

## Chapter One

**Opportunity Cost** is the quantity of other goods that must be sacrificed to get an increment in the first good

**Production efficiency** is when more output of one good or service can be obtained only by sacrificing some output of another good or service

**Economy Wide PPF** is the combination of goods and services that can be produced by an economy when all available productive resources are in use.

**Economics** is concerned with the improvement of society while using the translation of ideas into formal models through mathematics, and the testing of ideas/models through the use of statistics.

**Macroeconomics** studies economies as a system in which feedbacks among sectors determines national output, employment, and prices.

**Microeconomics** is the study of individual behaviour in the context of scarcity.

In a **Mixed Economy** goods and services are supplied both by private supplier and the government.

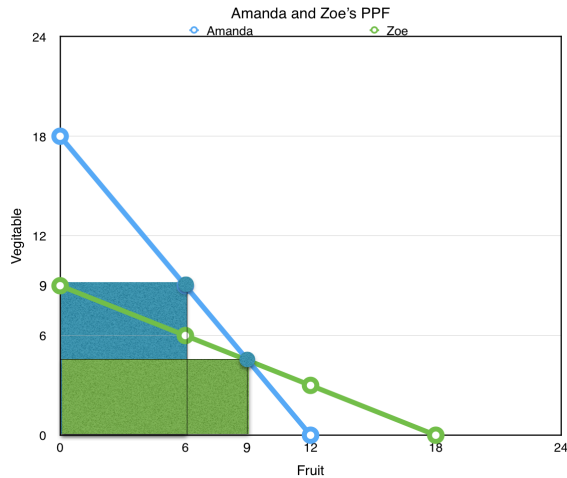
A **Model** is the formalization of theory that facilitates scientific enquiry.

A **Theory** is a logical view of how things work, and is frequently formulated on the basis of observation.

The **Opportunity Cost** of a choice is what must be sacrificed when a choice is made.

Here is an example of a PPF where Amanda and Zoe are producing fruits and vegetables with different efficiencies. Their resource in the case is time, which they have 36 hours of.

	Hours/F	Hours/V	Fruit	Veg
Amanda	3	2	12	18
Zoe	2	4	18	9



**Autarky(economic independence or self-sufficiency)**

Amanda:(6 Fruit, 9 Vegetables)

Zoe:(9 Fruit, 4.5 Vegetables)

**Production Optimization**

Opp Cost(Amanda) Fruit = Rise/Run =  $18V/12F = 1.5V/F$

Opp Cost(Amanda) Vegetables =  $12F/18V = 0.66F/V$

Opp Cost(Zoe) Fruit =  $9V/18F = 0.5V/F$

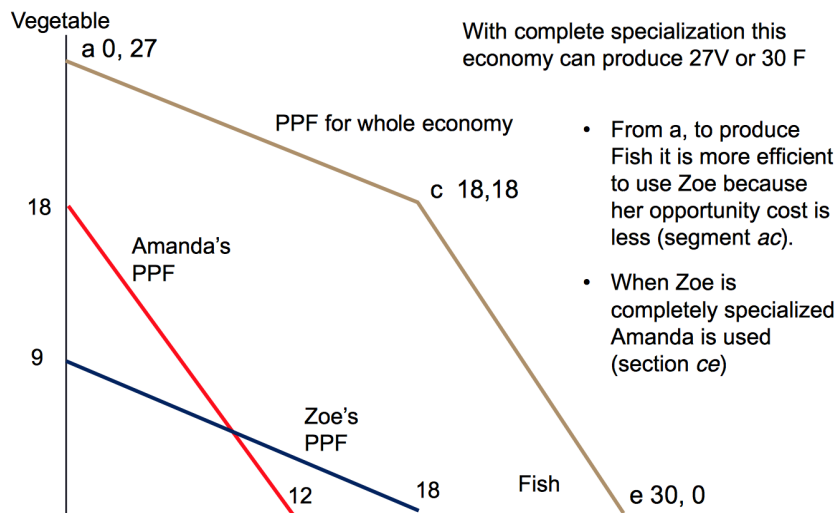
Opp Cost(Zoe) Vegetables =  $18F/9V = 2F/V$

Amanda's Opp = 18V

Zoe's Opp = 18F

-There for Amanda should specialize in producing Vegetables, where as Zoe should specialize in producing Fruit. This is an example of a comparative advantage

**Economy Wide PPF**



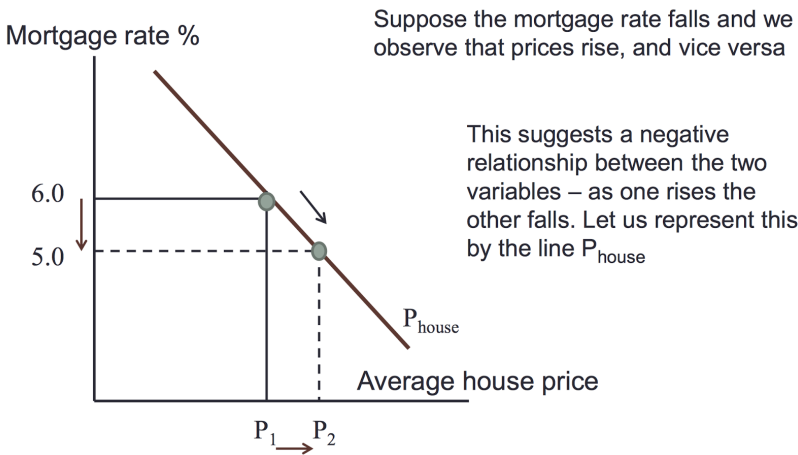
The **Economy-Wide PPF** (Production Possibility Frontier) is the set of products combinations that can be produced in the economy when all available productive resources are in use

An **Economic Recession** is when output falls below the economy's capacity output.

