ECO 209Y MACROECONOMIC THEORY AND POLICY

LECTURE 10: NEO-KEYNESIAN VIEW ON MONEY AND BANKING

THE NEO-KEYNESIAN DETERMINATION OF THE MONEY SUPPLY

- Following *Keynes*, we have assumed that the *money supply* was an *exogenous* variable (determined by the central bank)
 But the central bank does not set M directly
- According to the *Neo-Keynesian* theory, M is determined by the interaction among the *central bank*, the *commercial banks*, and the *public* (households and firms)
 - > Therefore, **M** is seen as an *endogenous* variable
- For simplicity, we will consider the M1 definition of money supply: M = CU_P + D

Therefore, anything that affects CU_P and/or D will affect M

THE ROLE OF THE PUBLIC

$M = CU_{p} + D$

- The *public* has a role in the determination of the money supply because their demand for currency affects CU_P
- The *public* also determines jointly with the *commercial banks* the level of deposits (D)
- What is important from the point of view of the public is thus the *currency-deposit ratio*:

THE ROLE OF THE COMMERCIAL BANKS $M = CU_P + D$

- As we have seen, the *commercial banks* determine jointly with the *public* the level of deposits (D)
- The role of the *commercial banks* in the determination of the money supply is summarized by the (desired) *reserve ratio*:

re = R/D

Reserves (R) consists of the currency the commercial banks hold in their vaults (CU_B) and deposits they hold at the Bank of Canada (D_{CB}):

$$R = CU_B + D_{CB}$$

THE ROLE OF BANKS RESERVES

$\mathbf{R} = \mathbf{CU}_{\mathbf{B}} + \mathbf{D}_{\mathbf{CB}}$

- Commercial banks hold *reserves* (R) in order to meet:
 - CU_B Their customers' demands for currency
 - D_{CB} Payments their customers make by cheques (or debit) which are deposited in other banks
- The commercial banks can determine the *reserve ratio* (re) they consider optimum and thus they can determine (jointly with the public) the level of deposits (D)
 - In this way, commercial banks can affect the component D of the money supply

THE ROLE OF THE BANK OF CANADA

- The role of the Bank of Canada in the determination of the supply of money is summarized by the stock of high-powered money or the monetary base (B)
- High-powered money consists of currency (CU) and deposits of the chartered banks at the Bank of Canada (D_{CB})

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B = CU + D_{CB}
= (CU<sub>P</sub> + CU<sub>B</sub>) + D<sub>CB</sub>
= CU<sub>P</sub> + R
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- The Bank of Canada cannot determine by itself the component CU_p of the money supply
- The Bank of Canada can affect R and most particularly D_{CB}, and thus indirectly the level of D

HIGH-POWERED MONEY AND MONEY SUPPLY

- Assumption: The Bank of Canada controls the supply of highpowered money (i.e., it determines the level of B)
 - As we will see later, the Bank can also *affect* the decisions of the commercial banks regarding the optimum level of re
- The demand for high-powered money comes from the public (CU_P) and the chartered banks (R)
- Assumption: The public has a preferred ratio of currency to deposits (cu = CU_P/D) and the banks have a desired ratio of reserves to deposits (re = R/D)
 - Therefore, given cu and re, we can estimate the total money stock that can be supported by any given stock of high-powered money

THE MONEY MULTIPLIER

- Assumption: There is a relationship between the stock of high-powered money (B) and the money stock (M)
 - They are related by the money multiplier (mm)
- By definition, the money multiplier is the ratio of the stock of money to the stock of high-powered money:

mm = M/B

Given mm and B, then

M = mm B

Therefore, given mm, a change in the stock of high-powered money affects the money stock as follows:

 $\Delta M = mm \Delta B$

MONETARY EQUILIBRIUM

Assumption: Suppose that there is equilibrium between the supply and the demand for money

 $M = CU_p + D$

 Assumption: Also suppose that there is equilibrium between the supply of high-powered money and the demand for highpowered money

