ECO 209Y MACROECONOMIC THEORY AND POLICY

LECTURE 11: THE IS-LM MODEL AND EXOGENOUS/ENDOGENOUS MONEY

KEYNESIAN MONETARY THEORY

EXOGENOUS MONEY SUPPLY

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KEYNESIAN MONETARY THEORY

 $M/P = L(Y_1, X_1)$

 The Keynesian model considers the real money supply (M^s) as an exogenous variable determined by the central bank

 $M^{s} = M/P$

For this model, the real *money demand* is determined by the nominal *interest rate* (*yield*) on bonds (i), the level of real *income* (Y), and the *state of bearishness* (X)

 $\mathbf{M}^{\mathsf{D}} = \mathbf{M} (\mathbf{i}, \mathbf{Y}, \mathbf{X})$

 For a given Y and X, i changes to equate the real money supply and the real money demand (or liquidity preference)

 $M^{D} = M(i, Y_{1}, X_{1}) = L(Y_{1}, X_{1})$

Keynesian Money Market Equilibrium



KEYNESIAN MONEY MARKET EQUILIBRIUM AND THE LM CURVE



AN INCREASE IN EXOGENOUS MONEY SUPPLY AND THE LM CURVE



IMPACT OF AN INCREASE IN EXOGENOUS MONEY SUPPLY



IMPACT OF AN INCREASE IN EXOGENOUS MONEY SUPPLY (CONT'D)



NEO-KEYNESIAN MONETARY THEORY

MONEY SUPPLY Rule

NEO-KEYNESIAN MODEL WITH MONEY SUPPLY RULE

- The Bank of Canada controls the stock of high-powered money or monetary base (B) but not the money supply
- The *money supply* (M^s) is determined by the *monetary base* (B) and the *money multiplier* (mm)

 $M^{s} = mm B$

- B is considered *exogenous* but mm is *endogenous*
 - mm depends on the banks' desired reserve ratio (re) and the public's desired currency-deposit ratio (cu)
 - For a given B, for instance, as i rises banks provide more risky loans and re falls and mm increases

Therefore, the real supply of money (M^s) increases with the interest rate (i), i.e., B is exogenous but M^s is endogenous

NEO-KEYNESIAN MONEY SUPPLY RULE AND THE LM CURVE



IMPACT OF AN INCREASE IN ENDOGENOUS MONEY SUPPLY



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THE MONETARY BASE AND THE MULTIPLIER



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NEO-KEYNESIAN MONETARY THEORY

INTEREST RATE Rule

NEO-KEYNESIAN MODEL WITH INTEREST RATE RULE

- In this case the *Bank of Canada* targets the *rate of interest* (not the *money supply*)
- The money supply (M^s) is assumed horizontal at the target interest rate (i₁)

i = i₁

- The real money stock is thus determined by the real money demand
- The Bank of Canada must change the *monetary base* as needed to keep the *rate of interest* at its target
 - Thus the monetary base becomes endogenous

NEO-KEYNESIAN INTEREST RATE RULE AND THE LM CURVE



POST-KEYNESIAN MONETARY THEORY

ENDOGENOUS Money Supply

POST-KEYNESIAN THEORY OF ENDOGENOUS MONEY

- This theory is in opposition to traditional Keynesian theory but, most particularly, to *monetarism*, for which *money* supply is also *exogenous*
- We'll examine two Post-Keynesian models of money supply determination: the *horizontalist* model and the *structuralist* model
- Both models subscribe to the core proposition that *bank lending* drives *money*
- We will focus on simple versions of the *horizontalist* and *structuralist* models of *endogenous* money supply

MAIN FEATURES OF POST-KEYNESIAN ENDOGENOUS MONEY MODELS

Loans create deposits

- That is, money creation is not the result of an increase in banks' reserves
- The *money multiplier* is an after-the-fact phenomenon
 It is *not* a driver of *money supply* creation
- The determination of the money supply (M^S) reflects a loan multiplier
 - Money is created by bank lending

POST-KEYNESIAN MONETARY THEORY

HORIZONTALIST MODEL

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ASSUMPTIONS OF THE POST-KEYNESIAN HORIZONTALIST MODEL

The banks' lending *interest rate* (i) is set as a *mark-up* over the *bank rate* (i*) set by the central bank

i = (1 + m) i*

- The supply of loans (L^s) is horizontal at the level of i
- The *demand for loans* (L^D) decreases with i and increases with Y
- The monetary base (B) equals the banks' reserves (R)
 - > Therefore, $CU_P = 0$ (and thus $CU_B = 0$ as well)
 - Therefore, M = D (only *deposit* money)
- Banks' *reserves* (R) are a fraction (k) of the *money supply* (M)

R = kM so M = R/k and mm = 1/k

POST-KEYNESIAN HORIZONTALIST MODEL

- Banks' assets consist of loans (L) and reserves (R) while banks' liabilities consist only of deposits (where D = M)
- Thus the banking sector's **balance sheet** is:

L + R = M + E

where **E** is banks' *equity*

Since R = kM, the supply of money is:

L + kM = M + E(1 - k)M = L - E $M^{s} = -E/(1 - k) + L/(1 - k)$

Note that there is no *demand for money* in this model

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POST-KEYNESIAN HORIZONTALIST MODEL (CONT'D)

