1 Introduction to Economic Analysis

1.1 Scarcity

Scarce: Quantity of resources lower than demand, hence insufficient to satisfv needs and wants
Resources: CELL (Capital - physical and human capital, Entrepreneurship, Land, Labour)

What is Economics?: study of choice under scarcity
- How people decide how much to work, what to buy, how much to save, how to invest, etc. given budget and costs
- How firms decide how much to produce, how many workers to hire, etc. given available budget and costs
- How society decides how to allocate its resources among national defense, health care, education, scientific research, social safety nets, etc.

Opportunity cost of any choice: whatever must be given up when we make that choice

$$\begin{aligned}\text{Opp. cost} &= \text{explicit costs} + \text{implicit costs} \\ &= \text{what you get when you give up the good}\end{aligned}$$

- Explicit cost: monetary sacrifice
- Implicit cost: non-monetary e.g. time
- **[IMPT]** when the alternatives to a choice are mutually exclusive, the implicit cost of the choice is the value of the next best alternative
  - can try listing all the possible alternatives; if it's infinite then usually opp cost is monetary value

1.2 Five core principles

1. **Scarcity implies trade-offs**
   - We have unlimited wants and limited resources
   - Hence having more of one good thing usually means having less of another.
2. **Bargaining strength comes through scarcity**
   - Scarce resources command high prices
3. **Compare costs and benefits**
   - An action should be taken if, and only if, the benefit is at least as great as the cost.
4. **People respond to changes in costs and benefits**
   - The likelihood of taking an action rises as the benefit rises, and falls as the cost rises.
5. **Focus on your comparative advantage**
   - Everyone gains when each individual (or each country) concentrates on the activities in which her opportunity cost is lowest.

1.3 Types of economics

Microeconomics: derived from *Mikros* or *small*
- The study of how households and firms make decisions and how they interact in markets

Microeconomics: derived from *Makros* or *large*
- The study of economy-wide phenomena e.g. inflation, unemployment, and econ growth

Positive Economics: *describe* the world as it is
- Addresses "What is?" question using tools of economics, without any value judgment
- Positive **statements**: can be confirmed or refuted by examining evidence
- Positive **disagreements**: due to differences in scientific judgments

Normative Economics: *prescribe* how the world should be
- Addresses "What should be?" question which require value judgment
- Every normative analysis is based on underlying positive analysis
- Normative **statements**: cannot be confirmed or refuted
- Normative **disagreements**: due to differences in values

1.4 Production Possibility Frontier (PPF)

Model: A simplification of a more complicated reality
- *Simplifying* assumptions: do not affect important conclusions
- *Critical* assumptions: affect important conclusions

Definition: A graph that shows all combinations of two goods that can be produced given the available resources and technology
- Points on the PPF: possible and efficient
- Points under the PPF: possible but not efficient
- Points above the PPF: not possible

Movements:
- **Moving along** a PPF
  - Involves shifting resources from the production of one good to the production of the other good
  - Because resources are limited and hence sacrifice has to be made
  - **Slope** of PPF = **Opportunity cost** of good x in terms of good y
- **Shifting** of PPF
  - Due to additional resources or improvement in technology
  - The economy can produce more of good x or good y or any combination in between

Shapes of PPF
- Straight line: opp. cost is constant
- Concave: the opp. cost of a good rises as the economy produces more of the good
  - When different resources are suited for different uses
  - Different resources have different opp. costs of producing one good in terms of the other good (e.g. different workers have different skills)
  - Explanation:
    - Initially, most workers including those who are better at producing good B are producing good A $\rightarrow$ to get more good B, we can shift workers who are more efficient in producing B from the production of A to B $\rightarrow$ hence we don't need to give up so many of good A
    - However, producing more of good B would require shifting workers who are more effi-

cient in A than B → hence there would be a huge drop in output of A → higher opp. cost

1.5 Gains from Trade

Absolute advantage: the ability to produce a good using fewer inputs than another producer

- Producer A can produce the same amount of good x with fewer inputs as compared to producer B
- **[IMPT]** Two countries can gain from trade when each specializes in the good it produces at lowest cost

Comparative advantage: the ability to produce good at a lower opportunity cost than another producer

- Producer A can produce the same amount of good x by giving up fewer of good y as compared to producer B
- **[IMPT]** Absolute advantage is not necessary for comparative advantage
- Gains from trade arise from comparative advantage (differences in opp. costs)
- When each country specializes in the good in which it has a comparative advantage,
  - total production in all countries is higher,
  - the world's economic pie is bigger,
  - and all countries can gain from trade.

Note that there are different possibilities for CA/AA

- AA possibilities
  - A has AA in both goods
  - A has AA in good X but B has AA in good Y
  - Neither has AA in either good
- CA possibilities
  - A has CA in both goods
  - A has CA in good X but B has CA in good Y
  - Neither has CA in either good

1.6 Supply and Demand

Why? How supply and demand determine prices in a market economy which has the function of allocating the economy's scarce resources

Market Economy : allocates resources through the decentralized decisions of households and firms as they interact in markets for goods and services

Market : a group of buyers and sellers of a particular good and service

Perfectly Competitive Market : Identical goods and services, Numerous buyers and sellers, no one can affect market price (price taker)

1.6.1 Demand

Q^D: the amount of the good that buyers are willing and able to purchase

- Q^D in the market is the sum of the Q^D by all buyers at each price

Law of Demand: As the P of good ⇑, the Q^D ⇓
Demand Schedule: a table that shows the relationship between P and Q^D of a good
Demand Curve: Shows how P affects Q^D, ceteris paribus (other things kept equal)

Non-price determinants of DD

- Number of buyers
- Y (Income)/type of good (*normal/inferior*); are they positively/negatively related to income?
- P of related goods (substitutes/complement?); **[IMPT]** will cause a shift in DD curve, not Q^D
- Tastes and preferences
- Expectations (of future P or Y)

1.6.2 Supply

Q^S: the amount of the good that sellers are willing and able to sell

- Q^S in the market is the sum of the Q^S by all sellers at each price

Law of Supply: As the P of good ⇑, the Q^S ⇑
Supply Schedule: a table that shows the relationship between P and Q^S of a good
Supply Curve: Shows how P affects Q^S, ceteris paribus (other things kept equal)

Non-price determinants of SS

- Number of sellers
- Input prices
  a ⇓ in input prices will ⇑ π at each output P, so firms increase Q^S at each P
- Technology
- Weather/Natural factors
- Expectations (of future events/P)
- Expectations (of future P or Y)

1.6.3 DD and SS

Equilibrium: a state in which opposing forces are balanced so that one is not greater than the other.

- Eq. P: the price that equates Q^D with Q^S
- Eq. Q: Q^S and Q^D at the eq. P

Surplus/excess supply: $Q^S - Q_D$ when $Q^S > Q^D$
Shortage/excess demand: $Q^D - Q^S$ when $Q^D > Q^S$

One important question to ask: will DD change more than SS when both curves shift?

1.7 Elasticity

1.7.1 PED

PED measures how much Q^D responds to a change in P

$$
\begin{aligned}
PED &= \frac{\%\Delta Q^D}{\%\Delta P} \\
&= \frac{\frac{Q_2^D - Q_1^D}{\frac{Q_2^D + Q_1^D}{2}} \cdot 100\%}{\frac{P_2 - P_1}{\frac{P_2 + P_1}{2}} \cdot 100\%} \\
&= \frac{Q_2^D - Q_1^D}{Q_2^D + Q_1^D} \Big/ \frac{P_2 - P_1}{P_2 + P_1} \text{ (using midpoint)}
\end{aligned}
$$

Types of DD curves:

- Perfectly inelastic ($PED = 0$)

- Inelastic ($PED < 1$)
- Unit elastic ($PED = 1$)
- Elastic ($PED > 1$)
- Perfectly elastic ($PED = \infty$)

Factors that affect PED:
- How **broadly** or **narrowly** the good is defined
  number of substitutes?? e.g. fruits vs apple
- Is the good a **necessity** or **luxury**?
  e.g. water vs orange juice
- The extent to which **close substitutes** are available
  e.g. breakfast cereal vs rabies vaccine
- How **expensive/cheap** the good is
  Proportion of income?? e.g. Nike vs nonbranded flip-flops
- **Time horizon**
  in the SR, when P changes, there's not much we can do (PED is close to 0)
  in the LR, more substitutes are available hence PED$\Uparrow$

How does PED affect R?
- Elastic $\Rightarrow \%\Delta Q^D > \%\Delta P$
  - If $P \Downarrow$, $R_{total} \Uparrow$ as the $\Uparrow R$ from $\Uparrow Q$ dominates $\Downarrow R$ from $\Downarrow P$
  - If $P \Uparrow$, $R_{total} \Downarrow$ as the $\Downarrow R$ from $\Downarrow Q$ dominates $\Uparrow R$ from $\Uparrow P$
- Inelastic $\Rightarrow \%\Delta Q^D < \%\Delta P$
  - If $P \Downarrow$, $R_{total} \Downarrow$ as the $\Downarrow R$ from $\Downarrow P$ dominates $\Uparrow R$ from $\Uparrow Q$
  - If $P \Uparrow$, $R_{total} \Uparrow$ as the $\Uparrow R$ from $\Uparrow P$ dominates $\Downarrow R$ from $\Downarrow Q$
    e.g. Pharmacies increase the price of insulin by 10%

1.7.2 CED

CED measures how much Q^D responds to a change in the price of another good

$$CED = \frac{\%\Delta Q_1^D}{\%\Delta P_2}$$

- Substitutes $\Rightarrow$ CED > 0
- Complements $\Rightarrow$ CED < 0

1.7.3 YED

YED measures how much Q^D responds to a change in the Y

$$YED = \frac{\%\Delta Q^D}{\%\Delta Y}$$

- Normal goods $\Rightarrow$ YED > 0
- Inferior goods $\Rightarrow$ YED < 0

1.7.4 PES

PES measures how Q^S responds to a change in P

$$PES = \frac{\%\Delta Q^S}{\%\Delta P}$$

Factors that affect PES:
- How **easily** sellers can change the quantity they produce
  The more easily, the greater the PES and vice versa
- **Time horizon**
  In the SR, PES is low. In the LR, PES is high because firms build new factories and new firms enter the market

[IMPT] If DD shift, consider PES

1.8 The Efficiency of Markets

Welfare economics: how the allocation of resources affects *economic well-being*
- *how much* of each good and service is produced
- *which producers* produce them
- *which consumers* consume them

Willingness to Pay (WTP): *maximum amount* the buyer will pay for that good
- measures how much the buyer values the good
- Buyer will buy the good if $WTP \geq P$

$$WTP_{\text{market}} = \sum WTP_{\text{buyer}}$$

- **Marginal buyer**: the buyer who would leave the market if P were any higher
  [IMPT] height of DD curve is the WTP of the marginal buyer
- **Consumer Surplus (CS)**: the amount a buyer is willing to pay - the amount he actually pays

$$CS = WTP - P$$

  (area below DD but above P from 0 to Q)
- If $P \uparrow$, CS will fall
  - $\downarrow CS$ due to less buyers and they leave market
  - $\downarrow CS$ due to remaining buyers paying higher P

