

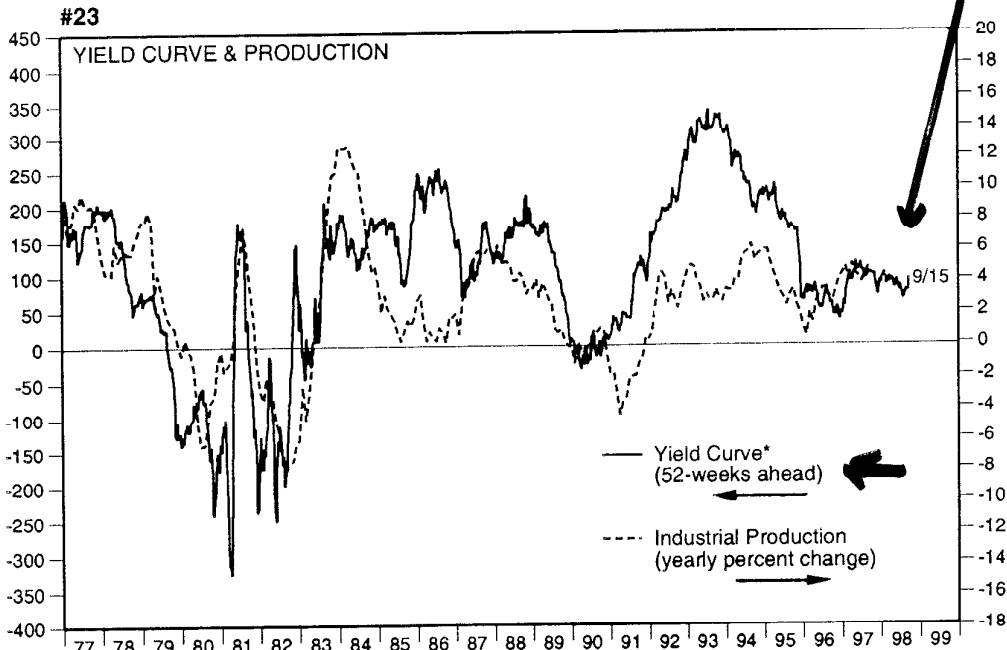
The LQ curve /

- combination of (i, y) for which financial market(s) are in equilibrium
 - why study this?
 - belief: interest rate matter
 - monetary policy matter
 - GDP/GDPA matter
- T F
- if True in what sense do interest rate matter

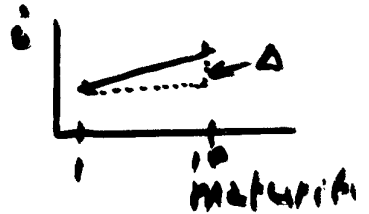
$$\left(\frac{\Delta y}{y}\right)_t = f(\Delta)_t + 1$$