An **Economic Boom** is when output grows above normal capacity output.

The **Productivity of Labour**, defined by the output per worker depends on skill, knowledge, and experience. Aswell as **Capital Stock**, like machinery, equipment, and software(which is also based on current technology).

## Chapter Two



With all other aspects constant, the downward sloping line  $P(\text{house})$  represents a negative relationship between the two variables.

Value of Index = (Absolute Value of Index/Absolute Value of Base Year) x 100

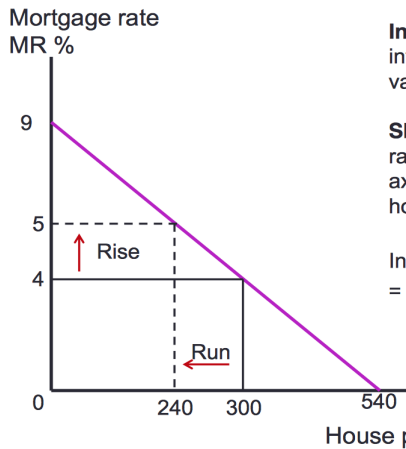
Ex. House Prices by Time Period

	Price in \$\$\$	House Price Index
<b>1999</b>	330,000	100
<b>2000</b>	345,000	104.6
<b>2009</b>	605,000	183.3
<b>2010</b>	740,000	224.2

<b>201 1</b>	800,000	242.4
<b>201 2</b>	870,000	263.3

**Value of Index**=(345,000/330,000) x 100

**Value of Index** = 104.6



**Intercepts:**

intersection of line with one axis when variable on other axis = 0

**Slope:**

ratio of change in variable on vertical axis to change in variable on horizontal axis (= rise/run)

In this example slope =  $\frac{9}{-540} = 1/60$   
= - 0.0167

**MR** = a - b\*(slope)

**MR** = 9-1/60Ph or **Ph** = 540 - 60MR

**Consumer Price Index(CPI):** Based on 'basket' of consumer goods and services

CPI=(Cost of Basket in year t prices/Cost of Basket in Base year prices) x 100

Inflation/Deflation Rates = Annual increase/decrease in CPI

Basket: average family of four consumption in cost, determined by the government

**Wage Rate Index:** Based on an average of earnings in different occupations

**Fuel Price Index:** Based on an average of different prices of fuel

**Basket** is a family of fours average consumption determined by the government, and its cost.

**Economists** use economic theories and models to explain behavior and predict policy outcomes.

**Econometrics** is the science of quantifying relationships between economic variables

**Regression line** shows average relationship between variables – here the mortgage rates and house prices. The equation of the regression line quantifies the relationship between mortgage rates and house prices.

**Positive Economics:** objective and scientific explanation of how the economy functions

**Normative economics:** recommendations that incorporate valued judgments

### **Nominal vs Real Return Rates**

Your Nominal Return Rate is the percent in which an investment grows over time due to things like interest rates, or mortgage rates. Where as a Real Return Rate is the percent in which an investment grows over time in relation to inflation rates over that period of time. For example if you invest 100\$ for a year with a 10% growth rate, by the end of the year your Nominal Return will be 110\$. During that year though there is a 2% inflation rate, meaning money is overall worth 2% more by the end of the year so your Real Return is only 108\$.

**Nominal Price Index** is based on current \$ price

**Real Index** = (nominal price index/CPI)x100

Nominal Earnings			Real Earnings		
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year	average weekly earnings	average hourly earnings	Consumer Prices (CPI)	Average weekly Earnings	Average hourly earnings
2003	100.0	100.0	100.0	100.0	100.0
2004	102.7	102.7	101.8	100.8	100.9
2005	106.7	106.2	104.2	102.4	101.9
2006	109.4	108.8	106.1	103.0	102.5
2007	114.1	113.8	108.5	105.2	104.9
2008	117.4	117.7	111.0	105.7	106.1
2009	119.2	121.3	111.3	107.1	109.0
2010	123.5	125.0	113.3	109.0	110.3
2011	126.6	127.5	116.6	108.6	109.4

Relative **Real** hourly earnings 2003-2011 =  $(127.5/116.6) \times 100$

Relative **Real** hourly earnings 2003-2011 = 109.4

**%Change** =  $((P2-P1)/P1) \times 100$

**%Change** =  $((263.3-242.4)/242.4) \times 100$

**%Change** = 8.62%

## Chapter Three

Price	Demand	Supply
10	0	18
3	7	4
2	8	2
1	9	0
0	10	0

### **Demand**

y-intercept: Quantity Demand = 0, Price = 10

slope:  $(\Delta \text{price} / \Delta \text{quantity supplied}) = (-1/1) = -1$

equation of line:  $P = a - b(Q)$ ,  $P = 10 - 1Q$

### **Supply**

intercept: Quantity Supplied = 0, Price 1

slope:  $(\Delta \text{price} / \Delta \text{quantity supplied}) = (1/2) = 0.5$

equation of line:  $P = a - b(Q)$ ,  $P = 1 + 0.5Q$

### **Equilibrium**

To find the equilibrium you must find when the equation for supply equals the equation for demand

**Equilibrium** = change in quantity demanded/change in quantity supplied

Ex.  $(P=10-1Q)=(P=1+0.5Q)$

**Aggregate Demand** is the combination of two consumers/markets. Instead of averaging them out you have to add both of these quantities, and prices.

### **Demand Influences**

- the prices of related goods
- consumer incomes
- tastes and networks
- expectations

### **Complementary Goods**

-if the price of one good increases, the demand for the other decreases (The demand curve for a good will shift to the left if the price of its complementary good increases)

### **Substitute Goods**

-if the price of one good increases, the demand for the other increases (the demand curve for a good will move to the right if the price of its substitute good increases)

**Quotas** is a limit on a market set by the government, price ceilings and floors are examples of this limit

When the government tries to regulate markets they incorporate price ceilings and price floors.

