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Abstract

This paper attempts to make a case of "sub-market interest rate" using the IS-LM framework. The argument is that when the market interest rate falls below a certain level, the low cost of borrowing would invite speculative varieties or unproductive investment, which could eventually crowd out productive investment. As such, both monetary policy and fiscal policy may not be effective under certain circumstances.

Key words: interest rate, IS-LM, monetary policy.

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Extending Keynes' Investment Behavior

The Keynesian discussion on the relationship between interest rate and investment assumes a downward sloping demand for investment, where total investment demand (I_T) varies inversely with interest rate (r) movements. The relationship can be shown as:

(1) $$I_T = d_0 - d_1 r.$$

Interest rate is the cost of capital. Investors will behave differently at different rates of interest. A high interest rate implies that loans lent to such investments must have a high return. On the contrary, at a low rate of interest, the cost of capital is cheap, and it encourages low return investment projects. The interest rate acts as a screening device in the distribution of high return and low return investments. The variation in interest rate produces different investment possibilities. A distinction can broadly be made between productive investment (I_p) and unproductive investment (I_{up}).

Productive investments refer to financial resources committed to projects that produce a stable and a return high enough to cover the high cost of borrowing. Productive investments can be long-term projects that concentrate either in industrial output, exports or infrastructure that will contribute to growth of the real economy. At a considerable high interest rate, only projects with a return higher than the interest rate will be able to acquire the loans. Given that interest rate is a screening device, the high cost of borrowing would encourage productive investment, and at the same time eliminate the low return investments, financial resources will thus be left available to productive investments.

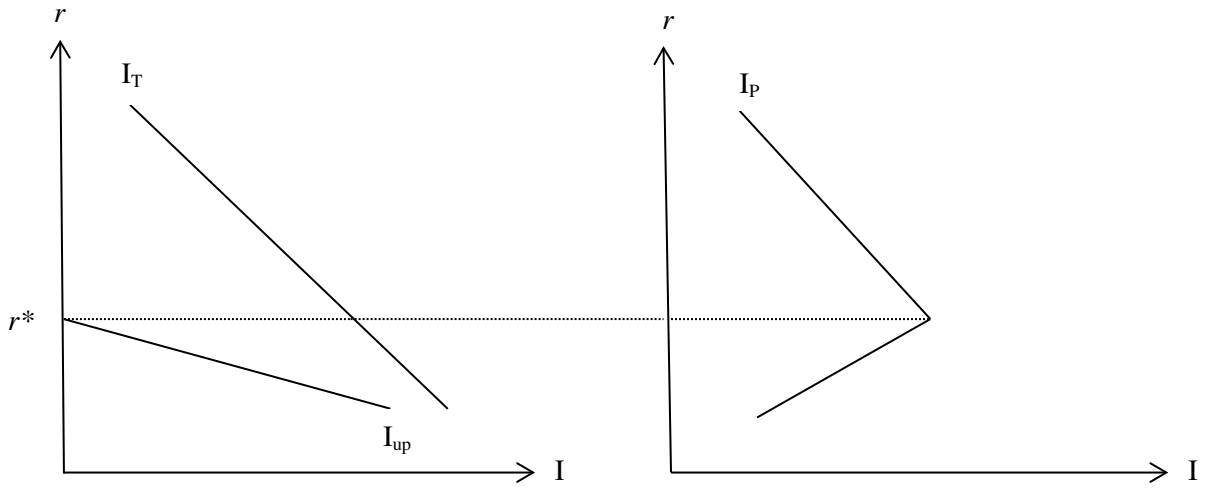
Unproductive investments refer to financial resources committed to projects that have low returns and/or speculative varieties that aimed at making windfall gains which are not geared to promote output in the real economy. Unproductive investment can only occur at a low interest rate when the price of borrowing is low. Speculative varieties take advantage of the low cost of capital and borrow to invest in activities that may not contribute to real output. The worsen scenario is that at a low interest rate, funds are borrowed and used for the payment of previous debts. Given the limited financial resources, the more financial resources given to low return and unproductive investments, the less will be available to productive investments. Thus, at a low interest rate, the chance of promoting low productivity investment increases and the demand for investment will become elastic at a slight change of the interest rate below a certain threshold.