 $B = CU + D_{CB} = (CU_{P} + CU_{B}) + D_{CB} = CU_{P} + R$

If these two conditions hold, then there is *monetary equilibrium*

- People hold the composition of their money balances in the preferred ratio (cu)
- Banks hold just the right ratio of reserves to deposits (re) and R are held in the right composition

THE MONEY MULTIPLIER

Given M = CU_P + D and B = CU_P + R, then the money multiplier is:



And if we divide both the numerator and the denominator by
 D, we obtain

mm =
$$\frac{cu + 1}{cu + re}$$

THE MONEY MULTIPLIER (CONT'D)

- The size of mm depends on cu and re
 - That is, it depends on the *assumed* preferences about the public's and the banks' composition of balances
- The ratio cu is determined primarily by payments habits
- One of the major determinant of re is the Bank of Canada's target for the overnight rate
 - The overnight rate is the rate at which banks borrow and lend among themselves for settlement payment purposes
- Neither cu nor re is fixed
 > and thus mm is not fixed either
 - For instance, re changes with the overnight rate and with expectations about the future
 - If mm is not fixed, then M is not exogenous

MONETARY POLICY

- The Bank of Canada implements *monetary policy* by targeting either M or i
 - Money supply rule: It targets M by changing the stock of high-powered money
 - Interest rate rule: It targets i by changing its target for the overnight rate of interest
- The Bank of Canada cannot target i and M at the same time
 - If it targets M, it must allow i to adjust to equate M^s and M^D
 - If it targets i, it must allow M^s to change until it matches M^D at that level of i

SUMMARY OF THE ROLES OF THE PUBLIC, THE CHARTERED BANKS, AND THE BANK OF CANADA

$M = CU_p + D$

- 1) The *public* determines $cu = CU_P/D$
- 2) The *commercial banks* determine **re = R/D**
- 3) The *Bank of Canada* determines:
 - To a large extent R and particularly D_{CB} but not D
 - The target for the overnight rate but neither re nor i

THE MONEY SUPPLY RULE

LIABILITIES OF THE BANK OF CANADA

 The components of *high-powered money* or *monetary base* (B) represent a liability in the balance sheet of the Bank of Canada

$$\mathbf{B} = \mathbf{CU}_{\mathbf{P}} + \mathbf{CU}_{\mathbf{B}} + \mathbf{D}_{\mathbf{CB}}$$

Also recall that $\mathbf{R} = \mathbf{CU}_{\mathbf{B}} + \mathbf{D}_{\mathbf{CB}}$

- Another liability in the balance sheet of the Bank of Canada is Government of Canada's deposits at the Bank of Canada
 - However, Government of Canada's deposits are neither part of the monetary base nor of the money supply

CREATION OF HIGH-POWERED MONEY

- High-powered money is created when the Bank of Canada acquires assets or reduces its liabilities in the form of Government of Canada's deposits
 - When the Bank of Canada acquires assets (e.g., when it buys Government Bonds from the public), it increases its liabilities (and, therefore, the monetary base) by the same amount
 - When the Bank of Canada reduces Government of Canada's deposits, it changes the form of liability to highpowered money

OPEN MARKET OPERATIONS

- The main means by which the Bank of Canada changes the monetary base is through *open market operations*
- By open market operations we mean the Bank of Canada purchasing or selling Government Bonds from or to the public or the commercial banks
 - An open market *purchase* will increase the monetary base, and thus the money supply
 - An open market sale will decrease the monetary base, and thus the money supply
- The use of this policy instrument to increase the money supply includes *quantitative easing*
- Let's look at some illustrations

OPEN MARKET PURCHASE

Public		Commercial Bank				Bank of Canada				
As	sets	Liabilities	As	sets	Lia	bilities	As	sets	Liab	ilities
GB	-100		D _{CB}	+100	D	+100	GB	+100	D _{CB}	+100
D	+100									

- Suppose the Bank of Canada buys bonds from the public in the amount of \$100 million
- Therefore, since $B = CU_P + CU_B + D_{CB}$

$$\blacktriangleright$$
 $\Delta B = \Delta CU_P + \Delta CU_B + \Delta D_{CB} = +100$

• And $\Delta M = \Delta CU_P + \Delta D = 0 + 100 = +100$

BANK LENDING AND THE MONEY MULTIPLIER

A change in B affects M as follows:

