Interest and Monetary Disequilibrium

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I. INTRODUCTION AND SUMMARY

In an interesting recent paper [4], Axel Leijonhufvud argues as follows:

> "—— one should not analyze the characteristic Wicksellian interest maladjustment and its consequences as if it does not matter whether the system maintains itself at full employment or not. *At full employment, there will be unrelenting pressures toward correction of any "unnatural" rate of interest — but otherwise not. — With the interest rate at the right level, market forces should make unemployment converge on its "natural" rate — but otherwise not"* [pp.168-169].

The purpose of this paper is to verify the characteristics of the Wicksellian monetary theory with fidelity to stock-flow relationships of monetary economy and stock-flow dynamic analysis.

Today the IS-LM diagram of Hicks is still a valuable device for showing the joint determination of interest and income. In the standard IS-LM framework, however, saving and investment are employed without regard to their financial character. The standard IS-LM characterization of a monetary economy is deficient in this dimension. This paper is to allow for a consideration of whether saving being applied to the purchase of securities or the holding of additional cash balances in the IS-LM system. Though Horwich [2] has tried a generalization of the Hicksian framework by assuming that saving and investment each have a dual financial character, ours is different in

assuming the savers' portfolio decision. In his model, the decision regarding the allocation of saving to the purchase of securities and the holding of additional cash balances depends upon the level of income. This paper assumes that while the level of saving varies positively with income, the composition of saving is affected by changes in the rate of interest.

Furthermore, we have a stock complaint about the standard IS-LM framework, because it is too static. Saving is added to wealth. An increase of wealth affects the asset demands in portfolio. Given money supply, a change in demand of money as asset causes a shift of the LM curve. Such a shift of LM continues until our economy arrives at a financial stock-flow equilibrium. In this paper, the problems of portfolio choice and the role of wealth are examined explicitly by the stock-flow analysis using a dynamic IS-LM model.

In theory of a monetary economy, there is no way of avoiding the issue of expectations. Two great economists, Keynes and Friedman, whose works on money are pre-eminently important, attach importance to the role of expectations. One of the dangers of the IS-LM tradition is that it leads easily to a neglect of expectation variables. In the stock-flow dynamic model shown in this paper, the anticipated normal rate of interest plays an important role. This paper assumes that the saving is a demand for not only securities but also additional cash balances, each portion of which depends upon a difference between current rate and anticipated normal rate of interest. If the actual rate of interest is lower relative to the expected normal level, there is a greater additional demand for money to hold as speculative balances. This is an application of the Keynesian liquidity preference theory to a stock-flow dynamic model.

Thus we will generalize the IS-LM framework as a stock-flow dynamic system in which investment and saving

are employed with regard to their financial character. Not only the current market rate and natural rate are given great consideration but also the anticipated normal rate of interest. The system shows the following: what matters in analysis of monetary disequilibrium is whether the anticipated normal rate instead of the current market rate equals to the natural rate or not. The standard IS-LM equilibrium in Hicksian framework is neither a temporary equilibrium nor a long-run equilibrium in our stock-flow dynamic model. An economy in the temporary equilibrium has market forces making the market rate converge on the anticipated rate. The long-run equilibrium where the market rate is equal to the expected normal rate does not necessarily imply full employment equilibrium. It is only if the ancitipated normal rate is equal to the natural rate that our stock-flow monetary equilibrium is the full employment equilibrium. So long as we cannot correctly expect the natural rate of interest, our economy remains at under-employment equilibrium. We conclude with Leijonhufvud:

with the expected normal rate of interest at the right level, market forces should make both any unnatural rate of interest and unemployment each converge on its "natural" rate — but otherwise not.

II. THE MODEL

The Keynesian theory of income determinatin by saving and investment is represented as an attempt to characterize the adjustment to equilibrium of saving being a leakage out of the demand and investment being an injection into the demand. According to the Classical theory, on the other hand, saving as a leakage is always balanced with investment as an injection by the adjustment mechanism of the interest rate. What is the basic difference between the Keynesian theory and the Classical theory? Whereas the Classical theory allows only the decision about income allocation between consumption and

saving for households, it is the decision about saving allocation between lending (demand of securities) and hoarding (demand of money) as well as the decision about income allocation that are allowed for consideration in the Keynesian theory.