Cost/Willingness to Sell (WTS): value of everything a seller must give up to produce a good (opportunity cost) = input costs + value of the seller's time
- Seller will produce only if $P \geq C$
- **Marginal seller**: the seller who would leave if the P were any lower
  [IMPT] the height of the SS curve is the WTS of the marginal seller
- **Producer Surplus (PS)**: the amount the seler receives for a good - his cost

$$PS = P - Cost$$

  (area above SS but below P from 0 to Q)
- If $P \downarrow$, PS will fall
  - $\downarrow PS$ due to less sellers and they leave market
  - $\downarrow PS$ due to remaining sellers receiving less

1.8.1 Efficiency

$$\begin{aligned}\text{Total Surplus} &= \text{Value to Buyers} - \text{Cost to Sellers} \\ &= CS - PS\end{aligned}$$

*CS = buyers' gains from participating in the market
*PS = sellers' gains from participating in the market
*Total Surplus = total gains from trade (a measure of *society's well-being*)

- An allocation of resources is efficient if Total Surplus is maximized
  - goods are consumed by buyers who value them most highly
  - goods are produced by sellers with the lowest cost

(Harford Chapter 3): A set of interconnected **perfectly competitive markets** results in:
1. Companies making things the right way (↓Costs)
2. Companies making the right things (no externalities)
3. Things being made in the right proportions (no under/over allocation)
4. Things going to the right people (those with the highest valuation get to consume the goods)

the Invisible Hand
- Interaction between buyers and sellers determine P
- Each P reflects sellers' costs and buyers' valuation of the good
- Self-interested sellers and buyers use P to guide and make decisions which will allocate resources

First Fundamental Theorem of Welfare Economics, Assume that:
1. **Markets** and **market prices** exist for all goods
2. All buyers and sellers are **competitive price takers**
3. Each person's utility depends only on his own consumption

then any market equilibrium is efficient

1.9 Government Intervention in Markets

Price Ceiling
- Unintended consequences: rental control law in Cambridge, MA led to subpar maintenance of rent-controlled properties (because PB for property owner decreases and hence need to keep costs down)
- Unintended consequences: **black market** (goods are sold illegally at prices above the legal ceiling and above the original P_{eq}), *e.g.* primary market and secondary market for NBA tickets
  - **[IMPT]** [Active Learning 4.2] Black market price would be the height of DD curve at $Q = Q^S$ (marginal buyer's willingness to pay)

Price Floor
- Unintended Consequences: surplus

Tax
- Payment by buyers/sellers to the government on each unit bough or sold
- Per-unit tax: DD/SS shifts down/up by the amount of tax imposed
  - if Tax on buyers, WTP decreases by the amount of the tax
  - if Tax on sellers, WTS
- The **Incidence** of a Tax: how the burden of a tax is shared between buyers and sellers
  - buyers' incidence: buyers pay $(P_{\text{final}} + \text{tax} - P_{\text{init}}) * Q$ more
  - sellers' incidence: sellers receive $(P_{\text{init}} - P_{\text{final}}) * Q$ less
  - tax revenue: Tax $* Q$
- **[IMPT]** Effects of PED and PES on Tax Incidence
  - If SS more elastic than DD: it is easier for sellers than for buyers to leave the market when P increases, so buyers bear most of the burden of the tax
  - If DD is more elastic than SS: sellers bear most of the burden
- DWL: some units between Q_T and Q_E are not sold
  The **value** of these units to buyers is greater than the **cost** of producing them
  Hence the tax prevents some mutually beneficial trades
  - The **more elastic** the PES/PED, the easier it is for sellers/buyers to leave the market and thus Q will drop by a significant amount $\Rightarrow$ the greater the DWL

Subsidy
- Payment by the government to buyers/sellers on each unit bought or sold
- shifts the D/S curve up/down by the amount of the subsidy
- The **Incidence** of a subsidy:
  - buyers' incidence: buyers pay $(P_{\text{init}} + \text{subsidy} - P_{\text{final}}) * Q$ less
  - sellers' incidence: sellers receive $(P_{\text{final}} - P_{\text{init}}) * Q$ more
  - government expenditure: Subsidy $* Q$
- DWL: The value of these units to buyers is less than the cost of producing them; the subsidy induces some wasteful trades

2 Market Failure

If one or more assumptions in the First Fundamental Theorem of Welfare Economics does not hold, then we have Market Failure.

Externalities a byproduct of consumption or production that affects someone other than the buyer or seller

$$\text{Social Cost} = \text{Private Cost} + \text{External Cost}$$

Private Marginal Costs (PMC) the costs directly incurred by sellers

Private Marginal Benefits (PMB) the value to buyers (the price they are willing to pay)

External Marginal Costs (EMC) value of the negative impact on bystanders

2.1 Negative Externality

- Market equilibrium is greater than the socially optimal equilibrium
- To internalize the externality,
  - introduce a tax with amount = EMC

2.2 Positive Externality

- Market equilibrium is less than the socially optimal equilibrium

$$\text{Social Marginal Benefits (SMB)} = \text{PMB} + \text{EMB}$$

- To internalize the externality,
  - introduce a subsidy with amount = EMB

2.3 Public Policies on Externality

Command-and-control policies regulate behaviour directly
- Limit the amount of pollution permitted
- Require firms to adopt a particular technology to reduce emissions

Market-based policies provide incentives so that decision makers will take into account externalities when making decisions
- Corrective taxes/subsidies
  - Pigouvian taxes will correct market failure if Amount = Amount of externalities
  - Align private incentives with society's interests
  - Move towards a more efficient market allocation
- Cap and trade (Tradable pollution permit)

Coase Theorem: If private parties can *costlessly* bargain over the allocation of resources, they can solve the externalities problem on their own

- The private market achieves the efficient outcome regardless of the initial distribution of rights
- Property rights determine the direction in which compensation payments are made (pay to the person with property rights)

Why private solution does not always work:
- **Transaction costs**: if costly to reach an agreement (*e.g.* legal fees etc.)
- **Stubbornness**: each party will wait for the other to concede so that they can get the better end of the stick
- **Coordination problems**: multiple parties are involved

2.4 Public Goods and Common Resources

excludable if a person can be prevented from using it
rival in consumption if a person's use of it diminishes another person's use of it

When goods have no **prices**, the market forces that normally allocate resources are absent; the private market fails to provide the **socially optimal** quantity of the good

	Rival	Not Rival
Excludable	Private Good	Natural Monopoly
Not Excludable	Common Resource	Public Good

Public Good

- Tends to be **underproduced**
  - The market fails to allocate resources efficiently because property rights are not well-established
  - Nobody can charge people who benefit from public resources → less than optimal quantity provided
- Not excludable ⇒ free riders (people get benefits without paying for it)
- Firms do not produce the good even if Collective Benefits > Cost of providing it
- If the Total Benefits > Total Costs, the government should provide the good and use taxpayers (people who benefit from it) money to finance it

Common Resource

- Tends to be **overused**
  - The market fails to allocate resources efficiently because property rights are not well-established
  - Nobody can charge people who benefit from public resources → more than optimal quantity consumed
- Not excludable
  - Free riders who enjoy without paying ⇒ Firms will not provide
  - Hence role of government is to ensure that they are provided
- Rival in consumption
  - Each person's use reduces another person's use
  - Role of government: ensuring they are not overused
- **[IMPT] The Tragedy of the Commons**: Each individual is motivated to maximize their own benefit through over-consumption and this will end up badly for everyone due to limited resources (e.g. overfishing, air-con usage, antibiotic usage)
  - However we also have social contracts and government laws which mitigates this
- **[IMPT] Policies to prevent overconsumption of common resource**
  - **Privatize** resources (convert common resource to private good)
    - however this means that only some people will have access to it
  - **Regulate** use of resources (e.g. Beijing car license plate where only cars with odd/even numbered plates can drive on certain days)
  - Impose a **corrective** tax: hunting and fishing licenses which requires money to register
  - Auction off **permits** allowing use of resources

3 Market Structure

$$\text{Profit} = \text{TR} - \text{TC}$$
$$\text{TR} = P \times Q$$
$$\text{AR} = \frac{\text{TR}}{Q} = P$$
$$\text{MR} = \frac{\Delta \text{TR}}{\Delta Q}$$
$$\text{ATC} = \frac{\text{TC}}{Q}$$
$$\text{MC} = \frac{\Delta \text{TC}}{\Delta Q}$$

Why MC crosses through ATC at the ATC minimum?
- When MC $<$ ATC, ATC will $\downarrow$
- When MC $>$ ATC, ATC will $\uparrow$

What Q maximizes the firm's profit?
- If MR $>$ MC, then $\uparrow Q$ to raise profit
- If MR $<$ MC, then $\downarrow Q$ to raise profit
- Hence profit is minimized at Q when MR $=$ MC
- **[IMPT]** Also note that $P > MR$ for a monopolistically competitive firm

Long run equilibrium?
- Only happens when $P = ATC$ so that profits $= 0$

3.1 Perfect Competition

- There are many buyers and sellers
- Sellers offer a standardized product
- Sellers can freely enter/exit market
- Buyers and sellers are well-informed
- Each buyer and seller is a price-taker

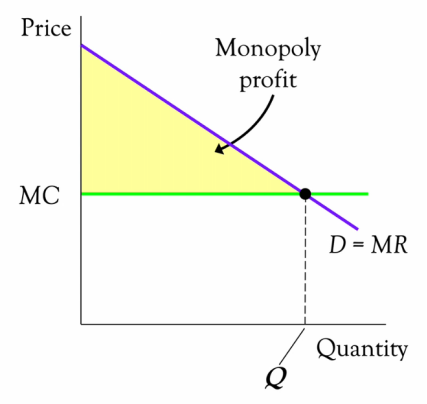
MR=P only for perfectly competitive firm
- A firm can keep increasing output without affecting market prices

3.2 Monopoly

- Only one firm sells a product with **no close substitutes**
- Has **market power** - ability to influence the market P of the product it sells due to
  - Selling unique product
  - Having large market share and few significant competitors
- **Barriers to Entry**
  - Single firm owns a key resource (De Beers)
  - Natural monopoly $\rightarrow$ high fixed costs $\rightarrow$ one firm can produce for all at significantly lower TC as compared to multiple firms
  - The government gives a single firm the exclusive right to produce the good (patents, copyright)
- It faces the market demand curve: To $\uparrow Q$, it must $\downarrow P$
  - Output effect: $\uparrow Q \Rightarrow R \uparrow$
  - Price effect: $\downarrow P \Rightarrow R \downarrow$
- $P > MC \Rightarrow$ buyers' valuation of the unit is more than the MC of producing that unit $\Rightarrow$ DWL

