Money and Banking – ECO 233

Lecture 9

The Bank Balance Sheet

- **Total assets = Total liabilities + Bank capital (banks' net worth)**
- A bank acquires funds by issuing (selling) liabilities, which are consequently also referred to as sources of funds.

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Liabilities

- **Checkable Deposits:** Checkable deposits are bank accounts that allow the owner of the account to write checks to third parties.
- Checkable deposits include all accounts on which checks can be drawn.
- A checkable deposit is an asset for the depositor because it is part of his or her wealth. Conversely, because the depositor can withdraw from an account funds that the bank is obligated to pay, checkable deposits are a liability for the bank.

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Liabilities

- **Nontransaction Deposits:** Owners cannot write checks on nontransaction deposits, but the interest rates are usually higher than those on checkable deposits.
- Fixed/Time deposits
- Time deposits have a fixed maturity length, ranging from several months to over five years, and have substantial penalties for early withdrawal

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Liabilities

- **Borrowings:** Banks obtain funds by borrowing from the Central Bank, other banks, and corporations.
- Borrowings from the Central bank are called **discount loans** (also known as advances).
- Banks also borrow reserves from other banks and financial institutions.
- Federal (fed) funds market in the U.S

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Liabilities

- **Bank Capital:** The final category on the liabilities side of the balance sheet is bank capital, the bank's net worth, which equals the difference between total assets and liabilities.

- Bank capital is a cushion against a drop in the value of its assets, which could force the bank into insolvency

condition being unable to pay the debts or any loan on it...

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The Bank Balance Sheet

- **Assets:**
  - Reserves
  - Cash items in process of collection
  - Deposits at other banks
  - Securities
  - Loans
  - Other assets

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Assets

- **Reserves:** All banks hold some of the funds they acquire as deposits in an account at the Central bank.
- Banks hold reserves for two reasons.
- First, some reserves, called **required reserves**, are held because of reserve requirements, the regulation that for every dollar of checkable deposits at a bank, a certain fraction (10 cents, for example) must be kept as reserves.

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Assets

- This fraction (10 percent in the example) is called the **required reserve ratio**.
- Banks hold **additional reserves**, called excess reserves, because they are the most liquid of all bank assets and can be used by a bank to meet its obligations when funds are withdrawn, either directly by a depositor or indirectly when a check is written on an account.

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Assets

- **Cash Items in Process of Collection:** Suppose that a check written on an account at another bank is deposited in your bank and the funds for this check have not yet been received (collected) from the other bank.
- The check is classified as a cash item in process of collection, and it is an asset for your bank because it is a claim on another bank for funds that will be paid within a few days.

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Assets

- **Deposits at Other Banks:** Many small banks hold deposits in larger banks in exchange for a variety of services, including check collection, foreign exchange transactions, and help with securities purchases.
- This is an aspect of a system called **correspondent banking.**

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Assets

- **Securities:** A bank's holdings of securities are an important income-earning asset.
- Securities (made up entirely of debt instruments for commercial banks, because banks are not allowed to hold stock)

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Assets

- **Loans**: Banks make their profits primarily by issuing loans.
- A loan is a liability for the individual or corporation receiving it, but an asset for a bank, because it provides income to the bank.
- Loans also have a higher probability of default than other assets.
- Because of the lack of liquidity and higher default risk, the bank earns its highest return on loans.

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Assets

- **Other Assets:** The physical capital (bank buildings, computers, and other equipment) owned by the banks is included in this category.

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Basic Banking

- Cash Deposit:

First National Bank				**First National Bank**			
Assets		Liabilities		Assets		Liabilities	
Vault cash	+$100	Checkable deposits	+$100	Reserves	+$100	Checkable deposits	+$100

- Opens a checking account with a $100 bill. She now has a $100 checkable deposit at the bank, which shows up as a $100 liability on the bank's balance sheet. The bank now puts her $100 bill into its vault so that the bank's assets rise by the $100 increase in vault cash.

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Basic Banking

- Check Deposit:
- If Jane had opened her account with a $100 check written on an account at another bank, say, the Second National Bank, we would get the same result.
- The First National Bank is owed $100 by the Second National Bank. This asset for the First National Bank is entered in the T-account as $100 of cash items in process of collection.

First National Bank			
Assets		Liabilities	
Cash items in process of collection	+$100	Checkable deposits	+$100

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Basic Banking

Check Deposit:

When a bank receives additional deposits, it gains an equal amount of reserves; when it loses deposits, it loses an equal amount of reserves.

First National Bank			
Assets		Liabilities	
Reserves	+$100	Checkable deposits	+$100

Second National Bank			
Assets		Liabilities	
Reserves	−$100	Checkable deposits	−$100

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Basic Banking

- Let's return to the situation when the First National Bank has just received the extra $100 of checkable deposits.
- The bank is obliged to keep a certain fraction of its checkable deposits as required reserves.
- If the fraction (the required reserve ratio) is 10%, the First National Bank's required reserves have increased by $10.

First National Bank			
Assets		Liabilities	
Required reserves	+$10	Checkable deposits	+$100
Excess reserves	+$90		

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Basic Banking

- The bank must put to productive use all or part of the $90 of excess reserves it has available.
- Let us assume that the bank chooses not to hold any excess reserves but to make loans instead.
- The bank is now making a profit because it holds short-term liabilities such as checkable deposits and uses the proceeds to buy longer-term assets such as loans with higher interest rates.
- This process of asset transformation is frequently described by saying that banks are in the business of "borrowing short and lending long."

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Basic Banking

- Making a profit:

First National Bank			
Assets		Liabilities	
Required reserves	+$10	Checkable deposits	+$100
Loans	+$90		

- Asset transformation: selling liabilities with one set of characteristics and using the proceeds to buy assets with a different set of characteristics
- The bank borrows short and lends long

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General Principles of Bank Management

- The bank must have enough ready cash to pay its depositors when there are **deposit outflows**, that is, when deposits are lost because depositors make withdrawals and demand payment.
- To keep enough cash on hand, the bank must engage in **liquidity management**, the acquisition of sufficiently liquid assets to meet the bank's obligations to depositors.

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General Principles of Bank Management

- The bank manager must pursue an acceptably low level of risk by acquiring assets that have a low rate of default and by diversifying asset holdings (**asset management**).
- The third concern is to acquire funds at low cost (**liability management**).
- Finally, the manager must decide the amount of capital the bank should maintain and then acquire the needed capital (**capital adequacy management**).

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General Principles of Bank Management

- How a financial institution manages **credit risk**, the risk arising because borrowers may default, and how it manages **interest-rate risk**, the riskiness of earnings and returns on bank assets that results from interest-rate changes.

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General Principles of Bank Management

- Liquidity Management
  - Acquisition of assets that are liquid enough
- Asset Management
  - Acquiring assets with a low risk of default
- Liability Management
  - Acquisition of funds at low cost
- Capital Adequacy Management
- Credit Risk
- Interest-rate Risk

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Liquidity Management and the Role of Reserves

- Excess reserves:

Assets		Liabilities	
Reserves	$20M	Deposits	$100M
Loans	$80M	Bank Capital	$10M
Securities	$10M		

- Suppose that the First National Bank's initial balance sheet
- The bank's required reserves are 10% of $100 million, or $10 million.
- Since it holds $20 million of reserves, the First National Bank has excess reserves of $10 million.

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Liquidity Management and the Role of Reserves

- Excess reserves:

Assets		**Liabilities**	
Reserves	$10M	Deposits	$90M
Loans	$80M	Bank Capital	$10M
Securities	$10M		

- If a deposit outflow of $10 million occurs, the bank's balance sheet.
- The bank loses $10 million of deposits and $10 million of reserves, but since its required reserves are now 10% of only $90 million ($9 million), its reserves still exceed this amount by $1 million.
- In short, if a bank has ample reserves, a deposit outflow does not necessitate changes in other parts of its balance sheet.

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Liquidity Management and the Role of Reserves

- Shortfall:

Assets		Liabilities	
Reserves	$10M	Deposits	$100M
Loans	$90M	Bank Capital	$10M
Securities	$10M		

- The situation is quite different when a bank holds insufficient excess reserves
- Let's assume that instead of initially holding $10 million in excess reserves, the First National Bank makes loans of $10 million, so that it holds no excess reserves.

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Liquidity Management and the Role of Reserves

- Shortfall:

Assets		Liabilities	
Reserves	$0	Deposits	$90M
Loans	$90M	Bank Capital	$10M
Securities	$10M		

- When it suffers the $10 million deposit outflow, its balance sheet becomes.
- After $10 million has been withdrawn from deposits and hence reserves, the bank has a problem: It has a reserve requirement of 10% of $90 million, or $9 million, but it has no reserves!

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Liquidity Management and the Role of Reserves

- Shortfall:
- To eliminate this shortfall, the bank has four basic options. One is to acquire reserves to meet a deposit outflow by borrowing them from other banks in the federal funds market or by borrowing from corporations.
- If the First National Bank acquires the $9 million shortfall in reserves by borrowing it from other banks or corporations, its balance sheet becomes:
- The cost of this activity is the interest rate on these borrowings

Assets		**Liabilities**	
Reserves	$9M	Deposits	$90M
Loans	$90M	Borrowing	$9M
Securities	$10M	Bank Capital	$10M

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Liquidity Management and the Role of Reserves

- Securities sale:
  - A second alternative is for the bank to sell some of its securities to help cover the deposit outflow.
  - The bank incurs some brokerage and other transaction costs when it sells these securities.

Assets		**Liabilities**	
Reserves	$9M	Deposits	$90M
Loans	$90M	Bank Capital	$10M
Securities	$1M		

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Liquidity Management and the Role of Reserves (5 of 7)

- Federal Reserve:

Assets		Liabilities	
Reserves	$9M	Deposits	$90M
Loans	$90M	Borrow from Fed	$9M
Securities	$10M	Bank capital	$10M

  – Borrowing from the Fed also incurs interest payments based on the discount rate.

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Liquidity Management and the Role of Reserves

- Federal Reserve:
- A third way that the bank can meet a deposit outflow is to acquire reserves by borrowing from the Fed.
- The cost associated with discount loans is the interest rate that must be paid to the Fed

Assets		**Liabilities**	
Reserves	$9M	Deposits	$90M
Loans	$90M	Borrow from Fed	$9M
Securities	$10M	Bank capital	$10M

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Liquidity Management and the Role of Reserves

- Reduce loans:

Assets		Liabilities	
Reserves	$9M	Deposits	$90M
Loans	$81M	Bank Capital	$10M
Securities	$10M		

- Finally, a bank can acquire the $9 million of reserves to meet the deposit outflow by reducing its loans by this amount and depositing the $9 million it then receives with the Fed, thereby increasing its reserves by $9 million

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Liquidity Management and the Role of Reserves

- Reduce loans:

Assets		Liabilities	
Reserves	$9M	Deposits	$90M
Loans	$81M	Bank Capital	$10M
Securities	$10M		

  - Reduction of loans is the most costly way of acquiring reserves.
  - Calling in loans antagonizes customers.
  - Other banks may only agree to purchase loans at a substantial discount.

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Liquidity Management and the Role of Reserves

- Excess reserves are insurance against the costs associated with deposit outflows.
- The higher the costs associated with deposit outflows, the more excess reserves a bank will want to hold.

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Asset Management

To maximize its profits, a bank has to

1. Seek the highest possible returns on loans and securities.
2. Reduce risk.
3. Have adequate liquidity.

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Asset Management

Four Tools:

1. Find borrowers who will pay high interest rates and have low possibility of defaulting.
2. Purchase securities with high returns and low risk.
3. Lower risk by diversifying.
4. Balance need for liquidity against increased returns from less liquid assets.

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Money and Banking – ECO 233

Lecture 11

Liability Management

- For the most part, banks took their liabilities as fixed and spent their time trying to achieve an optimal mix of assets.
- Expansion of overnight loan markets.
- This new flexibility in liability management meant that banks could take a different approach to bank management.
- The increased importance of liability management, most banks manage now both sides of the balance sheet together in a so-called asset–liability management (ALM) committee.

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Capital Adequacy Management

- Banks have to make decisions about the amount of capital they need to hold for three reasons.
- First, bank capital helps prevents *bank failure*, a situation in which the bank cannot satisfy its obligations to pay its depositors and other creditors and so goes out of business.
- Second, the amount of capital affects returns for the owners (equity holders) of the bank.
- And third, a minimum amount of bank capital (bank capital requirements) is required by regulatory authorities.

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Capital Adequacy Management

- Let's consider two banks with identical balance sheets, except that the High Capital Bank has a ratio of capital to assets of 10% while the Low Capital Bank has a ratio of 4%.
- Suppose that both banks get caught up in the euphoria of the telecom market, only to find that $5 million of their telecom loans became worthless later.
- When these bad loans are written off (valued at zero), the total value of assets declines by $5 million, and so bank capital, which equals total assets minus liabilities, also declines by $5 million.