**Price Ceilings** are below the equilibrium. They are meant to hold down the price which leads to excess demand.

**Price Floors** are above the equilibrium. They are meant to reduce demand which increases supply, and example of a price floor is minimum wage.

**Positive Economics:** objective and scientific explanations of how the economy functions

**Normative Economics:** recommendations that incorporate valued judgements

**Economic Equity:** the distribution of well being among members of society

## Chapter 4

### Summary

-Real GDP growth Rates

-Inflation Rates

-Unemployment Rates / indicators

The three main indicators of Macroeconomic Performance

a) Output of goods and services

Rate of growth of output

b) The Price Level

Rate of inflation (annual % change in price level)

c) Employment

Unemployment

Rate of Growth =  $[(\text{Second Term} - \text{First Term}) / (\text{First Term})] * 100$

Rate of Growth of Real GDP =  $[(\text{Real GDP year 2} - \text{Real GDP year 1}) / (\text{Real GDP year 1})] * 100$

Inflation Rate =  $[(\text{CPI year 2} - \text{CPI year 1}) / (\text{CPI year 1})] * 100$

Three measures of nominal GDP

1. Output-based GDP = sum of all net outputs by industries as measured by value (value added = market value of output - costs of inputs purchased from other businesses)

-inputs purchased from other businesses are intermediate inputs

2. Income-based GDP = sum of payments to factors of production (Domestic Income  $CCA + T_{IN}$ )
  - Capital Consumption Allowance(CCA): covers the depreciation of capital stock
  - Domestic Income(DI) =  $W + BI$
  - Employment Income(W): the sum of all wages, salaries, and benefits paid to labour
  - Business and Investment Income(BI): the sum of corporate profit, other business income and interest/investment
  - GDP at basic price =  $DI + CCA$
  - GDP at market price =  $W + BI + CCA + T_{IN}$
  - Net Indirect Tax( $T_{IN}$ ) = Sales + Excess Taxes - Subsidies
  
3. Expenditure-based GDP = sum of expenditures on final goods and services
  - Expenditure-based GDP =  $C + I + G + X - IM$
  - C = Consumption expenditure by households
  - I = Investment expenditure by business on buildings, machinery, and inventories
  - G = Government expenditure on currently produced final goods and services
  - X = exports of goods and services
  - IM = imports of goods and services
  - GDP at market price =  $C + I + G + X - IM$

Nominal GDP = output and incomes of a given year measured with current market prices of goods and services

- Real GDP, or GDP in constant dollars = output and incomes of given year measured with base year prices of goods and services
- Changes in Nominal GDP = Changes in prices and quantities
- Real GDP = Nominal GDP is adjusted by GDP deflator
- Changes in Real GDP = Changes in quantities
- GDP deflator for year t:  $GDP_t = (Nominal\ GDP_t / Real\ GDP_t) * 100$
- GDP deflator: covers all goods and services included in GDP
- GDP deflator: deflates the dollar value of current output to what it would have been in base years prices.
- the CPI is based on “representative baskets” of goods and services consumers buy

General Price Level (determined by three factors)

- 1 Labour cost per unit of output
- 2 Market and producer price setting that gives gross business income per unit of output
- 3 Net indirect taxes per unit of output

$$\text{Then } P = (W/Y) + (BI+CCI / Y) + (T_{IN} / Y)$$

Note: Changes in any one of these three components changes the general price level and nominal GDP

Per Capita Real GDP = Real GDP / Population (indicator of standard of living)

## Chapter 5

### Chapter Summary

- An Aggregate Demand and Supply Model
- Equilibrium output and potential output
- Growth in potential output
- Business cycles and output gaps
- Output gaps and unemployment rates
- Adjustments to output gaps

### Short-Run Aggregate Demand/Aggregate Supply Model

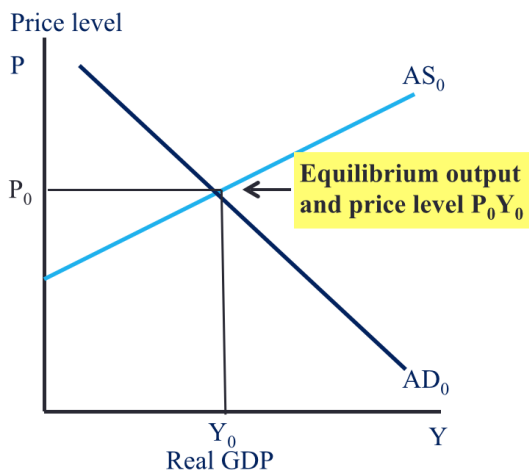
Short Run Assumptions: Constant factor-prices esp. money wage rates, fixed labour force, capital stock, and technology

$\Delta$ output  $\rightarrow$   $\Delta$ employment and  $\Delta$ capital utilization

$AD = (C + I + G + X - IM)$  (at different price levels)

$AS = P$  at different rates of real output

AS reflects unit costs of production with constant input prices and producer price setting



Aggregate Demand(AD) Slope =  $-\Delta P / \Delta Y$

Downward sloping AD from 3 different effects of  $\Delta P$

- 1) Interest Rates: increase in  $P$  = increase in interest rates = increase in finance cost = decreased expenditures
- 2) Substitution effect: increase price = increase (Canadian prices / US prices) = decrease exports = increased imports = decreased expenditures
- 3) Wealth effect: increased price = decreased (nominal wealth /  $P$ ) = decreased expenditures

### The Aggregate Demand Curve

- shows  $\Delta$ expenditure caused by  $\Delta P$
- assumes all determinants of expenditure, except prices which are constant