3.2.1 Price Discrimination

- Selling the same good at different prices to different buyers
  - Increase profit by charging a higher price to buyers with higher WTP
  - **Perfect discrimination**:
    - But no firm knows every buyer's WTP
    - Buyers do not announce their WTP to sellers
    - Solution: divide customers into group based on some traits that are likely related to WTP



  - Harford The Undercover Economist Chapter 2: *What Supermarkets Don't Want You to Know*
    - Unique target (first-degree)
      - Producer can easily determine consumers' WTP
      - Producer can prevent arbitrage
    - Group target (third-degree)
    - Self-incrimination

3.3 Monopolistic Competition

- **Many** buyers and sellers
- Offer **differentiated** products
- Sellers are **free** to enter and exit the market
  - LR Economic profit $= 0$ due to entry and exit
  - New firms enter the market due to existing firms making profits
- **[IMPT] Externalities due to entry of new firms**
  - **Product-variety externality**: consumers benefit from intro of new products
  - **Business-stealing externality**: existing firms lose revenues when new firms enter the market

3.4 Oligopoly

- **N-firm Concentration Ratio**: percentage of the market's total output supplied by the N largest firms
- Only **a few** sellers offer similar or identical products
- A firm's decision about P or Q can affect other firms
  - The firm will consider the reactions from other firms when making decisions
- **Game theory**: study of how people behave in strategic situations
- **Types of oligopoly**

- Collusion: an agreement among firms in a market about quantities to produce or prices to charge
- Cartel: A group of firms acting in unison (e.g. price fixing)
  - Cartel = Monopoly
  - Collective firms acting as a single unit, hence graph is equal to monopoly

3.4.1 Game Theory

Collusion vs self-interest

- Both firms would be better off if they both stick to the cartel agreement
- But each firm has an incentive to cheat

Nash Equilibrium

- A situation in which players interacting with one another each chooses his best strategy given the strategies that all the others have chosen

Dominant Strategy

- A strategy that is best for a player in a game regardless of the strategies chosen by the other players

Prisoners' Dilemma

- Cooperation is difficult even when it is mutually beneficial
- Both players have dominant strategies that result in inefficient outcomes

		P2	
		A	B
P1	A	P1: Good P2: Good	P1: Worst P2: Best
	B	P1: Best P2: Worst	P1: Bad P2: Bad

- Non-cooperative oligopoly equilibrium will be
  - Bad for oligopoly firms: prevented from achieving **monopoly** profits
  - Good for society: Q is closer to the socially efficient output, P is closer to MC
- Strategies that lead to cooperation:
  - **Grim**:
    Initially, a player using grim trigger will cooperate, but as soon as the opponent defects (thus satisfying the trigger condition), the player using grim trigger will defect for the remainder of the iterated game. Since a single defect by the opponent triggers defection forever, grim trigger is the most strictly unforgiving of strategies in an iterated game.
  - **Tit for Tat**
    For example, two competing economies can use a tit-for-tat strategy so that both participants benefit. One economy **starts with cooperation** by not imposing import tariffs on the other economy's goods and services to induce good behavior. The idea is that the second economy responds by also choosing not to impose import tariffs. If the second economy reacts by implementing tariffs, the first economy retaliates by implementing tariffs of its own to discourage the behavior.

4 Measurements in Macroeconomics

Origins of Macroeconomics

- Classical economy did not work during the Great Depression
- 3 branches:
  - *Theory*: John Maynard Keynes
  - *Policy*: Franklin D Roosevelt
  - *Measurement*: Simon Kuznets

Goals in Macro

- High and sustained economic growth: Real GDP/GDP Per Capita
- Stable Prices: CPI
- Low Unemployment: Employment Rate

4.1 Economic Growth

Making goods and services (g&s) that satisfy needs and wants

- Goods: tangbible goods
- Services: Enjoyed while produced, inseparable from their production
- **[IMPT]** Loan/deposit/cash/shares are not part of g&s

So, **Economic growth** = rise in an economy's economic production per period

Why is economic growth desired?

- Required for improvements in living standards and well-being
- Provides society with a sense of progress
- Helps society avoid conflicts over distribution

4.1.1 GDP

Definition: Total monetary value of final goods and services in a country during a given time period

- "Total Monetary value": use current **market prices**
  Indirect measurement of monetary value:
  - Financial services: use **spread**: difference between interest earned on loans and interest paid on deposits
  - Housing services:
    * for tenants, value is measured by **rent paid**
    * For occupiers, value is measured by rent for similar houses

  [IMPT] When there are no market prices: e.g. g&s produced by government for its own use / specialized eqpmt by firms for their own use: **estimated by cost of production**
- "Final": **avoid double-counting** goods and services
  e.g. Tire used on Ferrari sold to customer is not counted as it is part of a final good (Ferrari)
  - Final good: sold to final user
  - Intermediate good: used up to produce some other good
- "In a country": inside geographical boundaries (except embassies)

- "In a given period": Stock vs flow variables, in this case GDP is a flow

4.1.2 Three approaches to measuring GDP

1. **Expenditure**

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

   - Private consumption: g&s purchased by households as final users
     [IMPT] C excludes the purchase of new homes, but includes value of housing services enjoyed by both tenants and owner-occupiers
     Why?? Might be because of accrual accounting? purchasing 1 big house can be done anytime but
   - Private Investment: g&s purchased by firms as final users
     Include **capital goods**: goods made to produce other g&s
     Also include **change in inventories**: goods stored by firms for future use
     Also include **subsidies**
   - Government Expenditure: Expenditure on g&s by government as final users
     - **Government consumption**: inventory for railroad workers
     - **Government investment**: highways, bridges, railroads,
     - **[IMPT]** Does not include **government transfers** to households
   - Net Exports: Exports - Imports

2. **Value-added (Production)**

   A firm's value added = Value of g&s it produces − Value of intermediate g&s it uses up
   $= \text{Final} - \text{Initial value}$

$$Y = \sum \text{Value-added}$$

   This reveals the contribution of various industrial sectors to GDP

3. **Income (Income)**

$$\sum \text{Value-added} = \sum \text{Factor incomes}$$

   - A firm's value added is **paid out** to owners of FOP
   - Wages = Payments to workers
   - Interest = Payments to financiers
   - Rent = Payment to Landlords
   - Profit = income accruing to firms' owners

   [IMPT] : Can tell us distribution of incomes across different factors

Comparing GDP across time

- Nominal GDP: GDP at current prices
- Real GDP: To make better comparisons of GDP over time
- **Fixed-base approach**
  - Choose a base year (arbitrary?!)
  - Use base year prices to value production for all years
- **[IMPT] Annual Chain-linking approach**
  - Definition: Goods and services produced in each year are revalued using the prices of the previous year
  - Youtube Video
  - Instead of taking an arbitrary year as the base year, we set the last year as the base year
    * Find growth rate first for each year based on previous year
    * To get Real GDP in a given year, chain multiply growth rates from reference year until given year

$$RGDP_i = RGDP_k \times g_{k+1} \times \cdots \times g_i$$

  - Limitation: can only compute year-on-year changes of GDP
  - Benefits:
    * Takes into consideration changes in the relative prices of g&s that occur from one year to the next
    * Reflects any recent changes in economic conditions

The GDP Deflator: measure of price level of g&s included in GDP

$$\text{GDP Deflator} = 100 \times \frac{\text{nominal GDP}}{\text{real GDP}}$$

4.1.3 Problems with GDP

Quality changes

- Quality should account for more production, but this is subjective

Free goods and services

- *e.g.* Facebook, Youtube, TikTok
- There are associated payments for these but these likely underestimates the value of these products

Shadow Economy/Underground Economy

- informal, illegal, unreported market activities
- hard to obtain measurements
- Hard to compare GDP across countries if one country has greater importance of the shadow economy

GDP $\neq$ indicator of well-being: many important things that matter to well-being are not captured by GDP

4.2 Price Levels and Inflation

Note that GDP Deflator is not suitable for measuring changes in households' cost of living (COL) since it includes everything

Consumer Price Index

- Fix the market basket of g&s that the average household consumes in a year
- Collect prices of items in the market basket for each year
- Using the prices, compute the market basket's cost
- Choose a base year and compute the CPI and Inflation Rate (year-on-year)

$$\text{CPI}_{\text{current}} = 100 \times \frac{\text{CPI}_{\text{current}}}{\text{CPI}_{\text{base}}}$$

- Real value vs Nominal value

$$\text{Real Value} = \text{Nominal Value} \times \frac{100}{\text{CPI}}$$

$$\text{Real i/r} = \text{Nominal i/r} - \text{Inflation Rate}$$

The Economist Intelligence Unit's Cost of Living Index

- Basket of g&s = 160 items consumed by expatriate households
- Comparison is across cities rather than across time (New York is chosen as base city with index value = 100)
- Cost is converted to US Dollars at prevailing exchange rate

4.2.1 Problems with CPI

Upward bias: overstates the amount of inflation the households are experiencing

- **Substitution bias**: when one good increases its price, households tend to switch to cheaper goods but it is not reflected in market basket
- **Outlet bias**: as prices increase, consumers shift purchase from more expensive mainstream stores to cheaper discount outlets and retailers but this may be less represented in statistical authorities' data collection
- **Quality bias**: inflation does not take into account paying for higher quality
- **New goods bias**:
  - New products tend to fall in price and improve in quality during the during the early years of the product's life cycle
  - However they are only added to the market basket only much later
  - So CPI fails to capture the fall in price during early years

4.2.2 Stable Prices

[IMPT] The goal of keeping inflation **predictable, low, and positive** (2% per year as a guideline)

- Expected inflation can be incorporated into agreements ahead of time, thereby preventing unwanted redistribution of purchasing power
  - *e.g.* if inflation rate is higher than predicted, then lender will be worse off and borrower will be better off
  - **How to guarantee real inflation rate?**
    - Indexation to correct for inflation: loan agreement where

$$\text{Nominal i/r} = \text{Read i/r} + \text{Inflation rate}$$

whatever the latter turns out to be

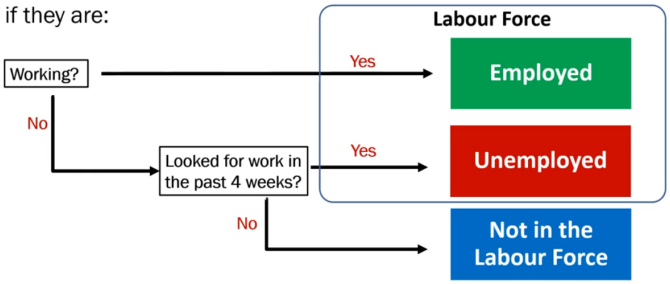
- *High inflation* is costly to society
  - **Distort relative price signals** → causing misallocation of resources
  - Prompts people to use up valuable resources and time to cope with it
  - **Menu costs**: Sellers change price more often
  - **Shoe leather costs**: costs due to efforts in minimizing money holdings as people go to bank more
- *Deflation* is also costly to society
  - **Definition**: a prolonged spell of negative inflation
  - Can make downturns and recessions worse as incomes ↓
    - Households and firms postpone purchases to anticipate for lower future prices
    - Borrowers incomes fall but their debt and interest may not; **loan defaults** and **bankruptcy declarations** increase