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Capital Adequacy Management

How Bank Capital Helps Prevent Bank Failure:

High Capital Bank				**Low Capital Bank**			
Assets		**Liabilities**		**Assets**		**Liabilities**	
Reserves	$10 million	Deposits	$90 million	Reserves	$10 million	Deposits	$96 million
Loans	$90 million	Bank capital	$10 million	Loans	$90 million	Bank capital	$ 4 million

High Capital Bank				**Low Capital Bank**			
Assets		**Liabilities**		**Assets**		**Liabilities**	
Reserves	$10 million	Deposits	$90 million	Reserves	$10 million	Deposits	$96 million
Loans	$85 million	Bank capital	$ 5 million	Loans	$85 million	Bank capital	−$ 1 million

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Capital Adequacy Management

- The High Capital Bank still has a positive net worth (bank capital) of $5 million after the loss.
- The Low Capital Bank, net worth is now -$1 million and hence it is insolvent.
- When a bank becomes insolvent, government regulators close the bank.
- A bank maintains bank capital to lessen the chance that it will become insolvent.

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Capital Adequacy Management

- A basic measure of bank profitability is the return on assets (ROA), the net profit after taxes per dollar of assets.
- The return on assets provides information on how efficiently a bank is being run, because it indicates how much profits are generated on average by each dollar of assets.
- However, what the bank's owners (equity holders) care about most is how much the bank is earning on their equity investment.
- This information is provided by the return on equity (ROE), the net profit after taxes per dollar of equity (bank) capital.

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Capital Adequacy Management (3 of 4)

How the Amount of Bank Capital Affects Returns to Equity Holders:

Return on Assets: net profit after taxes per dollar of assets

$$\text{ROA} = \frac{\text{net profit after taxes}}{\text{assets}}$$

Return on Equity: net profit after taxes per dollar of equity capital

$$\text{ROE} = \frac{\text{net profit after taxes}}{\text{equity capital}}$$

Relationship between ROA and ROE is expressed by the

Equity Multiplier: the amount of assets per dollar of equity capital

$$\text{EM} = \frac{\text{Assets}}{\text{Equity Capital}}$$

$$\frac{\text{net profit after taxes}}{\text{equity capital}} = \frac{\text{net profit after taxes}}{\text{assets}} \times \frac{\text{assets}}{\text{equity capital}}$$

$$\text{ROE} = \text{ROA} \times \text{EM}$$

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Capital Adequacy Management

- There is a direct relationship between the return on assets (which measures how efficiently the bank is run) and the return on equity (which measures how well the owners are doing on their investment).
- This relationship is determined by the so-called equity multiplier (EM), which is the amount of assets per dollar of equity capital.

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Capital Adequacy Management

- The High Capital Bank initially has $100 million of assets and $10 million of equity, which gives it an equity multiplier of 10 (=$100 million/$10 million).
- The Low Capital Bank, by contrast, has only $4 million of equity, so its equity multiplier is higher, equalling 25 (= $100 million/$4 million).
- Suppose that these banks have been equally well run so that they both have the same return on assets, 1%.

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Capital Adequacy Management

- The return on equity for the High Capital Bank equals

  1% X 10 =10%,

- The return on equity for the Low Capital Bank equals

  1% X 25 = 25%.

- The equity holders in the Low Capital Bank are clearly a lot happier than the equity holders in the High Capital Bank because they are earning more than twice as high a return.
- We now see why owners of a bank may not want it to hold too much capital.
- Given the return on assets, the lower the bank capital, the higher the return for the owners of the bank.

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Capital Adequacy Management

- Bank capital has benefits and costs.
- Bank capital benefits the owners of a bank in that it makes their investment safer by reducing the likelihood of bankruptcy.
- But bank capital is costly because the higher it is, the lower will be the return on equity for a given return on assets.
- In determining the amount of bank capital, managers must decide how much of the increased safety that comes with higher capital (the benefit) they are willing to trade off against the lower return on equity that comes with higher capital (the cost).

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Managing Credit Risk

- Adverse selection and moral hazard in loan markets.
- To be profitable, financial institutions must overcome the adverse selection and moral hazard problems that make loan defaults more likely.
- **Screening:** To accomplish effective screening, lenders must collect reliable information from prospective borrowers.
- Effective screening and information collection together form an important principle of credit risk management.

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Managing Credit Risk

- **Specialization in Lending:** One puzzling feature of bank lending is that a bank often specializes in lending to local firms or to firms in particular industries, such as energy.
- In one sense, this behaviour seems surprising, because it means that the bank is not diversifying its portfolio of loans and thus is exposing itself to more risk.
- It is easier for the bank to collect information about local firms/ firms in specific industries and determine their creditworthiness.

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Managing Credit Risk

- **Monitoring and Enforcement of Restrictive Covenants:** Financial institutions must adhere to the principle for managing credit risk that a lender should write provisions (restrictive covenants) into loan contracts that restrict borrowers from engaging in risky activities.
- By monitoring borrowers' activities to see whether they are complying with the restrictive covenants and by enforcing the covenants if they are not, lenders can make sure that borrowers are not taking on risks at their expense.
- The need for banks and other financial institutions to engage in screening and monitoring explains why they spend so much money on auditing and information-collecting activities.

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Managing Credit Risk

- Long-term customer relationships
- Loan commitments
- Collateral and compensating balances
- Credit rationing

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Managing Credit Risk

- **Long-term customer relationships:**
- Long-term customer relationships reduce the costs of information collection and make it easier to screen out bad credit risks.
- A firm with a previous relationship will find it easier to obtain a loan at a low interest rate because the bank has an easier time determining if the prospective borrower is a good credit risk and incurs fewer costs in monitoring the borrower.

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Managing Credit Risk

- **Loan Commitments:**
- A loan commitment is a bank's commitment (for a specified future period of time) to provide a firm with loans up to a given amount at an interest rate that is tied to some market interest rate.
- The majority of commercial and industrial loans are made under the loan commitment arrangement.
- The advantage for the firm is that it has a source of credit when it needs it.
- The advantage for the bank is that the loan commitment promotes a long-term relationship, which in turn facilitates information collection.

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Managing Credit Risk

- **Collateral and Compensating balances:**
- One particular form of collateral required when a bank makes commercial loans is called **compensating balances.**
- A firm receiving a loan must keep a required minimum amount of funds in an account at the bank.
- For example, a business getting a $10 million loan may be required to keep compensating balances of at least $1 million in its account at the bank.

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Managing Credit Risk

- **Credit rationing:**
- credit rationing: refusing to make loans even though borrowers are willing to pay the stated interest rate or even a higher rate.
- Credit rationing takes two forms.
- The first occurs when a lender refuses to make a loan of any amount to a borrower, even if the borrower is willing to pay a higher interest rate.
- The second occurs when a lender is willing to make a loan but restricts the size of the loan to less than the borrower would like.

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Managing Interest-Rate Risk

	First National Bank		
Assets		**Liabilities**	
Rate-sensitive assets	$20 million	Rate-sensitive liabilities	$50 million
Variable-rate and short-term loans		Variable-rate CDs	
Short-term securities		Money market deposit accounts	
Fixed-rate assets	$80 million	Fixed-rate liabilities	$50 million
Reserves		Checkable deposits	
Long-term loans		Savings deposits	
Long-term securities		Long-term CDs	
		Equity capital	

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Managing Interest-Rate Risk

- A total of $20 million of its assets are rate-sensitive, with interest rates that change frequently (at least once a year), and $80 million of its assets are fixed-rate, with interest rates that remain unchanged for a long period (over a year).
- On the liabilities side, the First National Bank has $50 million of rate-sensitive liabilities and $50 million of fixed-rate liabilities.
- Suppose that interest rates rise by 5 percentage points on average, from 10% to 15%.

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Managing Interest-Rate Risk

- The income on the assets rises by $1 million (=5% X $20 million of rate-sensitive assets), while the payments on the liabilities rise by $2.5 million (=5% X $50 million of rate-sensitive liabilities).
- The First National Bank's profits now decline by $1.5 million (=$1 million - $2.5 million).
- Conversely, if interest rates fall by 5 percentage points, similar reasoning tells us that the First National Bank's profits rise by $1.5 million.

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Managing Interest-Rate Risk

- This example illustrates the following point:
- If a bank has more rate-sensitive liabilities than assets, a rise in interest rates will reduce bank profits and a decline in interest rates will raise bank profits.

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Gap and Duration Analysis

- The sensitivity of bank profits to changes in interest rates can be measured more directly using gap analysis.
- In our example, this calculation (called the “gap”) is -$30 million (=$20 million - $50 million).
- For example, when interest rates rise by 5 percentage points, the change in profits is 5%X -$30 million, which equals -$1.5 million.
- The analysis we just conducted is known *as basic gap analysis.*

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Gap and Duration Analysis

- The basic gap analysis can be refined in two ways.
- Not all assets and liabilities in the fixed-rate category have the same maturity.
- One refinement, *the maturity bucket approach*, is to measure the gap for several maturity subintervals, called maturity buckets, so that effects of interest-rate changes over a multiyear period can be calculated.
- The second refinement, called standardized gap analysis, accounts for the differing degrees of rate sensitivity for different rate-sensitive assets and liabilities.

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Gap and Duration Analysis

- Basic gap analysis:

  (rate sensitive assets – rate sensitive liabilities) × Δ interest rates = Δ in bank profit

- Maturity bucked approach:
  - Measures the gap for several maturity subintervals
- Standardized gap analysis:
  - Accounts for different degrees of rate sensitivity

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The Economics of Money, Banking, and Financial Markets

Twelfth Edition, Global Edition

Chapter 15

The Money Supply Process

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Preview

- This chapter provides an overview of how commercial banks create deposits and describes the basic principles of the money supply creation process

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Learning Objectives (1 of 2)

- List and describe the “three players” that influence the money supply.
- Classify the factors affecting the Central Bank’s assets and liabilities.
- Identify the factors that affect the monetary base and discuss their effects on the Central bank’s balance sheet.
- Explain and illustrate the deposit creation process using T-accounts.

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Learning Objectives (2 of 2)

- List the factors that affect the money supply.
- Summarize how the “three players” can influence the money supply.
- Calculate and interpret changes in the money multiplier.

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Three Players in the Money Supply Process

1. **The Central bank:** Federal Reserve System
2. **Banks**: depository institutions; financial intermediaries
3. **Depositors**: individuals and institutions

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The Central Bank's Balance Sheet

Federal Reserve System	
Assets	Liabilities
Securities	Currency in circulation
Loans to Financial Institutions	Reserves

- **Liabilities**
  - Currency in circulation: in the hands of the public
  - Reserves: bank deposits at the Fed and vault cash
- **Assets**
  - Government securities: holdings by the Fed that affect money supply and earn interest
  - Discount loans: provide reserves to banks and earn the discount rate

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The Central Bank's Balance Sheet

- Reserves. All banks have an account at the Central bank in which they hold deposits.
- Reserves consist of deposits at the central bank plus currency that is physically held by banks (called vault cash because it is stored in bank vaults).
- Reserves are assets for the banks but liabilities for the Fed, because the banks can demand payment on them at any time and the Fed is required to satisfy its obligation by paying Federal Reserve notes.

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The Central Bank's Balance Sheet

- Total reserves can be divided into two categories: reserves that the central bank requires banks to hold (required reserves) and any additional reserves the banks choose to hold (excess reserves).
- For example, the Fed might require that for every dollar of deposits at a depository institution, a certain fraction (say, 10 cents) must be held as reserves.
- This fraction (10%) is called the required reserve ratio. Currently, the Fed pays no interest on reserves.

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Lecture 12

Control of the Monetary Base

High-powered money

$$MB = C + R$$

C = currency in circulation

R = total reserves in the banking system

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Open Market Operations

- The Federal Reserve exercises control over the monetary base through its purchases or sale of government securities in the open market, called open market operations.

- A purchase of bonds by the Fed is called an open market purchase, and a sale of bonds by the Fed is called an open market sale.

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Open Market Purchase from a Bank

- Suppose that the Fed purchases $100 of bonds from a bank and pays for them with a $100 check.

- The bank will either deposit the check in its account with the Fed or cash it in for currency, which will be counted as vault cash.

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Open Market Purchase from a Bank

Banking System	
Assets	Liabilities
Securities -$100m	
Reserves +$100m	

Federal Reserve System	
Assets	Liabilities
Securities +$100m	Reserves +$100m

- Net result is that reserves have increased by $100
- No change in currency
- Monetary base has risen by $100

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Open Market Purchase from the Non-Bank Public

- Suppose that the person or corporation that sells the $100 of bonds to the Fed, deposits the Fed's check in the local bank.

- When the bank receives the check, it credits the depositor's account with the $100 and then deposits the check in its account with the Fed, thereby adding to its reserves.

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Open Market Purchase from the Nonbank Public

Banking System	
Assets	Liabilities
Reserves +$100m	Checkable deposits +$100m

Federal Reserve System	
Assets	Liabilities
Securities +$100m	Reserves +$100m

- Person selling bonds to the Fed deposits the Fed's check in the bank
- Identical result as the purchase from a bank

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Open Market Purchase from the Non-Bank Public

- Suppose the person or corporation selling the bonds to the Fed cashes the Fed's check either at a local bank or at a Federal Reserve bank for currency.

- This seller will receive currency of $100 while reducing holdings of securities by $100.