- G7 Industrial Production -

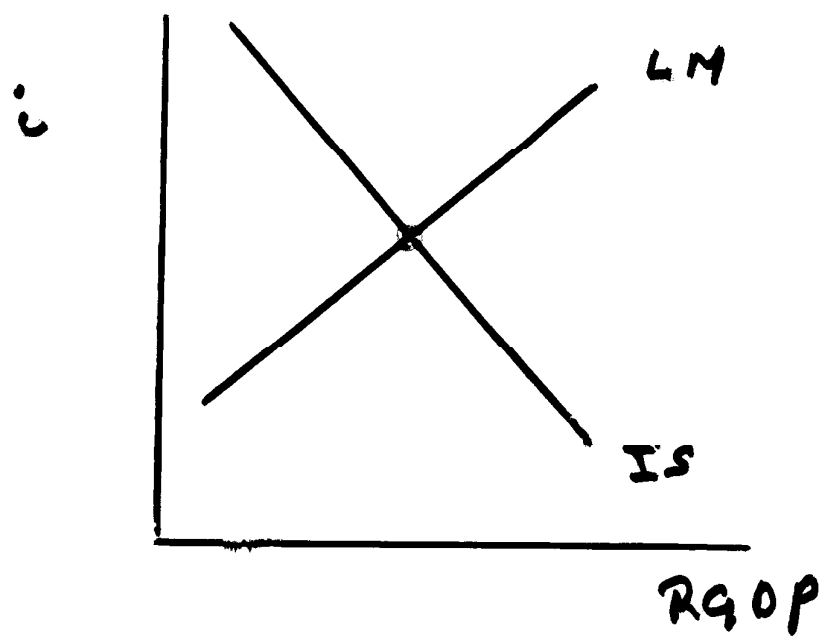
need to forecast Δ



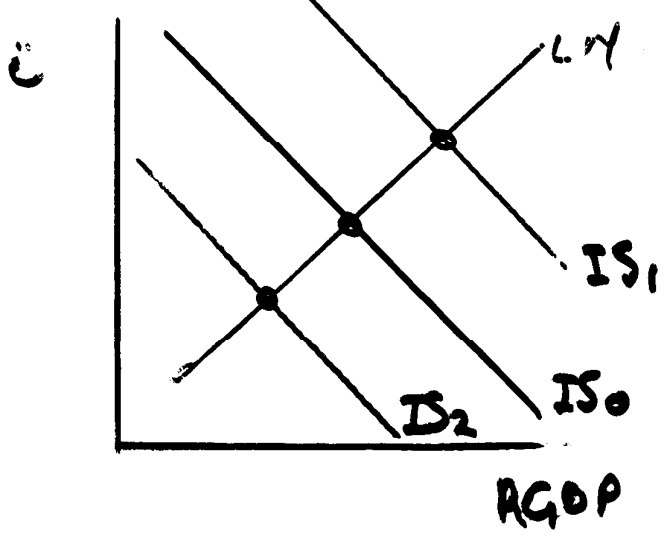
US yield curve still predicting solid real growth a year from now.



* 10-year government bond yield minus 1-year Treasury bill.

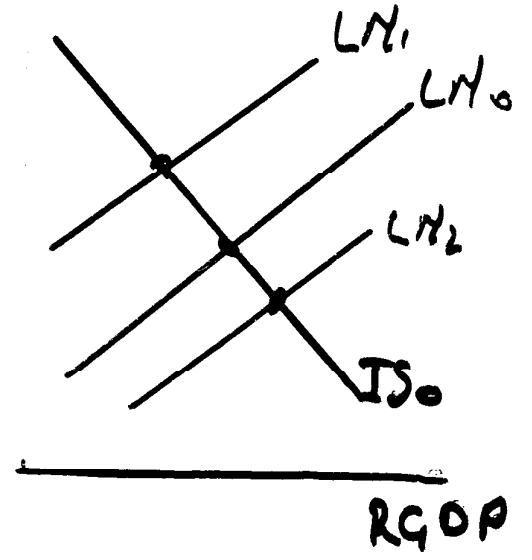


IS shocks



i and GDP move
pro-cyclically

LM shocks



i and RGDP move
countercyclically

does monetary policy matter?

• The LM Curve

- the alternative combinations of the nominal rate of interest and nominal income for which the "money market" is in equilibrium

"Demand for money"

• what is money? : a very liquid asset

"money"

• ad hoc definition

• short term liquid financial

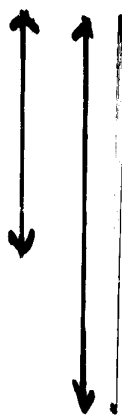
Chicago /

assets

Classical ↓

monetarism

Keynesian



- coins
- notes
- check. accts
- sav. accts
- 3mth - 3yr. T bills

"money" \equiv "cash balances" \equiv M

"real money" \equiv "real cash balances" \equiv $\frac{M}{P}$

Which M is relevant?

- in principle the broadest possible aggregate

- Keynes (read Chap. 13)
broad aggregate

- monetarism, narrower aggregate

- classical (Ricardo, Mill),
very narrow definition
(coins)