4.3 Low Unemployment

Social costs of having large numbers of unemployed people:

- Labour resources are underutilized
- Skills of workers erode with non-use
- Health, social, and political problems

Ask those *able to work*:

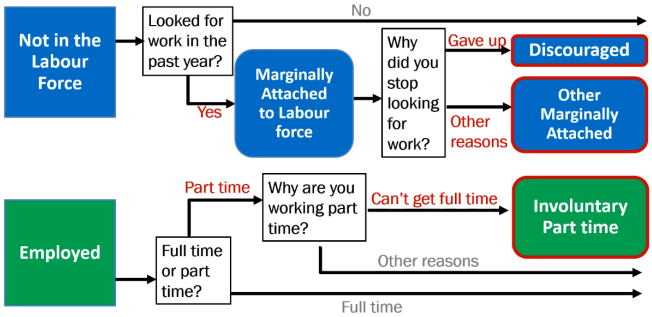


$$\text{Unemployment Rate} = 100\% \times \frac{\text{Unemployed}}{\text{Labour Force}}$$

$$\text{Labour Force Participation Rate} = 100\% \times \frac{\text{Labour Force}}{\text{Able to work}}$$

$$\text{Employment Rate} = 100\% \times \frac{\text{Employed}}{\text{Able to work}}$$

Ask more questions in the survey (II)



Modified U-rates

A	Employed	155.5m
B	Unemployed	6.3m
C	Discouraged	0.4m
D	Other marginally attached	1.0m
E	Involuntary part time	4.4m

$$\text{U-Rate (U-3)} = \frac{B}{A+B} = 3.9\%$$

$$\text{U-4} = \frac{B+C}{A+B+C} = 4.1\%$$

$$\text{U-5} = \frac{B+C+D}{A+B+C+D} = 4.7\%$$

$$\text{U-6} = \frac{B+C+D+E}{A+B+C+D} = 7.4\%$$

4.3.1 Seasonality in Unemployment

- Short term
- Entirely predictable
- Seasonally adjusted → modified to remove the seasonal variation to facilitate comparisons

4.3.2 Types of Unemployment

Frictional Unemployment: those in between jobs or just entering labour market

- Characteristics:
  - Looking for good matches
  - Short term
  - Generally painless
- Government provided unemployment insurance will extend job search time

Structural Unemployment:

- Skill mismatch: mismatch between skills and employers' requirements
- Geographic mismatch: workers' and employers' locations
- Labour market impediments: high minimum wage, discrimination, unionization

Cyclical Unemployment: fluctuations in unemployment that arises from changes in production over the **business cycle**

- Rise during recessions and fall in between recessions
- Note that **Full employment** refers to **zero cyclical unemployment** and other types of unemployment are present
- At full employment, the output the economy produces is called its **Potential output**

5 Long-run Macroeconomics

5.1 Growth Rate approximation

Rule of 70 approximation:

$$\text{Time to double} \approx \frac{70}{\text{growth rate percentage point}}$$

Approximation for growth rates products and quotients: let g_A be growth rate of variable A

- If $C = A \times B$, then $g_C \approx g_A + g_B$
- If $C = A/B$, then $g_C \approx g_A - g_B$

$$\text{RGDP per capita} = \text{Productivity} \times \text{Avg Hours} \times \text{EPR}$$

$$g_{\text{RGDP per capita}} = g_{\text{Productivity}} + g_{\text{Avg Hours}} + g_{\text{EPR}}$$

5.2 Divergence

Given sufficient time, even a **small difference** in annual growth rate of RGDP creates a **big difference** in RGDP
Why some countries have big growth and others don't?

- Institutions needed for markets to thrive must be developed for growth
- *e.g. Rule of law, market orientation, openness, stability*

5.2.1 Rule of Law

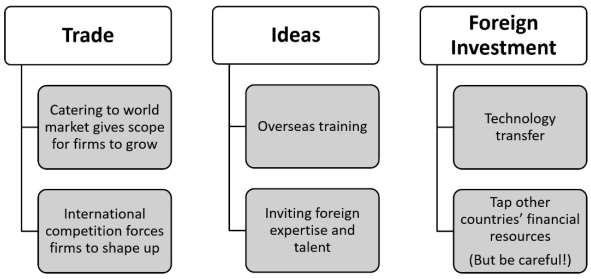
- **Private property rights**: investment must be secure against criminal and/or government appropriation
- **Enforcement of contracts**: Private enforcement is expensive, inefficient and uncertain, much better to rely on a trustable legal system

5.2.2 Market Orientation

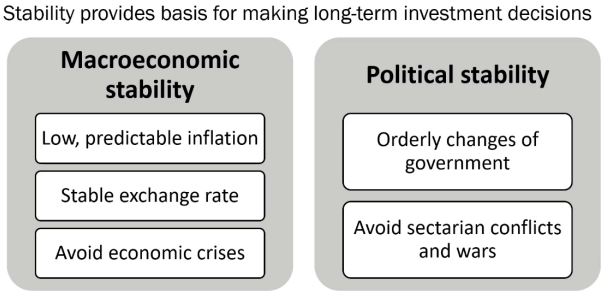
Central planning can mobilize resources on massive scale but is prone to **resource misallocation and mal-investment**

- In contrast **market-based economies** are faster in generating and processing information about needs and constraints
- So they are far more adaptive to changes in the economic environment
- **Industrial policy** (govt-directed attempts to grow specific targeted industries) has a mixed record
  - They are based on protectionism and will continue to be supported by government without much exposure to the real market, hence inefficient

5.2.3 Openness



5.2.4 Stability



5.3 Aggregate Production

$$Y = f(L, K, \text{Land}, A)$$

- Y is Output
- L is Labour
- K is Capital
- $Land$ is Natural Resources
- A is technology

5.3.1 Labour

For a given K and A, if L is doubled, Y would increase by a smaller extent due to **diminishing returns to labour**

$$g_{\text{RGDP per capita}} = g_{\text{Productivity}} + g_{\text{Avg Hours}} + g_{\text{EPR}}$$

Problems with increasing EPR/Avg. hours:
- More labourers will increase Labour Supply (LS) resulting in falling wages and falling household incomes
- Encourage **homemakers** to work: sacrifice child care
- Import **foreign workers**: inability to integrate, loneliness
- Encourage **elderly** to work: not efficient and desirable
- **Lengthen** work hours: Karoshi (death by overwork)

So the only effective alternative is to increase productivity (output per unit labour)

$$\frac{Y}{L} = f\left(\frac{K}{L}, A\right)$$

5.3.2 Capital Deepening

Definition: raising K/L. Assume that L is fixed so raising K/L means raising K

$$K_t - K_{t-1} = I_t + G_t - \delta K_t$$

- K_t and K_{t-1} are capital stock at time t and $t-1$ respectively, so $K_t - K_{t-1}$(Net Investment) is the change in capital stock (flow variable)
- I_t is private investment
- G_t is govt investment
- δK_t is **Depreciation** (loss due to wear and tear, obsolescence), assumed to be a constant fraction of existing capital stock

Policies for Capital Deepening
1. Change incentives to promote investment
   - Reduce corporate tax (on firm's profits) but this effectiveness is mixed
   - Grant Investment Tax Credit: tax reduction for firms that invest in new capital
2. Change inventives to promote saving
   - Shift from taxing income to taxing consumption
   - Reduce transfers to elderly, unemployed
   - Mandatory saving (*e.g.* Singapore's CPF)

Human Capital: workers' knowledge, skills, discipline, and health
- Increases productivity (H/L) but is not included under investment
- H/L: human capital per unit of labour

$$\frac{Y}{L} = f\left(\frac{K}{L}, \frac{H}{L}, A\right)$$

Catch-up growth: poor countries with solid institutional conditions can grow rapidly and catch up with other countries
- *e.g.* Post WWII Japan and Germany, Four Asian Tigers
- Elements of catch-up growth:
  - Reduce C, to boost I
  - Invest in health and education to improve H
  - Adopt and adapt technology from rest of the world (H and K)

Limitations of capital deepening
- More K, Less C goods (PPF), but PPF will shift more in the future due to more K goods (legitimate trade-off)
- **Diminishing returns to capital**: productivity growth from capital deepening eventually slows as we increase K (For a given amount of $\bar{L}$ and $\bar{A}$, Y will only increase marginally)
- **Rising depreciation**: as K increases, δK will increase and thus *more gross investment is needed to replace depreciated capita;, leaving less for net investment*

5.3.3 Technological Growth

Productivity growth can come from tech change: *Invention and application of new inputs, new products, or new production methods*
- **Discovery-based growth**: growth based on pushing the technological frontier by creating and using new ideas!

Some policies:
- **Intellectual property rights**:
  - needed to incentivize commercial R&D, otherwise copycats can reap gains without paying for R&D costs (non-rival)
  - But should not be too strong,otherwise people would be discouraged from using the discovery
  - Examples:
    - Patent: right to exclude others from, or charge others for the use of one's invention, valid for a set period
    - Copyright: right to exclude others from, or charge others for, reproducing one's work, valid for a set period
- **Promoting entrepreneurship**: startup culture, seed financing for fledgling entrepreneurship to obtain funding

- **Government funding for R&D**: Subsidies for private R&D, government direct funding of R&D

5.4 Loanable Funds Market

$$S = I^P + G - T$$

$$Y = C + I^P + G$$

$$\text{Output} = \text{Planned Spending}$$

5.4.1 Households

$$S = Y - T - C$$

- S is supply of savings, a portion of Y minus T (net taxes which is Taxes-Subsidies, now is disposable income) minus C
- **Determinants of S**
  - Real i/r $\Rightarrow$ if rates increase, it's more lucrative to save
  - Future expectations of income: if Future Y is expected to increase, there will be less S now
  - Households wealth:

5.4.2 Firms

$$I = I^P + \Delta\text{Inventories}$$

- Borrow loanable funds market to finance spending on planned private investment I^P
- Let all changes in inventories be unplanned
- **Determinants of I^P**
  - Real i/r
  - Expected future profits from new capital (optimism)

5.4.3 Government

- Govt purchases $= G$, Govt collects net taxes T
- If $G > T$, govt has budget deficit of size $G - T$ and will demand funds
- If $T > G$, govt has budget surplus of size $T - G$
- **[IMPT]** Assumption: $G > T$ and always running on budget deficit, and is insensitive to change in real i/r