Suppose that any portion of saving is not hoarding as demand for idle balances, but saving is always lent as demand for securities. Then, it implies that the saving which is a leakage of money funds out of active circulation is supplied for active balances, and is balanced with the investment which is the supply for new securities or the demand for active balances. It is found in such a case that there are no effective demand failures. In the Classical theory, therefore, the interest rate works only to determine the income allocation to consumption and saving, or the resource allocation between consumption and investment.

Keynes argues on the decision about saving allocation between lending and hoarding as well as the decision about income allocation between consumption and saving. While the current consumption (saving) depends on incomes and the readiness to consume for present and future, the hoarding (lending) depends on the present rate of interest and the anticipated rate of interest for the future. If the actual market rate of interest is lower than some expected normal level, savers may do better not to invest their funds in securities immediately, but to wait until they can buy those securities at a lower price (higher yield). Suppose now that some portion of saving is not lent as a demand for securities, but is hoarded as a speculative demand and is absorbed into idle balances. Then, it implies that there is a leakage of money funds out of active circulation, and our economy has a deficiency of effective demand. In Keynesian theory, in contrast to the Classical theory, the interest rates work to determine the saving allocation between lending (demand

for new securities) and hoarding (demand for additional idle balances). The following model formalizes such a basic idea of money circulation and interest working.

The rate of interest is the yield on securities, and is determined by the aggregate supply and demand for securities. Supply and demand are the sum of the flow variables — namely, supply and demand for new securities, plus the existing-security components. The lending part of saving (new security demand) is a supply of active balances, and the investment (new security supply) is a demand to use balances actively. The complement of existing-security supply and demand is the supply and demand for idle balances. When the securities market is in stock-flow equilibrium, therefore, the supply and demand for both active balances and idle balances are also in equilibrium.

The stock-flow model of a monetary economy is specified as follows:

$$I(r) = S(Y) - S_m(r^e - r), \qquad (1)$$

$$\text{where } S_m \gtreqless 0 \text{ as } r^e \gtreqless r,$$

$$M = kY + L(r; W), \quad L_r < 0. \qquad (2)$$

Here, I is the investment, S the saving, and Y the nominal income (effective demand). The current market rate of interest is r, and r^e the anticipated normal rate of interest. M is the nominal money supply, and L the stock demand for idle balances. S_m is the portion of saving directed to the additional cash balances, namely, S_m is the hoarding if $S_m > 0$, and if $S_m < 0$, it is the dishoarding which means money reduction in idle balances. k is the Marshallian k. W is wealth. We assume that investment is financed only by supplying new securities, and a decreasing function of the rate of interest. On an application of the Keynesian liquidity preference theory

to a stock-flow dynamic model, we assume that if an economy is in stock-flow equilibrium where the market rate is equal to the anticipated normal rate ($r = r^e$), savers might allocate all their funds to the purchase of new securities. If $r<r^e$, some portion of their saving might be allocated to money hoarding which is absorbed into idle balances, so that the new security demand is smaller than their saving, and if $r>r^e$, savers might make some portion of idle balances to be in active circulation, so that the new security demand is larger than their saving by the money reduction in idle balances. Thus equation (1) in which the right hand side indicates new security demand and the left hand side indicates new security supply is in a state of equilibrium in the flow security market. Equation (2) is the familiar equilibrium condition in a monetary market which implies state of financial stock market equilibrium, and complement of equilibrium in the existing-security market.

We should note that the system of equation (1) and (2) is static. Saving is the addition to wealth. An increase of wealth changes the asset demands in portfolio. Therefore, we must examine not only the price effect of interest but also the wealth effect on the asset demands for both money and securities. The wealth effect on the asset demand of money implies a shift of the L function. We shall adopt as working assumptions the following: first of all, neither asset is inferior with respect to wealth. Second, the saving allocation to new security demand and additional money holding does reflect a marginal change in the composition of asset demands in portfolio through an increase of wealth by saving. That is to say, at any rate of interest,

$$\Delta W = W_t - W_{t-1} = S, \tag{3}$$

$$\frac{\Delta L}{\Delta W} = \frac{S_m}{S}. \tag{4}$$

These equations show the dynamic process in our model.

III. CHANGES IN INVESTMENT DEMAND

In this section, we shall consider the consequences of a decline in the marginal efficiency of capital. Initially, our economy is in full employment long-run equilibrium where the market rate r is equal to the anticipated normal rate r^e, and where the anticipated normal rate r^e is equal to the natural rate r^*. The natural rate of interest is a rate of interest determined by saving and investment at full employment.