- broad aggregate

(M/P) is interest rate sensitive

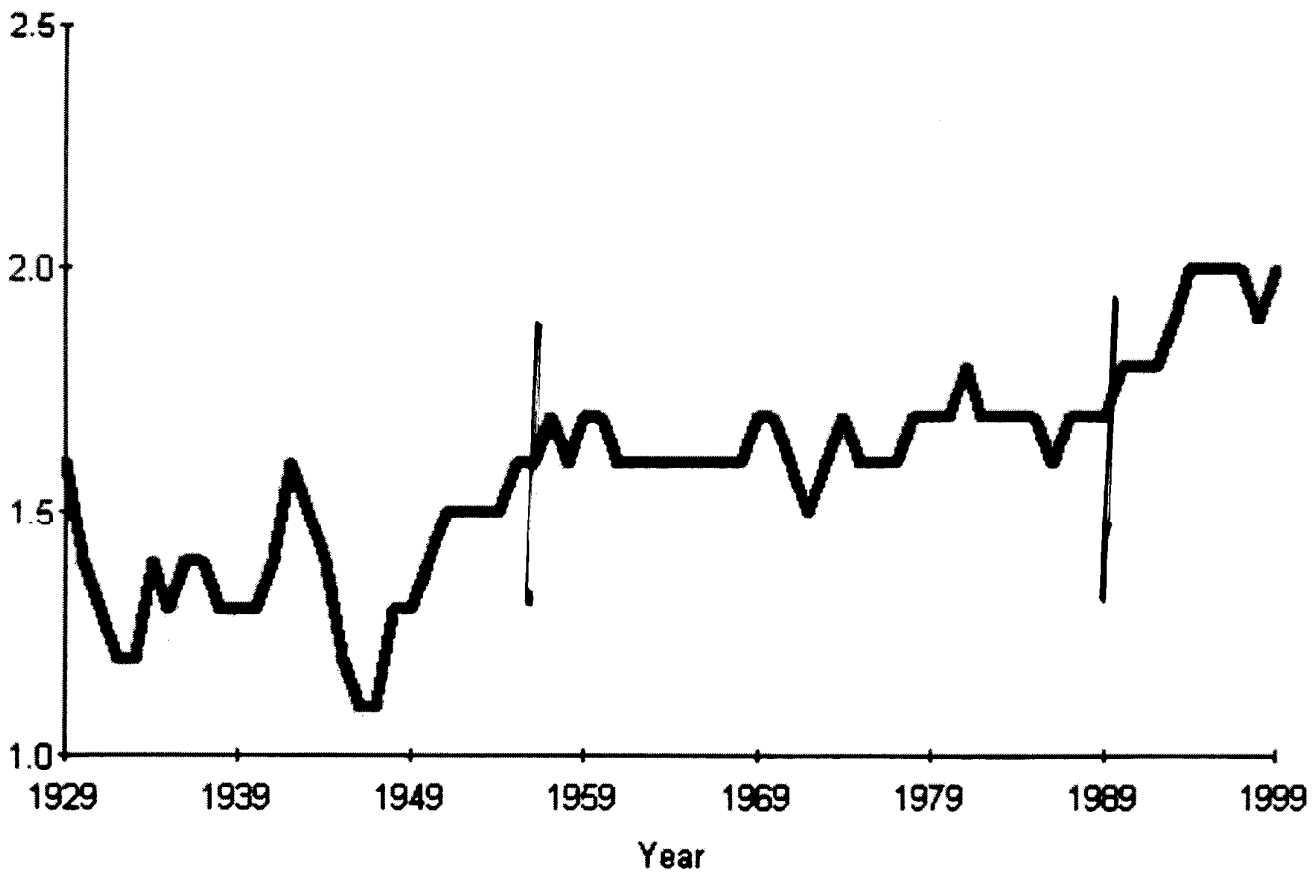
- narrow aggregate

(M/P) is interest rate insensitive

- leads to different LM curves

The U.S. Economy: 1929-1999

M2 velocity (GDP/M2)



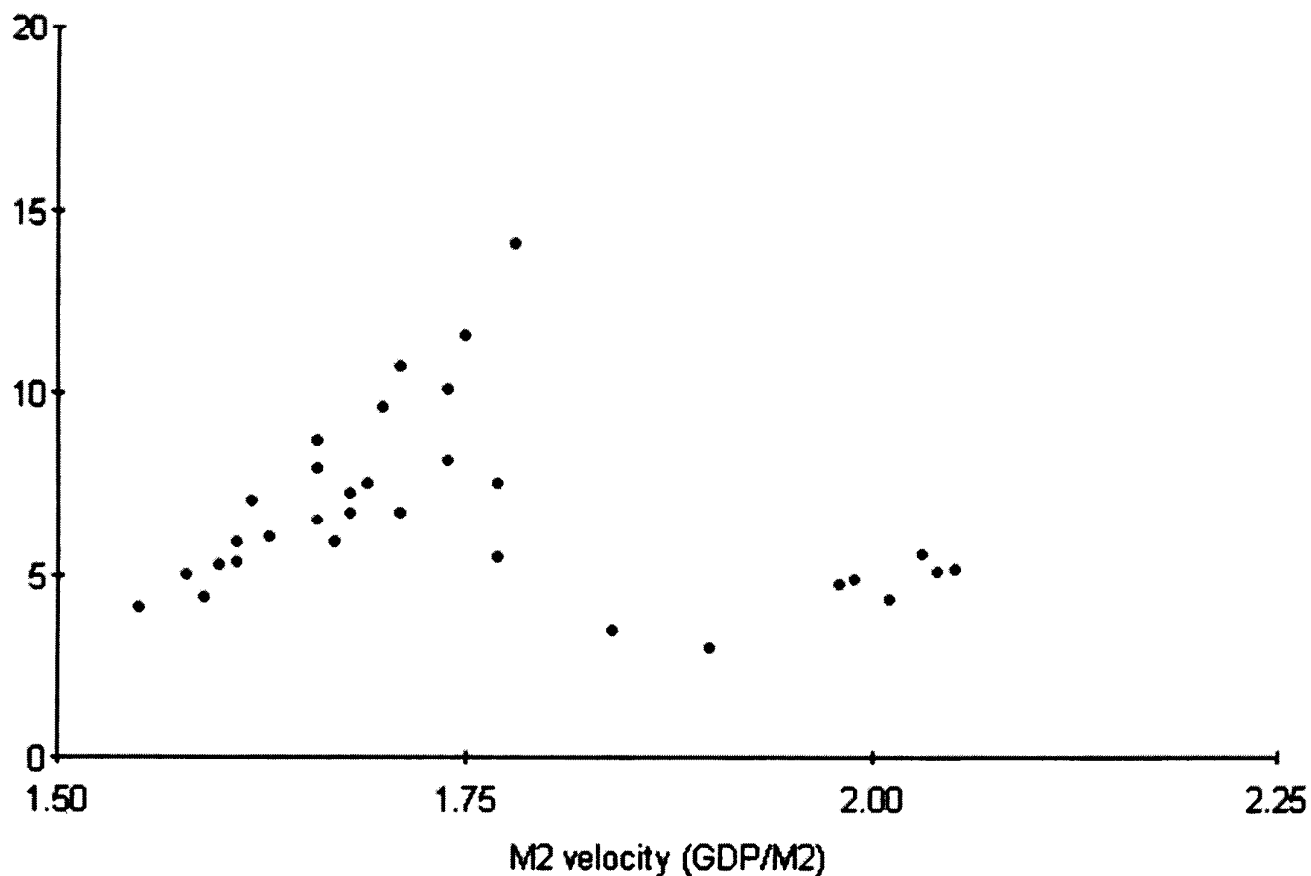
$$V_2 = M_2 \text{ velocity} = \frac{1}{k} \leftarrow \text{Nerzhall}$$