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Open Market Purchase from the Nonbank Public

Nonbank Public	
Assets	Liabilities
Securities -$100m	
Currency +$100m	

Federal Reserve System	
Assets	Liabilities
Securities +$100m	Currency in circulation +$100m

- The person selling the bonds cashes the Fed's check
- Reserves are unchanged
- Currency in circulation increases by the amount of the open market purchase
- Monetary base increases by the amount of the open market purchase

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Open Market Purchase: Summary

- The effect of an open market purchase on reserves depends on whether the seller of the bonds keeps the proceeds from the sale in currency or in deposits.
- The effect of an open market purchase on the monetary base always increases the monetary base by the amount of the purchase.

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Open Market Sale

- If the Fed sells $100 of bonds to a bank or the nonbank public, the monetary base will decline by $100.

- For example, if the Fed sells the bonds to an individual who pays for them with currency, the buyer exchanges $100 of currency for $100 of bonds.

- If the buyer pays with a check written on an account at a local bank lead to the same $100 reduction in the monetary base, although the reduction occurs because the level of reserves has fallen by $100.

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Open Market Sale

Nonbank Public	
Assets	Liabilities
Securities +$100m	
Currency -$100m	

Federal Reserve System	
Assets	Liabilities
Securities -$100m	Currency in circulation -$100m

- Reduces the monetary base by the amount of the sale
- The effect of open market operations on the monetary base is much more certain than the effect on reserves.

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Shifts from Deposits into Currency

- Even if the Fed does not conduct open market operations, a shift from deposits to currency will affect the reserves in the banking system.

- However, such a shift will have no effect on the monetary base

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Shifts from Deposits into Currency

Nonbank Public	
Assets	Liabilities
Checkable deposits -$100m	
Currency +$100m	

Banking System	
Assets	Liabilities
Reserves -$100m	Checkable deposits -$100m

Federal Reserve System	
Assets	Liabilities
	Currency in circulation +$100m
	Reserves -$100m

- Net effect on monetary liabilities is zero
- Reserves are changed by random fluctuations
- Monetary base is a relatively stable variable

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Discount Loans

- The monetary base is also affected when the Fed makes a discount loan to a bank.

- When the Fed makes a $100 discount loan to the First National Bank, the bank is credited with $100 of reserves from the proceeds of the loan.

- The monetary liabilities of the Fed have now increased by $100, and the monetary base, too, has increased by this amount.

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Loans to Financial Institutions

Banking System	
Assets	Liabilities
Reserves +$100m	Loans +$100m
	(borrowing from Fed)

Federal Reserve System	
Assets	Liabilities
Loans +$100m	Reserves +$100m
(borrowing from Fed)	

- Monetary liabilities of the Fed have increased by $100
- Monetary base also increases by this amount

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Discount Loans

- If a bank pays off a loan from the Fed, thereby reducing its borrowings from the Fed by $100

- The net effect on the monetary liabilities of the Fed, and hence on the monetary base, is then a reduction of $100.

Banking System	
Assets	Liabilities
Reserves -$100m	Loans -$100m

Federal Reserve System	
Assets	Liabilities
Loans -$100m	Reserves -$100m

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Overview of the Fed's Ability to Control the Monetary Base

- Open market operations are controlled by the Fed.
- The Fed cannot determine the amount of borrowing by banks from the Fed.
- Split the monetary base into two components:

$$MB = MB_n + BR$$

- The non-borrowed monetary base MB_n is under the Fed's control because it results primarily from open market operations.
- The level of borrowed reserves, BR, from the Fed is defined as the monetary base minus borrowings from the Fed.

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Multiple Deposit Creation: A Simple Model

- Suppose that the $100 open market purchase described earlier was conducted with the First National Bank.
- After the Fed has bought the $100 bond from the First National Bank, the bank finds that it has an increase in reserves of $100.
- Because the bank has no increase in its checkable deposits, required reserves remain the same, and the bank finds that its additional $100 of reserves means that its excess reserves have increased by $100.

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Multiple Deposit Creation: A Simple Model

- Let's say that the bank decides to make a loan equal in amount to the $100 increase in excess reserves.
- When the bank makes the loan, it sets up an account for the borrower and puts the proceeds of the loan into this account.
- In this way, the bank alters its balance sheet by increasing its liabilities with $100 of deposits and at the same time increasing its assets with the $100 loan.
- Because deposits are part of the money supply, the bank's act of lending has in fact created money.

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Multiple Deposit Creation: A Simple Model

Deposit Creation: Single Bank

First National Bank	
Assets	Liabilities
Securities -$100m	
Reserves +$100m	

First National Bank	
Assets	Liabilities
Securities -$100m	Checkable deposits +$100m
Reserves +$100m	
Loans +$100m	

First National Bank	
Assets	Liabilities
Securities -$100m	
Loans +$100m	

- Excess reserves increase
- Bank loans out the excess reserves
- Creates a checking account
- Borrower makes purchases
- The Money supply has increased

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Multiple Deposit Creation: A Simple Model

- The borrower took out a loan not to leave $100 idle at the First National Bank but to purchase goods and services from other individuals and corporations.
- When the borrower makes these purchases by writing checks, they will be deposited at other banks, and the $100 of reserves will leave the First National Bank.
- The increase in reserves of $100 has been converted into additional loans of $100 at the First National Bank, plus an additional $100 of deposits that have made their way to other banks.

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Multiple Deposit Creation: A Simple Model

- Let us assume that the $100 of deposits created by First National Bank's loan is deposited at Bank A and that this bank and all other banks hold no excess reserves.
- If the required reserve ratio is 10%, this bank will now find itself with a $10 increase in required reserves, leaving it $90 of excess reserves.
- Because Bank A (like the First National Bank) does not want to hold on to excess reserves, it will make loans for the entire amount.

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Multiple Deposit Creation: A Simple Model

Deposit Creation: The Banking System

Bank A		Bank A	
Assets	Liabilities	Assets	Liabilities
Reserves +$100 m	Checkable deposits +$100 m	Reserves +$10	Checkable deposits +$100 m
		Loans +$90	

Bank B		Bank B	
Assets	Liabilities	Assets	Liabilities
Reserves +$90	Checkable deposits +$90	Reserves +$9	Checkable deposits +$90
		Loans +$81	

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Multiple Deposit Creation: A Simple Model

- If the money spent by the borrower to whom Bank A lent the $90 is deposited in another bank, such as Bank B.
- The checkable deposits in the banking system have increased by another $90, for a total increase of $190 ($100 at Bank A plus $90 at Bank B).
- Bank B must keep 10% of $90 ($9) as required reserves and has 90% of $90 ($81) in excess reserves and so can make loans of this amount.

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Multiple Deposit Creation: A Simple Model

Deposit Creation: The Banking System

Bank A		Bank A	
Assets	Liabilities	Assets	Liabilities
Reserves +$100 m	Checkable deposits +$100 m	Reserves +$10	Checkable deposits +$100 m
		Loans +$90	

Bank B		Bank B	
Assets	Liabilities	Assets	Liabilities
Reserves +$90	Checkable deposits +$90	Reserves +$9	Checkable deposits +$90
		Loans +$81	

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Multiple Deposit Creation: A Simple Model

- The $81 spent by the borrower from Bank B will be deposited in another bank (Bank C).
- Consequently, from the initial $100 increase of reserves in the banking system, the total increase of checkable deposits in the system so far is $271 (= $100 + $90 + $81).
- The total increase in deposits from the initial $100 increase in reserves will be $1,000

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Multiple Deposit Creation: A Simple Model

- If the banks choose to invest their excess reserves in securities, the result is the same.
- When the bank buys $90 of securities, it writes a $90 check to the seller of the securities, who in turn deposits the $90 at a bank such as Bank B.
- Bank B's deposits rise by $90, and the deposit expansion process is the same as before.

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Table 1 Creation of Deposits (Assuming 10% Reserve Requirement and a $100 Increase in Reserves)

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Deriving the Formula for Multiple Deposit Creation

- The multiple increase in deposits generated from an increase in the banking system's reserves is called the ***simple deposit multiplier.***
- In our example with a 10% required reserve ratio, the simple deposit multiplier is 10.

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Deriving the Formula for Multiple Deposit Creation

- Assume that banks do not hold any excess reserves. The assumption means the total amount of required reserves equal total reserves:

$$RR = R$$

- The total amount of required reserves equals the required reserve ratio times the amount of checkable deposits D, or

$$RR = rr \times D$$

- Combining the above equations, we will have

$$D = R / rr$$

- Taking the change in both sides of the equation and using Δ to represent the changes:

$$\Delta D = (\Delta R) / rr$$

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Critique of the Simple Model

- Holding cash stops the process
  - Currency has no multiple deposit expansion
- Banks may not use all of their excess reserves to buy securities or make loans.
- Depositors' decisions (how much currency to hold) and bank's decisions (amount of excess reserves to hold) also cause the money supply to change.

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Factors That Determine the Money Supply

(1 of 2)

- Changes in the nonborrowed monetary base MB_n
  - The money supply is positively related to the non-borrowed monetary base MB_n
- Changes in borrowed reserves from the Fed
  - The money supply is positively related to the level of borrowed reserves, BR, from the Fed

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Factors That Determine the Money Supply (2 of 2)

- Changes in the required reserves ratio
  - The money supply is negatively related to the required reserve ratio.
- Changes in currency holdings
  - The money supply is negatively related to currency holdings.
- Changes in excess reserves
  - The money supply is negatively related to the amount of excess reserves.

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Overview of the Money Supply Process

SUMMARY TABLE 1

Money Supply Response

Player	Variable	Change in Variable	Money Supply Response	Reason
Federal Reserve System	Nonborrowed monetary base, MB_n	↑	↑	More *MB* for deposit creation
	Required reserve ratio, *rr*	↑	↓	Less multiple deposit expansion
Banks	Borrowed reserves, *BR*	↑	↑	More *MB* for deposit creation
	Excess reserves	↑	↓	Less loans and deposit creation
Depositors	Currency holdings	↑	↓	Less multiple deposit expansion

Note: Only increases (↑) in the variables are shown. The effects of decreases on the money supply would be the opposite of those indicated in the "Money Supply Response" column.

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Chapter 7

The Stock Market, the Theory of Rational Expectations, and the Efficient Market Hypothesis

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One-Period Valuation Model

$$P_0 = \frac{Div_1}{(1+k_e)} + \frac{P_1}{(1+k_e)}$$

P_0 = the current price of the stock

Div_1 = the dividend paid at the end of year 1

k_e = the required return on investment in equity

P_1 = the sale price of the stock at the end of the first period

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Generalized Dividend Valuation Model

The value of stock today is the present value of all future cash flows

$$P_0 = \frac{D_1}{(1+k_e)^1} + \frac{D_2}{(1+k_e)^2} + \ldots + \frac{D_n}{(1+k_e)^n} + \frac{P_n}{(1+k_e)^n}$$

If P_n is far in the future, it will not affect P_0

$$P_0 = \sum_{t=1}^{\infty} \frac{D_t}{(1+k_e)^t}$$

The price of the stock is determined only by the present value of the future dividend stream

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Gordon Growth Model

$$P_0 = \frac{D_0(1+g)}{(k_e - g)} = \frac{D_1}{(k_e - g)}$$

D_0 = the most recent dividend paid

g = the expected constant growth rate in dividends

k_e = the required return on an investment in equity

Dividends are assumed to continue growing at a constant rate forever

The growth rate is assumed to be less than the required return on equity

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How the Market Sets Prices

- The price is set by the buyer willing to pay the highest price
- The market price will be set by the buyer who can take best advantage of the asset
- Superior information about an asset can increase its value by reducing its perceived risk

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How the Market Sets Prices

- Information is important for individuals to value each asset.
- When new information is released about a firm, expectations and prices change.
- Market participants constantly receive information and revise their expectations, so stock prices change frequently.

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Application: The Subprime Financial Crisis and the Stock Market

- Financial crisis that started in August 2007 led to one of the worst bear markets in 50 years.
- Downward revision of growth prospects: $\downarrow g$.
- Increased uncertainty: $\uparrow k_e$
- Gordon model predicts a drop in stock prices.

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Adaptive Expectations

- Expectations are formed from past experience only.
- Changes in expectations will occur slowly over time as data changes.
- However, people use more than just past data to form their expectations and sometimes change their expectations quickly.

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Theory of Rational Expectations

- Expectations will be identical to optimal forecasts using all available information
- Even though a rational expectation equals the optimal forecast using all available information, a prediction based on it may not always be perfectly accurate
  - It takes too much effort to make the expectation the best guess possible
  - Best guess will not be accurate because predictor is unaware of some relevant information

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Formal Statement of the Theory

$$X^{e} = X^{of}$$

$X^{e} =$ expectation of the variable that is being forecast

$X^{of} =$ optimal forecast using all available information

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Implications

- If there is a change in the way a variable moves, the way in which expectations of the variable are formed will change as well
  - Changes in the conduct of monetary policy (e.g. target the federal funds rate)
- The forecast errors of expectations will, on average, be zero and cannot be predicted ahead of time.

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Efficient Markets: Application of Rational Expectations

Recall

The rate of return from holding a security equals the sum of the capital gain on the security, plus any cash payments divided by the initial purchase price of the security.

$$R = \frac{P_{t+1} - P_t + C}{P_t}$$

R = the rate of return on the security

P_{t+1} = price of the security at time $t + 1$, the end of the holding period

P_t = price of the security at time t, the beginning of the holding period

C = cash payment (coupon or dividend) made during the holding period

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Efficient Markets (cont'd)

At the beginning of the period, we know P_t and C.

