

# International Monetary Economics

## Lecture 2

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# Today

- 1 Macroeconomic Basics
  - Neoclassical vs Post-Keynesian theories of Money
- 2 ISLM
- 3 Bernanke-Blinder

# Last Time

- ① Balance sheet approach
- ② Functions of money/sources of money creation/money multiplier
- ③ Central banks, banking institutions, and open market operations

## Recall from Last Week

- 1815-1873, Bimetallism. Relative price ratio of gold and silver varied only between 15:1 and 16:1
- 1873-1896, Price level falling everywhere. (Cross of Gold)
- 1914, Everyone off gold to finance war spending
- 1914-1924, Anchored Gold standard to dollar.
- 1925/26, Everyone on gold again, massive price deflation into the 1930's.
- 1936-1971, Tripartite Monetary Agreement established a new int'l monetary system → dollar standard, where the dollar was the only currency anchored to gold.
- Since 1973, a flexible exchange rate regime
- 1985, Plaza Accord. Moves the system into a kind of managed dollar system relative to European currencies.
- Present Day: Euro, Dollar, Yen.

# Part I

## Basic Macroeconomics

# Basic Macroeconomics

- 1 Agents: Households, firms, government, other countries
- 2 Agents have 'reasonable rationality'
- 3 Cost plus unit pricing rules for firms
- 4 We model 'entrepreneur economies'
- 5 Principle of effective demand: market clearing through prices doesn't usually occur except in financial markets
- 6 'real markets' are demand-led: they clear through quantity adjustments—not price adjustments.
- 7 Economic activity measured through national income/product accounts.
- 8 Open up economies to include forex/imports/exports

## Example

	Households	Business Current	Business Capital	Government	$\Sigma$
Consumption	-C	+C			0
Government		+G		-G	0
Investment		+I	-I		0
<b>GDP</b>		<b>Y</b>			0
Wages	+WB	-WB			0
Profits	+F	-F			0
Taxes	-T			+T	0
$\Sigma$	0	0	0	0	

# Examples

[Please see handout.]

# Quarterly Accounts

[ Source: <http://www.cso.ie/releasespublications/documents/economy/current/qna.pdf>]

Period	Personal consumption of goods and services	Net exp. by central and local government on current goods and services	Gross domestic fixed capital formation	Value of physical changes in stocks	Exports of goods and services	Imports of goods and services	Statistical discrepancy
2003	67,203	18,985	31,338	1,288	117,172	-94,701	-1,521
2004	70,899	20,557	36,435	425	125,199	-102,882	-1,535
2005	76,927	22,246	43,220	730	132,671	-113,457	-247
2006	83,979	24,593	47,628	1,645	141,042	-123,574	1,446
2007	91,948	27,275	49,429	-146	153,481	-134,112	1,876
2008	93,863	28,901	39,474	317	151,896	-133,000	365
2003							

Figure: National Accounts breakdown

# Simple Macroeconomic Relationships

Gross Domestic Product:

$$GDP = C + I + G = WB + F + T \quad (1)$$

Disposable Income:

$$YD = WB + F - T \quad (2)$$

Savings:

$$Sav_h + (F - I_f) - Def = 0 \quad (3)$$

## Advantages of this approach

- 1 Based on National Accounts.
- 2 No black holes. Everything must add up.
- 3 Allows full description of portfolio choice
- 4 Can reproduce other models easily, as we'll see.
- 5 Quadruple entry principle

### Quadruple Entry

Any change in the sources of funds of a sector must be compensated by at least one change in the uses of funds of the same sector.

# Matrices

Need:

- 1 A stock matrix (balance sheet)
  - 2 A matrix of transactions (flows)
  - 3 A revaluation matrix (capital gains)
- Each variable must be defined by one equation (a behavioural equation, a definitional equation, or an identity equation).
  - To track variables (in large models), put each variable on the left-hand side of one and only one equation.

# Constructing Macro Models

- 1 Start by assuming that all stocks of the balance sheet add up.
- 2 Make sure that the row identities of the transactions-flow matrix are fulfilled.
- 3 Make sure the adding-up conditions of the parameters of the portfolio component are verified.
- 4 There is no need to start from the equilibrium.
- 5 Running the model will get you there, if the equilibrium is stable.
- 6 Once an equilibrium has been found, parameters can be modified to examine what happens.