↑
Fisher

constant?

File

United States: 1968-1999
3 month Treasury bill rate (% per year)



$$M_2 \text{ velocity} = \frac{1}{k}$$

Short term nominal interest rate sensitive?

modeling

• the commodity market

• commodity market
equilibrium

• $AS = AD$

• the "money market"

• money market
equilibrium

• $M^{Supply} = M^{Demand}$

or

① \longrightarrow • $\frac{M^{Supply}}{P} = \frac{M^{Demand}}{P}$

② \longrightarrow $\frac{M^0}{P} = h \cdot Y - h \cdot i$

③ \longrightarrow $M^{Supply} = \bar{M}$

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the nominal supply of money is
exogenous: The Fed controls \bar{M}

"Money market model"

① $M^s/P^s = M^d/P^d$

② $M^d/P^d = k \cdot Y - h \cdot i$

③ $M^s = \bar{M}$

} Solve

$$\frac{\bar{M}}{P} = kY - hi$$

Solving for the interest rate:

Let us write

$$i = \frac{1}{h} \left(kY - \frac{\bar{M}}{P} \right)$$

(11a)

note

$$M = \bar{M}$$

$$P = \bar{P}$$

The relationship (11a) is the *LM* curve.

Next we ask the same questions about the properties of the *LM* schedule that we asked about the *IS* curve.

$$\text{slope} = \frac{\partial i}{\partial Y} = \frac{k}{h}$$

interpret $h \rightarrow 0$

interpret k

note:

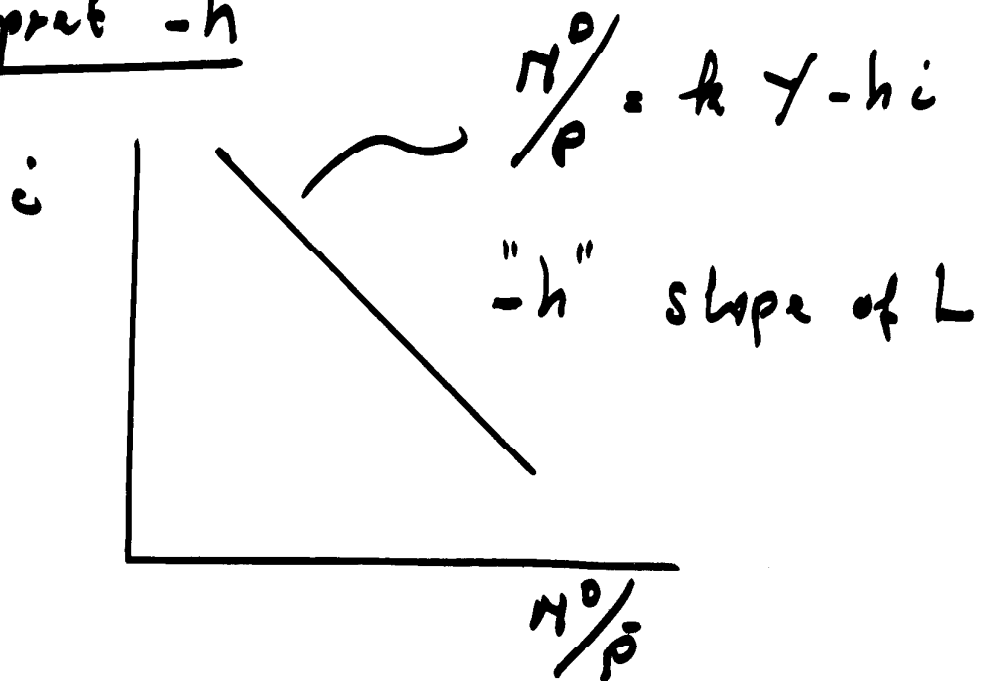
$$L_1 = k \cdot Y - h \cdot i$$

$$i = \frac{k}{h} Y - \frac{1}{h} L_1$$

$$i = \frac{1}{h} \left(k \cdot Y - \frac{M^d}{P} \right)$$

$\frac{\Delta i}{\Delta Y}$ = slope of LM curve

interpret "-h"