5.5 The Classical Model

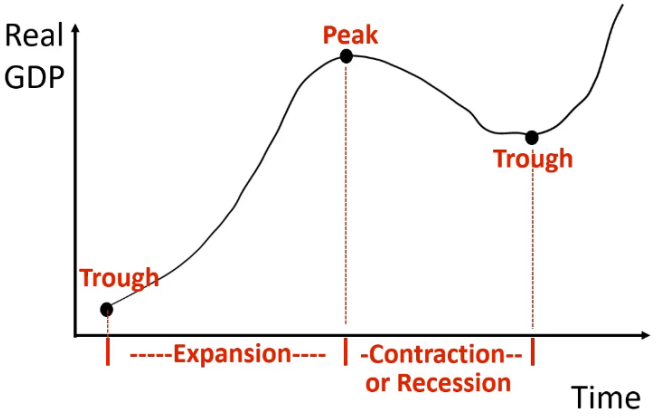
Focuses on **resource markets and technology** as **determinants** of an economy's potential output

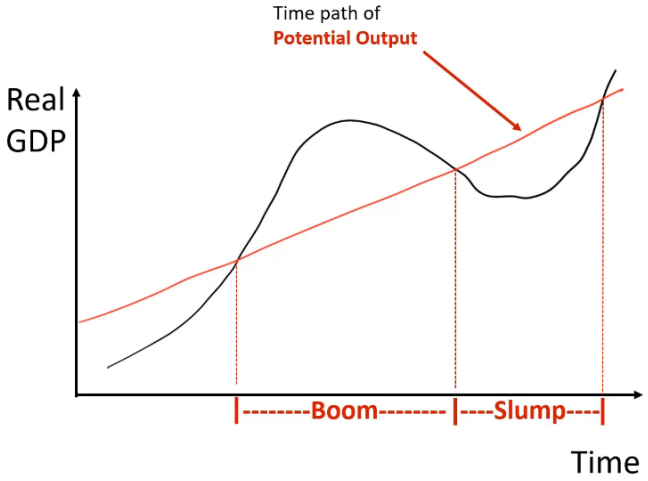
Assumption: markets clear:
- Labour market reaches equilibrium
- Loanable funds market reaches equilibrium
- Open vs closed economy?

Say's Law: "Spending adjusts to equal output (and not the other way around)"
- Supply creates its own demand
- **100% crowding out**: If one spending component increases/falls, output does not change, instead the other spending components fall/increase by the same extent
  - Use $Y = C + I^P + G$ at equilibrium and other assumptions (loanable markets, labour market at equilibrium)

6 Short-run Macroeconomics

Singapore's Covid-19 Resilience Package (Fiscal Policy)
- G elements
  - Spending on public health and safe reopening
  - Spending on investments in hardest-hit sectors
- T elements
  - Job Support Scheme: paying a portion of workers' salaries
  - Recovery Grant: Financial support for workers who lost jobs or were forced to take no-pay leave
  - Grants for workers in hardest hit sectors





Some terms: (refer to diagrams)
- **Business Cycles**: another name for econ fluctuations
- **Technical Recession**: two consecutive quarters of contraction (might be abit arbitrary so that's why it's called technical)
- **Boom/Slump**: depends on the position with regards to the economy's Potential output (not directly measured and so is estimated)

What is Short Run Macro?
- LR Macro refers to the time when all markets clear, so the Classical Model is a useful guide because the assumptions hold
- SR Macro refers to the time period where some markets do not clear (Classical Model is not suitable) and economic fluctuations during the period
  - **Labour markets do not clear**: Sticky Wages assumption h

  - Wage rates tend to fall slowly, if at all due to inertia, long-term contracts, worries about morale
  - During recessions, Labour Demand do not usually fall as this will entail a decrease in wages which is not what is observed
  - Instead, the Sticky Wages assumption holds and so there is a surplus of workers (unemployment) and markets do not clear
- **Loanable funds markets do not clear**:
  - Other forces affect i/r, lending and borrowing, especially within relatively shorter time periods
- **Spending depends on output = income**
  - The more output produced $\Rightarrow$ more income households receive $\Rightarrow$ more goods and services they purchase
- **Output depends on spending**
  - If spending $>$ output, firms will increase output in response
  - If spending $<$ output, firms will reduce output in response

6.1 Keynesian Model

6.1.1 Spending Depends on Output

Spending is due to Households (C), Firms (I^P), Government (G), and the External Sector (NX) and they are assumed to be **autonomous** (meaning they do not change when the output Y changes)

$$C = a + b(Y - T), 0 < b < 1$$

- a is the part of consumption independent on disposable income (**autonomous consumption**)
- $b(Y - T)$ is part of consumption that depends on disposable income
- **Marginal Propensity to Consume (MPC)**

$$MPC = \frac{\Delta C}{\Delta Y} = b$$

- **Aggregate Expenditure (AE)**

$$AE = C + I^P + G + NX$$

- **Demand Shocks**: When AE shifts due to factors that affect a, I^P, G, T, and NX
  - a: expected future income, wealth, real i/r
  - I^P: business optimism, real i/r
  - G: fiscal policy decisions
  - NX: exchange rate, other countries' spending

6.1.2 Output Depends on Spending

$$I = I^P + \Delta\text{Inventories}$$

- I is total investment, I^P is planned investment, change in inventories is assumed to be always unplanned
- If $Y > AE$, Inventories will increase as there are unsold goods in the warehouse, $I > I^P$ and Firms will $\downarrow Y$ to $\downarrow$ inventories
- If $Y < AE$, Inventories will decrease as firms are producing insufficient g&s to satisfy spending from parties, $I < I^P$ and Firms will $\uparrow Y$ to $\uparrow$ inventories
- Note that firms respond by changing output, not prices as the economy's price level is assumed to be fixed (short run stickiness in wages and prices)

6.1.3 Goods Market Equilibrium

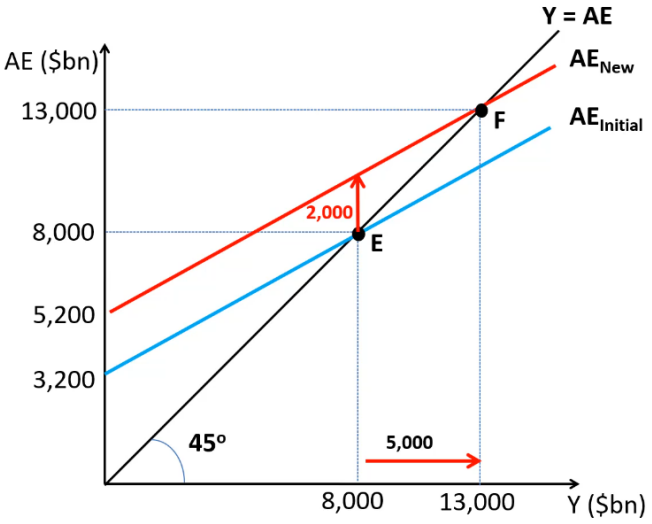
Equilibrium is achieved when $Y = AE$ and

$$AE = (a - bT + I^P + G + NX) + bY$$

which is achieved at Y^*, the equilibrium level of Y

$$Y^* = \frac{1}{1-b}(a - bT + I^P + G + NX)$$

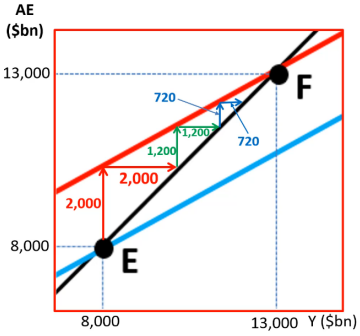
Note that T = Net Taxes = Taxes - Transfers **[IMPT]**



When there is a change in components (a, I^P, G, or NX) due to demand shock, the new equilibrium will increase through **multiplier process** by

$$\Delta Y^* = \frac{1}{1-b}\Delta I^P \text{ or } G \text{ or } NX$$

The equilibrating process



Initially at E
- AE↑ by $2 tr
- Firms respond: Y↑ by $2tr
- Households respond: AE↑ by 0.6 x$2tr = $1.2tr
- Firms respond: Y↑ by $1.2tr
- Households respond: AE↑ by 0.6 x $1.2tr = $720bn
- Firms respond: Y↑ by $720bn...

and $\frac{\Delta Y^*}{\Delta I^P}$, $\frac{\Delta Y^*}{\Delta a}$, $\frac{\Delta Y^*}{\Delta G}$, $\frac{\Delta Y^*}{\Delta NX}$ are called **expenditure multipliers** and are most of the time given by $\frac{1}{1-b}$

6.1.4 Explaining Economic Fluctuations

- Fluctuations are mostly due to **demand shocks**, which are amplified by the multiplier process
- Main sources of demand shocks
  - I^P is the most volatile because it depends on business optimism and expectations which are volatile (animal spirits)
  - For small open economies, NX can be highly volatile
- There is no relationship between equilibrium output (Y^*) and potential output (Y_{FE}), as the economy can be in a slump or a boom for a protracted period of time
  - Output gap $= Y^* - Y_{FE}$
  - Percentage output gap $= 100\% \times \frac{Y^* - Y_{FE}}{Y_{FE}}$

6.1.5 Automatic Stabilizers and Destabilizers

- **Automatic stabilizers**: features of the economy that automatically dampen the spending resposne during the multiplier process
  - makes the multiplier smaller
  - makes the economy more stable in the short run
- **Automatic destabilizers**: features of the economy that automatically strengthen the spending resposne during the multiplier process
  - makes the multiplier bigger
  - makes the economy less stable in the short run

Suppose there is a positive demand shock and $Y \uparrow$

- Relax the assumption that T is autonomous
  - When $Y \uparrow$, there will be increase in income tax revenue, sales tax revenue, and decrease in trasnfers to unemployed & poor (overall increase in T)
  - $T \uparrow$ means $C \downarrow$ and this partially **counteracts** the initial $Y \uparrow$
- Relax the assumption that M (imports) are autonomous
  - When $Y \uparrow$, $C \uparrow$ and more of this is spent on purchasing imports
  - Hence the multiplier becomes smaller
- Household wealth may rise with income
  - Stock prices, prices of homes rise rapidly during booms
  - When $Y \uparrow$, $a \uparrow$ which means a is not autonomous
- Planned investment (I^P) may rise with income as firms become more optimistic as economy booms

6.1.6 Keynesian vs Classical

In the Keynesian model, spending depends on output so an increase in S will lead to a fall in Y and so on and so forth which is not good for the economy (**The Paradox of Thrift**)
In the Classical model, spending adjusts to output $\Rightarrow$ an increase in S will be counteracted by a fall in I^P (Say's Law) so Y remains unchanged