The two schedules of investment behavior can be shown in Figure 1. The total investment

schedule (I_{Total}) is downward sloping, as shown in Figure 1(a), but when the interest rate is too low, say r^*, unproductive investment (I_{up}) begins to appear, and its increase will crowd out productive investment, reducing the impact of investment in the economy. At a rate of interest falls below r^*, unproductive investment increases faster than productive investment. Figure 1(b) shows the schedule for the net productive investment (I_P), and below r^*, total productive investment declined, resulting in a kinked investment schedule. The relation can be shown as

(2) $$I_{UP} = d_2 - d_3 r.$$

(3) $$I_P = (d_0 - d_2) - (d_1 - d_3) r, \quad \text{when } r < r^*$$
$$I_P = I_T = d_0 - d_1 r, \quad \text{when } r > r^*$$



(a) Two Investment Behaviors (b) Productive Investment

Figure 1

Using the expenditure approach, a real closed economy is indicated by the income identity:

(4) $$Y = C + I + G,$$

where in real terms, Y is aggregate output, C is total consumption, I is the level of investment and G is the level of government expenditure. However, investment consists of both productive and unproductive investment. Productive investment generates real output, but unproductive investment relates more to speculative varieties and affects the nominal output (Y') only. Total output that incorporates both productive and unproductive investment becomes:

(5) $$Y + Y' = C + I_p + I_{up} + G.$$

Unproductive investment affects the nominal economy indicated by Y'. The real output identity shown in Figure 1(b) is effectively indicated by:

(6) $Y = C + I_p + G.$

Equation (6) implies that productive investment has a direct impact on real output. The high interest rate ($r > r^*$) encourage only investment projects whose return is equal to or higher than r^*. Investment productivity will inversely be related to the movement of the rate of interest. At a low rate of interest ($r < r^*$), the low cost of borrowing allows low return projects to crowd out productive investment. Speculative varieties and low return investments are encouraged, and their contribution to real output will be low, investment productivity will decline, generating a positive relationship between the rate of interest and investment productivity.

The IS Construction

The distinction between the two types of investment behavior can have implication on the IS curve. The original construction of the IS curve is expressed in real economic activities. Because of its speculative variety, unproductive investment will have no effect on real output, and increases in unproductive investment may increase money supply and price, but not increase in real economic activities. The closed economy IS curve indicating the real economy using the expenditure approach is derived from the output identity shown by Equation (4). Consumption and government expenditure in turn are defined as:

(7) $C(Y_D) = c_0 + c_1 Y_D,$

(8) $Y_D = (Y - \bar{T}),$

(9) $G = \bar{G}.$

Total real output becomes:

(10) $Y = c_0 + c_1(Y - \bar{T}) + d_0 - d_1 r + \bar{G},$ when $r > r^*$.

$Y = c_0 + c_1(Y - \bar{T}) + (d_0 - d_2) - (d_1 - d_3)r + \bar{G},$ when $r < r^*$.

Expressed as a function of the interest rate, the IS curve becomes:

(11) $r = \frac{1}{d_1}(c_0 + d_0 + (c_1 - 1)Y - c_1\bar{T} + \bar{G}),$ when $r > r^*$.

$r = \frac{1}{d_1 - d_3}(c_0 + (d_0 - d_2) + (c_1 - 1)Y - c_1\bar{T} + \bar{G}),$ when $r < r^*$.

Given that there is difference in investment behavior as the interest rate changes, a high interest rate ($r_h > r^*$) that generates productive investment and real output. On the contrary, a low

interest rate (r_l < r*) encourages unproductive investment which will crowd out productive investment, and real output will fall if the consequent rise in money supply and inflation reduce real output. The IS curve will have a "kinked" shape, as shown in Figure 2.