P_{t+1} is unknown and we must form an expectation of it.

The expected return then is :-

$$R^e = \frac{P_{t+1}^e - P_t + C}{P_t}$$

Expectations of future prices are equal to optimal forecasts using all currently available information so

$$P_{t+1}^e = P_{t+1}^{of} \Rightarrow R^e = R^{of}$$

Supply and Demand analysis states R^e will equal the equilibrium return R^*, so $R^{of} = R^*$

of = optimal forecast

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Efficient Markets

- Current prices in a financial market will be set so that the optimal forecast of a security's return using all available information equals the security's equilibrium return
- In an efficient market, a security's price fully reflects all available information

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Rationale

$$R^{of} > R^{*} \Rightarrow P_t \uparrow \Rightarrow R^{of} \downarrow$$

$$R^{of} < R^{*} \Rightarrow P_t \downarrow \Rightarrow R^{of} \uparrow$$

$$\text{until}$$

$$R^{of} = R^{*}$$

of = optimal forecast

In an efficient market, all unexploited profit opportunities will be eliminated

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Application Investing in the Stock Market

- Recommendations from investment advisors cannot help us outperform the market
- A hot tip is probably information already contained in the price of the stock
- Stock prices respond to announcements only when the information is new and unexpected
- A "buy and hold" strategy is the most sensible strategy for the small investor

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Behavioral Finance

- The lack of short selling (causing over-priced stocks) may be explained by loss aversion
- The large trading volume may be explained by investor overconfidence
- Stock market bubbles may be explained by overconfidence and social contagion

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Money and Banking – ECO 233

Lecture 14

The Money Multiplier

- Define money as currency plus checkable deposits: M1
- Link the money supply (M) to the monetary base (MB) and let m be the money multiplier

$$M = m \times MB$$

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The Money Multiplier

- We ignored the effects on deposit creation of changes in the public's holdings of currency and banks' holdings of excess reserves
- The desired level of currency C and excess reserves ER grows proportionally with checkable deposits D
- The ratios of these items to checkable deposits are constants in equilibrium.

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Deriving the Money Multiplier

- Assume that the desired holdings of currency C and excess reserves ER grow proportionally with checkable deposits D.
- Then,

$c = \{C / D\}$ = currency ratio

$e = \{ER / D\}$ = excess reserves ratio

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Deriving the Money Multiplier

- The total amount of reserves (R) equals the sum of required reserves (RR) and excess reserves (ER):

$$R = RR + ER$$

- The total amount of required reserves equals the required reserve ratio times the amount of checkable deposits:

$$RR = rr \times D$$

- Substituting for RR in the first equation gives

$$R = (rr \times D) + ER$$

where rr is set to be less than 1 by the Central Bank

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Deriving the Money Multiplier

- The monetary base MB equals currency (C) plus reserves (R):

$$MB = C + R = C + (rr \times D) + ER$$

- Equation reveals the amount of the monetary base needed to support the existing amounts of checkable deposits, currency, and excess reserves.

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Deriving the Money Multiplier

$$c = \{C / D\} \Rightarrow C = c \times D \text{ and}$$

$$e = \{ER / D\} \Rightarrow ER = e \times D$$

Substituting in the previous equation

$$MB = (r \times D) + (e \times D) + (c \times D) = (r + e + c) \times D$$

Divide both sides by the term in parentheses

$$D = \frac{1}{r + e + c} \times MB$$

$$M = D + C \text{ and } C = c \times D$$

$$M = D + (c \times D) = (1 + c) \times D$$

Substituting again

$$M = \frac{1 + c}{r + e + c} \times MB$$

The money multiplier is then

$$m = \frac{1 + c}{r + e + c} = \frac{1}{rr}$$

r = required reserve ratio = 0.10
C = currency in circulation = \$400 billion
D = checkable deposits = \$800 billion
ER = excess reserves = \$0.8 billion
M = money supply (M1) = $C + D$ = \$1,200 billion

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Deriving the Money Multiplier

$$
\begin{aligned}
r &= \text{required reserve ratio} = 0.10 \\
C &= \text{currency in circulation} = \$400 \text{ billion} \\
D &= \text{checkable deposits} = \$800 \text{ billion} \\
ER &= \text{excess reserves} = \$0.8 \text{ billion} \\
M &= \text{money supply (M1)} = C + D = \$1{,}200 \text{ billion}
\end{aligned}
$$

From these numbers we can calculate the values for the currency ratio c and the excess reserves ratio e:

$$c = \frac{\$400 \text{ billion}}{\$800 \text{ billion}} = 0.5$$

$$e = \frac{\$0.8 \text{ billion}}{\$800 \text{ billion}} = 0.001$$

The resulting value of the money multiplier is:

$$m = \frac{1 + 0.5}{0.1 + 0.001 + 0.5} = \frac{1.5}{0.601} = 2.5$$

The money multiplier of 2.5 tells us that, given the required reserve ratio of 10% on checkable deposits and the behavior of depositors as represented by $c = 0.5$ and banks as represented by $e = 0.001$, a \$1 increase in the monetary base leads to a \$2.50 increase in the money supply (M1).

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Money Supply in India (M2)

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Cash Reserve Ratio-India

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The Economics of Money, Banking, and Financial Markets

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Chapter 16

Tools of Monetary Policy

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Preview

- This chapter examines the tools used by the Central Bank to control the money supply and interest rates

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Learning Objectives

- Illustrate the market for reserves and demonstrate how changes in monetary policy can affect the federal funds rate.
- Summarize how conventional monetary policy tools are implemented and the advantages and limitations of each tool.
- Explain the key monetary policy tools that are used when conventional policy is no longer effective.

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Federal Funds Rate

- Federal funds rate: The interest rate charged on overnight loans in the federal funds market, an indicator of the cost to banks of borrowing funds from other banks.

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The Market for Reserves and the Federal Funds Rate

- Demand and Supply in the Market for Reserves
- What happens to the **quantity of reserves demanded** by banks, holding everything else constant, as the federal funds rate changes?
- Excess reserves are insurance against deposit outflows, and the cost of holding these excess reserves is their opportunity cost, the interest rate that could have been earned on lending these reserves out.

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The Market for Reserves and the Federal Funds Rate

- As the federal funds rate decreases, the opportunity cost of holding excess reserves falls and, holding everything else constant, including the quantity of required reserves, the quantity of reserves demanded rises.

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The Market for Reserves and the Federal Funds Rate

- Since the fall of 2008, the Fed has paid interest on reserves
  - The level is set at a fixed amount below the federal funds rate target (i.e., $i_{or} \leq i_{ff}$).
- When the federal funds rate is above the rate paid on reserves, then as the federal funds rate decreases, the opportunity cost of holding excess reserves falls.
- Excess reserves are insurance against deposit outflows
  - The *opportunity cost* of holding these equals i_{ff} - i_{or}

or = rate on reserves
ff = federal fund rate

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Demand in the Market for Reserves

- The demand curve for reserves slopes downward when i_{ff} is above i_{or} and it becomes flat (infinitely elastic) at i_{or}
  - When the federal funds rate is above the rate paid on excess reserves, i_{or}, as the federal funds rate decreases, the opportunity cost of holding excess reserves falls, and the quantity of reserves demanded increases.
  - When i_{ff} falls below i_{or} , banks keep on adding their holdings of excess reserves indefinitely.

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Supply in the Market for Reserves

- Two components: nonborrowed (NBR) and borrowed reserves (BR)
- The primary cost of borrowing from the Fed is the discount rate.
- Borrowing from the Fed is a substitute for borrowing from other banks
- If $i_{ff} < i_d$, then banks will not borrow from the Fed and borrowed reserves are zero
  - The supply curve will be vertical

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Supply in the Market for Reserves

- As i_{ff} rises above i_d, banks will borrow more and more at i_d, and relend at i_{ff}
  - The supply curve is horizontal (perfectly elastic) at i_d

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Figure 1 Equilibrium in the Market for Reserves

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Market Equilibrium

- Market equilibrium occurs where the quantity of reserves demanded equals the quantity supplied.
- Equilibrium therefore occurs at the intersection of the demand curve R^d and the supply curve R^s

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How Conduct of Open Market Operations Affect the Federal Funds Rate

- Open market purchases (sales) shift the supply curve to the right (left).
- An open market purchase leads to a greater quantity of reserves supplied.
- This is true at any given federal funds rate because of the higher amount of nonborrowed reserves.

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How Conduct of Open Market Operations Affect the Federal Funds Rate

- The effect of an open market operation depends on whether the supply curve initially intersects the demand curve in its downward sloped section versus its flat section.
- An open market purchase causes the federal funds rate to fall whereas an open market sale causes the federal funds rate to rise (when intersection occurs at the downward sloped section).
- Open market operations have no effect on the federal funds rate when intersection occurs at the flat section of the demand curve.

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Figure 2 Response to an Open Market Operation

(a) Supply curve initially intersects demand curve in its downward-sloping section

(b) Supply curve initially intersects demand curve in its flat section

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How Changes in the Discount Rate Affect the Federal Funds Rate

- If the intersection of supply and demand occurs on the vertical section of the supply curve, a change in the discount rate will have no effect on the federal funds rate.
- If the intersection of supply and demand occurs on the horizontal section of the supply curve where $i_{ff} = i_d$, a fall in the discount rate shifts that portion of the supply curve downward. Hence, the federal funds rate falls and borrowed reserves increase.

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Figure 3 Response to a Change in the Discount Rate

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How Changes in the Reserve Requirement Affect the Federal Funds Rate

- When the Fed raises reserve requirement, the federal funds rate rises and when the Fed decreases reserve requirement, the federal funds rate falls.
- When the required reserve ratio increases, required reserves increase and hence the quantity of reserves demanded increases for any given interest rate.

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Figure 4 Response to a Change in Required Reserves

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How Changes in Interest on Reserves Affect the Federal Funds Rate

- If the intersection occurs on the demand curve's downward-sloping section, a rise in the interest rate on reserves does not cause changes in the federal funds rate.
- If the supply curve intersects the demand curve on its flat section, a rise in the interest rate on reserves raises the federal funds rate.

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Figure 5 Response to a Change in the Interest Rate on Reserves

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Money and Banking – ECO 233

Lecture 15

Conventional Monetary Policy Tools

- During normal times, the Federal Reserve uses three tools of monetary policy—open market operations, discount lending, and reserve requirements—to control the money supply and interest rates, and these are referred to as conventional monetary policy tools.

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Open Market Operations

- Open market operations are the most important monetary policy tool
- They are the primary determinants of changes in interest rates and the monetary base, the main source of fluctuations in the money supply.
- Open market purchases expand reserves and the monetary base, thereby raising the money supply and lowering short-term interest rates.
- Open market sales shrink reserves and the monetary base, lowering the money supply and raising short-term interest rates.

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Open Market Operations

- There are two types of open market operations.
- **Dynamic open market operations** are intended to change the level of reserves and the monetary base.
- **Defensive open market operations** are intended to offset movements in other factors that affect reserves and the monetary base
- Open market operations are conducted electronically through a specific set of dealers in government securities, known as **primary dealers**.

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Open Market Operations

- Defensive open market operations are of two basic types.
- In a repurchase agreement (often called a **repo**), the Fed purchases securities with an agreement that the seller will repurchase them in a short period of time, anywhere from 1 to 15 days from the original date of purchase.
- A repo is actually a temporary open market purchase and is an especially desirable way of conducting a defensive open market purchase that will be reversed shortly.

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Open Market Operations

- When the Fed wants to conduct a temporary open market sale, it engages in a **matched sale–purchase transaction** (sometimes called a **reverse repo**)
- The Fed sells securities and the buyer agrees to sell them back to the Fed in the near future.

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Open Market Operations

- Dynamic open market operations
  - intended to change reserves and monetary base
- Defensive open market operations
  - Repurchase agreements (Repo)
  - Matched sale-purchase agreements (Reverse Repo)
- Primary dealers

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Open Market Operations: Advantages

- Open market operations occur at the initiative of the Fed, which has complete control over their volume.
- Open market operations are flexible and precise; they can be used to any extent.
- Open market operations are easily reversed. If a mistake is made in conducting an open market operation, the Fed can immediately reverse it.
- Open market operations can be implemented quickly; they involve no administrative delays.

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Discount Policy and the Lender of Last Resort

- The Federal Reserve facility at which discount loans are made to banks is called the **discount window**.
- The Fed's discount loans to banks are of three types: primary credit, secondary credit and seasonal credit.
- *Primary credit* is the discount lending that plays the most important role in monetary policy.
- Healthy banks are allowed to borrow all they want from the primary credit facility, and it is therefore referred to as a standing lending facility.

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Discount Policy and the Lender of Last Resort

- The interest rate on these loans is the discount rate.
- It is set higher than the federal funds rate target, usually by 100 basis points (one percentage point)

primary credit

- The facility is intended to be a backup source of liquidity for sound banks.