Aggregate Supply(AS) Slope =  $\Delta P/\Delta Y > 0$

-The AS curve shows the relationship between  $\Delta$ Output and  $\Delta P$

-assumes money wage rates and other input prices are constant

$$\Delta Y = \Delta(Y/N) = \Delta(W/Y) = \Delta P, \quad \Delta P/\Delta Y > 0$$

Business Cycles and Outputs

Business Cycles = Output Gap when  $Y$  does not equal  $Y_p$

$$\text{Output Gap} = [(Y - Y_p)/Y_p] * 100$$

-caused by fluctuations in AD/AS conditions, and act as indicators of macro performances

$Y - Y_p < 0$  Recessionary Gap (high unemployment, low inflation pressure or deflation)

$Y - Y_p > 0$  Inflationary Gap (low unemployment, inflationary pressure)

$Y = Y_p$  Full Employment (stable inflation)

**Output Gaps in AD/AS diagrams**

Given  $Y_p$  and  $AS_0$

**Recessionary gap:**

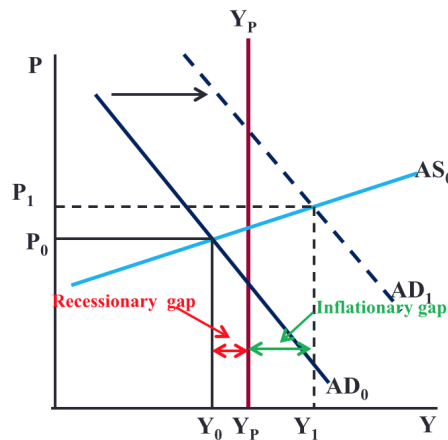
$$AD_0 \rightarrow P_0 Y_0$$

$$Y_0 < Y_p$$

**Inflationary gap:**

$$AD_1 > AD_0 \rightarrow P_1 Y_1$$

$$Y_1 > Y_p$$



**Adjustment to Output Gaps (Inflationary Gap)**

Initial equilibrium AD/

$AS_1$  involves

**inflationary gap**

$$Y_1 > Y_p > 0$$

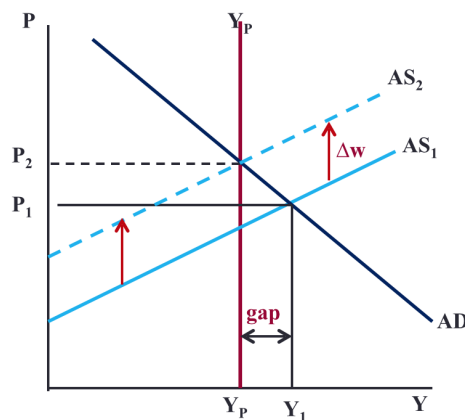
Low unemployment and labour shortages

→ ↑ money wage

→ ↑ unit labour costs

→ ↑ shift in AS,  $AS_1 \rightarrow AS_2$

→ **Equil** with  $Y = Y_p, P = P_2$



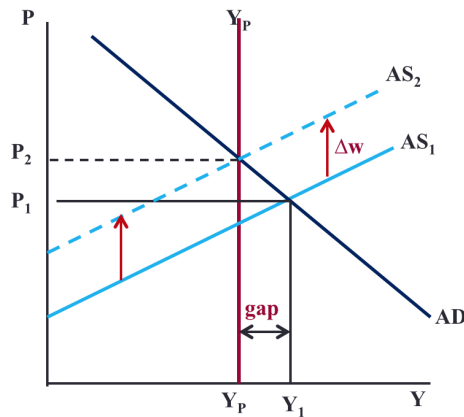
## Adjustment to Output Gaps (Recessionary Gap)

Initial equilibrium AD/  
 $AS_1$  involves  
 inflationary gap  
 $Y_1 > Y_P > 0$

Low unemployment and  
 labour shortages

- ↑ money wage
- ↑ unit labour costs
- ↑ shift in AS,  $AS_1 \rightarrow AS_2$

→ Equil with  $Y = Y_P, P = P_2$



Two roles for macroeconomic policy:

- 1 Moderate short term transitory fluctuations to stabilize output and employment
- 2 Change AD and AS to offset persistent output gaps

Monetary Policy: sets short term interest rates to achieve medium term inflation control. Responds strongly to offset persistent output gaps in setting its interest rate.

Fiscal Policy: sets annual budget plan to control deficits and debt ratios. Tax and transfer programs provide built-in short term AD stabilization. Change structural budget balances to offset persistent recessionary gaps.

## Chapter 6

### Chapter Summary

- Short Run AD output
- Consumption, saving, and investment
- Exports / Imports
- Aggregate Expenditure and Equilibrium Real GDP
- The Multiplier

### Short run AD and Output

Assume: All prices and wages are fixed; businesses produce output demand and labour, accepts opportunities to work; money supply, interest rates and exchange rates are fixed

### Aggregate Expenditure (AE)

From National Account (without government)  $AE = C + I + X - IM$

With P constant  $Y = AE$  (equilibrium real GDP)

## Consumption Function

- Consumption Expenditure(C) is the largest component of AE
  - Consumption Expenditure is the planned expenditure by households on current output
  - Relationship between C and disposable income(YD) assuming no government  $YD = Y$
  - changes in Y cause changes in C
- Ex. increase Y = increase C, and decreased Y = decreased C,  $0 < \Delta C / \Delta Y < 1$

Ex. Let  $C_0 = \text{constant} > 0$ ,  $0 < c < 1$  ( $c = \text{positive fraction}$ )  
 explain  $C = C_0 + cY$

$C_0$  autonomous consumption (consumption not related to current Y)

$c = \text{marginal propensity to consume}$  ( $c = \Delta C / \Delta Y = \text{MPC}$ )

