaluation of the currency would not act as a break and that there is no reason for expecting the monetary authorities to take such a step. (Of course it is quite a different story when the cause of the inflow of dollars to the country concerned is a deficit in America's balance of payments on current account.) Nevertheless there have been occasions in recent years when, although the primary cause of the inflow of dollars to a country clearly was an interest rate differential, the expectation did gain ground that the inflow would eventually result in an upward revaluation of that country's currency. In such circumstances what was at first a flow of manageable dimensions may turn into an avalanche. And the Central Bank may then be unable to keep the interest rate level up.

4. Should Money Claims be Indexed?

The last question I am going to take up is one which has aroused a great deal of discussion in many countries, but to which we cannot say that a generally accepted answer has been given. This is the question of whether it is advisable to attach to money claims index clauses aimed at protecting the capital sum against the loss of purchasing power due to inflation, or, that is, at maintaining the real value of the capital intact. Three arguments seem to speak in favour of this procedure.

First, indexation recommends itself on moral grounds. It is a way of preventing debtors from making a profit at the expense of creditors, and thus of avoiding shifts in the distribution of wealth, which, as experience shows, tend on balance to work in the wrong direction, i.e. to increase the share of the rich rather than that of the poor. It also helps to remove another injustice, that which arises when the nominal interest rate earned, in spite of being little above or even below what is required to compensate for the rate of price inflation, is treated wholly as taxable income, instead of partly or wholly as an allowance required for maintaining real capital intact.

Secondly, indexation relieves savers from the necessity of protecting themselves against the depreciation in the value of money by using their savings for purposes that are often undesirable from the general economic point of view. In most European countries the flight into real goods has in the recent inflationary period largely been one into real estate, partly taking the form of a greatly increased demand for secondary residences which has driven land and house price abnormally high.

The *third* argument is that the high nominal interest rate which emerges in the inflationary process, when there is no indexation, is itself a factor complicating the task of reintroducing price stability. For firms which have issued medium or long-term debentures at such a high rate may often have difficulty in covering their interest charges once the price level has been stabilised, so that what was previously only a very high *nominal* rate has become a correspondingly high *real* rate. Indexation which prevents the nominal interest rate from rising so high avoids this difficulty.

Although the three arguments I have just presented undoubtedly

weigh heavily in favour of the indexation of money claims, they are not by themselves a sufficient demonstration of its desirability. The main argument of the opponents of indexation is that it is likely to have the effect of accelerating the inflation because the practice of indexing will be difficult to confine to long contracts, and once it is extended to other incomes, especially wages, it will intensify an already existing tendency towards a wage-price-spiral. This is not an argument that can be easily dismissed. Nevertheless, I am inclined to take the view that, so long as the monetary authorities do not succeed in stopping inflation, the indexing of medium or long-term securities should not be forbidden by law, as it is in certain European countries.

A sensible arrangement seems to me to be that under which, as I understand is the case in Israel, indexed and non-indexed debentures and bonds exist alongside each other. If the two types do exist simultaneously, and other conditions such as lenght of time to maturity and tax treatment are the same, then the differences between the money rates of interest calculated to maturity on the two types of loans would roughly reflect the prevailing expectation, among those engaged in such borrowing and lending operations, about the rate of price inflation. It follows from my previous theoretical analysis that the existence of such an index of the expectations of the public ought to be of considerable value to the monetary authorities.

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