**IS-LM**

The IS-LM model: bringing it all together

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**Equilibrium in the IS-LM Model**

The IS curve represents equilibrium in the goods market.

\[ Y = C(Y - T) + I(r) + G \]

The LM curve represents money market equilibrium.

\[ \bar{M}/\bar{P} = L(r, Y) \]

The intersection determines the unique combination of \( Y \) and \( r \) that satisfies equilibrium in both markets.

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**Policy analysis with the IS-LM Model**

Policymakers can affect macroeconomic variables with

- fiscal policy: \( G \) and/or \( T \)
- monetary policy: \( M \)

We can use the IS-LM model to analyze the effects of these policies.

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**Change in G**

- \( Y = C + I + G; C = a + b \ (Y-T); \) b is MPC
- \( I = z - dr; T \) is fixed
- Equation of IS curve:
  \[ Y = C + I + G \]
  \[ Y = a + b \ (Y-T) + z - dr + G \]
  \[ dr = (a - bT + z + G)/(1-b) + (b/(1-b))Y \]
  \[ r = [(a - bT + z + G)/d] - [(1-b)/d)]Y \]
**IS curve**

- \( r = \frac{(a - bT + z + G)}{d} - \frac{(1-b)}{d}Y \)
- \( r = Q - FY \)

When G increases, Q increases. IS curve shifts out.

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**An increase in government purchases**

1. IS curve shifts right causing output & income to rise.

2. This raises money demand, causing the interest rate to rise...

3. ...which reduces investment, so the final increase in Y is smaller than in (1).

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**IS curve**

- \( r = \frac{(a - bT + z + G)}{d} + \frac{(1-b)}{d}Y \)
- \( r = Q - FY \)

When T increases, Q falls. T increase implies IS curve shifts inwards.

A tax cut shifts IS outwards; similar to G increase.

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**A tax cut**

Tax cut raises consumption, raises Y. Higher Y raises money demand and raises interest rates, which reduces investment, and brings the increase in Y down [from (1) to (3)].
**Equilibrium**

\[ \frac{M^s}{P} = \left( \frac{M}{P} \right)^d = L(i, Y) \]

The supply of real money balances

Real money demand

Equilibrium in the money market gives us the other equation connecting \( r \) and \( Y \)

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**LM curve**

- \( \frac{M}{P} = L(Y,r) = hY - qr \)
- \( r = \left( \frac{h}{q} \right)Y - \left( \frac{M}{P} \right)/q \)
- LM curve; positively sloped

An increase in \( M \) shifts LM down

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**Monetary Policy: an increase in \( M \)**

1. \( \Delta M > 0 \) shifts the \( LM \) curve down (or to the right)
2. ...causing the interest rate to fall
3. ...which increases investment, causing output & income to rise.

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**Algebra of ISLM**

- IS curve:
  \[ r = \left[ \frac{(a - bT + z + G)}{d} \right] + \left[ \frac{(1 - b)}{d} \right]Y \]
- LM curve: \( r = \left( \frac{h}{q} \right)Y - \left( \frac{M}{P} \right)/q \)
**Algebra -2**

\[
\frac{a-bT+z+G}{d} + \frac{(1-b)Y}{Pq} = \frac{h}{p} - \frac{M}{Pq}
\]

\[
\Rightarrow \frac{a-bT+z+G}{d} + \frac{M}{Pq} = Y + \left[ \frac{h}{p} - \frac{(1-b)}{Pq} \right]
\]

\[
\Rightarrow Y = \frac{a-bT+z+G}{d} + \frac{M}{Pq} \left[ \frac{h}{p} - \frac{(1-b)}{Pq} \right]
\]

\[
r = \frac{h}{q} \left\{ \frac{a-bT+z+G}{d} + \frac{M}{Pq} \right\} - \frac{M}{Pq}
\]

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**Example: problem 3, pg. 305**

- \(C = 200 + 0.75 (Y - T)\)
- \(I = 200 - 25 r\)
- \(G = T = 100\)
- \((M/P)^d = Y - 100 r\)
- \(M = 1000; P = 2\)

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**Summary**

- Increase in \(G\) (ceteris paribus) shifts IS curve to the right; no effect on LM
- **Cut** in taxes has same general effect as above (ceteris paribus); no effect on LM
- Increase in M (money supply) shifts LM curve down (ceteris paribus); no effect on IS