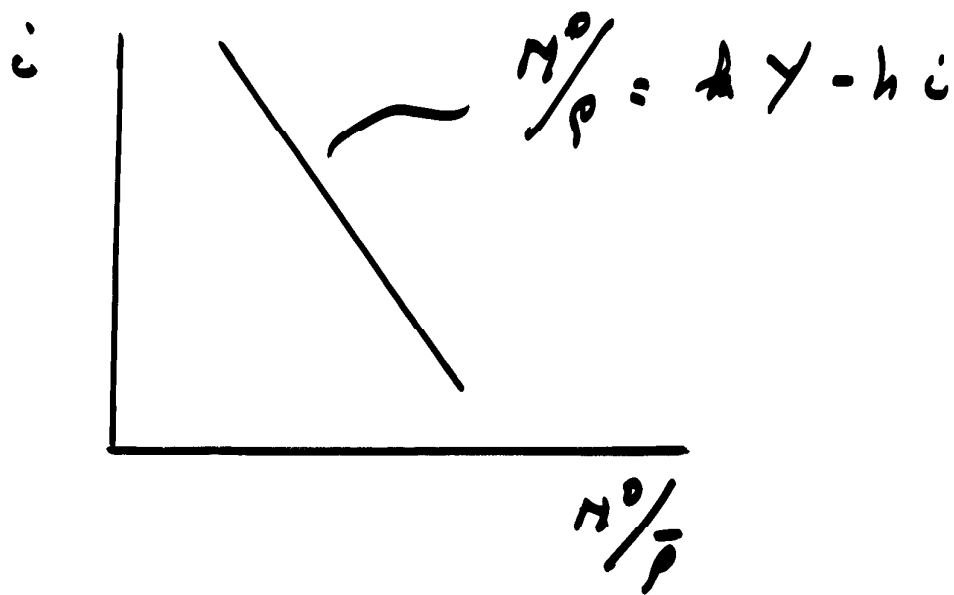


interest rate elasticity

"interest rate elasticity of the demand for real cash balances"

$$\frac{\frac{\Delta (M^d/P)}{M^d/P}}{\frac{\Delta i}{i}} = e * \frac{\Delta i}{i}$$

$$e = \frac{\Delta (M^d/P)}{\Delta i} * \frac{i}{(M^d/P)} = -h * \frac{i}{(M^d/P)}$$



$$e = -h * \frac{i}{(M^o/P)}$$

- if $-h \rightarrow -\infty$ then $e \rightarrow -\infty$

broad definition
of money: Keynesian

interest elastic
demand for real
cash balances

- if $-h \rightarrow 0$

narrow definition
of money: monetarists,
Classical analysis

then $e \rightarrow 0$

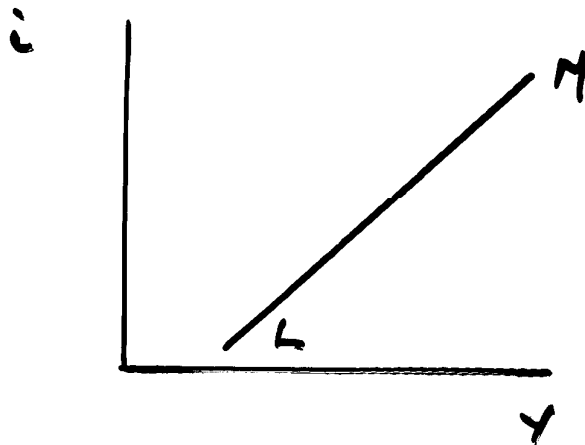
interest inelastic
demand for cash bal.

LM curve

$$i = \frac{1}{h} \left(kY - \frac{M}{P} \right)$$

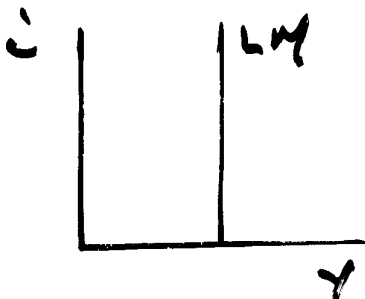
• slope of LM curve

$$\frac{\Delta i}{\Delta Y} = \frac{k}{h} = \frac{+}{+} = (+)$$

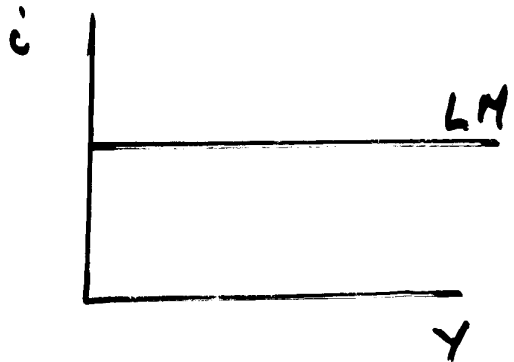


if $h \rightarrow 0$

(monetarism,
classical)



if $h \rightarrow \infty$
(Keynesian)



