

THE IS-LM MODEL

How Goods Market & Money Market Interact

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Principles of Macroeconomics

Semester 2/2019-2020

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Version: April 2, 2020

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Endogenising interest rates

Towards a more complete model

When we looked at the Keynesian Cross, we assumed that (i) **prices** are fixed; and (ii) **interest rates** are fixed.

We will now take a step further. Since we know that *interest rates* can be determined:

- We will first assume that **prices** are still **fixed**
- As such, there is no inflation, and nominal vs. real Y are the same
- Based on the fisher equation, since $\pi = 0$;

$$r = i$$

Overview of the new model – IS-LM

This model is called IS-LM – short for “Investment – Saving and Liquidity Preference – Money Supply model”.

We are putting the two markets together:

1. The goods market
2. The money market

And we say that there is a common price – in this model, the interest rate – that *clears both markets*.

Overview of the new model [cont.]

Basic assumptions to be aware of:

1. We will start with an autarky (closed) economy model (the open economy one is called the Mundell-Fleming model)
2. Still a *short-run* model ! Why???
3. Price is fixed! $\Rightarrow \pi = 0$
4. Therefore: $r = i - 0$
5. IS-LM is a decent “top-of-the-head” tool to guess the impacts of policy in the short-run.

What it essentially looks like

Deriving and understanding the IS curve

The Investment-Saving curve

We will begin with the less complicated part of the IS-LM model. Let's go back to the **Keynesian cross**:

$$Y = C + I + G$$

This can actually be written as:

$$Y = C(Y, T) + I(r) + G$$

We will be looking at the relationship between **the real interest rates** (r) and **aggregate output** (Y).

Why is IS curve a decreasing function?

Do you remember the simple investment function:

$$I(r) = I_0 - I_1 r$$

where $I_0 > 0$
 $I_1 > 0$

Thus, when $r \downarrow (\uparrow) \Rightarrow I \uparrow (\downarrow) \Rightarrow Y \uparrow (\downarrow)$

Graph: deriving the IS curve

Characterising the IS curve

As such, IS curve represents **all the equilibrium level of output** for each **level of interest rates**.

As such, the identity equation for the IS curve is AE itself:

$$Y = C(Y, T) + I(r) + G$$

The IS curve considers the changes in Y when r changes, **caeteris paribus** – meaning considering the rest (T and G) constant (exogenous). It is a **locus of points**.

We can deduce **two** elements from the model:

1. The slope depends on (i) elasticity of investment to interest rates; and (ii) the size of the Keynesian multiplier;
2. Shifts in the IS curve happens when T and/or G changes.

What does the slope of the IS curve means?

Shifts in the IS curve

Deriving and understanding the LM curve

The Liquidity preference – Money supply (LM) Curve

Now, we are back at considering the money market. Just like the IS curve, it is a locus of points – each point on the LM curve represents **an equilibrium in the money market**.

Remember that:

$$M_d = L(Y, r)$$

$$\text{For instance} = L_1 Y - L_2 r$$

$$\text{And } M_s = \frac{M}{P} \text{ (exogenous)}$$

At the equilibrium we have $M_s = M_d$

Logic is easy!

- Higher level of output leads to higher demand for money;
- This higher demand causes the equilibrium interest rate to rise.

Another way to look at things (perhaps a less useful version).

- Since money supply M/P is determined by the central bank (exogenous), they are constant.
- Thus, in order to hold the equilibrium, when Y changes, r needs to change as well
- In other words, the LM curves show the combination of r and Y that constitute the money market equilibrium.

Deriving graphically the LM curve

Characterising the LM curve

We can take away some important key points:

1. Thus, changes in the money demand are represented by movements **along** the LM curve.
2. This means that the slope is the interest and income elasticities of money demand (likely steep)
3. Shifts are caused by changes in the money supply and price (here assumed fixed)
4. e.g. when the BoT does an expansionary monetary policy, it lowers the interest rates at a given level of income

The IS-LM equilibrium & fiscal and monetary policies

The IS-LM equilibrium

The IS-LM equilibrium [cont.]

Both the **real** and the **money** markets are in equilibrium only at the intersections of the IS and the LM curve.

We have successfully endogenise:

- Interest rates and output
- Things that depends on the interest rates, e.g. investments
- Things that depends on income, e.g. consumption

Do we have a stable equilibrium?

Fiscal policy shock

What the IS-LM tells us about expansionary fiscal policy

As government spending increases, the IS curve shifts right – raising both r and Y . However, the size of the effect depends on **how the government financed their spending**:

- Bonds/taxes/seigniorage – usually in this model we assume financing through bonds to be the default
- If government prints money, LM shifts as well!

We can see here another “*crowding out*” – higher G raises the interest rate.

Expansionary monetary policy

Exceptional cases – liquidity trap

Exceptional cases – quantity theory