- Given M^s = E/(1 k) + L/(1 k), the solution for the model is as follows:
 - L is determined by the *demand* for *loans* (L^D) at i
 - Given L, we thus find M^s
 - \succ Given **M**^s, we find **R R** = **kM**
 - And given R, we find B (the monetary base)
- Therefore, the monetary base is also endogenous
 - The Bank of Canada creates as much B as the banks demand (i.e., the supply of B is perfectly elastic)

 $\mathbf{B} = \mathbf{R}$

ENDOGENOUS MONETARY BASE IN THE HORIZONTALIST MODEL



POST-KEYNESIAN MONETARY THEORY

STRUCTURALIST MODEL

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POST-KEYNESIAN STRUCTURALIST MODEL

- Like *horizontalism*, *structuralism* also embodies the core logic of *loans* creating *money*
- Structuralism addresses two main shortcomings of the horizontalist approach
 - The absence of *money demand*
 - The exogeneity of *long-term* (*bond*) *interest rate*

Structuralism introduces money demand and restores
 Keynes's theory of long-term interest rate determination

ASSUMPTIONS OF THE POST-KEYNESIAN STRUCTURALIST MODEL

- There is no *interest* paid on *deposits*
- There are three *interest rates* in the financial sector:
 - The short-term *policy* or *bank rate* (i*) exogenously set by the *monetary authority*
 - The *lending rate* of interest (i_L) set by the banks as a mark-up over the policy rate

i_L = (1 + m) i*

The long-term *bond rate* (i_B) determined by the *money demand* (i.e., liquidity preference)

ASSUMPTIONS OF THE POST-KEYNESIAN STRUCTURALIST MODEL (CONT'D)

The *demand for money* depends on i_B (*bond rate*), Y (*real income*), and X (*state of bearishness*)

 $M^{D} = M(i_{B}, Y, X)$

where $\partial M/\partial i_B < 0$, $\partial M/\partial Y > 0$, and $\partial M/\partial X > 0$

- The supply of loans (L^S) is horizontal at the level of i_L
- The demand for loans (L^D) decreases with i_L and increases with Y
- The monetary base (B) equals the banks' reserves (R) which consist of borrowed (R_B) and non-borrowed (R_N) reserves

$$\mathbf{B} = \mathbf{R}_{\mathbf{B}} + \mathbf{R}_{\mathbf{N}} = \mathbf{k}\mathbf{M}$$

POST-KEYNESIAN STRUCTURALIST MODEL

- Banks' assets consist of loans (L) and reserves (R = kM) while banks' liabilities consist of deposits (M) and borrowed reserves (R_B)
- Thus the banking sector's **balance sheet** is:

 $L + kM = M + R_B + E$

where **E** is banks' *equity*

Therefore, the supply of money is:

$$M^{S} = -(R_{B} + E)/(1 - k) + L/(1 - k)$$

POST-KEYNESIAN STRUCTURALIST MODEL (CONT'D)

- Given M^s = (R_B + E)/(1 k) + L/(1 k), the solution for the model is as follows:
 - L is determined by the *demand for loans* (L^D) at i_L
 - Given L, we thus find M^s
 - Siven M^s , we find R = kM
 - \succ And given $M^{s} = M^{D}$, we find i_{B}
- Therefore, the money supply and monetary base are both endogenous
 - Banks' lending creates money, and banks' borrowing creates high-powered money

ENDOGENOUS MONEY SUPPLY IN THE STRUCTURALIST MODEL



POST-KEYNESIAN MONETARY THEORY

THE STRUCTURALIST MODEL AND THE LM SCHEDULE

THE LM CURVE IN THE POST-KEYNESIAN STRUCTURALIST MODEL

 Suppose the *financial sector* is initially in equilibrium as shown in slide 31

 \succ At Y = Y₁, i = i_B¹

This is one point on the LM curve

- Consider now the impact of an increase in Y to Y₂
 - The *loan demand* curve shifts to the right to L (Y₂) and L increases to L₂
 - As L increases, *deposits* (i.e., the *money supply*) increase along the M^s curve to M₂
 - As Y increases, the *liquidity preference* curve also shifts to the right to M(Y₂, X₁)

THE LM CURVE IN THE POST-KEYNESIAN STRUCTURALIST MODEL

- Given the new M_2 and $M(Y_2, X_1)$, the *bond rate* changes to i_B^2
 - > This is another point on the LM curve
- But is it i_B² > i_B¹ or i_B² < i_B¹? That is, is the slope of the LM curve positive or negative?
- The sign of the slope of the LM curve is determined by the relative income elasticities of the demand for loans (E_L) and the demand for money (E_M)

> If $\mathcal{E}_{M} > \mathcal{E}_{L} \rightarrow i_{B}^{2} > i_{B}^{1}$ and LM has a *positive* slope

> If $\mathcal{E}_{M} < \mathcal{E}_{L} \rightarrow i_{B}^{2} < i_{B}^{1}$ and LM has a *negative* slope

THE DERIVATION OF THE LM CURVE IN THE STRUCTURALIST MODEL



THE DERIVATION OF THE LM CURVE IN THE STRUCTURALIST MODEL (CONT'D)