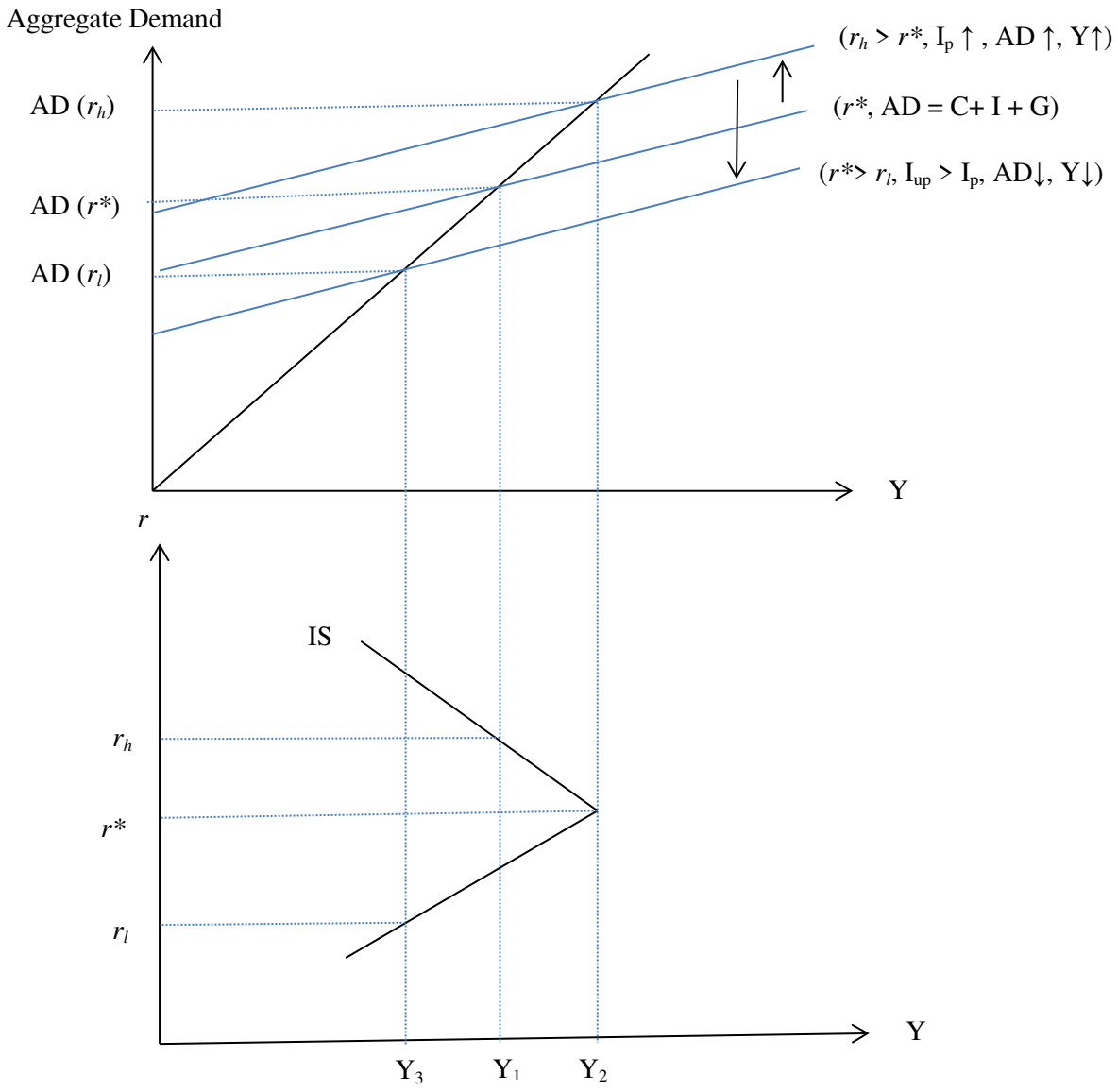


Figure 2

When interest rate remains at a level above r^* in the upper portion of Figure 2, productive investment is promoted and real output rises from Y_1 to Y_2, as shown in the lower portion of Figure 2. However, as interest rate falls from r_h to below r^* to r_l, for example, the change in investment behavior will induce speculative varieties of investment as the cost of borrowing has fallen. Unproductive investment is promoted and crowds out productive investment, leading to rise in such nominal variables as money supply and inflation, but a fall in real aggregate demand and real output to Y_3. Figure 2 shows a kinked IS curve, with the turning point at r^*.