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Discount Policy and the Lender of Last Resort

- *Secondary credit* is given to banks that are in financial trouble and are experiencing severe liquidity problems.
- The interest rate on secondary credit is set at 50 basis points (0.5 percentage points) above the discount rate.
- This interest rate on these loans is set at a higher, penalty rate to reflect the less-sound condition of these borrowers.
- *Seasonal credit* is given to meet the needs of a limited number of small banks in vacation and agricultural areas that have a seasonal pattern of deposits.

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Lender of Last Resort

- **Discounting** is important in preventing financial panics.
- The central bank's important role was intended to be as the lender of last resort.
- Prevent bank failures from spinning out of control, provide reserves to banks when no one else would, thereby preventing bank and financial panics.

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The Economics of Money, Banking, and Financial Markets

Twelfth Edition, Global Edition

Chapter 17

The Conduct of Monetary Policy: Strategy and Tactics

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Preview

- This chapter examines the goals of monetary policy and then considers one of the most important strategies for the conduct of monetary policy, inflation targeting

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Learning Objectives

- Define and recognize the importance of a nominal anchor.
- Identify the six potential goals that monetary policy makers may pursue.
- Summarize the distinctions between hierarchical and dual mandates.
- Compare and contrast the advantages and disadvantages of inflation targeting.

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Learning Objectives

- List the four lessons learned from the global financial crisis and discuss what they mean to inflation targeting.
- Summarize the arguments for and against central bank policy response to asset-price bubbles.
- Describe and assess the four criteria for choosing a policy instrument.
- Interpret and assess the performance of the Taylor rule as a hypothetical policy instrument for setting the federal funds rate.

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The Price Stability Goal and the Nominal Anchor

- Over the past few decades, policy makers throughout the world have become increasingly aware of the social and economic costs of inflation and more concerned with maintaining a stable price level as a goal of economic policy.
- **Price stability** is increasingly viewed as the most important goal for monetary policy.
- Price stability is desirable because a rising price level (inflation) creates uncertainty in the economy, and that uncertainty might hamper economic growth.

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The Price Stability Goal and the Nominal Anchor

- For example, when the overall level of prices is changing, the information conveyed by the prices of goods and services is harder to interpret, which complicates decision making for consumers, businesses, and government.
- The most extreme example of unstable prices is *hyperinflation*, such as Argentina, Brazil, and Russia have experienced in the recent past.

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The Price Stability Goal and the Nominal Anchor

- Inflation also makes it hard to plan for the future.
- For example, it is more difficult to decide how much funds should be put aside to provide for a child's college education in an inflationary environment.
- Further, inflation can strain a country's social fabric: Conflict might result, because each group in the society may compete with other groups to make sure that its income keeps up with the rising level of prices.

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The Role of a Nominal Anchor

- A central element in successful monetary policy is the use of a **nominal anchor**
- The role of a **nominal anchor**: a nominal variable, such as the inflation rate or the money supply, which ties down the price level to achieve price stability
- Adherence to a nominal anchor that keeps the nominal variable within a narrow range promotes price stability by directly promoting low and stable inflation expectations.
- A more subtle reason for a nominal anchor's importance is that it can limit the **time-inconsistency problem**.

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The Time-Inconsistency Problem

- We find ourselves unable to *consistently* follow a good plan over *time;* the good plan is said to be *time-inconsistent.*
- Clearly, a central bank will do better if it does not try to boost output by surprising people with an unexpectedly expansionary policy, but instead keeps inflation under control.

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The Time-Inconsistency Problem

- However, even if a central bank recognizes that discretionary policy will lead to a poor outcome—high inflation with no gains on the output front—it may still fall into the time-consistency trap.
- Politicians are likely to apply pressure on the central bank to try to boost output with overly expansionary monetary policy.
- A nominal anchor is like a behavior rule

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The Time-Inconsistency Problem

- As rules help to prevent the time-consistency problem in parenting, a nominal anchor can help to prevent the time-consistency problem in monetary policy by providing an expected constraint on discretionary policy.

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The Time-Inconsistency Problem

- For example, at any given point in time, it seems to make sense for a parent to give in to a child to keep the child from acting up.
- The more the parent gives in, however, the more the demanding the child is likely to become.
- Thus, the discretionary time-consistent actions by the parent lead to a bad outcome—a very spoiled child—because the child's expectations are affected by what the parent does.
- How-to books on parenting suggest a solution to the time-consistency problem by telling parents that they should set rules for their children and stick to them.

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Other Goals of Monetary Policy

- Five other goals are continually mentioned by central bank officials when they discuss the objectives of monetary policy:

1. High employment and output stability
   - To achieve the level of full employment, which is called the natural rate of unemployment
2. Economic growth
3. Stability of financial markets
4. Interest-rate stability
   - Fluctuations in interest rates create uncertainty for financial institutions
5. Stability in foreign exchange markets

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High Employment

- High employment is a worthy goal for two main reasons:
- (1) the alternative situation—high unemployment—causes much human misery, with families suffering financial distress, loss of personal self-respect, and increase in crime (sometimes)
- (2) when unemployment is high, the economy has not only idle workers but also idle resources (closed factories and unused equipment), resulting in a loss of output (lower GDP).

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High Employment

- At first, it might seem that full employment is the point at which no worker is out of a job; that is, when unemployment is zero.
- This definition ignores the fact that some unemployment, called *frictional unemployment*, which involves searches by workers and firms to find suitable matchups.
- Workers often decide to leave work temporarily to pursue other activities (raising a family, travel, returning to school) or for a better job.

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High Employment

- Another reason that unemployment is not zero when the economy is at full employment is due to what is called *structural unemployment*, a mismatch between job requirements and the skills or availability of local workers.
- This kind of unemployment is undesirable.
- Nonetheless, it is something that monetary policy can do little about.

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High Employment

- The goal for high employment should therefore not seek an unemployment level of zero but rather a level above zero consistent with full employment at which the demand for labor equals the supply of labor.
- This level is called the **natural rate of unemployment**.
- The central bank should try to move the level of output toward the **natural rate of output** (also called **potential output**)
- The level of output consistent with the natural rate of unemployment.

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Economic Growth

- The goal of steady economic growth is closely related to the high-employment goal because businesses are more likely to invest in capital equipment to increase productivity and economic growth when unemployment is low.
- Policies can be specifically aimed at promoting economic growth by directly encouraging firms to invest or by encouraging people to save, which provides more funds for firms to invest.

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Economic Growth

- This is the stated purpose of so-called *supply-side* economics policies, which are intended to spur economic growth by providing tax incentives for businesses to invest in facilities and equipment and for taxpayers to save more.
- There is also an active debate over what role monetary policy can play in boosting growth.

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Stability of Financial Markets

- Financial crises can interfere with the ability of financial markets to channel funds to people with productive investment opportunities, thereby leading to a sharp contraction in economic activity.
- The promotion of a more stable financial system in which financial crises are avoided is thus an important goal for a central bank.

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Interest-Rate Stability

- Interest-rate stability is desirable because fluctuations in interest rates can create uncertainty in the economy and make it harder to plan for the future.
- Fluctuations in interest rates that affect consumers' willingness to buy houses, for example, make it more difficult for consumers to decide when to purchase a house and for construction firms to plan how many houses to build.
- Upward movements in interest rates generate hostility toward central banks like the Fed and lead to demands that their power be curtailed.

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Interest-Rate Stability

- The stability of financial markets is also fostered by interest-rate stability.
- An increase in interest rates produces large capital loses on long-term bonds and mortgages.
- Loses can cause the failures of the financial institutions holding them.

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Stability in Foreign Exchange Markets

- With the increasing importance of international trade the exchange rate has become a major consideration for the Central Bank.
- A rise in the value of rupee makes Indian industries less competitive with those abroad, and declines in the value of the rupee can stimulate inflation in India.
- In addition, preventing large changes in the value of the rupee makes it easier for firms and individuals purchasing or selling goods abroad to plan ahead.

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Stability in Foreign Exchange Markets

- Stabilizing extreme movements in the value of the rupee in foreign exchange markets is thus viewed as a worthy goal of monetary policy.
- Countries, which are highly dependent on foreign trade, stability in foreign exchange markets takes on even greater importance.

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Money and Banking – ECO 233

Lecture 16

Foreign Exchange Market (1 of 2)

- **Exchange rate**: price of one currency in terms of another
- **Foreign exchange market**: the financial market where exchange rates are determined
- **Spot transaction**: immediate (two-day) exchange of bank deposits
  - Spot exchange rate
- **Forward transaction**: the exchange of bank deposits at some specified future date
  - Forward exchange rate

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Foreign Exchange Market (2 of 2)

- **Appreciation**: a currency rises in value relative to another currency
- **Depreciation**: a currency falls in value relative to another currency
- When a country's currency appreciates, the country's goods become more expensive to foreigners and foreign goods in that country become less expensive to domestic economic agents.

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Why are exchange rates so important?

- Exchange rates are important because they affect the relative price of domestic and foreign goods.
- The dollar price of French goods to an American is determined by the interaction of two factors:
  - the price of French goods in euros
  - and the euro/dollar exchange rate

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Why are exchange rates so important?

- If the price of the wine in France is 1,000 euros and the exchange rate is $1.08 to the euro, the wine will cost Wanda (an American) $1,080 (=1,000 euros X $1.08/euro). Now suppose that
- Wanda delays her purchase by two months, at which time the euro has appreciated to $1.20 per euro.
- If the domestic price of the wine remains 1,000 euros, its dollar cost will have risen from $1,080 to $1,200.

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Why are exchange rates so important?

- The same currency appreciation, however, makes the price of foreign goods in that country less expensive.
- At an exchange rate of $1.08 per euro, a HP computer priced at $2,000 costs Pierre the Programmer in France 1,852 euros.
- If the exchange rate increases to $1.20 per euro, the computer will cost only 1,667 euros.

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Why are exchange rates so important?

- A depreciation of the euro lowers the cost of French goods in America but raises the cost of American goods in France.
- If the euro drops in value to $0.90, Wanda's wine bottle will cost her only $900 instead of $1,080,
- and the HP computer will cost Pierre 2,222 euros rather than 1,852.

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Why are exchange rates so important?

- When a country's currency appreciates (rises in value relative to other currencies), the country's goods abroad become more expensive and foreign goods in that country become cheaper (holding domestic prices constant in the two countries).
- Conversely, when a country's currency depreciates, its goods abroad become cheaper and foreign goods in that country become more expensive.
- Appreciation of a currency can make it harder for domestic manufacturers to sell their goods abroad and can increase competition at home from foreign goods, because they cost less.

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Exchange Rates in the Long Run

- Like the price of any good or asset in a free market, exchange rates are determined by the interaction of supply and demand.
- To simplify our analysis of exchange rates in a free market, we divide it into two parts.
- First, we examine how exchange rates are determined in the long run;
- then we use our knowledge of the long-run determinants of the exchange rate to help us understand how they are determined in the short run.

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Exchange Rates in the Long Run

- Law of one price: the prices of an identical good should be the same throughout the world if trade barriers are low
- Suppose that American steel costs $100 per ton and identical Japanese steel costs 10,000 yen per ton.
- For the law of one price to hold, the exchange rate between the yen and the dollar must be 100 yen per dollar ($0.01 per yen)
- so that one ton of American steel sells for 10,000 yen in Japan (the price of Japanese steel) and one ton of Japanese steel sells for $100 in the United States (the price of U.S. steel).

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Exchange Rates in the Long Run

- One of the most prominent theories of how exchange rates are determined is the theory of purchasing power parity (PPP).
- **PPP** states that exchange rates between any two currencies will adjust to reflect changes in the price levels of the two countries.
- The theory of PPP is simply an application of the law of one price to national price levels rather than to individual prices.

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Exchange Rates in the Long Run

- Suppose that the yen price of Japanese steel rises 10% (to 11,000 yen) relative to the dollar price of American steel (unchanged at $100).
- For the law of one price to hold, the exchange rate must rise to 110 yen to the dollar, a 10% appreciation of the dollar.
- Applying the law of one price to the price levels in the two countries produces the theory of purchasing power parity, which maintains that if the Japanese price level rises 10% relative to the U.S. price level, the dollar will appreciate by 10%.

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Exchange Rates in the Long Run

- Why the Theory of Purchasing Power Parity Cannot Fully Explain Exchange Rates?
- The PPP conclusion that exchange rates are determined solely by changes in relative price levels rests on the assumption
- All goods are identical in both countries
- Transportation costs and trade barriers are very low.
- The assumption that goods are identical may not be too reasonable for American and Japanese products.

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Exchange Rates in the Long Run

- PPP theory furthermore does not take into account that many goods and services (whose prices are included in a measure of a country's price level) are not traded across borders.
- Housing, land, and services such as restaurant meals, haircuts, and golf lessons are not traded goods.
- So even though the prices of these items might rise and lead to a higher price level relative to another country's, there would be little direct effect on the exchange rate.

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Factors That Affect Exchange Rates in the Long Run

- The basic rule: Anything that increases the demand for domestically produced goods relative to foreign traded goods tends to appreciates domestic currency
  - Relative price levels
  - Trade barriers
  - Preferences for domestic versus foreign goods
  - Productivity

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Factors That Affect Exchange Rates in the Long Run

- Similarly, anything that increases the demand for foreign goods relative to domestic goods tends to depreciate the domestic currency
- Domestic goods will continue to sell well only if the value of the domestic currency is lower.