## More on building

- The same model can be closed in several different ways.
- This can involve bumping and inverting several equations
- For instance, a 2-country model can be closed with the assumption of a fixed exchange rate, which is held constant because:
  - A central bank accepts to purchase/sell any foreign asset at the constant exchange rate (endogenous foreign reserves)
  - Interest rates are let to move freely to keep the exchange rate constant, while foreign reserves stay constant
  - Government expenditures are let to move freely to keep the exchange rate constant, while foreign reserves stay constant

# BIG disadvantage

Any attempt at realism makes the models really, really big.

## Two Views

Features	PK school	Neoclassical
Money	Has counterpart entries	Falls from helicopter
Money is seen	As a flow and as a stock	A stock
Money is tied to	Production	Exchange
Money supply is	Endogenous	Exogenous
Main concern with	Debts, credits	Assets, money
Causality	Reversed: credits→deposits	Reserves→deposits
Credit rationing due to	Lack of confidence	Asymmetric info.

## Two Views

Features	PK School	Neoclassical
Interest rates	Distribution variables	Arise from market laws
Liquidity preference	Diff. rel. base rate	Determines interest rate
Base rates	Set by central bank	Influenced by market forces
Natural rate	Takes multiple value/≠	Unique, based on thrift/prod

# Main Features/Policy differences

See (2), (4)

<b>Features</b>	<b>PK School</b>	<b>Neoclassical</b>
Restrictive monetary policy	(-) effects in short/long run	Has negative effects only in short run
Schumpeter's distinction	Monetary analysis (monetized production economy)	Real analysis (money neutrality, inessential veil)
Macro causality	Investment determines saving	Saving determines investment
Inflation	The growth in money stock aggregates is caused by the growth in output and prices	Price inflation is caused by an excess supply of money

# Part II

## ISLM

# Simplified CB Balance Sheet

[See (3, Chapter 17)]

Assets		Liabilities	
Foreign reserves		Banknotes	
Domestic T-bills	Reserves of commercial banks		

## Basic Idea

- IS Curve: Describes goods market equilibrium
- LM Curve: Shows choice between liquid assets & illiquid assets.
- Money supply is supplied by Central Bank, assumed exogenous.
- CB chooses  $M/P$ .
- Interest Rate Targeting/MS Targeting?

# A Macro Model with Four Sectors

- The product market,
- The money market,
- The bond market,
- The labour market.

# The Output Market

$$Y = \underbrace{C}_{\text{Consumption}} + \underbrace{I}_{\text{Investment}} + \underbrace{G}_{\text{Govt. Expenditure}} \quad (4)$$

$$C = C(Y). \quad (5)$$

(Our only behavioural equation)

$$Y = C(Y) + \bar{I} + \bar{G}. \quad (6)$$

(The bars mean we're fixing the values of  $I$  and  $G$  for the moment.)

# Derivation

$$C = C(\underbrace{YD}_{\text{Disposable Income}}). \quad (7)$$

$$C = C(YD, \underbrace{A}_{\text{Assets}}, \overbrace{r}^{\text{Int.rate}}). \quad (8)$$

# Assets

$$A = \frac{\overbrace{M}^{\text{Money}} + P_k \overbrace{B}^{\text{bonds}} + P_k \overbrace{K}^{\text{Capital}}}{P}. \quad (9)$$

# The Investment Function

$$I = I(\underbrace{\quad}_{\text{nominal interest rate } r} - \underbrace{\quad}_{\text{Inflation } \pi}). \quad (10)$$

## Put it all together

$$Y = C\left(Y - T, r - \pi, \frac{M + B + P_k K}{P}\right) + I(r - \pi) + G. \quad (11)$$

# The IS Curve

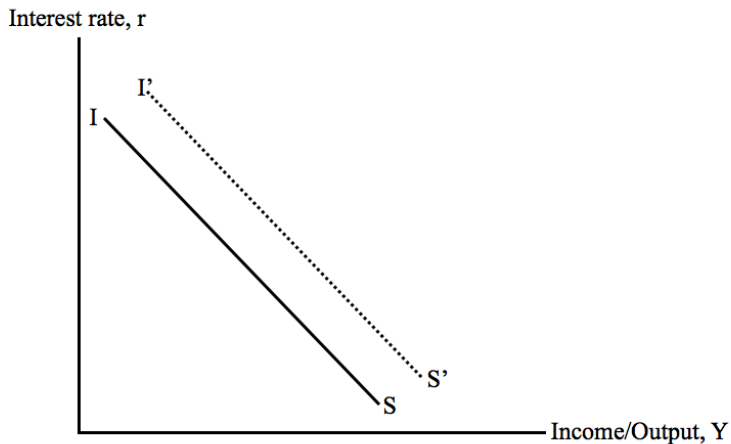


Figure: The IS curve.