LM curve

$$i = \frac{1}{h} (k \cdot Y - \frac{M}{P})$$

$$i = -\frac{\bar{M}}{h \cdot \bar{P}} + \frac{k}{h} \cdot Y$$

↑
intercept
< 0

⊕
↑
slope
> 0

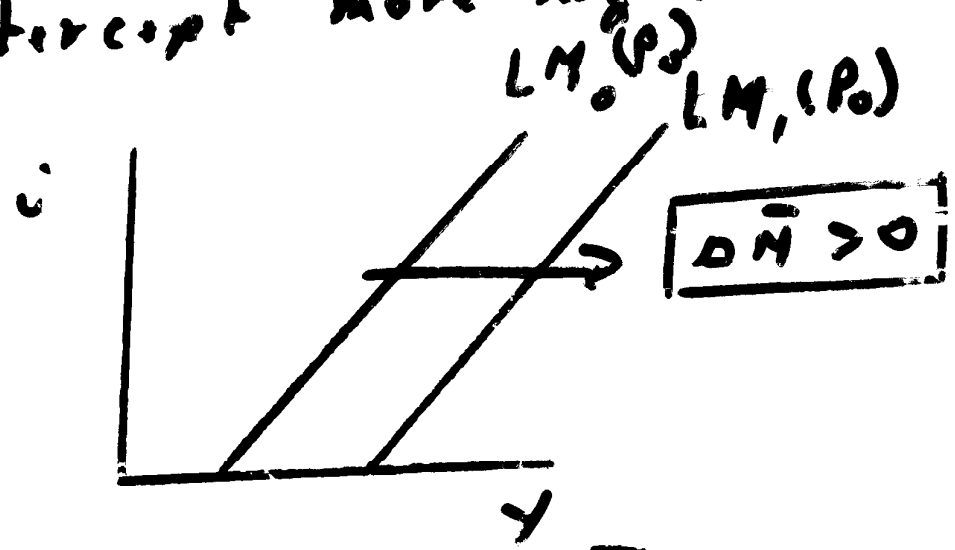
- What causes the LM curve to shift
- What causes the LM curve to rotate
- What happens if \bar{M} or \bar{P} are off the LM curve?

LM curve

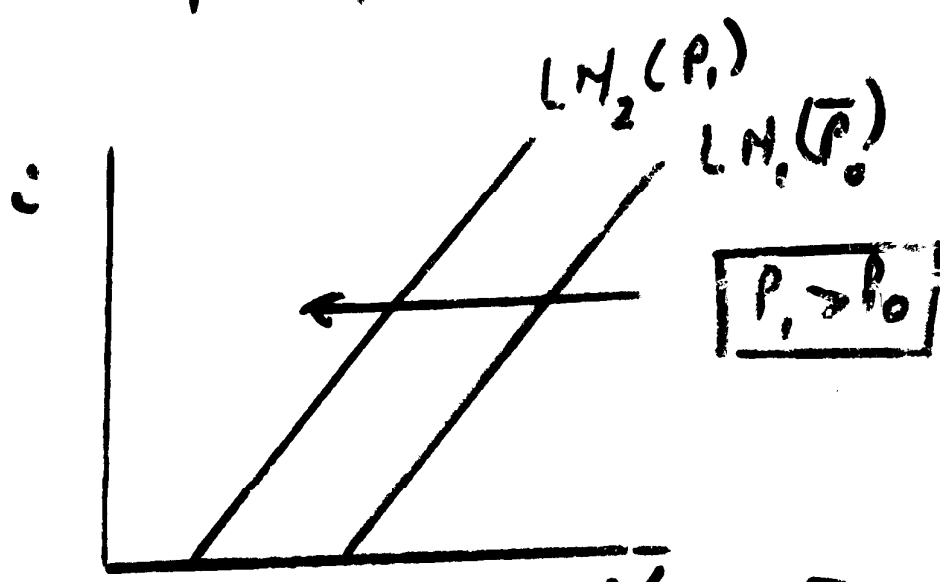
$$i = \frac{1}{h} (k \cdot Y - \frac{\bar{M}}{\bar{P}})$$

• what happens if $\Delta \bar{M} > 0$?