6.2 Countercyclical Fiscal Policy

Definition: fiscal policy aiming to dampen economic fluctuations

- If $Y^* < Y_{FE}$, countercyclical FP should be **expansionary** (Aim to $\uparrow AE$ by $\uparrow G$ or $\downarrow T$)
- If $Y^* > Y_{FE}$, countercyclical FP should be **contractionary** (Aim to $\downarrow AE$ by $\downarrow G$ or $\uparrow T$)
- By contrast, **fiscal austerity** during a slump is **procyclical**

To counter a slump, G only needs to be a fraction of the output gap to close the gap and reach Y_{FE}, in contrast, we need bigger change in T as a change in T only affects a portion of Y

$$\text{G-Multiplier} = \frac{\Delta Y^*}{\Delta G} = \frac{1}{1 - MPC}$$

$$\text{T-Multiplier} = \frac{\Delta Y^*}{\Delta T} = -MPC \times \frac{1}{1 - MPC}$$

[IMPT] in SG, G is pegged to a seven-year moving average of past and projected GDP to reduce volatility in G spending

6.2.1 Problems with FP

Timeliness Problem: discretionary FP prone to lags since time is used to

- Collect and interpret macroeconomic data
- Formulate the fiscal plan
- Get legislative approval for the spending plan

Irreversibility Problem

- Ideally counter-cyclical policy should be reversible (should be able to withdraw stimulus after recovery)
- But it is difficult to reverse
  - Voters hate $T \uparrow$ again and $G_{\text{transfers}} \downarrow$
  - Businesses that benefit from G will lobby the govt to keep spending

Monetary Policy is available

- Central Bank may already have used monetary policy to stabilize the economy which is fast and easy to reverse
- Central banks are usually independent from govt, to insulate monetary policy from political considerations

Theory vs Practice

- Size of output gap: cannot be estimated accurately
- Size of multiplier: uncertainty about size
- Size of stimulus: political considerations dominate (govt wants to appease as many people as possible, big stimulus would anger some people)
- Mix of G&T: similar to above (political considerations)
- Timing of stimulus: ideally applied ASAP, but there is always time lag

Leakages and Savings

- Effectiveness of FP is more limited for open economies due to M leakages
- Fiscal transfer effect would be blunted if the economy has a high S savings rate because injections are not fully spent, but instead kept as precautionary savings

Fiscal Sustainability: trading off long-term investments

- Large deficits necessitates the government to borrow, which increases interest rates and crowd out funds for private investments
- This will reduce long-term growth prospects
- However in Singapore, budget deficits is always financed from past year surplus

6.2.2 Singapore's Countercyclical FP in 2020

- Jobs Support Scheme: $20 billion wage subsidy
  - Able to support businesses wage expenses and prevent retrenchment
- Covid-19 Support Grant: discretionary unemployment benefit
- Care and Support Package:
  - Vouchers for groceries, utilities, and conservancy
  - Poorer families get more
- Solidarity payment: cash transfers to citizens and PR
- Government-sponsored traineeships: to reduce unemployment spell for those entering job market
- Industry-specific help: $100 credit per household to use on local tourism ⇒ **[IMPT]** improve business expectations and demand, reduce precautionary savings inclination that can dampen consumption

7 Money and Banking

7.1 Money

Functions of money

- Medium of exchange: without money, people have to barter, but each party has to desire the other party's good
  - Move purchasing power through space
- Unit of account: measuring stick for valuing g&s, assets, liabilities on a common basis, also needed to record values
  - Reference point.
  - Different currencies, so need to choose a unit of measurement that is stable relative to the problem at hand
- Store of value: keep money today to be spent in the future (an asset part of people's asset portfolios)
  - Need to have long lifetime as opposed to having perishables as 'assets' which can expire in a few days
  - Store purchasing power

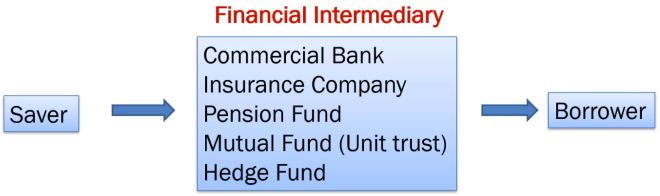
Money history

- **Commodity as money**: For most of history, commodities were used as money, with their intrinsic value as an exchange value
- **Commodity-backed money**: Certificates representing a claim on commodity in storage
  - More convenient than carrying commodity around
  - Example would be bank issued bank notes for gold and silver deposits
- **Fiat Money**: value of fiat money depends on peoples' willingness to accept it in payment
  - Govt can decree a currency to be **legal tender** (recognize by law as valid for payments), but ultimately it's up to people to accept it

Monetary aggregates

- **M1**: greatest liquidity: assets can be sold quickly for currency, with as little impact on its selling price
  - **Currency in circulation**: excludes cash in bank vaults and ATMS
  - **Demand deposits/Checking Deposits**: deposits that are used for making transactions
- **M2** = M1 + very liquid assets
- **M3** = M1 + liquid assets

7.2 Banks



Financial Intermediaries

- Get money from savers, and the money is in turn invested/lent to borrowers
- Earn profit by charging a **spread** between i/r they pay to savers and i/r they obtain from borrowers
- Benefits of finanical intermediaries
  - Expertise at evaluating and monitoring borrowers: need to know if the borrower has good/bad risk
  - Ability to finance large projects: bank pools funds from many savers as compared to needing many people if need to borrow individually
  - Low risk to saver: the risk is diversified across many borrowers
  - Liquidity for savers: Bank deposits are liquid as opposed to loans from individuals which are *bound by contract* (cannot be converted into cash readily)

Financial Markets

- Where lending and borrowing of funds are conducted
  - *e.g.* market for bank loans, and organized markets where securities (tradable financial instruments) are bought and sold
  - *e.g.* **Stocks**: represent claim in equity and ownership of a company; Stock exchange (secondary market) and IPO (primary market)
  - *e.g.* **Bonds** in bond market: a tradable debt security representing a promise to repay borrowed funds

Banks

- Balance sheet:
  - Assets comprises of Cash in Vault and ATMS and Deposits at the Central Bank
  - Liabilities: Demand Deposits
  - Equity: Bank Capital

7.2.1 Money Multiplier (Money Creation)

Assumption:

- RRR = 10%
- Banks do not want to hold excess reserves
- **Cashless society**, with money held only in the form of bank deposits
- Bank reserves are composed entirely of deposits at the Central Bank

Process

1. Central Bank buys bond from the government, reserves (assets) and deposits (liabilities) of the first bank increases

2. Since RRR is 10%, the remaining 90% of the reserves is loaned to another individual using a different bank
3. Second bank gets 90% of original amount of reserves, and the process continues
4. **Money Multiplier**: amount of money created (or destroyed) for each dollar of reserves injected (or withdrawn)

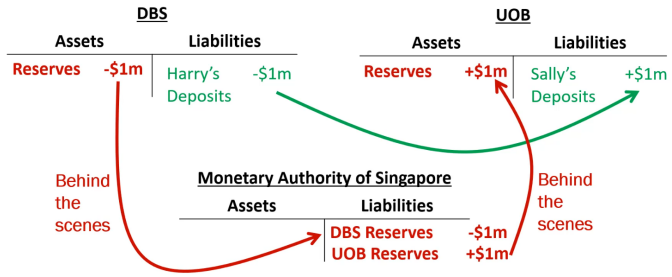
$$\text{Money Multiplier} = \frac{1}{\text{RRR}}$$

5. In practice, the multiplier could be smaller than $\frac{1}{\text{RRR}}$ because
   - Banks may hold excess reserves → actual reserves ratio is higher than RRR
   - People may hold part of money as cash (cashless assumption is not held)

$$\text{Money Multiplier} = \frac{1}{1-(1-\%\text{cash})(1-\text{RRR})}$$

7.3 Central Bank

- Independent from government
- Not allowed to print money to make transfers or to purchase goods and services (since it can lead to hyperinflation (50% sustained inflation rate))
- **Objectives**
  - Ensure financial stability
  - Conduct monetary policy for price stability and/or managing economic fluctuations
- **Role of Central Bank in banking**
  - Bank for commercial banks: banks keep most of their reserves in the form of deposits with the central bank



  - Regulator of banks and fin institutions

$$\text{Reserve Ratio} = \frac{\text{Reserves}}{\text{Demand Deposits}}$$

Many central bank impose minimum reserve requirements which is the **Required Reserve Ratio** (RRR)

* Banks can choose to hold excess reserves
* If banks are short of reserves, they can (1) attract deposits, (2) recall loans or sell other assets, (3) borrow reserves from other banks or from the Central Bank

7.3.1 Central Bank's Role in Money Creation

1. **Changing RRR**
   - ↑RRR ⇒ Loans↑, Deposits↑
   - ↓RRR ⇒ Loans↓, Deposits↓
2. **Open Market Operations**: change the quantity of reserves by purchasing or selling short-term government securities
   - Open Market Purchase ⇒ Reserves↑, Loans↑, Deposits↑
   - Open Market Sale ⇒ Reserves↓, Loans↓, Deposits↓
3. **Discount loans**: Banks that are short of reserves can take a discount loan from the Central Bank
   - **Discount rate** = interest rate on discount loan
   - Reduce discount rate ⇒ Banks can have bigger reserves and this bigger reserves can be used for loans ⇒ Reserves↑, Loans↑, Deposits↑
   - Raise discount rate ⇒ Reserves↓, Loans↓, Deposits↓
4. **Changing the i/r paid on reserves**: changes banks' willingness to make loans and reserves
   - ↓i/r ⇒ encourages bank to make more loans, Loans↑, Deposits↑
   - ↑i/r ⇒ encourages bank to make fewer loans, Loans↓, Deposits↓

7.3.2 Central Bank's Role in Stability

Banks are inherently fragile

- In making loans, they create money
- Bank failures can damage the functioning of the economy
- Banks are fragile because
  - Highly **leveraged**: using borrowed funds to buy assets

$$\text{Leverage Ratio} = \frac{\text{Assets}}{\text{Equity}}$$

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

Leverage amplifies losses and gains (if assets change, the equity will change drastically assuming liabilities is constant and A = L+E)⇒ easy for banks to get **insolvent**: cannot pay off its liabilities even if it sells all its assets

  - "borrow short" and "lend long"
  - Banks are required to adhere to capital requirements
    * In order to meet capital requirements, banks can **deleverage**: selling assets to pay off liabilities, or **recapitalize**: et investors to add their own funds to bank capital, in return for getting a share of the bank's ownership

Bank Runs

- **Bank runs**: If depositors suspect a bank to be insolvent, they will rush to withdraw deposits
- Deposits are short term liabilities and can be withdrawn anytime, but banks DO NOT have the reserves to handle massive deposit withdrawals
- Banks need to convert non-current assets such as loans to short-term and relatively more liquid assets
- So bank will have to shut down
- **Bank panic**: depositors become suspicious about health of other banks so many banks will have to shut down