$cY = \text{induced consumption determined by Y}$

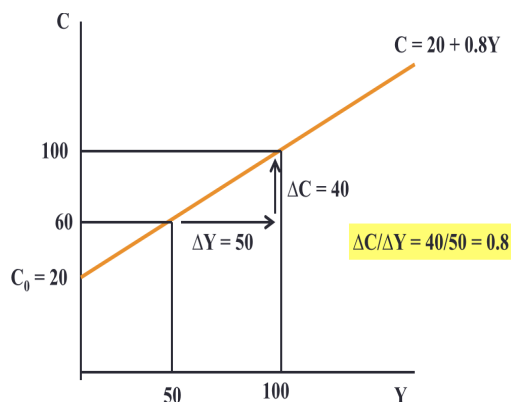
A numerical example:

$$C = C_0 + cY, \quad \text{and} \quad S = -C_0 + (1-c)Y$$

$$C = 20 + 0.8Y \quad \text{and} \quad S = -20 + 0.2Y$$

Y	C	$\Delta C / \Delta Y$	S = Y - C	$\Delta S / \Delta Y$
0	20	--	-20	--
50	60	0.8	-10	0.2
100	100	0.8	0	0.2
150	140	0.8	10	0.2
200	180	0.8	20	0.2

- Autonomous  $C = 20$
- $\text{MPC} = \Delta C / \Delta Y = 0.8$



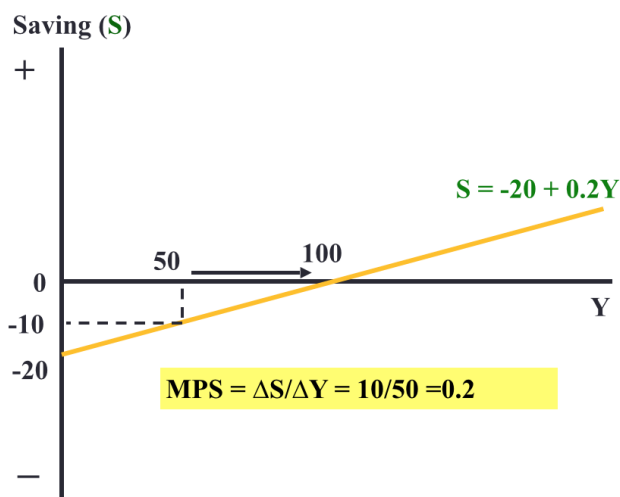
## The Saving Function

$$C = 20 + 0.8Y$$

$$S = Y - C$$

$$S = Y - (20 + 0.8Y)$$

$$S = -20 + 0.2Y$$



## The Investment Function

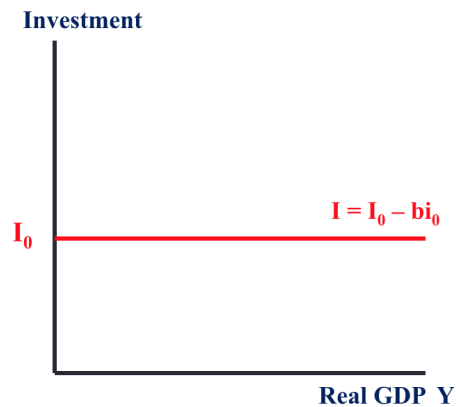
Investment (**I**) *planned* business spending on plant, equipment & inventories

$$I = I_0 - bi_0 \text{ (assuming } i \text{ constant)}$$

Investment is *autonomous*,

Based on business expectations of demand for output & profit

$\Delta i$  &/or  $\Delta$ Expectations  $\rightarrow$  shift  
**I** function



## Export Function (X)

- spending by residents or foreign countries on domestic output
- exports are autonomous expenditure  $X = X_0$

## Export Factors

- Foreign Y
- Domestic and Foreign P
- Foreign Exchange Rates
- Tastes and preferences...

## Import Function (IM)

- domestic spending on foreign output
- IM is embedded in C, I, and X
- $IM = IM_0 + mY$
- $IM_0$  = autonomous imports
- $m = \Delta IM / \Delta Y$  (marginal propensity to import)

## Import Factors

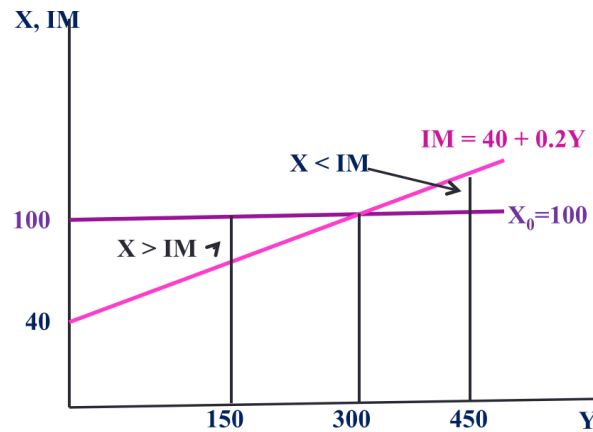
- domestic income Y
- domestic and foreign P
- foreign exchange rates
- tastes and preferences...