• intercept more negative

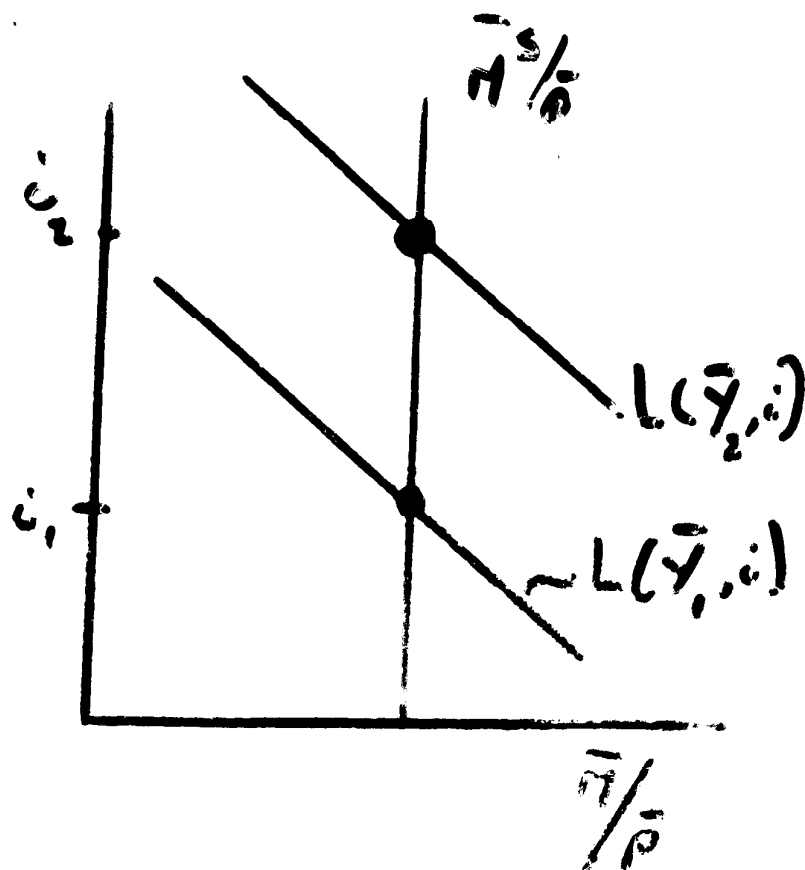
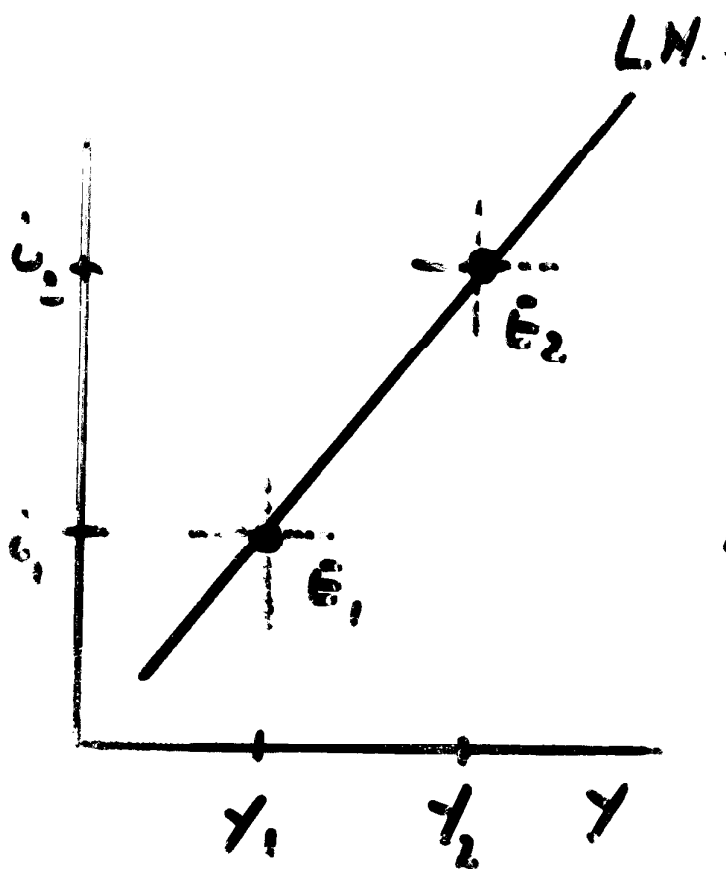