## Shifts in IS Curve

- ① an increase the expected rate of inflation, or
- ② a fall in the price of output, or
- ③ a rise in the stock of assets, or
- ④ an increase in the price of capital, or
- ⑤ a reduction in the level of taxes.

# Money Markets

$$\frac{M^D}{P} = L \left( Y, -\pi, r - \pi, r_k, \frac{M + B + P_k K}{P} \right) \quad (12)$$

(Money demand is a function of output, inflation, the real interest rate, level of assets)

$$\frac{B^D}{P} = J \left( Y, -\pi, r - \pi, r_k, \frac{M + B + P_k K}{P} \right) \quad (13)$$

(Demand for bonds is a function of output, inflation, real interest rate, return on capital, assets.)

$$\frac{P_k K}{P} = N \left( Y, -\pi, r - \pi, r_k, \frac{M + B + P_k K}{P} \right) \quad (14)$$

(Work this one out yourself on paper)

$$\frac{M^D + B^D + P_k K^D}{P} = \frac{M + B + P_k K}{P} = A \quad (15)$$

(just a balancing condition.)

## Put this all together

$$\frac{M}{P} = L \left[ Y, -\pi, r - \pi, r_k, \frac{M+B}{P} + \frac{RK}{r_k} \right] \quad (17)$$

$$\frac{B}{P} J \left[ Y, -\pi, r - \pi, r_k, \frac{M+B}{P} + \frac{RK}{r_k} \right] \quad (18)$$

What do these equations (17 and 18) say to you?

## Edging towards LM

$$r_k = r - \pi. \quad (19)$$

$$\frac{M}{P} = L(Y, r, A) \quad (20)$$

# LM Curve

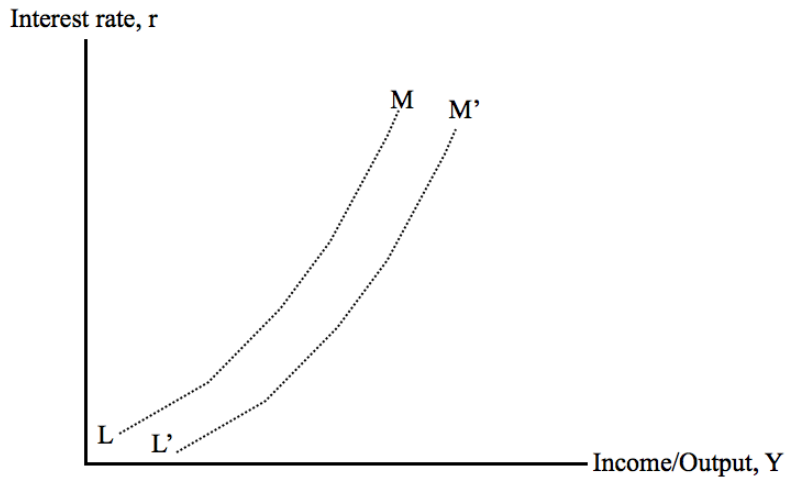


Figure: The LM Curve.