ΔM = mm ΔB

We have also seen that

If we assume cu = 0.25 and re = 0.1, then
mm = 1.25/0.35 = 3.57

Therefore, if ΔB = +100, then

ΔM = 3.57 (+100) = +357

INDIVIDUALS' MONEY HOLDINGS

- Individuals' total money holdings are CU_P + D
- The fraction of currency in total money holdings is:

CU _P		0.25	= 0.2 or 20%
CU _P + D	cu + 1	1.25	- 0.2 01 2070

The fraction of deposit in total money holdings is:

$$\frac{D}{CU_{P} + D} = \frac{1}{cu + 1} = \frac{1}{1.25} = 0.8 \text{ or } 80\%$$

OPEN MARKET PURCHASE (STEP 1)

Pul	Commercial Bank				Bank of Canada				
Assets	Liabilities	Assets		Liabilities		Assets		Liabilities	
GB –100		CU _B	-20	D	+80	GB	+100	D _{CB}	+100
CU _P +20 D +80		D _{CB}	+100						

- $\Delta B = \Delta CU_P + \Delta CU_B + \Delta D_{CB} = 20 20 + 100 = +100$
- $\Delta R = \Delta CU_B + \Delta D_{CB} = -20 + 100 = +80$
- $\Delta M = \Delta CU_{p} + \Delta D = 20 + 80 = +100$
- ΔDesired Reserves = +8
- Excess Reserves = ΔR ΔDesired Reserves = +72⁴

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This implies that the actual **re** is greater than the desired **re**.

OPEN MARKET PURCHASE (STEP 2)

Public			Commercial Bank			Bank of Canada			ada		
Assets		Liabi	lities	Assets		Liabilities		As	sets	Liak	oilities
GB	-100	L	+72	D _{CB}	+100	D	+80	GB	+100	D _{CB}	+100
D	+20			CU _B	-20	D	+57.6				
CU _P	+14.4			L	+72						
D	+57.6			CU _B	-14.4						

- $\Delta B = \Delta CU_P + \Delta CU_B + \Delta D_{CB} = 34.4 34.4 + 100 = +100$
- $\Delta R = \Delta CU_B + \Delta D_{CB} = -34.4 + 100 = +65.6$
- $\Delta M = \Delta CU_P + \Delta D = 34.4 + 137.6 = +172$
- ΔDesired Reserves = +13.76
- Excess Reserves = $\Delta R \Delta Desired$ Reserves = +51.84

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OPEN MARKET PURCHASE

As the process continuous and all excess reserves are eliminated, the money stock increases by the full multiplying effect:

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\Delta M = mm \Delta B = 3.57 (+100) = +357

\Delta CU_p = 0.2 \Delta M = 0.2 (+357) = +71.4

\Delta D = 0.8 \Delta M = 0.8 (+357) = +285.6

\Delta L = +257
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 At the end of the process, the banking system has created \$257 in new money

OPEN MARKET PURCHASE (FINAL)

Public			Commercial Bank				Bank of Canada				
Assets Liabilitie		oilities	Assets		Liabilities		Assets		Liabilities		
GB	-100	L	+257	D _{CB}	+100	D	+80	GB	+100	D _{CB}	+100
CU _P	+20			CU _B	-20	D	+205.6				
D	+80			L	+257						
CU _P ·	+51.4			CU₀	-51.4						
D +	205.6			D							

- $\Delta B = \Delta CU_P + \Delta CU_B + \Delta D_{CB} = 71.4 71.4 + 100 = +100$
- $\Delta R = \Delta CU_B + \Delta D_{CB} = -71.4 + 100 = +28.6$
- $\Delta M = \Delta CU_{P} + \Delta D = 71.4 + 285.6 = +357$
- ΔDesired Reserves = +28.6
- Excess Reserves = $\Delta R \Delta Desired$ Reserves = 0