The LM Curve

The LM equation links output (Y) and interest rate (r) in such a way that the real demand for liquidity and money supply are in balance. There are two channels through which money supply can be increased. One exogenous channel of money supply is controlled by the government ($\overline{MS}$) through open market operations, for example. The endogenous aspect of money supply is controlled by the banking institutions that depend on a behavioral function $b_0 - b_1 r$. Letting P represents the price level, total real money supply can then be stated as:

(12) $$\frac{\mathrm{MS}}{\mathrm{P}} = \overline{MS} + b_0 - b_1 r \, .$$

The coefficient of b_1 is the elasticity of the change of bank reserve to the interest rate. Given that the profit of banks comes from provision of loans, banks normally will maximize their loans subject to the legal requirement on the bank reserve ratio. Because of the reserve restriction, we assume that b_1 is inelastic and takes a small value.

The real demand for money (MD) is influenced by income and the price level (P). In the speculative demand motive, an increase in the interest rate will lead to a decline in the demand for real money balances. The real demand for money function is:

(13) $$\frac{\mathrm{MD}}{\mathrm{P}} = a_0 + a_1 Y - a_2 \, \mathrm{r} \, ,$$

where a_1 and a_2 are positive parameters. The parameter a_0 captures the effect of variables other than real income and the nominal interest rate, which may also affect money demand. The transaction demand motive suggests that real income has a positive influence and the demand for real money for transaction motives varies in the same direction as Y. On the other hand, the rate of interest has a negative influence on demand for money for speculative motives so that the

demand for money varies inversely with *r*. The coefficient a_2 is assumed to be elastic and large.

The equilibrium on in the money market is defined as:

(14) $$\overline{MS} + b_0 - b_1 r = a_0 + a_1 Y - a_2 r,$$

(15) $$Y = \frac{1}{a_1}[\overline{MS} + b_0 - a_0 - (b_1 - a_2)r],$$

(16) $$r = \frac{1}{(b_1 - a_2)}(\overline{MS} + b_0 - a_0 - a_1 Y).$$

Since b_1 is inelastic and a small coefficient and a_2 is elastic and large, we expect $a_2 - b_1 > 0$ and an upward sloping LM curve.

The Low Interest Rate Trap

Given a kinked IS curve, overall economic equilibrium can be achieved when the downward portion of the IS curve above r^* intersects with the upward sloping LM curve. There is no problem if the IS-LM equilibrium intersects at a portion of the IS curve above r^*. The "low interest rate trap" may appear in situations when the IS-LM intersects below r^*. At a low rate of interest, below r^*, restoring economic equilibrium can be a problem, depending on the slope of the LM curve. Figure 3 shows two possibilities. The first possibility shows the intersection at r_l between IS and LM_1, where LM_1 is less elastic than IS. The second possibility shows the intersection at r_l between a flatter LM_2 and a steeper IS.

The first case is when the LM_1 curve is steeper than the upward sloping IS curve. This implies that $\frac{-a_1}{(b_1 - a_2)} > \frac{c_1 - 1}{(d_1 - d_3)}$, which means that the interest rate is more sensitive to output in the money market than that of the goods market. A solution to the first case is feasible with an expansionary monetary policy that shifts the LM curve outwards, or a contraction fiscal policy that shifts the IS inwards will both lead to a rise in interest rate and a rise in real output. On the contrary, Figure 4(a) shows a reduction in money supply (LM shifting inward) and Figure (4b) shows an expansionary fiscal policy (IS curve shifting outward). The end result in these two situations would be a drop in the interest rate, leading to a further rise in unproductive investment that further reduces real output.

