# Pre-recording:
# *Instrument choice*

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# Disclaimer

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# Poole's analysis and instrument choice

Central banks have 'ultimate targets' (or goals) such as price stability, maximal employment, macroeconomic stability...

- To achieve these goals they may focus on 'intermediate targets', such as inflation forecasts
- To hit (or try to hit) these intermediate and ultimate targets, they will employ policy 'instruments'

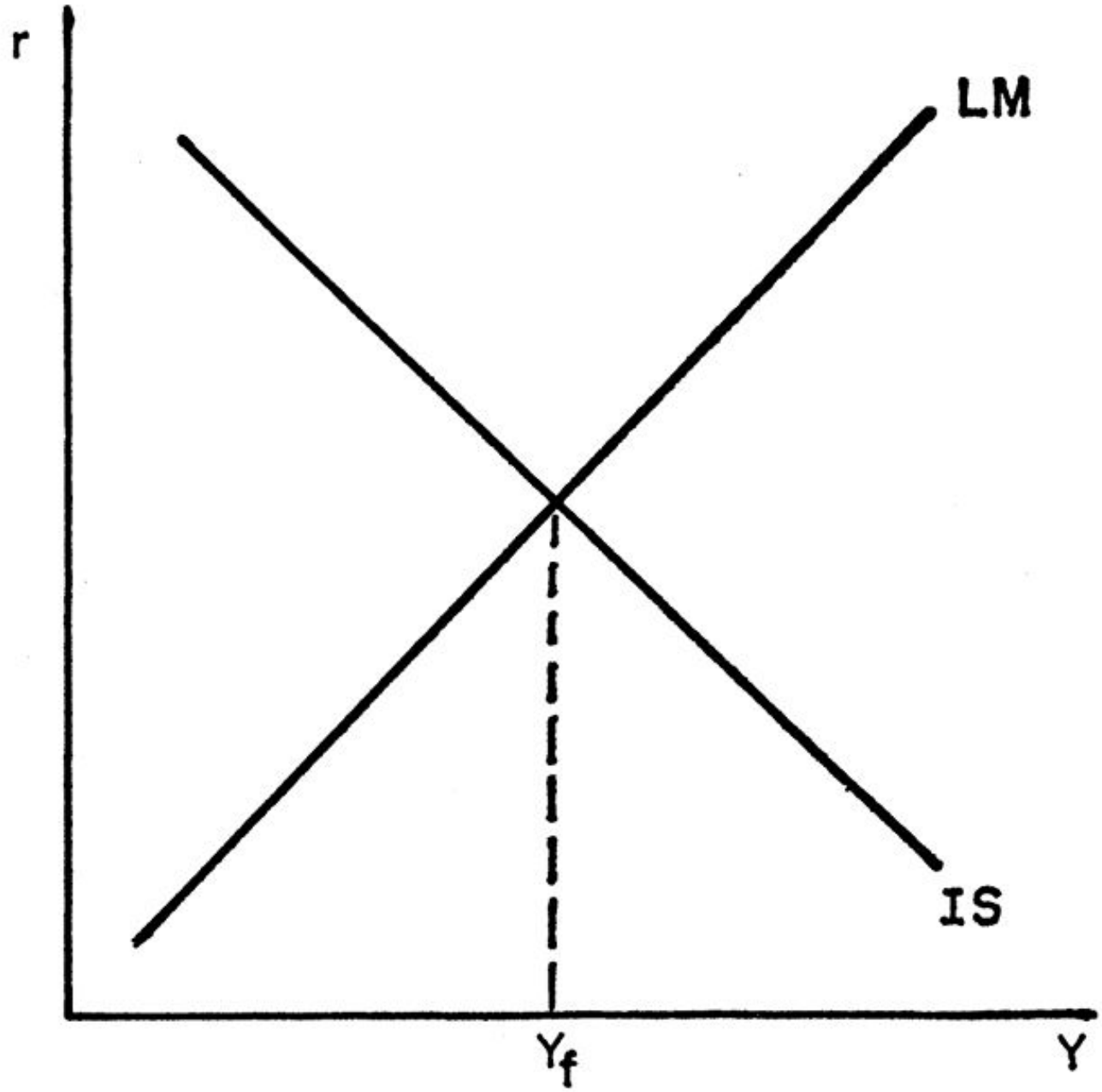
Two classes of instruments often discussed are 'money supply' and 'interest rates'

- In a famous analysis, Poole (1970), argued that which of these is superior will depend on which sources of randomness dominate, in buffeting the economy
- Traditionally (see the nice treatment in Walsh Ch. 12) people consider shocks to goods demand and to money demand

Some of you may already have encountered the dated (but still somewhat useful) IS-LM approach to analysing macroeconomic dynamics and the role of policy

- The IS curve reflects market balance in the 'goods market'
  - It relates GDP (negatively) to the interest rate
  - Higher interest rates choke off consumption, investment etc.
- The LM curve reflects market balance in the 'money market'
  - It relates GDP (positively) to the interest rate
  - Higher transactions demand implies higher money demand
  - Given money supply, this requires a higher interest rate to clear the money market