  - Payment systems are disrupted
  - Wealth is destroyed
  - Lack of bank lending

Policies for Financial Stability: to prevent banking runs

- Reserve requirements: RRR
- Capital requirements: minimum capital ratio to reduce leverage
- Restricting bank's activities, regular monitoring
- Deposit insurance: mandatory provided by government to prevent runs and panics
  - Banks pay premiums to the SDIC (Singapore Deposit Insurance Corporation)
  - If there is a bank run and the bank cannot pay depositors, SDIC will pay on its behalf
  - Deposit insurance removes the sense of urgency to withdraw deposits, preventing bank runs from happening
- Lender of last resort: central banks lend to troubled banks when no one else will
- Owner of last resort: Central banks/govt inject funds to boost bank capital

8 Crisis, Recession, and Monetary Policy

8.1 2007-08 Financial Crisis

Factors that caused the financial crisis

- **Financial innvations**
  - New types of securities
  - New ways to borrow short-term
  - New ways to insure against falling asset values
  - Increased importance of non-bank financial institution **(NBFI)**
- **Securitization**: turning loans into debt securities
  1. Bank makes mortgage loans, where loans are 20-30 years and home is collateral
  2. Bank bundles the mortgages into a **Mortgage-Backed Security (MBS)**: owner of MBS gets regular interest payments from the mortgages
  3. Bank sells MBS to another financial institution - taking the mortgages off its balance sheets
- **Slicing and Dicing**
  1. Financial institution buys many different MBS
  2. MBS can have high risk if the borrower is of questionable financial background/credit history/low salaries (**subprime**) or low risk (**prime**)
  3. Financial institution chops up each MBS into slices and combine slices to form **Collateralized Debt Obligations (CDOs)** to create a security that
     - Pays high interest
     - Has low risk due to diversification
  4. Sells CDOs to other banks, funds; owner of CDOs get regular interest payments from MBS
  5. More "Slicing and Dicing" even obtaining CDO^2
- **A new way to borrow short-term**: Repurchase agreement (repo and reverse repo)
  - Bank A sells CDO to bank B for $10m but agrees to buy it back 7 days later at $11m
  - 7 days later, Bank A fulfills commitment and buys back the CDO at $11m
  - The security acts as collateral: if Bank A defaults (doesn't buy back the security 7 days later), Bank B keeps the security
    * liquid and safe assets are preferred as collateral: short-term govt securities, MBS and CDOs (before 2008 Financial Crisis as the markets were deep, making them liquid)
- **Insuring against falling assets values**
  - If the value of assets/securities sold by Bank A falls in value to $8m, Bank A will just default
  - Bank B will approach American Insurance Group (AIG) and AIG will pay Bank B $3m
  - Of course Bank B pays premium to AIG
- **Shadow Banking**
  - NBFIs that undertake short-term liabilities (borrow short-term such as repo) to purchase long-term assets (such as MBS's, CDOs)
  - *e.g.* hedge funds, mutual funds, subsidiaries and divisions of commercial banks
  - Also New York-based investment banks: Goldman Sachs, Morgan Stanley, Merrill Lynch, Lehman Bros, Bear Stearns
  - They are highly leveraged: a small fall in asset values would put it into insolvency

8.1.1 Positive Feedback Loop

- US Nationwide housing market downturn causes rising mortgage defaults
- Prices of MBS and CDOs fell drastically
- Lenders became less willing to enter into repos as
  - Borrowers might be insolvent (because value of MBS/CDOs might fall and the borrower can default)
  - Less willing to accept securities as collateral as the value of the security is diminishing
- Since value of assets $\downarrow$, the bank might have to face insolvency
- So Banks and NBFIs try to deleverage
- Deleveraging works if just a few firms do it
  - But when all sell at the same time. prices of MBS and CDOs fall even further
  - Become even closer to insolvency
- Cycle feeds on itself

8.1.2 How it Happened

- Bear Sterns collapsed but the Fed arranged restructuring and sale
- Lehman Bros failed without Fed intervention and brough on panic in repo market
- Suspect that major financial institutions are close to insolvency
- Since it is AIG's job to pay the amount to cover falling asset values, and meanwhile at the same time asset values are falling drastically everywhere, it could not cover the **Credit Default Swap** (CDS) it had sol and also collapsed

Actions by the Fed and Treasury to restore financial stability

- Persuaded healthier financial institutions to **buy troubled ones**
  - JP Morgan Chase was persuaded to buy Bear Stearns
  - Bank of America was persuaded not to renege on buying Merrill Lynch
- **Bought securities** to ↑Asset prices
  - Fed bought MBS + commercial bonds
- Gave NBFI's **access to emergency Fed loans**
  - Goldman Sachs and Morgan Stanley were converted into banks to qualify for the Fed's discount loans (lender of last resort)
- **Injected equity into troubled financial intermediaries**
  - US Treasury took over ownership of AIG, paid off its liabilities
  - US Treasury became part owner of Citigroup, JP Morgan Chase, Goldman Sachs (owner of last resort)

8.2 The Money Market

Some simplifying assumptions

- Only two financial assets that people can buy!
  - **Bonds**: pay interest, not used for transaction, risky
  - **Money**: no interest, used for transactions, safe
- **Inflation rate is fixed**: nominal and real interest rates move together

8.2.1 Money Demand

Definition: amount of wealth households choose to hold as money

Determinants:

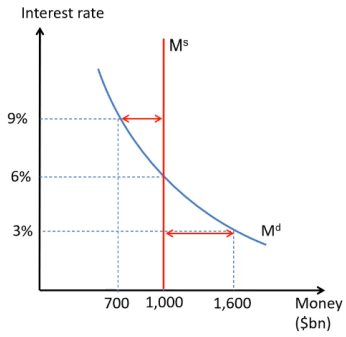
- Asset demand for money:
  - The Nominal i/r falls: opp. costs. of holding money falls
- Transactions demand for money:
  - Price level rises: need to hold more money to purchase the same g&s
  - Output rises: more income hence more purchasing power and wealth

8.2.2 Money Supply

We assume that the Central Bank has complete control of the quantity of money (Vertical Supply Curve) through instruments:

- Required reserve ratio (RRR)
- Open market operations
- Discount rate
- Interest rate paid on reserves (IOR)

8.2.3 Equilibrium in the Money Market



- If i/r is above eqm. level:
  - Excess supply of money: people would rather hold less money
  - Excess demand for bonds: people would rather hold more bonds ⇒ bond price will ↑ in the bond market
  - As bond price ↑, i/r ↓
    - Bond price here means the initial price buyers need to pay
    - The amount payable promised by bonds at the maturity date remains the same
    - Hence, returns given by bonds will fall and i/r will fall
  - i/r fall until people are satisfied with holding the eqm quantity of money

8.2.4 Interaction Between Goods Market and Money Market

- If i/r ↑, ↓ I^P and ↓ a ⇒ AE ↓
- If Y ↑, M^D (Money demand) ↑ ⇒ i/r ↑
- Eventually both markets reach equilibrium at some intermediate value of Y^* and some intermediate value of i/r r^*
- Expenditure multiplier depends not just on AE slope, but also how i/r changes
- **Crowding out**: an increase in AE is offset by a decrease due to increase in i/r, but crowding out is not 100%

8.3 Monetary Policy

Monetary policy is central bank's actions and communications to manage the money supply to influence economic activity

- Tools are used to target i/r
- **Expansionary** monetary policy aims to ↑ Y^*
  - Money market: ↑ M^S to ↓i/r
  - Goods market: i/r ↓, ↑ I^P and ↑ a ⇒ AE ↑ ⇒ Y^* ↑
- **Contractionary** monetary policy aims to ↓ Y^*
  - Money market: ↓ M^S to ↑i/r
  - Goods market: i/r ↑, ↓ I^P and ↓ a ⇒ AE ↓ ⇒ Y^* ↓
- Note that the Central Bank can prevent/allow i/r to rise/fall to prevent/allow crowding out due to Fiscal Policy

Countercyclical Monetary Policy
- Is faster to enact and easier to reverse
- If $Y^* < Y_{FE}$, use expansionary monetary policy
- If $Y^* > Y_{FE}$, use contractionary monetary policy

8.3.1 Conventional Monetary Policy

- There isn't a single i/r in the economy, but Central banks usually target one short-term i/r
- The Fed targets the **Fed Funds Rate (FFR)**: rate at which banks lend reserves to one another overnight (**interbank rate**)
- Interbank rate acts as benchmark for other i/r
  - other assets pay higher rates due to being longer-term and higher risk, thus earning term premiums and risk premiums
  - Difference (**spread**) between these rates and the FFR is usually stable
  - When FFR changes, other rates tend to move in tandem

$$\text{IOR} \leq \text{FFR} \leq \text{Discount rate}$$

- If IOR $>$ interbank rate, then banks will not lend reserves to other banks
- If Discount rate $<$ interbank rate, then banks will just borrow from central bank and not borrow from other banks

8.3.2 Unconventional Monetary Policy

Hard for central bank to keep the nominal i/r significantly below 0% especially in a deep, prolonged slump where conventional monetary policy may hit the zero lower bound
- During the 07/08 Financial Crisis, FFR hit 0.25% in Dec 2008 but long-term i/r did not fall significantly
- **Spread widened** because lenders were wary of increased defaults; need to take in more money to survive the defaults
- So targeting FFR is not effective

Quantitative Easing (QE): large scale purchases of financial assets, paying with newly created reserves
- "open market purchases on steroids"
- Objectives: **Boost asset prices** and **reduce long term i/r**
- Reduce pressure on financial institutions to deleverage and so increase capital ratio
- Increase wealth due to increase in asset values $\Rightarrow$ induce consumption and spending???
- ↑Bank Reserves but did not lead to a massive increase in deposit creation
  - No money multiplier since banks wanted to hold excess reserves as a safeguard when there is a massive money pullout from depositors
  - As a precaution in the 2007/2008 Financial Crisis, Fed started paying IOR of 0.25 percent, equal to FFR $\Rightarrow$ no urgency for bank to get rid of reserves
- **[IMPT]** But QE doesn't directly help the unemployed or people who have lost their homes; may have worsened inequality
  - If there is deep and prolonged slump, need to use FP in tandem
  - Fiscal policy was too focused on the long run (deficit reduction for growth)

Forward guidance: communicating future monetary policy
- In 2011, Fed announced that it would keep its target rate at 0.25% for the extended future
- Meant to influence business and household expectations of the future interest rate
- If banks know that CB will provide lower interest rates, they will also be more willing to lend money at lower interest rates
- Lower interest rates for loans means more people will borrow money $\Rightarrow$ higher I^P and C

8.3.3 Monetary Policy and Inflation

- Central Banks have tried to dampen inflationary pressures by increasing i/r at the cost of lower output
- Inflation can be caused by
  - Demand shock: overly FP policy
  - Supply shock: may cause **stagflation** (high unemployment + inflation)
- **Sustained high inflation** requires two ingredients
  - Central banks being hesitant to tighten monetary policy (↑i/r)
    - **Volcker Disinflation**: contractionary monetary policy need to be maintained until the job is done
  - People grow to expect high inflation to persist (positive feedback loop)
    - Unions push for cost-of-living adjustments to wages every year (Wages↑)
    - Firms raise prices of their products as costs increase
    - Governments raise transfers to help people cope with inflation (Expansionary FP to increase Demand)
    - **Indexation** becomes more common?