## Export and Import Function

Suppose:

$$X_0 = 100$$

$$IM = 40 + 0.2Y$$



$$\text{Aggregate Expenditure (AE)} = C + I + X - IM$$

AE = autonomous expenditure + induced expenditure

$$\text{Suppose } C = 20 + 0.8Y$$

$$I = 20$$

$$X = 50$$

$$IM = 10 + 0.2Y$$

$$AE = 80 + 0.6Y$$

Y	C	I	X	IM	AE	$\Delta AE / \Delta Y$
0	20	20	50	10	80	-
100	100	20	50	30	140	0.6
150	140	20	50	40	170	0.6
200	180	20	50	50	200	0.6

$$AE = C + I + X - IM$$

$$C = C_0 + cY$$

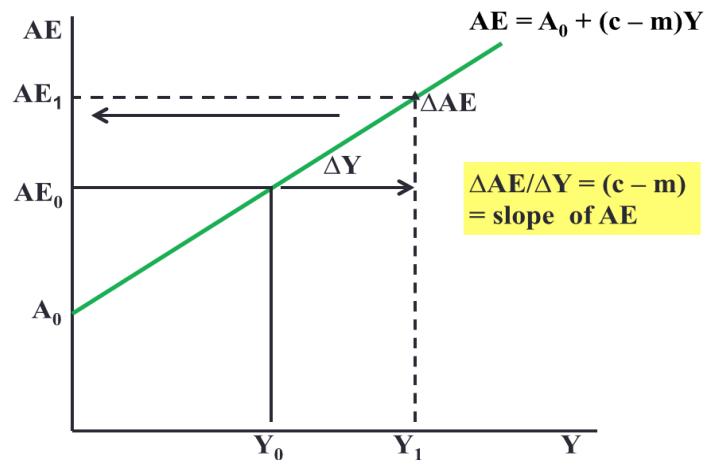
$$I = I_0$$

$$X = X_0$$

$$IM = IM_0 + mY$$

$$AE = C_0 + cY + I_0 + X_0 - IM_0 - mY$$

$$AE = A_0 + (c - m)Y$$



$$(AE = C_0 + cY + I_0 + X_0 - IM_0 - mY) = (AE = 20 + 20 + 50 - 10 + 0.8Y - 0.2Y)$$

$$(AE = A_0 + (c - m)Y) = (AE = 80 + 0.6Y)$$

$$(\Delta AE / \Delta Y = c - m) = (-60 / -100 = 0.6)$$

A numerical example

$$C = 20 + 0.8Y$$

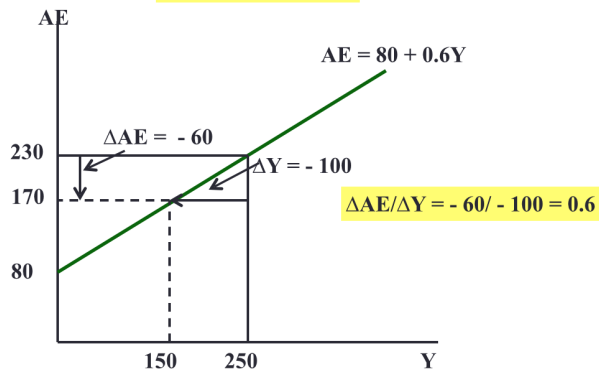
$$I = 20$$

$$X = 50$$

$$IM = 10 + 0.2Y$$

$$AE = 20 + 20 + 50 - 10 + 0.8Y - 0.2Y$$

$$AE = 80 + 0.6Y$$



Equilibrium Output (Short-Run)  $Y = AE$

-current output = planned expenditure on current output

-business revenue cover cost and expected profit

-no unplanned change in inventories

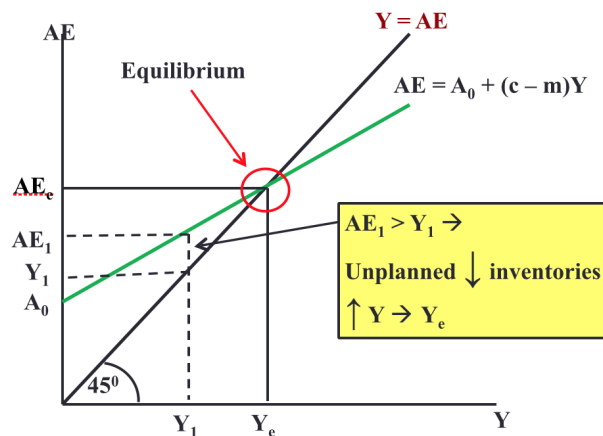
**Equil:  $Y = AE$**

45° line plots all  
 **$Y = AE$**

$$AE = A_0 + (c - m)Y$$

At intersection  
AE & 45° line  
 **$Y = AE$**

$Y \neq Y_e \rightarrow$  unwanted  
 $\Delta$  inventories  $\rightarrow \Delta Y$



**Finding equil Y with basic algebra:**

**The Model:** Consumption:

$$C = 20 + 0.8Y$$

Investment:

$$I = 20$$

Exports:

$$X = 50$$

Imports:

$$IM = 10 + 0.2Y$$

Agg Expend:

$$AE = 80 + 0.6Y$$

**Equilibrium:  $Y = AE$**

$$Y = 80 + 0.6Y$$

$$Y = \frac{80}{(1 - 0.6)} = 200$$

$$Y - 0.6Y = 80$$

$$(1 - 0.6)Y = 80$$

### Adjusted Short-run Equilibrium

-suppose  $Y$  cannot equal  $AE$

$Y > AE$  = increase in unplanned inventory = decrease in  $Y$

$Y < AE$  = decrease in unplanned inventory = increase in  $Y$

change in  $Y = (Y = AE)$

### Equilibrium output and Employment ( $Y_e = AE$ )

$(Y_e < Y_p)$  = Recessionary Gap and high unemployment

$(Y_e > Y_p)$  = Inflationary Gap and low unemployment

$(Y_e = Y_p)$  = full employment

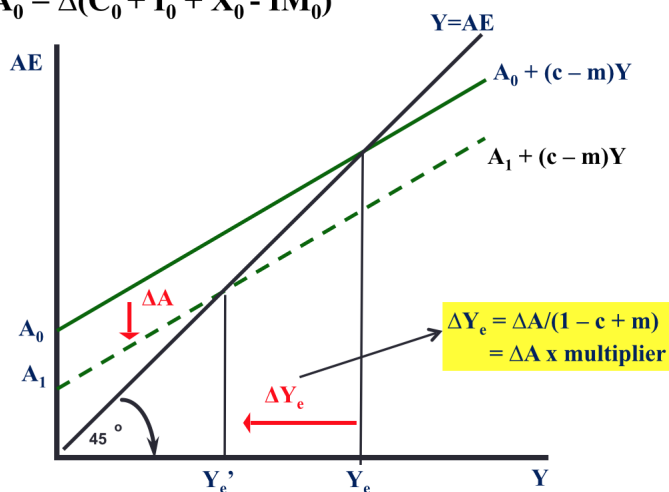
### The MULTIPLIER ( $\Delta Y_e / \Delta A$ that cause it)