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Relative Price Levels

- When prices of American goods rise (holding prices of foreign goods constant), the demand for American goods falls and the dollar tends to depreciate so that American goods can still sell well.
- By contrast, if prices of Japanese goods rise so that the relative prices of American goods fall, the demand for American goods increases, and the dollar tends to appreciate, because American goods will continue to sell well even with a higher value of the domestic currency.
- In the long run, a rise in a country's price level (relative to the foreign price level) causes its currency to depreciate, and a fall in the country's relative price level causes its currency to appreciate.

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Trade Barriers

- Barriers to free trade such as tariffs (taxes on imported goods) and quotas (restrictions on the quantity of foreign goods that can be imported) can affect the exchange rate.
- Suppose that the United States increases its tariff or puts a lower quota on Japanese steel.
- These increases in trade barriers increase the demand for American steel, and the dollar tends to appreciate because American steel will still sell well even with a higher value of the dollar.
- Increasing trade barriers cause a country's currency to appreciate in the long run.

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Preferences for Domestic Versus Foreign Goods

- If the Japanese develop an appetite for American goods, the increased demand for American goods (exports) tends to appreciate the dollar.
- American goods will continue to sell well even at a higher value for the dollar.
- Likewise, if Americans decide that they prefer Japanese cars to American cars, the increased demand for Japanese goods (imports) tends to depreciate the dollar.
- Increased demand for a country's exports causes its currency to appreciate in the long run; conversely, increased demand for imports causes the domestic currency to depreciate.

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Productivity

- If one country becomes more productive than other countries, businesses in that country can lower the prices of domestic goods relative to foreign goods and still earn a profit.
- As a result, the demand for domestic goods rises, and the domestic currency tends to appreciate.
- If, however, its productivity lags behind that of other countries, its goods become relatively more expensive, and the currency tends to depreciate.
- In the long run, as a country becomes more productive relative to other countries, its currency appreciates

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Tip

- The trick to figuring out what long-run effect a factor has on the exchange rate is to remember the following:
- If a factor increases the demand for domestic goods relative to foreign goods, the domestic currency will appreciate
- and if a factor decreases the relative demand for domestic goods, the domestic currency will depreciate.

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Summary Table 1 Factors That Affect Exchange Rates in the Long Run

Factor	Change in Factor	Response of the Exchange Rate, *E**
Domestic price level†	↑	↓
Trade barriers†	↑	↑
Import demand	↑	↓
Export demand	↑	↑
Productivity†	↑	↑

*Units of foreign currency per dollar: ↑ indicates domestic currency appreciation; ↓, depreciation.

†Relative to other countries.

Note: Only increases (↑) in the factors are shown; the effects of decreases in the variables on the exchange rate are the opposite of those indicated in the "Response" column.

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Nominal vs. Real Exchange Rate

- Real exchange rate: the rate at which domestic goods can be exchanged for foreign goods
- For example, let us consider a basket of goods in New York worth 50 USD; meanwhile, the same basket of goods is worth 7500 JPY in Tokyo. The nominal exchange rate is 100 JPN/USD.
- The real exchange rate is “how many foreign goods you can buy by paying one unit of domestic foods”
- In the above question, the real rate is

$$E_R = 50*100/7500 = 0.66$$

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Application:
Burgernomics: Big Macs and PPP

- Since 1986, The Economist magazine has published the Big Mac index as a “light- hearted guide to whether currencies are at their ‘correct’ level based on the theory of purchasing power parity.”
- Big Macs are sold by McDonald’s all around the world and are supposed to taste the same wherever they are sold.
- The Economist collects prices (in the local currency) of Big Macs sold in 56 different regions and countries, then uses these prices to compare the exchange rate implied by PPP and the Big Mac index.

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Application: Burgernomics: Big Macs and PPP

- Burgernomics was never intended as a precise gauge of currency misalignment, merely a tool to make exchange-rate theory more digestible.
- Yet the Big Mac index has become a global standard, included in several economic textbooks and the subject of dozens of academic studies.

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Application:
Burgernomics: Big Macs and PPP

- Burgernomics was never intended as a precise gauge of currency misalignment, merely a tool to make exchange-rate theory more digestible.
- Yet the Big Mac index has become a global standard, included in several economic textbooks and the subject of dozens of academic studies.

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Application:
Burgernomics: Big Macs and PPP

A Big Mac costs 190 rupees in India and US$5.81 in the United States. The implied exchange rate is 32.70. The difference between this and the actual exchange rate, 74.62, suggests the Indian rupee is 56.2% undervalued

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Exchange Rates in the Short Run: A Supply and Demand Analysis

- We have developed a theory of the long-run behavior of exchange rates.
- To understand why exchange rates exhibit such large changes from day to day, we must develop a theory of how current exchange rates (spot exchange rates) are determined in the short run.
- The key to understanding the short-run behavior of exchange rates is to recognize that an exchange rate is the price of domestic bank deposits (those denominated in the domestic currency) in terms of foreign bank deposits (those denominated in the foreign currency).

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Exchange Rates in the Short Run: A Supply and Demand Analysis

- Earlier approaches to exchange rate determination emphasized the role of import and export demand.
- The more modern asset market approach used here does not emphasize the flows of purchases of exports and imports over short periods, because these transactions are quite small relative to the amount of domestic and foreign bank deposits at any given time.
- Thus over short periods, decisions to hold domestic or foreign assets play a much greater role in exchange rate determination than the demand for exports and imports does.

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Supply Curve for Domestic Assets

- In this analysis, we treat the United States as the home country, so as an example, domestic bank deposits are denominated in dollars.
- For simplicity, we use euros to stand for any foreign country's currency, so foreign bank deposits are denominated in euros.
- The quantity of dollar assets supplied is primarily the quantity of bank deposits, bonds, and equities in the United States.
- We take this amount as fixed with respect to the exchange rate and the supply curve, S is vertical.

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Equilibrium in the Foreign Exchange Market

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Demand Curve for Domestic Assets

- The demand curve traces out the quantity demanded at each current exchange rate by holding everything else constant, particularly the expected future value of the exchange rate.
- Suppose the current exchange rate (the spot exchange rate) is E_t
- The expected exchange rate for the next period is E^e_{t+1}
- As the theory of asset demand suggests, the most important determinant of the quantity of domestic (dollar) assets demanded is the relative expected return of domestic assets

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Demand Curve for Domestic Assets

- Let's see what happens as the current exchange rate, E_t, falls
- Suppose we start at point A in Figure, where the current exchange rate is at E_A.
- With the future expected value of the exchange rate held constant, a lower value of the exchange rate, say at E*, implies that the dollar is more likely to rise in value, that is appreciate.
- The greater the expected rise (appreciation) of the dollar, the higher is the relative expected return on dollar (domestic) assets.

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Demand Curve for Domestic Assets

- The theory of asset demand then tells us that because dollar assets are now more desirable to hold, the quantity of dollar assets demanded will rise, as is shown by point B
- If the current exchange rate falls even further to E_C, there is an even higher expected appreciation of the dollar, a higher expected return, and therefore an even greater quantity of dollar assets demanded.
- This is shown in point C
- The resulting demand curve, D, which connects these points, is downward sloping, indicating that at lower current values of the dollar (everything else equal), the quantity demanded of dollar assets is higher.

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Figure 2 Equilibrium in the Foreign Exchange Market

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Equilibrium in the Foreign Exchange Market

- The market is in equilibrium when the quantity of dollar assets demanded equals the quantity supplied.
- The equilibrium occurs at point B, the intersection of the demand and supply curves and the exchange rate is E*

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Equilibrium in the Foreign Exchange Market

- Suppose that the exchange rate is at E_A, which is higher than the equilibrium exchange rate of E*.
- The quantity of dollar assets supplied is then greater than the quantity demanded, a condition of excess supply.
- Given that more people want to sell dollar assets than want to buy them, the value of the dollar will fall.
- As long as the exchange rate remains above the equilibrium exchange rate, there will continue to be an excess supply of dollar assets.
- The dollar will fall in value until it reaches the equilibrium exchange rate of E*.

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Equilibrium in the Foreign Exchange Market

- If the exchange rate is less than the equilibrium exchange rate at E_C, the quantity of dollar assets demanded will exceed the quantity supplied, a condition of excess demand.
- Given that more people want to buy dollar assets than want to sell them, the value of the dollar will rise until the excess demand disappears.
- The value of the dollar is again at the equilibrium exchange rate of E*.

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Money and Banking – ECO 233

Lecture 17

Figure 2 Equilibrium in the Foreign Exchange Market

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Explaining Changes in Exchange Rates

- By assuming the amount of dollar assets is fixed: The supply curve is vertical at a given quantity and does not shift.
- Under this assumption, we need look at only those factors that shift the demand curve for dollar assets to explain how exchange rates change over time.

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Shifts in the demand for domestic assets

- Shifts in the demand for domestic assets
  - Domestic interest rate
  - Foreign interest rate
  - Expected future exchange rate

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Domestic interest rate

- Suppose that dollar assets pay an interest rate of i^D.
- When the domestic interest rate on dollar assets i^D rises, holding the current exchange rate E_t and everything else constant, the return on dollar assets increases relative to foreign assets, so people will want to hold more dollar assets.
- The quantity of dollar assets demanded increases at every value of the exchange rate, as shown by the rightward shift of the demand curve
- An increase in the domestic interest rate i^D shifts the demand curve for domestic assets, D, to the right and causes the domestic currency to appreciate

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Figure 3 Response to an Increase in the Domestic Interest Rate, i^D

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Domestic interest rate

- Conversely, if i^D falls, the relative expected return on dollar assets falls, the demand curve shifts to the left, and the exchange rate falls.
- A decrease in the domestic interest rate i^D shifts the demand curve for domestic assets, D, to the left and causes the domestic currency to depreciate.

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Foreign interest rate

- Suppose that the foreign asset pays an interest rate of i^F.
- When the foreign interest rate i^F rises, holding the current exchange rate and everything else constant, the return on foreign assets rises relative to dollar assets.
- Thus the relative expected return on dollar assets falls.
- Now people want to hold fewer dollar assets, and the quantity demanded decreases at every value of the exchange rate
- This scenario is shown by the leftward shift of the demand curve
- An increase in the foreign interest rate i^F shifts the demand curve D to the left and causes the domestic currency to depreciate

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Figure 4 Response to an Increase in the Foreign Interest Rate, i^F

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Foreign interest rate

- Conversely, a decrease in i^F raises the relative expected return on dollar assets, shifts the demand curve to the right, and raises the exchange rate.
- A fall in the foreign interest rate i^F shifts the demand curve D to the right and causes the domestic currency to appreciate.

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Changes in the Expected Future Exchange Rate

- Expectations about the future value of the exchange rate play an important role in shifting the current demand curve, because the demand for domestic assets, like the demand for any durable good, depends on the future resale price.
- Any factor that causes the expected future exchange rate, to rise increases the expected appreciation of the dollar.
- The result is a higher relative expected return on dollar assets, which increases the demand for dollar assets at every exchange rate, thereby shifting the demand curve to the right.

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Figure 5 Response to an Increase in the Expected Future Exchange Rate, E^e_{t+1}

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Changes in the Expected Future Exchange Rate

- A rise in the expected future exchange rate shifts the demand curve to the right and causes an appreciation of the domestic currency.
- Using the same reasoning, a fall in the expected future exchange rate, shifts the demand curve to the left and causes a depreciation of the currency.

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Changes in the Expected Future Exchange Rate

- We discussed the determinants of the exchange rate in the long run:
  - the relative price level
  - relative trade barriers
  - import and export demand
  - relative productivity
- These four factors influence the expected future exchange rate

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Changes in the Expected Future Exchange Rate

- The theory of purchasing power parity suggests that if a higher American price level relative to the foreign price level is expected to persist, the dollar will depreciate in the long run.
- A higher expected relative American price level should thus have a tendency to lower the expected exchange rate, lower the relative expected return on dollar assets, shift the demand curve to the left, the lower the current exchange rate.

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Changes in the Expected Future Exchange Rate

- The following changes, all of which increase the demand for domestic goods relative to foreign goods, will raise the expected future exchange rate

- (1) Expectations of a fall in the American price level relative to the foreign price level;
- (2) Expectations of higher American trade barriers relative to foreign trade barriers;
- (3) Expectations of lower American import demand
- (4) Expectations of higher foreign demand for American exports

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Changes in the Expected Future Exchange Rate

- (5) expectations of higher American productivity relative to foreign productivity
- All of these changes increase the relative expected return on dollar assets
- shift the demand curve to the right, and cause a appreciation of the domestic currency, the dollar.

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Summary Table 2 Factors That Shift the Demand Curve for Domestic Assets and Affect the Exchange Rate

Factors That Shift the Demand Curve for Domestic Assets and Affect the Exchange Rate

Factor	Change in Factor	Change in Quantity Demanded of Domestic Assets at Each Exchange Rate	Response of Exchange Rate, E_t	
Domestic interest rate, i^D	↑	↑	↑	
Foreign interest rate, i^F	↑	↓	↓	
Expected domestic price level*	↑	↓	↓	
Expected trade barriers*	↑	↑	↑	
Expected import demand	↑	↓	↓	
Expected export demand	↑	↑	↑	
Expected productivity*	↑	↑	↑	

*Relative to other countries.