9 Exchange Rates

Currency market: market where one currency is traded for another
Foreign exchange reserves: foreign currency holdings of central banks
Exchange rate: rate at which one currency is traded for another
- There are two ways to quote the exchange rate (*e.g.* Dollars per Yen and Yen per Dollar)

Appreciation: strengthen
- Note that if USD/JPY falls, then it means USD has appreciated against JPY

Depreciation: weakened
- Note that if USD/JPY rises, then it means USD has depreciated against JPY

9.1 Demand-Supply Model

9.1.1 Demand for USD in the USD/JPY market

Why the demand curve is downward-sloping

- USD is needed by Japan residents to buy US goods (US exports)
- USD is needed by Japan residents to buy US assets (capital inflow to US – US receives more cash)
- If USD appreciates against JPY, US exports and assets are more expensive to Japan residents ⇒ buy fewer goods and assets ⇒ demand fewer dollars

Factors that can shift the demand curve to the right

- Japan's real GDP rises
- Tastes/preferences
- Japan's price level rises, relative to US prices
  - Or alternatively, Japan's inflation rate is higher than US' inflation rate
  - Japanese goods become relatively more expensive
- Japan's interest rate falls relative to US interest rate
- Expectations that the USD will appreciate against JPY
  - Japan residents prefer to hold more USD

9.1.2 Supply for USD in the USD/JPY market

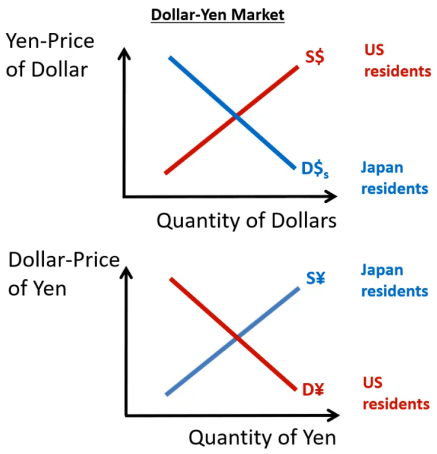
Why the supply curve is upward-sloping

- US residents need to sell USD for JPY to buy Japanese goods
- USD sold to buy Japanese assets (capital outflow from US)
- If USD appreciates, choose to import more Japanese goods and buy Japanese assets as they are relatively cheaper ⇒ US residents supply more USD
- **[IMPT]** If USD appreciates against JPY, less dollars is needed to buy the same amount of JPY, so if USD prices increase, Quantity of USD supplied may fall!
  - Here we use the simplifying assumption that rise in quantity of imports and asset purchases > fall in USD prices so that the supply curve is always upward-sloping

Factors that can shift supply curve to the right

- Similar to JPY

[IMPT] Note that there are two ways of representing the USD/JPY market!



9.2 Explaining Fluctuations in Exchange Rates

9.2.1 Short Run: Economic Fluctuations

Usually RGDP changes

9.2.2 Very Short Run: Hot Money

Hot money: funds that can be moved from one type of asset to another at very short notice

- Changes in **expectations** and **interest rates** influence hot money flows!
- Hot money flows can be highly volatile, so exchange rates can be highly volatile
- **[IMPT]** If i/r changes, both DD and SS will shift!
  - Example if US i/r↓ falls relative to Japan i/r, then DD for USD shifts left and SS for USD shifts right
  - Together, there would be a very large change in the price of USD
- **[IMPT]** if expectations (will it depreciate/appreciate) change, both DD and SS will shift too

Arbitrage: buy an item in one market, sell it in another market for a higher price

- To make riskless profit, a trader can buy another currency where its price is low and sell to the original currency at a higher price at another location
- Demand where price is low will shift right, and supply where price is high will shift right
- Both locations will appreciate and depreciate until exchange rate is equal in the two cities
- **[IMPT]** So arbitrage removes virtually all geographic differences in exchange rates

9.2.3 Long Run: Purchasing Power Parity

Arbitrage trades: similar to arbitrage but buy commodities in one country where it is relatively cheaper and sell the commodities in another country where it is more expensive to earn profits

- USD will stop appreciating against JPY when USD/JPY reaches the PPP Exchange Rate (undervaluation/overvaluation disappears)

$$\text{PPE Exchange Rate} = \frac{\text{Price of Big Mac in Japan in JPY}}{\text{Price of Big Mac in US in USD}} = \frac{\text{Price Level in Japan (JPY)}}{\text{Price level in the US (USD)}}$$

$$\text{Undervalue} = 100\% \times \left(\frac{\text{PPP exchange rate} - \text{Exchange rate}}{\text{Exchange rate}} \right)$$

- However PPP Theory does not hold exactly because
  - Transport costs are not zero
  - Many goods and services are non-tradable (*e.g.* haircuts, education)
  - Barriers to trade may be present
  - Other determinants of exchange rate

Inflation differentials

- If Japan inflation rate > US inflation rate, USD appreciates against JPY
- If Japan inflation rate < US inflation rate, USD depreciates against JPY
- Proof: see PPP Exchange rate formula and $g_{A/B} \approx g_A - g_B$

  $g_{\text{PPP exchange rate}} \approx$ Japan Inflation rate−US inflation rate

- **[IMPT]** PPP Theory predicts that countries with inflation rates $X\%$ per year higher than the US will see

their currencies depreciate by $X\%$ per year against the USD

9.3 Government's Role in Exchange Market

Types of central bank's roles

- Managed/fixed: *e.g.* HKD/USD market has a fixed exchange rate (aka **peg**)
  - To prevent/slow down appreciation to help exporters and those competing against exports
  - To prevent/slow down depreciation help import-using industries and consumers
  - Keeping the xchange rate stable to reduce the risk for doing international business transactions (SG)
  - Pegging one's currency to USD ties one's monetary policy to that of the Fed, gaining credibility to fight inflation
- Floating/flexible: Central banks allow demand and supply to operate freely in the currency market
- Managed float: *e.g.* would be MAS which manages the value of SGD against a basket of currencies of its major trading partners, but without explicit commitments

9.3.1 Managed exchange rate

- To prevent appreciation, the Central bank sells the currency to increase supply of currency, eliminate excess demand, and accumulates foreign reserves
  - Amount sold is equal to the amount of excess demand
- To prevent depreciation, the Central bank buys the currency by depleting foreign reserves to eliminate excess supply
  - Amount bought is equal to the amount of excess supply
- **[IMPT]** If currency traders expect depreciation (*e.g.* Thai Baht if they suspect that the Central Bank does not have enough foreign reserves),
  - Supply of Baht shifts right (Thai residents prefer to hold foreign currencies)
  - Demand for Baht shifts left
  - Excess supply widens
  - Even faster depletion of reserves!
- **[IMPT]** If foreign exchange reserves run out
  - Allow the Baht to float: depreciate
  - Devalue the Baht: Lower the peg to a more sustainable level
  - Impose capital control: Restrictions on inflows/outflows of funds
    - Effectively lock the currency market
    - Not recommended since this can scare away investor, nobody wants to invest in a country where you cannot take out money
  - Borrow from IMF: IMF as lender of last resort, but it imposes stringent conditions

9.3.2 97/98 Asian Financial Crisis

- Bank of Thailand abandoned its peg in July 1997
- Baht depreciated by nearly 20% but kept weakening
- Thai banks and business with USD debt are now in trouble (could not pay their debts and so bankruptcy?)
- Currency crisis became financial crisis and serious recession!
- By January 1998, the Baht had depreciated by over 50%
- Investors started to wonder if banks and companies in nearby countries were similarly vulnerable
- Currency crisis spread to rest of Asia
- Thailand Indonesia, and South Korea received IMF loans to stabilize currencies, but had to cut budget deficits and raise interest rates during recessions
- Malaysia imposed capital controls and devalued the MYR
- Lessons learnt
  - The need for ample foreign exchange reserves
  - The need to monitor private sector borrowing in foreign currency

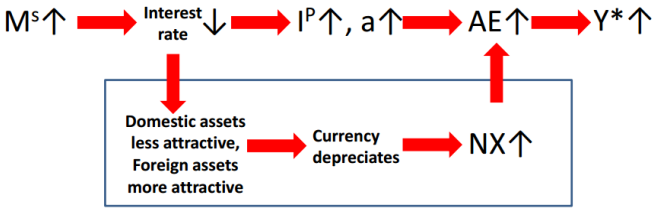
9.4 Exchange Rate and the Macroeconomy

9.4.1 Exchange rate, AE, and Y

- $\uparrow Y$ can lead to currency depreciation
- Similarly, currency depreciation leads to ↑NX ⇒ AE↑ ⇒ $\uparrow Y^*$
- Hence, open economies can be subjected to demand shocks from exchange rates

9.4.2 Exchange rate and monetary policy

- Monetary policy affects exchange rate



- **[IMPT]** Exchange rate channel makes monetary policy's impact on output more powerful in an open economy than in a closed one
- If exchange rate is fixed against another currency, there will be loss of monetary autonomy
  - *e.g.* HK pegs HKD to USD so HK's i/r must follow US i/r, cannot maintain its own monetary policy
  - Suppose HK's and US's initial interest rates are the same, if the Fed chooses to ↑i/r and if HK Monetary Authority (HKMA) does not follow suit, investors and traders will put depreciation pressure on the HKD
  - Because US assets are perceived to have higher returns, HKMA cannot defend the peg forever
  - Hence, HKMA must follow the Fed's i/r
- **The Impossible Trinity** (The Trilemma): We can at most pick 2 out of 3 policy ideals
  - Free Capital Mobility

- Exchange Rate Management
- Monetary Autonomy

9.4.3 Exchange rate and the trade balance

Trade deficit: Imports - Exports > 0
Trade surplus: Exports - Imports > 0
Bilateral trade balance: measured against one other country
Overall trade balance: measured against the world
Trade deficit = Net Financial Inflow

$$Q^D \text{ of USD} = Q^S \text{ of USD}$$

US trade deficit w/ Japan = US net financial inflow from Japan

Japan trade surplus w/ US = Japan net financial outflow to US

Start at A

Japan residents decide to buy $5 billion of US assets

- Demand for $ shifts **right**
- $ **appreciates**
- US exports to Japan ↓ by $2bn (movement along $D\$_2$)
- US imports from Japan ↑ by $3bn (movement along S$)
- US trade deficit rises by **$5 billion!**