$\Delta A$  = parallel vertical shift in  $AE$

$\Delta A = \Delta Y =$  induced  $AE = (c-m) \cdot \Delta Y$

$\Delta Y / \Delta A = 1 / (1 - \text{slope of } AE) = 1 / (1 - (c - m)) = 1 / (1 - c + m)$

### Example $\Delta A_0 = \Delta(C_0 + I_0 + X_0 - IM_0)$



-the multiplier is a number that predicts  $\Delta Y_e$  caused by  $\Delta A$

-the multiplier =  $\Delta Y / \Delta A$

-the multiplier =  $\Delta A / (1 - \text{slope of } AE)$

-larger MPC's and smaller MPM's = steeper AE, larger multipliers

**A Numerical example:**

	<u>Initial case</u>	<u>Increased A: <math>\Delta X = 10</math></u>
Consumption: $C = 20 + 0.8Y$	$C = 20 + 0.8Y$	$C = 20 + 0.8Y$
Investment: $I = 20$	$I = 20$	$I = 20$
Exports: $X = 50$	$X = 50$	<b><math>X = 60</math></b>
Imports: $IM = 10 + 0.2Y$	$IM = 10 + 0.2Y$	$IM = 10 + 0.2Y$
Equilibrium: $Y = 80 + 0.6Y$	$Y = 80 + 0.6Y$	$Y = \mathbf{90} + 0.6Y$
$Y_e = 200$	$Y_e = 200$	<b><math>Y_e = 225</math></b>

$$\Delta Y / \Delta A = 25 / 10 = 2.5 = 1 / (1 - 0.6)$$

An alternative view of equilibrium Y:

from  $Y = AE$

$Y = C + I + X - IM$ , which gives  $Y - C = I + X - IM$ , but  $Y - C = S$

therefore  $S + IM = I + X$  also gives  $Y_c$

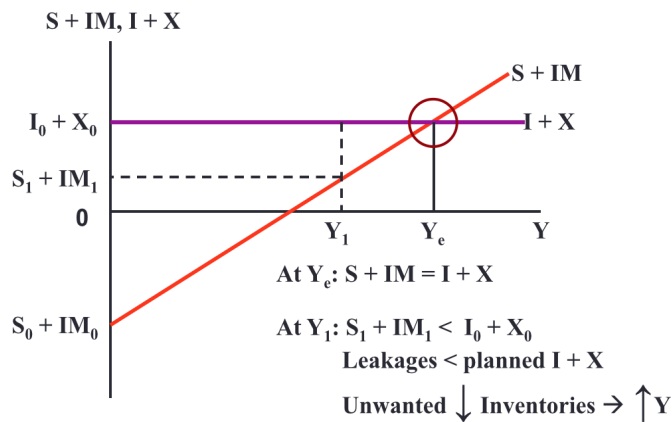
-S and IM are leakages from AE

-I and X are injections into AE

Injections = Leakages = Equilibrium Y

(Paradox of thrift)

**Equilibrium Y:  $S + Z = I + X$**



**Paradox of Thrift: An increase in S at every Y  $\rightarrow$   $\downarrow$   $Y_e$  but no change in S**

Aggregate Expenditure, Equilibrium GDP and Aggregate Demand

Autonomous Expenditure

-independent of current income

$$A_0 = C_0 + I_0 + X_0 + IM_0$$

Induced Expenditure

-spending decisions based on current income

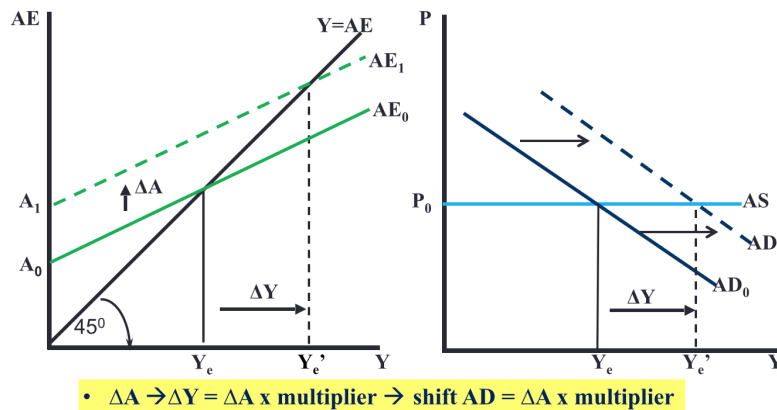
$$MPC \text{ and } MPM = (c - m) = \Delta AE$$

## Key Models

- Equilibrium  $Y = A_0$  multiplier
- Induced Expenditure = Multiplier
- $\Delta A$  multiplier =  $\Delta Y > \Delta A$
- Volatility in  $A$  = Business cycles in  $Y$

## The AD function:

- $Y_e$  from  $Y = AE$  positions the AD curve
- $\Delta A = \Delta Y_e =$  horizontal shift in AD =  $\Delta A \times$  Multiplier
- fluctuations in AD from fluctuations in  $A$  = business cycles in  $Y_e$