Note: Only increases (↑) in the factors are shown; the effects of decreases in the variables on the exchange rate are the opposite of those indicated in the "Response" column.

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Application: Effects of Changes in Interest Rates on the Equilibrium Exchange Rate

- Changes in domestic interest rates i^D are often cited as a major factor affecting exchange rates.
- The Fisher equation (Chapter 4) states that a nominal interest rate such as i^D equals the real interest rate plus expected inflation.
- The interest rate i^D can change for two reasons:
  - Either the real interest rate changes or the expected inflation rate changes.
- The effect on the exchange rate is quite different, depending on which of these two factors is the source of the change in the nominal interest rate

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Application: Effects of Changes in Interest Rates on the Equilibrium Exchange Rate

- Suppose that the domestic real interest rate increases so that the nominal interest rate i^D rises while expected inflation remains unchanged.
- In this case, the increase in i^D increases the relative expected return on dollar assets, increases the quantity of dollar assets demanded at each level of the exchange rate, and shifts the demand curve to the right.
- When domestic real interest rates rise, the domestic currency appreciates

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Application: Effects of Changes in Interest Rates on the Equilibrium Exchange Rate

- When the nominal interest rate rises because of an increase in expected inflation, we get a different result.
- The rise in expected domestic inflation leads to a decline in the expected appreciation of the dollar, which is typically thought to be larger than the increase in the domestic interest rate.
- As a result, at any given exchange rate, the relative expected return on domestic (dollar) assets falls, the demand curve shifts to the left, and the exchange rate falls

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Figure 6 Effect of a Rise in the Domestic Interest Rate As a Result of an Increase in Expected Inflation

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Application: Effects of Changes in Interest Rates on the Equilibrium Exchange Rate

- When domestic interest rates rise due to an expected increase in inflation, the domestic currency depreciates.
- We must always distinguish between real and nominal measures when analyzing the effects of interest rates on exchange rates

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Application: Effects of Changes in Money Supply on the Equilibrium Exchange Rate

- Suppose that the Central Bank decides to increase the level of the money supply.
- The higher money supply will lead to a higher price level in the long run and hence to a lower expected future exchange rate.
- The resulting decline in the expected appreciation of the dollar lowers the quantity of dollar assets demanded at each level of the exchange rate and shifts the demand curve to the left.

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Application: Effects of Changes in Money Supply on the Equilibrium Exchange Rate

- In addition, the higher money supply will lead to a higher real money supply M/P, because the price level does not immediately increase in the short run.
- The resulting rise in the real money supply causes the domestic interest rate to fall, which also lowers the relative expected return on dollar assets, providing a further reason why the demand curve shifts to the left.
- A higher domestic money supply causes the domestic currency to depreciate.

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Application: Effects of Changes in Interest Rates on the Equilibrium Exchange Rate

- Changes in Interest Rates
  - When domestic real interest rates raise, the domestic currency appreciates.
  - When domestic interest rates rise due to an expected increase in inflation, the domestic currency depreciates.
- Changes in the Money Supply
  - A higher domestic money supply causes the domestic currency to depreciate.

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Balance of Payments

- International financial transactions such as foreign exchange interventions have considerable effects on monetary policy, it is worth knowing how these transactions are measured.
- The balance of payments is a bookkeeping system for recording all receipts and payments that have a direct bearing on the movement of funds between a nation (private sector and government) and foreign countries.

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Balance of Payments

- The current account shows international transactions that involve currently produced goods and services.
- The difference between merchandise exports and imports, the net receipts from trade, is called the trade balance.
- When merchandise imports are greater than exports, we have a trade deficit; if exports are greater than imports, we have a trade surplus.
- Three additional items included in the current account are the net receipts that arise from investment income, the purchase and sale of services, and unilateral transfers (gifts, pensions, and foreign aid).

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Current Account: India

Trade in Goods and Services: India

Net trade in goods and services (BoP, current US$) - India

International Monetary Fund, Balance of Payments Statistics Yearbook and data files.

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Balance of Payments

- Another important item in the balance of payments is the capital account, the net receipts from capital transactions.
- This includes all types of trading in capital. In other words, all investments inside and outside the country are recorded here — for example, if an Indian firm invests money in the US to build a new company there, or if an Indian buys stocks on an American exchange.

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Net Capital Account: India

CURRENT ACCOUNT	CAPITAL ACCOUNT
It records the export and import of merchandise and unilateral transfers that are done during a year by a nation.	It records the trading of foreign assets and liabilities during a year by a country.
It reflects the net income of the country.	It reflects the net change in ownership in the national assets.
It is concerned with the receipt and disbursements of cash and non-capital items.	It is concerned with the sources and application of capital.
Key components of the current account are export and import of goods and services, the investment income, and current cash transfers.	Key components are Foreign Direct Investment, Foreign Portfolio Investment, Government loans etc.

Balance of Payments

- The sum of the current account and the capital account equals the official reserve transactions balance
- Current account + capital account

  = net change in government international reserves
- When economists refer to a surplus or deficit in the balance of payments, they actually mean a surplus or deficit in the official reserve transactions balance.

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Exchange Rate Regimes in the International Financial System

- **Fixed exchange rate regime**
  - Value of a currency is pegged relative to the value of one other currency (anchor currency)
- **Floating exchange rate regime**
  - Value of a currency is allowed to fluctuate against all other currencies
- **Managed float regime (dirty float)**
  - Attempt to influence exchange rates by buying and selling currencies

exchange rate is allowed by the central bank to change on its own.

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Money and Banking – ECO 233

Lecture 18

The Demand for Money

- We will now explore the role of the money supply in determining the price level and total production of goods and services (aggregate output) in the economy.
- The study of the effect of money on the economy is called **monetary theory**.
- The supply of money is an essential building block in understanding how monetary policy affects the economy, because it suggests the factors that influence the quantity of money in the economy.
- Not surprisingly, another essential part of monetary theory is the demand for money

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Quantity Theory of Money

- Developed in the nineteenth and early twentieth centuries, the quantity theory of money is a theory of how the nominal value of aggregate income is determined.
- It also tells us how much money is held for a given amount of aggregate income, it is also a theory of the demand for money.
- The most important feature of this theory is that it suggests that interest rates have no effect on the demand for money.

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Quantity Theory of Money

- The clearest exposition of the classical quantity theory approach is found in the work of the American economist Irving Fisher.
- Fisher wanted to examine the link between the total quantity of money M (the money supply) and the total amount of spending on final goods and services produced in the economy P X Y
- P is the price level and Y is aggregate output (income).

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Quantity Theory of Money

Velocity of Money and The Equation of Exchange:

M = the money supply

P = price level

Y = aggregate output (income)

$P \times Y$ = aggregate nominal income (nominal GDP)

V = velocity of money (average number of times per year that a dollar is spent)

$$V = \frac{P \times Y}{M}$$

Equation of Exchange

$$M \times V = P \times Y$$

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Quantity Theory of Money QTM

- Total spending P X Y is also thought of as aggregate nominal income for the economy or as nominal GDP.
- The concept that provides the link between M and P X Y is called the velocity of money (often reduced to velocity)
- Velocity - the average number of times per year that a dollar is spent in buying the total amount of goods and services produced in the economy.
- If, for example, nominal GDP (P X Y) in a year is $5 trillion and the quantity of money is $1 trillion, velocity is 5, meaning that the average dollar bill is spent five times in purchasing final goods and services in the economy

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Quantity Theory of Money

- The equation of exchange states that the quantity of money multiplied by the number of times that this money is spent in a given year must be equal to nominal income
- This equation is nothing more than an identity—a relationship that is true by definition.
- It does not tell us, for instance, that when the money supply M changes, nominal income (P XY) changes in the same direction; a rise in M, for example, could be offset by a fall in V that leaves M XV (and therefore P X Y) unchanged

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Determinants of Velocity

- Velocity is determined by the institutions in an economy that affect the way individuals conduct transactions.
- If people use credit cards to conduct their transactions and consequently use money less often when making purchases, less money is required to conduct the transactions generated by nominal income.
- M↓ relative to P X Y) , and velocity (P X Y)/M will increase.

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Determinants of Velocity

- Conversely, if it is more convenient for purchases to be paid for with cash, more money is used to conduct the transactions generated by the same level of nominal income, and velocity will fall.
- The institutional and technological features of the economy would affect velocity only slowly over time, so velocity would normally be reasonably constant in the short run.

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Demand for Money

- Fisher's view that velocity is fairly constant in the short run transforms the equation of exchange into the **quantity theory of money**
- When the quantity of money M doubles, M X V doubles and so must P X Y, the value of nominal income.
- let's assume that velocity is 5, nominal income (GDP) is initially $5 trillion, and the money supply is $1 trillion.
- If the money supply doubles to $2 trillion, the quantity theory of money tells us that nominal income will double to $10 trillion (= 5 X $2 trillion).

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Quantity Theory of Money (4 of 4)

- From the equation of exchange to the quantity theory of money:
  - Fisher's view that velocity is fairly constant in the short run, so that transforms the equation of exchange into the quantity theory of money, which states that nominal income (spending) is determined solely by movements in the quantity of money M.

$$P \times Y = M \times \bar{V}$$

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Quantity Theory of Money

Demand for money: To interpret Fisher's quantity theory in terms of the demand for money…

Divide both sides by V

$$M = \frac{1}{V} \times PY \qquad k = \frac{1}{V}$$

When the money market is in equilibrium

$$M = M^d$$

Let

$$M^d = k \times PY$$

- Because k is constant, the level of transactions generated by a fixed level of PY determines the quantity of M^d.
- The demand for money is not affected by interest rates.

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Demand for Money

- The demand for money is determined

(1) by the level of transactions generated by the level of nominal income PY and

(2) by the institutions in the economy that affect the way people conduct transactions and thus determine velocity and hence k.

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Quantity Theory and the Price Level

- Because the classical economists (including Fisher) thought that **wages and prices were completely flexible**, they believed that the level of aggregate output Y produced in the economy during normal times would remain at the full-employment level.
  - Dividing both sides by $\bar{Y}$, we can then write the price level as follows:

Y = Aggregate output
P = Price Level
M = Money supply
V = velocity

$$P = \frac{M \times \bar{V}}{\bar{Y}}$$

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Demand for Money

- Changes in the quantity of money lead to proportional changes in the price level.
- If aggregate output is $10 trillion, velocity of 5, and the money supply is $2 trillion, then price level equals 1
- P= ($2 trillion X 5)/$10 trillion= 1
- When the money supply doubles to $4 trillion, the price level also double to 2
- P= ($4 trillion X 5)/$10 trillion= 2

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Quantity Theory of Money

- Velocity fairly constant in the short run
- Aggregate output at full-employment level
- Changes in money supply affect only the price level
- Movement in the price level results solely from change in the quantity of money

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Quantity Theory and Inflation

- Percentage Change in ($x \times y$) = (Percentage Change in x) + (Percentage Change in y)
- Using this mathematical fact, we can rewrite the equation of exchange as follows:

$$\%\Delta M + \%\Delta V = \%\Delta P + \%\Delta Y$$

- Subtracting from both sides of the preceding equation and recognizing that the inflation rate is the growth rate of the price level,

$$\pi = \%\Delta P = \%\Delta M + \%\Delta V - \%\Delta Y$$

- Since we assume velocity is constant, its growth rate is zero, so the quantity theory of money is also a theory of inflation:

$$\pi = \%\Delta M - \%\Delta Y$$

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Quantity Theory and Inflation

- The quantity theory of inflation indicates that the inflation rate equals the growth rate of the money supply minus the growth rate of aggregate output.

- If the aggregate output is growing at 3% per year and the growth rate of money is 5%, then inflation is 2% (=5% - 3%)

- If the central bank increases the growth rate to 10%, then according to the equation, inflation rate will rise to 7% (= 10% - 3%)

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The Quantity Theory of Money in the Long Run

- The quantity theory of money provides a long-run theory of inflation because it is based on the assumption that wages and prices are flexible.

- A strong positive relationship exist between inflation and money growth rates – seen in panel (a)

- Panel (b) plots the average inflation rate over the ten year period from 2003 – 2013 against the ten-year money growth rate for several countries.

- Countries with high money growth rates tend to have higher inflation rates.

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Testing the Quantity Theory: Relationship Between Inflation and Money Growth

Sources: Panel (a): Milton Friedman and Anna Schwartz, *Monetary Trends in the United States and the United Kingdom:*

Their Relation to Income, Prices, and Interest Rates, 1867–1975; Federal Reserve Bank of St. Louis, FRED database: http://research.stlouisfed.org/fred2/. Panel (b): International Financial Statistics. International Monetary Fund, http://www.imfstatistics.org/imf/.

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Figure 2 Annual U.S. Inflation and Money Growth Rates, 1965–2015

Source: Federal Reserve Bank of St. Louis, FRED database: http://research.stlouisfed.org/fred2/series/CPIAUCSL; http://research.stlouisfed.org/fred2/series/M2SL.