Slot IS into LM to get

$$Y = Y(P; M, B, K, \pi, G, T). \quad (21)$$

Which looks like

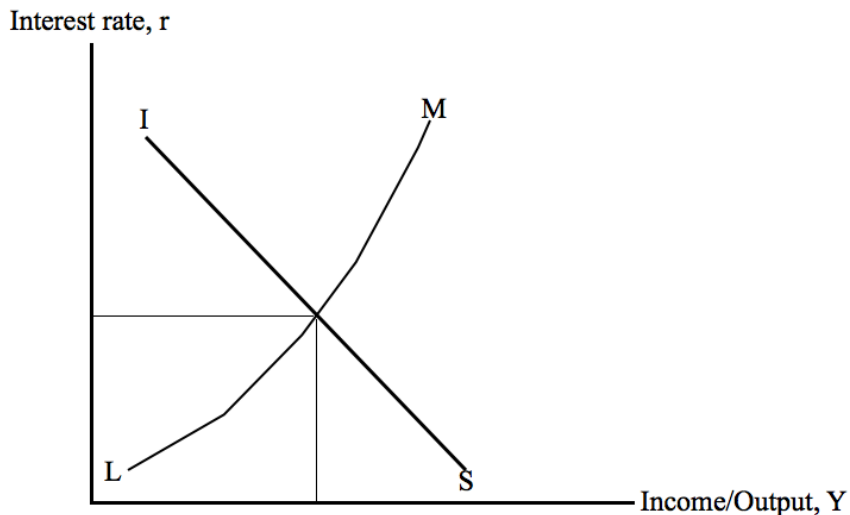


Figure: Equilibrium in the IS-LM model

## [Bush's fiscal stimulus]

### Exercise 1

Consider a standard IS-LM model in equilibrium. Graphically analyse the effects of a large increase in government expenditure financed through taxation on output/income and the interest rate, and briefly explain your reasoning.

# [The credit crunch]

## Exercise 2

Consider a standard IS-LM model in equilibrium. Graphically analyse the effects of a large decrease in the supply of money on output/income and the interest rate, and briefly explain your reasoning.

## [Numerical example]

### Numerical example

Imagine a closed economy with equilibrium output given by  $Y = C + I + G$ . Total supply is given by  $Y = 5,000$ . Consumption is determined by  $C = 250 + 0.75(Y - T)$ . Investment is given by  $I = 1000 - 50r$ . Initially, fix  $G$  and  $T$  at  $G = 1,000, T = 1,000$ . Suppose the government pursues an expansionary policy, driving  $G$  from 1000 to 1250. What happens to national savings? Is there a deficit? How much of one? Will the interest rate decrease or increase? By how much?

# Aggregate Supply

This aggregate production function relates the labour input  $L$  and the level of the capital stock employed to the level of output in the economy.

$$Y = F(K, L). \quad (22)$$

## Labour/Leisure Tradeoff

$$\Sigma = Pf(L^D) - wL. \quad (23)$$

$$\frac{W}{P} = \theta L^D, \quad (24)$$

# Household utility maximisers

$$\max(Y, Le) \quad (25)$$

subject to

$$Le = Tot - L^S, \quad (26)$$

$$Y = \frac{W}{P} L^S. \quad (27)$$

$$L^S = L^D = L. \quad (28)$$

## Household utility maximisers

$$\frac{W}{P} = \theta(L) = \phi(L). \quad (29)$$

## [Lifetime earnings and the budget constraint]

### Lifetime earnings and the budget constraint

Jill earns 200 in period 1, and 50 in period two. Jill wants to consume the same amount throughout her life. Without access to a credit market, Jill's consumption stream is  $\{200, 50\}$ . With a credit market, Jill can consume  $200+50/2 = 125$  per period, so her consumption stream at  $\{c_1, c_2\}$ , which is  $\{125, 125\}$ . In reality, Jill would buy a bond or a treasury bill to achieve consumption patterns like this. What would her consumption set look like?

# The Phillips Curve

The Phillips curve relates changes in inflation to changes in unemployment.

$$\dot{p} = \frac{\dot{P}}{P} = \alpha(Y - \bar{Y}) + \pi \quad (30)$$

## Govt. Budget Constraint; Growth theory

$$\dot{M} + \dot{B} = P[G - T] + rB. \quad (31)$$

$$\dot{K} = I. \quad (32)$$

# Expectations

$$\dot{\pi} = \gamma(\rho - \pi). \quad (33)$$

$$\pi = \rho. \quad (34)$$

# Part III

## Bernanke-Blinder

## ISLM Variant

(1) build a variant of the IS-LM model. Their model is simple, elegant, and has relevance for the financial market effects we might be seeing in the US and EU economies today.

The Bernanke-Blinder (BB) model extends the simple IS-LM world by considering convertibility of money, bonds, and loans.