A long-run equilibrium at full employment in our stock-flow dynamic model is represented by points A and a in Figure 1. Figure 1-1 shows the flow equilibrium in security markets. $I^o(r)$ is the investment schedule (supply function of new securities) which is the decreasing function of r. $S(Y^f)$ is the level of saving at full employment. Equality of the investment and saving at full employment determines the natural rate of interest

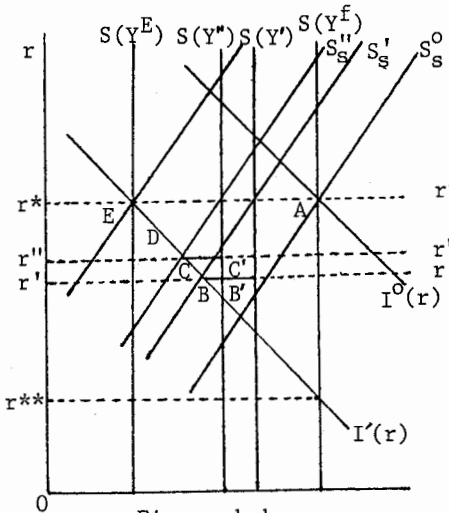


Figure 1-1.

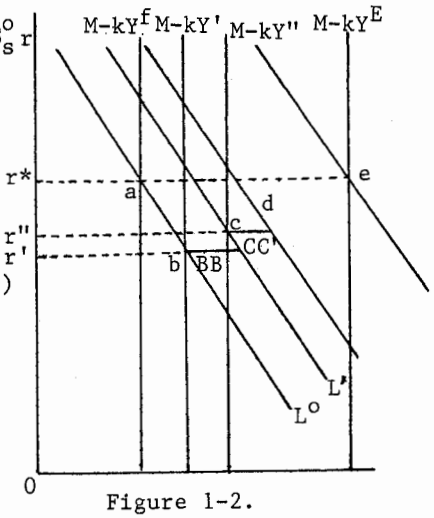


Figure 1-2.

r^*. S_s^o is the new security demand function on the assumption that the expected normal rate of interest r^e is equal to the natural rate of interest r^*: $S_s^o = S(Y^f) - S_m(r^* - r)$. The difference between the full employment level of saving $S(Y^f)$ and the new security demand schedule S_s^o is, therefore, money addition to idle balances as $r<r^*$, or money reduction in idle balances as $r>r^*$. New security demand is balanced with investment (supply of new securities) at the natural rate of interest r^*. Thus we have $S(Y^f) = S_s^o = I^o(r^*)$ and $S_m = 0$ at full employment equilibrium in the flow market, which is shown at point A.

Figure 1-2 shows a familiar pattern of equilibrium in the money market, i.e. the equilibrium of idle balances or the equilibrium in the existing-security market. Given wealth, the demand of idle balances L^o is the decreasing function of r. Vertical line $M - kY^f$ is the suypply for idle balances at full employment level of income. It is shown at point a that demand and supply for idle balances are in equilibrium at the natural rate of interest r^*.

Suppose now that the investment schedule shifts down from $I^o(r)$ to $I'(r)$. This directly implies that the natural rate of interest falls down from r^* to r^{**}. Here we assume that the savers cannot correctly expect the falling of the natural rate. To simplify our discussion, we suppose that notwithstanding decrease of investment demand, they expect the normal level of interest not to change but to remain at the former natural rate r^*. The impact-effect of this investment disturbance is to create an excess demand for securities by the difference between I' and S_s^o at the natural rate r^*, AE. To this there corresponds a fall of market rate of interest, which creates money hoarding on our assumption that $r^e = r^*$. The hoarding of savers is a withdrawal of money from the expenditure stream. A leakage of active money out of the circular flow causes the effective demand failure, and consequently decreases the level of income from Y^f to Y'. By the decrease of income, the level of saving decreases

from $S(Y^f)$ to $S(Y')$ with a leftward shift of new security demand from S_s^o to S_s' in the flow market; and in the stock market, the supply curve of idle balances shifts rightward from $M - kY^f$ to $M - kY'$. Thus we have an equilibrium which is represented at points B and b. The equilibrium rate of interest r' is lower than r* , and the equilibrium level of nominal income Y' is smaller than Y^f.