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The Quantity Theory of Money in the Short Run

- Does the quantity theory of money provide a good explanation of short-run inflation fluctuations as well?
- From the data shown in Figure 2, the quantity theory of money is a good theory of inflation in the long-run but not in the short run.
- The classical assumption that wages and prices are completely flexible may not apply in the case of short-run fluctuations in inflation and aggregate output.
- There are models which relaxes this assumption to explain short-run inflation and output fluctuations.

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Hyperinflation

- **Hyperinflations** are periods of extremely high inflation of more than 50% per month.
- Many economies—both poor and developed—have experienced hyperinflation over the last century, but the United States has been spared such turmoil.
- One of the most extreme examples of hyperinflation throughout world history occurred recently in Zimbabwe in the 2000s.

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Keynesian Theories of Money Demand

- Keynes's liquidity preference theory: developed a theory of money demand that emphasized the importance of interest rates.
- Why do individuals hold money? Three motives:
  - Transactions motive
  - Precautionary motive
  - Speculative motive
- Distinguishes between real and nominal quantities of money

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Transactions Motive

- Keynes initially accepted the quantity theory view that the transactions component is proportional to income.
- Later, he and other economists recognized that new methods for payment, referred to as **payment technology**, could also affect the demand for money.
- In Keynes's view, as payment technology advanced, the demand for money would be likely to decline relative to income.

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Precautionary Motive

- Keynes also recognized that people hold money as a cushion against unexpected wants.
- Keynes argued that the precautionary money balances people want to hold would also be proportional to income.

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Speculative Motive

- Keynes also believed people choose to hold money as a store of wealth, which he called the **speculative motive**.
- As the interest rate *i* rises, the opportunity cost of money rises (it becomes more costly to hold money relative to bonds), and the quantity of money demanded falls.

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Putting the Three Motives Together

- Keynes was careful to distinguish between nominal quantities and real quantities.
- Money is valued in terms of what it can buy. If, for example, all prices in the economy double (the price level doubles), the same nominal quantity of money will be able to buy only half as many goods.
- Keynes thus reasoned that people want to hold a certain amount of real money balances

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Putting the Three Motives Together

$\frac{M^d}{P} = f(i, Y)$ where the demand for real money balances is

negatively related to the interest rate i,
and positively related to real income Y

Rewriting

$$\frac{P}{M^d} = \frac{1}{f(i, Y)}$$

Multiply both sides by Y and replacing M^d with M

$$V = \frac{PY}{M} = \frac{Y}{f(i, Y)}$$

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Putting the Three Motives Together

- Keynes's conclusion that the demand for money is related not only to income but also to interest rates is a major departure from Fisher's view of money demand, in which interest rates can have no effect on the demand for money.
- Keynes's theory of the demand for money implies that velocity is not constant, but instead fluctuates with movements in interest rates.

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Measuring a Nation's Income

Primary Reference: Principles of Macroeconomics by Mankiw

Indraprastha Institute of Information Technology, Delhi

May 28th, 2022

Micro vs Macro

- *Microeconomics*: Individual households, firms and their interaction in the market.
- *Macroeconomics*: The economy as a whole. (Households, firms and markets simultaneously).

The Economy's Income and Expenditure

- Gross Domestic Product (GDP) measures two things:
  - The total income of everyone in the economy.
  - The total expenditure on the economy's output of goods and services.
- For an economy as a whole, income must equal expenditure.

The Economy's Income and Expenditure

Figure 1

The Circular-Flow Diagram
Households buy goods and services from firms, and firms use their revenue from sales to pay wages to workers, rent to landowners, and profit to firm owners. GDP equals the total amount spent by households in the market for goods and services. It also equals the total wages, rent, and profit paid by firms in the markets for the factors of production.

**Source: Principles of Macroeconomics by N. Gregory Mankiw

The Measurement of GDP

- *GDP* is the market value of all final goods and services produced within a country in a given period of time.
  - Market value
  - of all
  - final
  - goods and services
  - produced
  - within a country
  - in a given period of time.

Components of GDP

$$Y = C + I + G + NX$$

- Y is GDP.
- C is consumption.
- I is investment.
- G is government purchases.
- NX is net exports.
  - Given by $(X - M)$.
  - X is exports.
  - M is imports.

Consumption

- Purchases made by households on goods and services.
- Housing is an exception.
- Examples include
  - Automobiles, appliances, food, clothing (goods).
  - Haircuts, medical care, education (services).

Investment

Inventory or stock refers to the goods and materials that a business holds for the ultimate goal of resale, production or utilisation.

- Goods purchased to produce more goods in future.
- Sum of capital equipment, inventories and structures.
- What are inventories?
- Since GDP aims at measuring the production of an economy, inventories play a crucial role.

Capital Equipment is that you use to manufacture a product, provide a service or use to sell, store and deliver merchandise.

Government Purchases

- Spending by governments on goods and services.
- Can be local, state or central government.
- Different from transfer payments.
- Transfer payments alter household income, but do not reflect an economy's production.

Net Exports

- Exports minus imports
- Exports are the foreign purchases of domestically produced goods.
- Imports are the domestic purchases of foreign goods.

Calculating GDP

Table 1

GDP and Its Components

This table shows total GDP for the U.S. economy in 2009 and the breakdown of GDP among its four components. When reading this table, recall the identity $Y = C + I + G + NX$.

	Total (in billions of dollars)	Per Person (in dollars)	Percent of Total
Gross domestic product, Y	$14,259	$46,372	100%
Consumption, C	10,093	32,823	71
Investment, I	1,623	5,278	11
Government purchases, G	2,933	9,540	21
Net exports, NX	−390	−1,269	−3

Source: U.S. Department of Commerce. Parts may not sum to totals due to rounding.

**Source: Principles of Macroeconomics by N. Gregory Mankiw

Calculating GDP

GDP can be calculated three ways:

- Add up all spending on domestically produced final goods and services.
  - $Y = C + I + G + NX$.
- Add up the value added of all producers.
- Add up all income paid to factors of production.

Calculating GDP

2. Aggregate spending on domestically produced final goods and services = $21,500

	American Ore, Inc.	American Steel, Inc.	American Motors, Inc.	Total factor income
Value of sales	$4,200 (ore)	$9,000 (steel)	$21,500 (car)	
Intermediate goods	0	4,200 (iron ore)	9,000 (steel)	
Wages	2,000	3,700	10,000	$15,700
Interest payments	1,000	600	1,000	2,600
Rent	200	300	500	1,000
Profit	1,000	200	1,000	2,200
Total expenditure by firm	4,200	9,000	21,500	
Value added per firm = Value of sales – Cost of intermediate goods	4,200	4,800	12,500	

3. Total payments to factors = $21,500

1. Value of production of final goods and services, sum of value added = $21,500

**Source: Macroeconomics in Modules by Paul Krugman and Robin Wells

Real vs Nominal GDP

- When GDP increases, either,
  - Production has increased.
  - Prices have increased.
- It is important to separate these two effects.
- To do this, economists measure what is known as *real GDP*.
- Real GDP uses a base year's prices, while *nominal GDP* uses current year prices.

Real vs Nominal GDP

Basis For Comparison	Nominal GDP	Real GDP
Meaning	Nominal GDP is Sum-total of economic output produced in a year valued at current market price	Real GDP is Sum-total of economic output produced in a year valued at a pre-determined base market price
Effect of Inflation	Nominal GDP doesn't take inflation into account	Real GDP is a Inflation-Adjusted GDP
Expressed in	Current Market Price	Base Year's Market Price
Value of GDP	Is much higher since current market changes are taken into effect	Is much lower since market price of the base year is taken into consideration
Uses	Can be compared with various quarters of the given year	Can be compared with two or more financial years
Economic Growth	From Nominal GDP, economic growth can't be analysed easily	Real GDP is a Good Indicator of economic growth

Real vs Nominal GDP

Table 2

Real and Nominal GDP

This table shows how to calculate real GDP, nominal GDP, and the GDP deflator for a hypothetical economy that produces only hot dogs and hamburgers.

Prices and Quantities

Year	Price of Hot Dogs	Quantity of Hot Dogs	Price of Hamburgers	Quantity of Hamburgers
2010	$1	100	$2	50
2011	$2	150	$3	100
2012	$3	200	$4	150

Calculating Nominal GDP

2010	($1 per hot dog × 100 hot dogs) + ($2 per hamburger × 50 hamburgers) = $200
2011	($2 per hot dog × 150 hot dogs) + ($3 per hamburger × 100 hamburgers) = $600
2012	($3 per hot dog × 200 hot dogs) + ($4 per hamburger × 150 hamburgers) = $1,200

Calculating Real GDP (base year 2010)

2010	($1 per hot dog × 100 hot dogs) + ($2 per hamburger × 50 hamburgers) = $200
2011	($1 per hot dog × 150 hot dogs) + ($2 per hamburger × 100 hamburgers) = $350
2012	($1 per hot dog × 200 hot dogs) + ($2 per hamburger × 150 hamburgers) = $500

Calculating the GDP Deflator

2010	($200 / $200) × 100 = 100
2011	($600 / $350) × 100 = 171
2012	($1,200 / $500) × 100 = 240

**Source: Principles of Macroeconomics by N. Gregory Mankiw

The GDP Deflator

- The *GDP deflator* is calculated as follows:

$$\text{GDP deflator} = \frac{\text{Nominal GDP}}{\text{Real GDP}} \times 100$$

- The GDP deflator in the base year is always 100.

Real vs Nominal GDP

Table 2

Real and Nominal GDP

This table shows how to calculate real GDP, nominal GDP, and the GDP deflator for a hypothetical economy that produces only hot dogs and hamburgers.

Prices and Quantities

Year	Price of Hot Dogs	Quantity of Hot Dogs	Price of Hamburgers	Quantity of Hamburgers
2010	$1	100	$2	50
2011	$2	150	$3	100
2012	$3	200	$4	150

Calculating Nominal GDP

2010	($1 per hot dog × 100 hot dogs) + ($2 per hamburger × 50 hamburgers) = $200
2011	($2 per hot dog × 150 hot dogs) + ($3 per hamburger × 100 hamburgers) = $600
2012	($3 per hot dog × 200 hot dogs) + ($4 per hamburger × 150 hamburgers) = $1,200

Calculating Real GDP (base year 2010)

2010	($1 per hot dog × 100 hot dogs) + ($2 per hamburger × 50 hamburgers) = $200
2011	($1 per hot dog × 150 hot dogs) + ($2 per hamburger × 100 hamburgers) = $350
2012	($1 per hot dog × 200 hot dogs) + ($2 per hamburger × 150 hamburgers) = $500

Calculating the GDP Deflator

2010	($200 / $200) × 100 = 100
2011	($600 / $350) × 100 = 171
2012	($1,200 / $500) × 100 = 240

**Source: Principles of Macroeconomics by N. Gregory Mankiw

GDP Deflator

- GDP deflator can also be used to calculate inflation (though a more popularly accepted measure is Consumer Price Index or CPI).
- The inflation rate between two consecutive years is given as follows:

$$\text{Inflation rate in year 2} = \frac{\text{GDP deflator in year 2} - \text{GDP deflator in year 1}}{\text{GDP deflator in year 1}} \times 100$$

Real GDP over Recent History

**Source: Tradingeconomics.com | Ministry of Statistics and Program Implementation (MOSPI)

GDP as a Measure of Economic Well-Being

- Is it a good measure?
- Strengths?
- Weaknesses?

International Differences in GDP and Quality of Life

Table 3

GDP and the Quality of Life

The table shows GDP per person and three other measures of the quality of life for twelve major countries.

Country	Real GDP per Person (2007)	Life Expectancy	Adult Literacy (% of population)	Internet Usage (% of population)
United States	$45,592	79 years	99%	63%
Germany	34,401	80	99	45
Japan	33,632	83	99	67
Russia	14, 690	66	99	15
Mexico	14,104	76	93	18
Brazil	9,567	72	90	19
China	5,383	73	93	9
Indonesia	3,843	71	92	7
India	2,753	63	66	3
Pakistan	2,496	66	54	7
Nigeria	1,969	48	72	4
Bangladesh	1,241	66	54	0.3

Source: *Human Development Report 2009,* United Nations. Data on real GDP, life expectancy, and literacy are for 2007. Data on Internet use is for 2005.

**Source: Principles of Macroeconomics by N. Gregory Mankiw

Pattern

Easier questions

1 mark x 15 (0.3 -ve)

Medium questions

1 mark x 7 (0.2 -ve)

Hard questions

2 marks x 4 (0.25 -ve)

Difficulty : Little harder than mid sem

* ID Cards Compulsory. TA's will check during attendance. No questions asked approach to asking people to leave.

Lectures 9 - 19.

There are some parts that

appear tedious. For those who have attended class, you will know which of those bits are important

By and large, focus is on concepts, formulae, intuition.

Notably, chapters 9-15 form a large part of Part 1 (easy questions) Nothing great but will require effort.

Topics like QTM are good for harder questions

GDP is in your syllabus. Please

treat it as important

Chapters 14 & 17 have theory that can make good questions

* Chapter 7 is extremely important for intuition questions

* 1-2 questions from pre-mid sem syllabus

Good luck. Hope this course was worth your time. I look forward to seeing you in more econ classes.