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IMPACT OF GOVERNMENT BORROWING TO COVER A DEFICIT

- When the Government borrows from the public, the money supply doesn't change
 - That is, the monetary base doesn't change and thus the money supply doesn't either
- When the Government borrows from the Bank of Canada, the money supply increases
 - That is, the monetary base increases and thus the money supply also increases
 - In this case, it is said that the Government is *monetizing* the deficit

FINANCING A DEFICIT BY BORROWING FROM THE PUBLIC

	Puk	olic		Со	mmer	cial E	Banks
GB	+100			D _{CB}	-100	D	-100
D	-100			D _{CB}	+100	D	+100
D	+100						
	Bank of	Cana	da	Fed	eral G	over	nment
		D _G	+100	D _G	+100	GB	+100
		D _{CB}	-100	D _G	-100		
		D _G	-100				
		D _{CB}	+100				

When the Government borrows from the public, B decreases and so does M; and when the Government spends the borrowed money, B increases and so does M.

FINANCING A DEFICIT BY BORROWING FROM THE BANK OF CANADA

Public								
D	+100							

Bank of Canada										
GB	+100	D _G	+100							
		D _G	-100							
		D _{CB}	+100							

Commercial Banks									
D _{CB}	+100	D	+100						

Federal Government								
D _G	+100	GB	+100					
D _G	-100							

When the Government borrows from the Bank of Canada, B increases and so does M.

IMPACT OF BORROWING FROM THE PUBLIC OR THE BANK OF CANADA



The money supply doesn't change when the Government borrows from the public. Therefore, income increases to Y_1 .

The money supply increases when the Government borrows from the Bank of Canada. Therefore, income increases further to Y₂.

THE INTEREST RATE RULE

CONTROL OF THE RATE OF INTEREST

- The Bank of Canada can also affect *i* and the commercial banks' re by changing a target for the *overnight rate*
- The Bank of Canada sets the bank rate 8 times a year
 - The bank rate is the rate of interest the Bank of Canada charges for loans to commercial banks
 - > This represents a *ceiling* for the overnight rate
- The Bank of Canada also accepts deposits from the commercial banks at a 0.5 percent below the bank rate
 - > This represents a *floor* for the overnight rate
- The target overnight rate is the mid point in this interest rate band, i.e., 25 basis points below the bank rate

OVERNIGHT AND PRIME RATES JANUARY 2000 TO JANUARY 2019



Source: Trading Economics / Bank of Canada.

THE U.S. FEDERAL FUND RATE JANUARY 2000 TO JANUARY 2020



Source: Trading Economics / Federal Reserve.

CONTROL OF THE RATE OF INTEREST (CONT'D)

- How does a decrease in the *bank rate* affect the level of *credit* in the economy (and thus M)?
- A decrease in the *bank rate* decreases the band of the *overnight rate*, and thus the overnight rate decreases
 - A decrease in the overnight interest rate affects the entire spectrum of market interest rates
 - A decrease in the overnight rate also affects the desired reserve ratio of the commercial banks
- Therefore, a change in the bank rate affects in two ways the level of credit in the economy (and thus M)
 - That is, by affecting re and i

CONTROL OF THE RATE OF INTEREST (CONT'D)

- A reduction in the desired *reserve ratio*:
 - As the desired *reserve ratio* decreases, banks find themselves with *excess reserves* (i.e., re is too high)
 - Banks start lending more money to increase D and reduce re, and thus the money supply increases
- A reduction in *market interest rates*:
 - As the demand for new loans gradually adjusts, commercial banks may find their actual re falling below the desired level

□ Commercial banks need higher *reserves* (R)

The commercial banks will then sell government bonds to the Bank of Canada and R will increase

SUMMARY: CONTROL OF THE MONEY STOCK OR THE RATE OF INTEREST

- The Bank of Canada implements *monetary policy* by targeting either M or i
- But the Bank of Canada cannot simultaneously target both the i and the level of M
 - If it targets M, it must allow i to adjust to equate M^s and M^D
 - If it targets the *rate of interest*, it has to allow the money supply to change until it matches the amount of money demanded at that interest rate
- That is, the Bank of Canada can implement monetary policy by following either a *money supply rule* or an *interest rate rule*
 - Since the late 1980s, the Bank of Canada has mostly followed an *interest rate rule*