The IS-LM framework is a 'short run' framework that assumes prices are fixed (there is no allowance for inflation) so the distinction between nominal and real 'interest rate' is not emphasized.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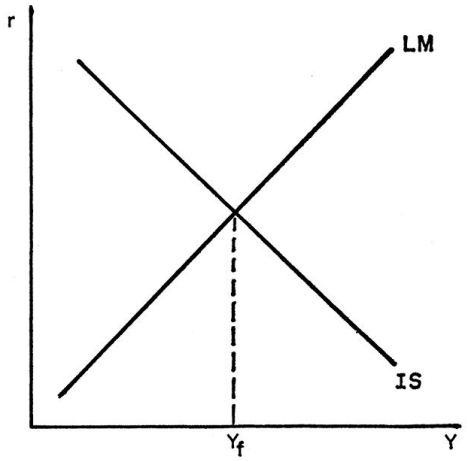
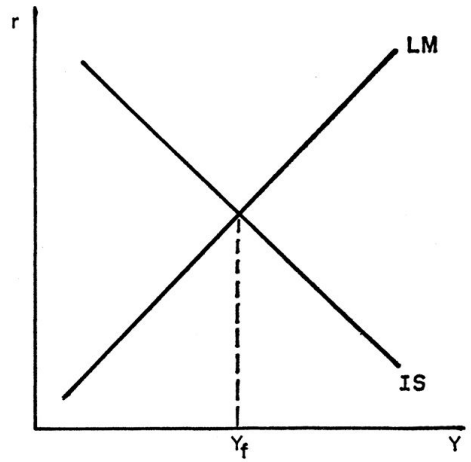



Increasing the money supply implies that for a given level of money demand, the market clearing interest rate will be lower

- LM curve will 'shift' so that there is a lower interest rate for any given output level
- This will be associated with additional output (tracing out along the IS curve as consumption/investment is stimulated)
- The increased output will support money demand, and ensure the decline in equilibrium $r$ is not as great as the LM shift




In addition to (monetary) policy-induced shifts in the LM curve there may be random disturbances to the IS or LM schedules

- There may be 'animal spirits' that shift consumption or investment at any given interest rate
  - Think about a $\beta$ shock from our 2-period consumption note
- There may be a sudden desire for liquidity (high money demand), shifting the LM curve
  - Think about changes in the desirability of (non-money) assets that are substitutes for money in a portfolio
  - Could be a risk or risk aversion shift among those demanding liquidity for precautionary reasons

Following the notation in Walsh, we write the IS and LM as

$$\begin{aligned} y_t &= -\alpha r_t + u_t \\ y_t &= m_t + c r_t + v_t \end{aligned}$$

where...

- $y_t$, $r_t$ and $m_t$ are GDP, the interest rate, and money
- $\alpha > 0$, and $c > 0$ are parameters (coefficients in this case)
- $u_t$ and $v_t$ are uncorrelated mean zero, Normally distributed disturbances with variances $\sigma_u^2$ and $\sigma_v^2$ respectively

## Question:

- What happens if we get a positive realization of $u_t$? Of $v_t$?
- What does it look like on the IS-LM diagram?

Suppose the central bank must set its instrument at the 'start' of the period

- That is, before the shocks are known
- The CB detects market pressure on interest rates but cannot precisely assess the source

Suppose that it is aiming to minimize $E[y_t^2]$

- Trying to minimize output volatility (around normalized 'natural' value of 0)

The question then is, would it be better to fix the money supply and allow $r_t$ to adjust, or fix $r_t$ and allow the money supply to adjust?

- The answer depends on the shape of the curves and the volatility of the shocks

**Approach 1:** Fix $m_t$ and let $r_t$ adjust

- Use the LM and IS equations to eliminate $i_t$, yielding

$$y_t = \frac{\alpha m_t + c u_t - \alpha v_t}{\alpha + c}$$

- To achieve $E_t[y_t] = 0$ set $m_t = 0$ (remember, these variables are normalized), which then implies

$$E[y_t^2] = \frac{c^2 \sigma_u^2 + \alpha^2 \sigma_v^2}{(\alpha + c)^2}$$

**Approach 2:** Fix $r_t$ and let $m_t$ adjust

- Use IS equations to observe that $i_t = 0$ implies $E_t[y_t] = 0$
  - The LM curve will indicate what $m_t$ ensures money market equilibrium
- We then have that

$$E[y_t^2] = \sigma_u^2$$

Which is the better system? That depends on:

$$\sigma_v^2 \quad vs. \quad \left(1 + \frac{2c}{\alpha}\right)\sigma_u^2$$

Recall our IS-LM setup:

$$\begin{aligned} y_t &= -\alpha r_t + u_t \\ y_t &= m_t + c r_t + v_t \end{aligned}$$

$$\sigma_v^2 \quad \textit{vs.} \quad \left(1 + \frac{2c}{\alpha}\right)\sigma_u^2$$

- If $\sigma_v^2$ is sufficiently large (vs. $\sigma_u^2$) then favor interest rate target
  - **Intuition:** Money demand shocks cause interest rate to jump around, which pushes consumption/investment around
  - Shifting the money supply curve to prevent the interest rate movements can then insulate output
- If $\sigma_u^2$ is sufficiently large, relative to $\sigma_v^2$ then favor money target
  - **Intuition:** Fluctuations in demand (confidence, govt. spending...) will buffet the IS curve
  - If the interest rate is allowed to rise (fall) after a positive (negative) shock, it will choke off some of the effect
  - So don't want to keep interest rate fixed - thus, no offsetting money supply changes should be instituted
- Tradeoff depends on slopes of the curves
  - Big $\alpha \Rightarrow$ demand very interest elastic ($r_t$ movements disruptive)
  - Small $c \Rightarrow$ big response of interest rate to money demand shock (will pass through and disrupt output)