We should notice, however, that this equilibrium is temporary. We have the dynamic process through an increase of wealth by saving, which is shown in the equations (3) and (4). Since there is an additional cash holding BB' in saving S(Y') at the rate of interest r', the increase of wealth by S(Y') causes a rightward shift of the L function by BB'. This rightward shift of the L function from L^o to L' creates an excess demand for money (an excess supply for securities) at the current rate r'. This raises the market rate of interest, so that investment decreases and the level of income declines. Since the decrease of income brings a reduction of transaction demand for money and a rightward shift of the supply curve for idle balances, the excess demand for money caused by the shift of L is canceled out. Thus we have again an equilibrium which is represented at points C and c. The equilibrium rate of interest r" is above r' and is closer to the anticipated normal rate $r^e = r^*$. The equilibrium level of income is reduced from Y' to Y", and is far away from the full employment level Y^f.

Of course, this equilibrium is also temporary since the market rate r" is not equal to the anticipated normal rate $r^e(=r^*)$. There is an additional cash holding CC' in the saving S(Y") at the interest rate r". It causes a rightward shift of the L function. By this shift, an excess demand for money is created again, the rate of interest rises, investment and income decrease, and we have again a temporary equilibrium. The movement of these temporary equilibriums continues until the market rate of

interest is equal to the anticipated normal rate. Such equilibrium with $r = r^e (= r^*)$ is represented at points E and e. In the equilibrium, the saving is equal to the new security demand, and there is no part of additional money holding in the saving, or no disturbance which causes a shift of the L function in the stock market. This implies that the equilibrium is a long-run stationary equilibrium where levels of interest and income are both constants at r^* and Y^E respectively over time, but wealth is accumulated by the constants $S(Y^E)$. Since $Y^E < Y^f$ our economy remains at unemployment equilibrium over time.

We should notice that even if we do not assume that the anticipated normal rate r^e is equal to the former natural rate r^*, the long-run equilibrium in our stock-flow dynamic model is still the unemployment equilibrium so long as the anticipated normal rate r^e is above the new natural rate r^{**}. Since an equality between the market rate r and the anticipated normal rate r^e determines a long-run equilibrium in our stock-flow model, the equilibrium level of investment is $I'(r^e)$. As $r^e > r^{**}$, so $I'(r^e) < I'(r^{**})$. By the multiplier process, therefore, the long-run equilibrium level of income is under the full employment level Y^f so long as $r^e > r^{**}$.

The anticipated normal rate of interest r^e is exogenous in our model. Nothing has been discussed about the theory of expectations. Expectations may depend upon current and past observations. As is easily seen in Figure 1, current and past rates of interest may be generally above r^{**}. Therefore, the anticipated normal rate of interest r^e could be higher than the new natural rate r^{**}. Changes in investment may be subject to uncertainty in terms of Keynes. They are out of application with rational expectations. Thus we might remain long in an unemployment economy unless we could always expect the natural rate to be the anticipated normal rate.

IV. CHANGES IN MONEY SUPPLY

In this section, we shall consider the consequences of an increase in money supply. Initially, we are in a full employment stationary equilibrium with interest rate r*, which is shown at points A and a in Figure 2. Assume an increase in money supply from M^o to M'. Here we shall make an additional assumption that the anticipated normal rate of interest remains to be the natural rate of interest r* without reference to a change in the money supply.

The impact-effect of this money supply disturbance is to create an excess supply in the money market. It causes a falling of the market rate of interest. Therefore, the investment increases, and consequently the effective demand, the nominal income also increases. This increase of nominal income raises the transaction demand for money, so that the excess supply in the money market is canceled out. Thus we have an equilibrium which is represented at points B and b. The equilibrium rate of interest r' is lower than r*, and the equilibrium level of nominal income Y' is higher than Y^f.

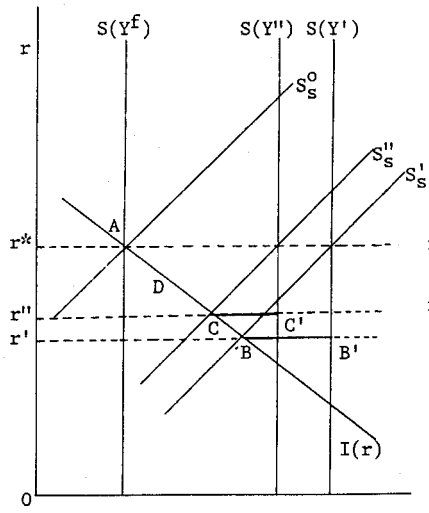


Figure 2-1.