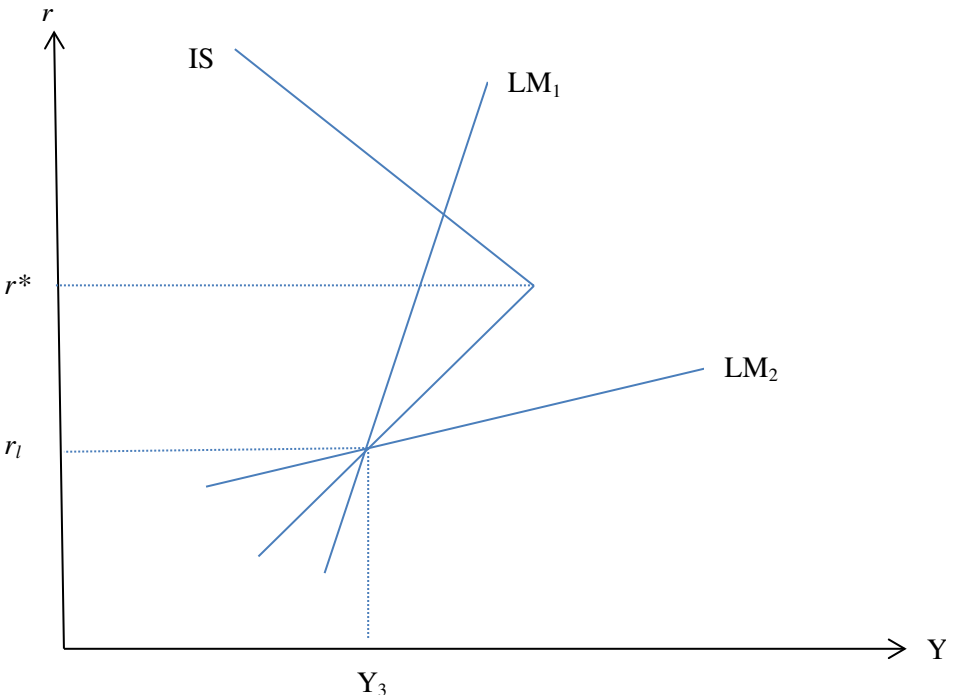
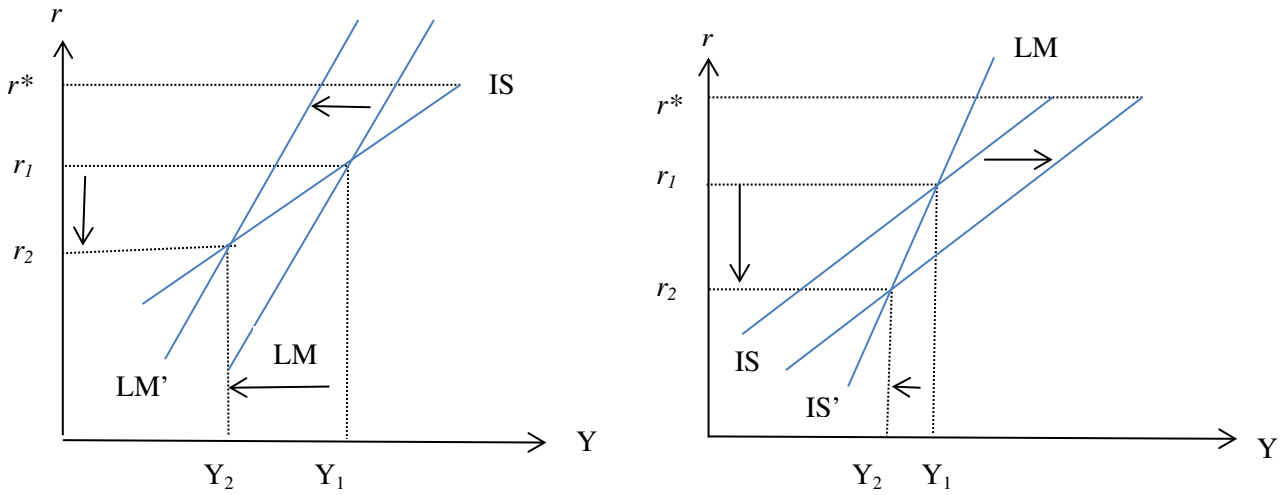