• what happens if after \bar{M} increases \bar{P} increases



• monetary policy effective only if $P = \bar{P}$

- Derive the LM curve



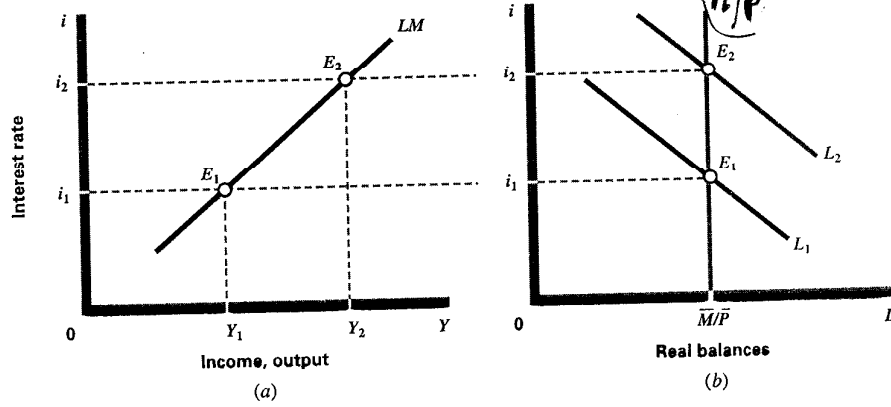
Money Market Equilibrium

$$M^s = M^d$$

$$= L(Y, i)$$

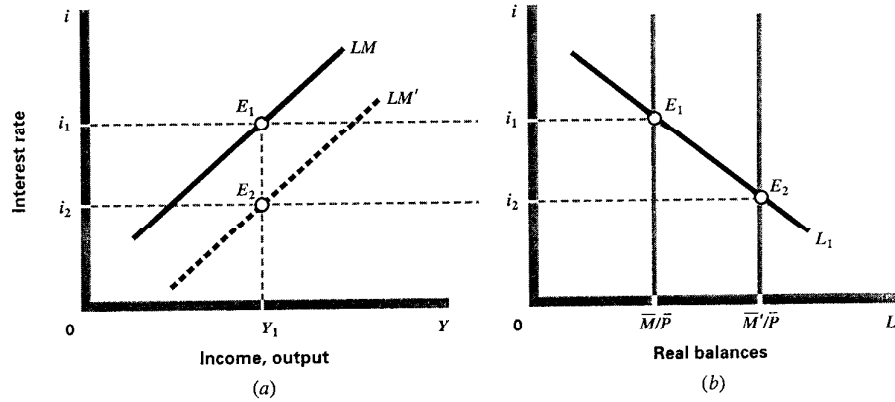
LM curve \rightarrow $i = k \cdot Y - h \cdot i \rightarrow \boxed{i = \frac{1}{h} (kY - \frac{M}{P})}$

MONEY, INTEREST, AND INCOME



DERIVATION OF THE LM CURVE. The right-hand panel shows the money market. The supply of real balances is the vertical line \bar{M}/\bar{P} . The nominal money supply \bar{M} is fixed by the Fed, and the price level \bar{P} is assumed given. Demand for money curves L_1 and L_2 corresponds to different levels of income. When the income level is Y_1 , L_1 applies, and the equilibrium interest rate is i_1 . This gives point E_1 on the LM schedule in part (a). At income level Y_2 , greater than Y_1 , the equilibrium interest rate is i_2 , yielding point E_2 on the LM curve.

The Position of the *LM* Curve

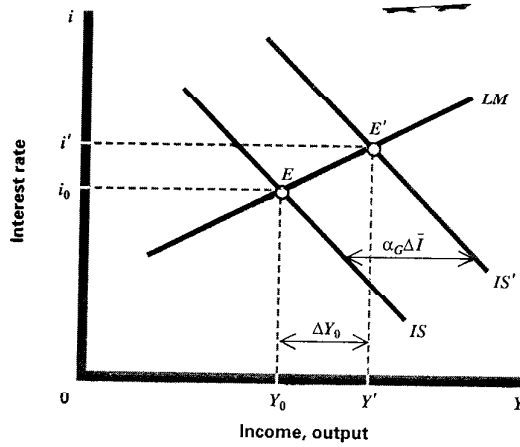


AN INCREASE IN THE SUPPLY OF MONEY FROM \bar{M} TO \bar{M}' SHIFTS THE *LM* CURVE TO THE RIGHT. An increase in the stock of real balances shifts the supply schedule in the right panel from \bar{M}/\bar{P} to \bar{M}'/\bar{P} . At the initial income level Y_1 , the equilibrium interest rate in the money market falls to i_2 . In the left panel we show point E_2 as one point on the new *LM* schedule, corresponding to the higher money stock. Thus an increase in the real money stock shifts the *LM* schedule down and to the right.

$$i = \frac{1}{h} \left(k \cdot Y - \frac{\bar{M}}{\bar{P}} \right)$$



Changes in the Equilibrium Levels of Income and the Interest Rate



EFFECTS OF AN INCREASE IN AUTONOMOUS SPENDING ON INCOME AND THE INTEREST RATE. An increase in autonomous spending shifts the IS schedule out and to the right. Income increases, and the equilibrium income level rises. The increase in income is less than is given by the simple multiplier α_G . This is because interest rates increase and dampen investment spending.

• $\Delta \bar{A} > 0$

a private exp. shock

• $\Delta \bar{G} > 0$

a public exp. shock

• $\Delta \bar{P} > 0$

an "oil shock"

• $\Delta \bar{M} > 0$

a "money shock"

	$\Delta \bar{A}$	$\Delta \bar{G}$
Δy^{ex}	+	+
Δi^{ex}	+	+

	$\Delta \bar{P}$	$\Delta \bar{M}$
Δy^{ex}	-	+
Δi^{ex}	+	-