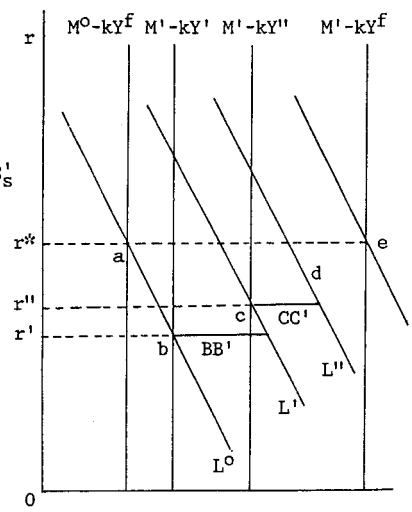


Figure 2-2.

As discussed in Section III, this equilibrium is temporary. Since there is an additional money holding BB' in the saving S(Y') at the interest rate r', the increase of wealth by S(Y') causes a rightward shift of the L function by BB'. A rightward shift of the L function from L^o to L' creates an excess demand for money (an excess supply for securities) at interest rate r'. This raises the market rate of interest, so that investment decreases and income falls down. Since the decrease in income brings a reduction of transaction demand for money and a rightward shift of the supply curve of idle balances from M'- kY' to M'- kY", the excess demand for money originating in the shift of L is canceled out. Thus we have again an equilibrium which is represented at points C and c. The equilibrium rate of interest r" is above r', and the equilibrium level of income Y" is lower than Y'. Both are respectively closer to the initial levels of full employment equilibrium.

Of course, this equilibrium is also temporary since the market rate r" is not equal to the anticipated normal rate $r^e (= r^*)$. There is an additional cash holding CC' in the saving S(Y") at interest rate r", which causes a rightward shift of the L function. By this shift, an excess demand for money is again created, the interest rate rises, the investment and income decrease, and we have again a temporary equilibrium, where both levels of interest and income are much closer to the initial levels of full employment equilibrium. The movement of these temporary equilibriums continues until the level of market rate of interest becomes to be the anticipated normal level. Such equilibrium with $r=r^e (= r^*)$ is represented at points A and e. As argued in Section III, this equilibrium is a long-run stationary equilibrium where both levels of interest and income are constants over time at r^* and Y^f respectively.

We should notice that levels of interest rate and income in the new long-run equilibrium with money supply M' are both equal to, respectively, the levels in the original long-run equilibrium with money supply M^o. The effect of an increase in money supply is absorbed completely into the portfolio demand for money on the process of wealth accumulation. This is an interesting result, because it implies that the changes in money supply have neither monetary disturbance nor real disturbance in the long-run. The general price may be higher only during the stock-flow dynamic adjustment process where nominal income is always higher than Y^f. These interesting consequences are not derived, however, except for making an assumption that the anticipated normal rate r^e remains to be the natural rate r* without reference to the increase in money supply.

The change in money supply cannot affect the natural rate of interest which is determined by investment and saving at full employment, but might affect the savers' expectation of a future normal level of interest through changes in the market rate. Suppose now that savers expect the future normal rate to be lower than the natural rate r* through their observations of market rates being under r* with an increase in money supply. Since, as argued before, the level of investment in the long-run equilibrium is $I(r^e)$, it is larger than $I(r^*)$ as $r^e<r^*$. Thus we have a long-run equilibrium with nominal income at a level higher than Y^f. This implies that prices may remain at a higher level over a period of time so long as $r^e<r^*$.

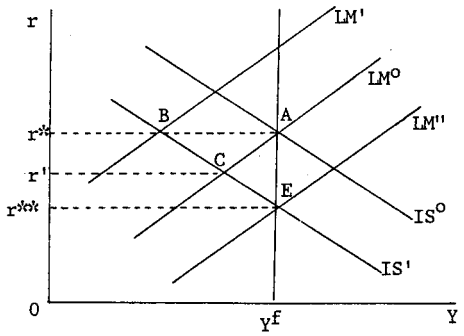
In summary, changes in the money supply could affect our economy by having an effect on neither the natural rate nor the market rate but upon the anticipated normal rate. In case of a decrease of investment demand as discussed in Section III, monetary policy is not effective unless it can reduce the anticipated normal rate to the

lower natural rate r^{**}.