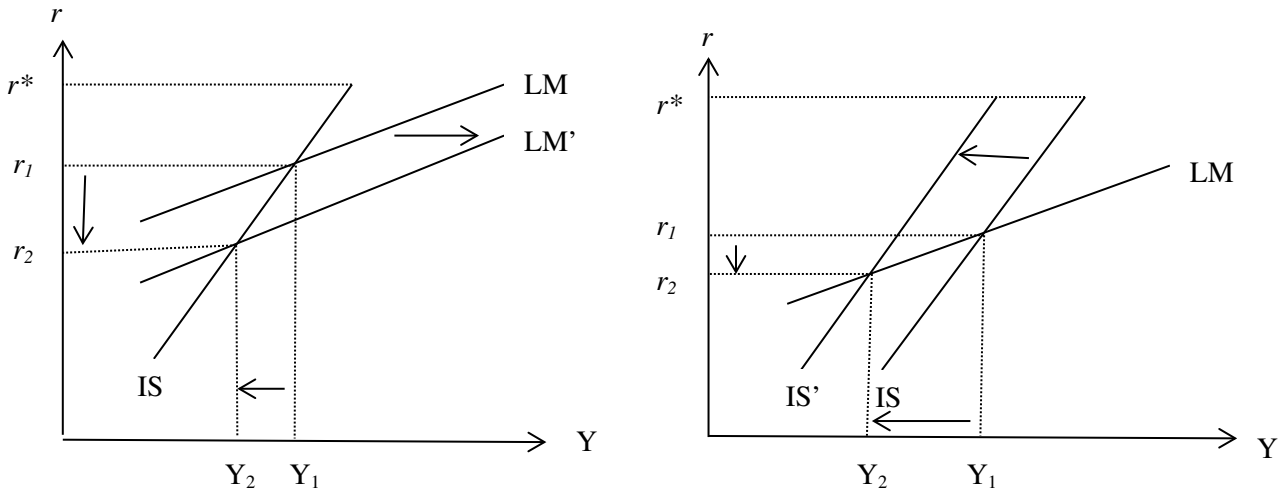
Figure 3



(a) Monetary Contraction (b) Fiscal Expansion

Figure 4

The "sub-market interest rate" can be shown in the second case when the upward sloping IS curve is steeper than the flatter LM_2, implying a situation where $\frac{-a_1}{(b_1-a_2)} < \frac{c_1-1}{(d_1-d_3)}$, which means interest rate is more sensitive to output in the goods market than in the money market. Consider the two situations in Figure 5 that show how the economy will react when a change in either monetary policy or fiscal policy occurs in situations when unproductive investment dominates and the interest rate is situated lower than r^*. In both cases, the economy is situated in the low interest rate regime. Figure 5(a) shows a case of monetary expansion, and the LM curve shifts out. The increase in money supply will simply be absorbed into the unproductive sector, either in the form of speculation or repayment of previous debts. The rise in money supply will fuel inflation and the consequent fall in real output produces a recessed economy, requiring the government to reduce the interest rate further, thinking that an even lower interest rate is needed to "stimulate" investment. Figure 5(b) shows a situation of fiscal contraction, such as a rise in the tax rate or a drop in government expenditure. The IS curve shifts inwards. The fall in fiscal expenditure may be needed to reduce the budget deficit, but the resulting recession will send real output down, and a further round of interest rate cut will be needed in order to reduce the cost of borrowing further.



(b) Monetary Expansion (b) Fiscal Contraction

Figure 5

In both cases, the answer lies in restoring a rate of interest higher than r^* in order to restore economic equilibrium. In Figure 5(a), it will be correct to have a monetary contraction and a rise in interest rate to ensure a high cost of borrowing so as to discourage unproductive investment. In Figure 5(b), the appropriate fiscal policy is to expand government expenditure to raise the level of real output, such as infrastructure provision or exports.

In conclusion, a "sub-market interest rate" may occur when the interest rate is set below r^*, say at r_l, especially when such a rate is kept for a long period of time. The equilibrium at a low interest rate between IS and LM shown in Figure 3 is the intersection between r_l and Y_3. This intersection indicates that if an unreasonably low rate of interest is kept for a considerable period of time, real output is low because the low interest rate has encouraged crowding out of unproductive investments and loans increased money supply and inflation could have reduced real level of aggregate demand and output.