

LINEAR IS-LM KEYNESIAN MODEL A CLOSED ECONOMY

We present a linear IS-LM Keynesian model for a closed economy developed by John Hicks. Our treatment is based on [1]. The initials IS-LM come from the two equations in the model. The first equation involves the investment by firms and consumption by consumers (and so savings by consumers). The second equation represents the money market equilibrium and is called the liquidity-money equation.

The variables and functions are the following:

Y	National income, GDP
C	Consumer spending
I	Investment spending by firms
G	Government spending
r	Interest rate
M	Money supply

The GDP is a sum of the consumption, investment, and government spending,

$$Y = C + I + G.$$

The consumption is assumed to be proportional to Y , $C = bY$, with $0 < b < 1$; b is the marginal propensity to consume, and $s = 1 - b$ is the marginal propensity to save. The investment is assumed to be given by $I = I_0 - ar$, which is a decreasing function of the interest rate, where a is the marginal efficiency of capital and I_0 is the investment when $r = 0$. Substituting in the above equation gives $Y = bY + I_0 - ar + G$, or

$$sY + ar = I_0 + G.$$

In this equation, the parameters satisfy $0 < s < 1$, $a > 0$, and $I_0 > 0$.

The money supply is a function (called the liquidity function) of GDP and the interest rate, and is assumed to be given by

$$M = mY + M_0 - hr.$$

The term mY represents the demand for funds for transactions that is proportional to the size of the economy. The term $M_0 - hr$ represents the demand for funds from investors for the part of the portfolio not invested in bonds. In the last equation, the parameters satisfy $0 < m < 1$, $h > 0$, and $M_0 > 0$.

Taken together, we get the system of equations

$$\begin{aligned} sY + ar &= I_0 + G \\ mY - hr &= M - M_0. \end{aligned}$$

We can solve these two equations for Y and r as functions of the variables G and M and the parameters s , a , I_0 , m , h , and M_0 :

$$\begin{aligned} Y &= \frac{h(I_0 + G) + a(M - M_0)}{sh + am} \\ r &= \frac{m(I_0 + G) - s(M - M_0)}{sh + am}. \end{aligned}$$

Thus, we consider G and M as the independent variables that can be controlled, and Y and r are dependent variable determined by G , M , and the other parameters.

These solutions show that, in this model, an increase in G or M leads to an increase in the national income Y ; also, an increase in G or a decrease in M leads to an increase in the interest rate r .

REFERENCES

- [1] C. Simon and L. Blume, **Mathematics for Economists**, W. W. Norton & Company, New York, 1994