V. REINTERPRETATION OF THE MODEL IN IS-LM DIAGRAM

It is useful to compare our model with the standard IS-LM model. In our model, the market rate of interest must be equal to a given expected normal rate of interest on long-run equilibrium where saving and investment are equated, and on the other hand, the equality between saving and investment does not hold in temporary equilibrium. From this characterization of our model, it is immediately seen that an intersection of IS with LM in the Hicksian diagram is neither temporary equilibrium nor long-run equilibrium unless it could happen that the interest rate at the intersection is equal to the given expected normal rate.

Initially, we are in a full employment stationary equilibrium on assumption that $r^e=r^*$, which is shown at point A in Figure 3-1. Assume a decrease of investment demand and a consequent downward shift of the IS curve from IS^o to IS'. The natural rate of interest,



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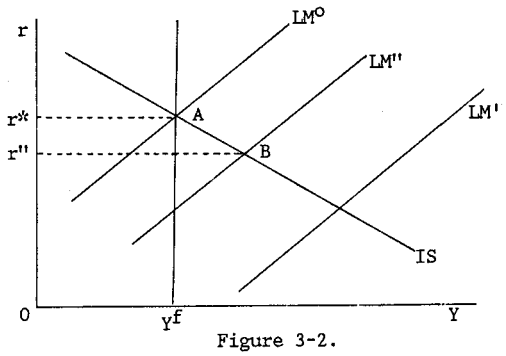

Figure 3-2.

which is determined by equality between saving and investment at full employment, decrease from r^* to r^{**}. Also a falling of the market rate of interest corresponds to this investment demand disturbance. We suppose, however, that the anticipated normal rate of interest does not change but remains as the former natural rate r^*. Then, the actual market rate of interest is lower than the expected normal level; consequently there is a greater additional demand for money to hold as speculative balances. As saving is added to wealth, it is included in the stock demand for money, and consequently causes a leftward shift of the LM curve from LM to LM' with given constant M. Thus, ultimately, we have a new long-run equilibrium represented at point B. It is an unemployment equilibrium.

Notice that even if $r^e \neq r^*$, the long-run equilibrium in our stock-flow dynamic model is an unemployment equilibrium so long as $r^e > r^{**}$. We suppose, for example, that the anticipated normal rate is given at r' which is between r^* and r^{**}. Then, we have a long-run equilibrium at point C, which happen to be the Hicksian IS-LM equilibrium. As is well known, it is the unemployment equilibrium.

If the decrease of investment might be accompanied by the full falling of anticipated normal rate r^e, and it could happen that r^e is equal to the new lower natural rate r^{**}, then the long-run equilibrium is a full employment equilibrium which is represented at point E. This is arrived at by reckoning that since the decrease of market rate by the impact-effect of investment disturbance might be less than a full decrease of the anticipated normal rate, the speculative motive makes savers demand more securities by withdrawal from idle balances, which implies that the asset demand for money decreases; consequently the LM curve is shifted down from LM^o to LM" with constant M.

Now let us consider the effects of change in the money supply. We suppose again that our economy is initially in a full employment stationary equilibrium on our assumption that $r^e = r^*$, which is shown at point A in Figure 3-2. Assume an increase of the money supply and a rightward shift of the LM curve from LM^o to LM'. At impact, the market rate of interest falls down. On an additional assumption that the expected normal rate of interest does not change but remains at the level of r^* without reference to the increase in money supply, the actual market rate of interest is lower relative to the normal level, so that there is a greater additional money holding as speculative demand. Through wealth accumulation by saving, it is included in the asset demand for money, and consequently causes a leftward shift of the LM curve with a new constant money supply M'. Thus, ultimately, a new long-run equilibrium with M' returns back to the initial long-run equilibrium with M^o on assumption that $r^e = r^*$. If the normal level is expected to be lower than r^* through corresponding to the falling of market rates, say, $r^e = r''$, then the leftward return of the LM curve stops at position LM"; consequently, point B represents the long-run equilibrium in this case. The equilibrium rate of interest r" is lower than the original equilibrium rate r^*. The equilibrium level of nominal income is higher than full employment equilibrium level Y^f; consequently, the prices may remain at higher level over time.

In summary, since $S_m = 0$ and $I(r^e) = S(Y)$ on the long-run equilibrium in our model, the equilibrium point is represented at an intersection of the IS curve with given r^e. Through the wealth accumulation by saving, the LM curve comes to pass through this intersection. Therefore, the Hicksian equilibrium of IS and LM is neither temporary equilibrium nor long-run equilibrium in our point of view unless the Hicksian equilibrium level of interest might

happen to be identical with the given r^e.

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