## Loans

The loan market is built by assuming borrowers and lenders choose between bonds and loan according to an interest rate differential on the two instruments, so if  $\rho$  is the interest rate on loans and  $i$  is the interest rate on bonds, then loan demand will be

$$L^D = L(\rho, i, y). \quad (35)$$

The condition for clearing the market for loans will be

$$L(\rho, i, y) = \lambda(\rho, i) D(i - \underbrace{\tau}_{\text{ReserveRatio}}), \quad (36)$$

Where  $\tau$  is the reserve ratio.  $\tau D$  is the level of required reserves. If  $R$  is the level of actual reserves in the system, then the supply of deposits must equal the stock of bank reserves,  $Rm(i)$ , where  $m(i) = [\epsilon(i)D(1 - \tau)]$ . All of this is captured in equation 37 below:

$$D(i, y) = m(i)R \quad (37)$$

Finally, the goods market is the standard IS curve, which Bernanke and Blinder write as

$$y = Y(i, \rho) \quad (38)$$

Substitute equation 37 into 36 to replace  $D(1 - \tau)$  with  $(1 - \tau)m(i)R$ . Now solve for  $\rho$  as a function of  $i, y$  and  $R$  to get

$$\rho = \theta(i, y, R) \quad (39)$$

Now substitute 39 into 38 to get

$$y = Y(i, \theta(i, y, R)). \quad (40)$$

Equation 40 is called the CC curve. Graphically it looks like figure 5 below.

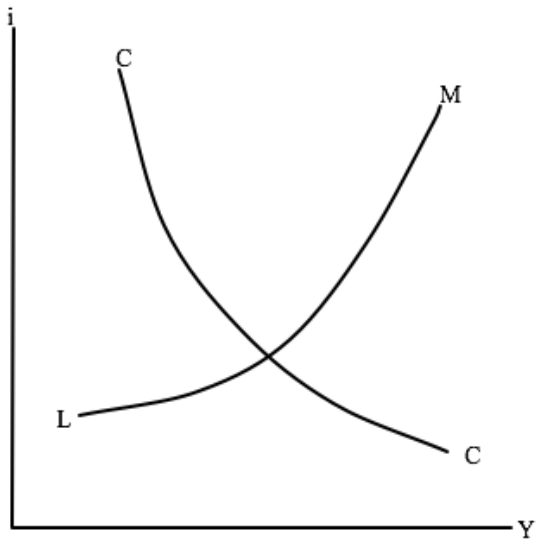


Figure: Bernanke-Blinder Model Equilibrium.

# Shocks

The BB model is affected in the following ways by different shocks:

Rise in	Income	Money	Credit	Interest Rate on bonds
Bank Reserves	+	+	+	-
Money Demand	-	+	-	+
Credit Supply	+	+	+	+
Credit Demand	-	-	+	-
Commodity Demand	+	+	+	+

**Table:** Effects of Shocks on Observable Variables. (1, pg. 438.)

## Exercises

[

Manipulating the BB model] Suppose a central bank engages in open market operations and decreases the level of bank reserves  $R$ . Show graphically how this affects output  $Y$ . Give an intuitive explanation, making sure to distinguish between the interest rate channel and the bank lending channel.

[

Manipulating the BB model] Suppose a central bank engages in open market operations and decreases the level of bank reserves  $R$ . Show graphically how this affects output  $Y$ . Give an intuitive explanation, making sure to distinguish between the interest rate channel and the bank lending channel.

# Summary

**STOP! Write down 2/3 things you remember from today's lecture**

Here's what I'd like you to remember:

- There are many ways of modeling the world. Here you've seen 2.
- You've been introduced in a rigorous way to ISLM, and met the Philips curve and growth theory along the way
- You've met the Bernanke-Blinder model, which may help you understand what's going on at the moment a bit more.

## References

- [1] B. Bernanke and A. Blinder. Credit money and aggregate demand. *American Economic Review*, 78(2):435–439, May 1988.
- [2] Wynne Godley and Marc Lavoie. *Monetary Economics An Integrated Approach to Credit, Money, Income, Production and Wealth*. Palgrave-Macmillan, 2006.
- [3] Anthony J. Leddin and Brendan M. Walsh. *The Macroeconomy of the Eurozone: An Irish Perspective*. Gill and Macmillan, 1st edition, 2003.
- [4] Frederic S. Mishkin. *The Economics of Money, Banking, and Financial Markets*. Pearson: Addison Wesley, 2004.