## Chapter 7

### Chapter Summary

- Government Expenditure
- Net tax revenue
- Disposable Income
- Government Budget
- Automatic Fiscal Stabilizers (transitory fluctuations)
- Discretionary Fiscal Policy
- Public Debt(PD)

### Government Expenditure(G), Taxes and Equilibrium GDP

- $G = G_0$  is an autonomous part of AE
- then  $A_0 = C_0 + I_0 + G_0 + X_0 - IM_0$
- Net Tax (NT) =  $tY$  (where  $t =$  net tax rate =  $\Delta NT / \Delta Y$ )
- Disposable Income (YD) =  $Y - NT$
- $\Delta NT$  induced by  $\Delta Y = \Delta$  slope of AE =  $\Delta$  multiplier  $\Delta Y / \Delta A$

## Net Taxes and Consumption

-Net Taxes (NT = tY) reduced YD at every Y

$$YD = Y - NT = Y - tY = (1 - t)Y$$

-then  $C = C_0 + cYD$

$$C = C_0 + c(Y - tY)$$

$$C = C_0 + c(1 - t)Y$$

-C is lower at every Y when  $t > 0$

- $\Delta t = \Delta C$  at every Y,  $\Delta C/\Delta t < 0$

A numerical example  $\Delta C/\Delta t < 0$

Assume : NT = tY = 0.15Y

$$YD = Y - NT = Y - 0.15Y$$

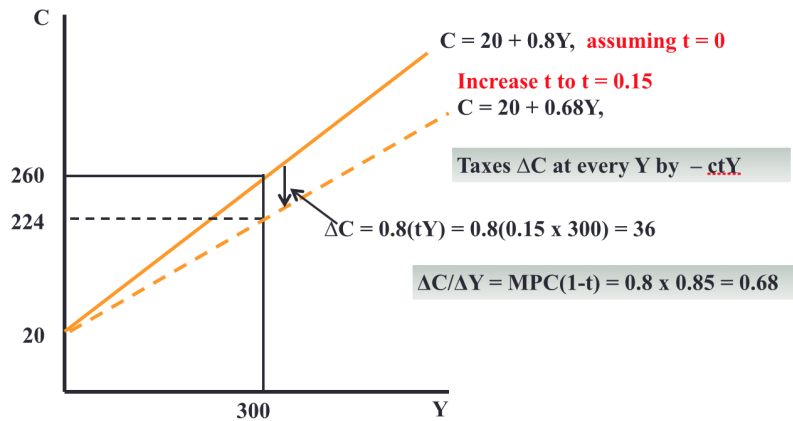
Then:  $C = 20 + 0.8YD$

$$C = 20 + 0.8(Y - 0.15)Y$$

$$C = 20 + 0.68Y$$

Now  $\Delta C/\Delta Y = 0.68$

Slope of C function = 0.68



### Case 1: No Govt

$$\begin{aligned} Y &= C + I + X - IM \\ C &= 20 + 0.8YD \\ I &= 20 \\ G &= 0, NT = 0 \\ X &= 50 \\ IM &= 10 + 0.2Y \end{aligned}$$

### Equilibrium Y

$$\begin{aligned} Y &= 80 + 0.6Y \\ Y &= \frac{80}{(1-0.6)} = \frac{80}{0.4} = 200 \end{aligned}$$

### Case 2: Govt Expend & Tax

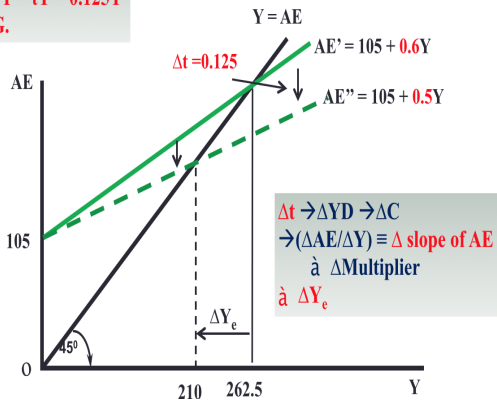
$$\begin{aligned} Y &= C + I + G + X - IM \\ C &= 20 + 0.8YD \\ I &= 20 \\ G &= 25, NT = 0.125Y \\ X &= 50 \\ IM &= 10 + 0.2Y \end{aligned}$$

### Equilibrium Y

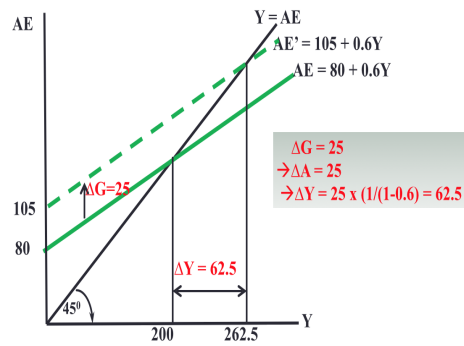
$$\begin{aligned} Y &= 105 + 0.8(1 - 0.125)Y - 0.2Y \\ Y &= 105 + 0.5Y \\ Y &= \frac{105}{(1-0.5)} = \frac{105}{0.5} = 210 \end{aligned}$$

- NT ↓ slope AE: 0.6 to 0.5 → ↓ multiplier: 2.5 → 2.0

Effect on equilibrium Y of adding  $NT = tY = 0.125Y$  to finance G.



- Effect of  $\Delta G$  on equilibrium Y
- Assume  $NT = 0$ ,  $\Delta G = 25$
- Then increase in G, is an increase in A,
- Increase in G  $\rightarrow \Delta Y = \Delta A \times \text{multiplier}$



### The Multiplier Revisited

Multiplier =  $1 / 1 - \text{slope of AE}$

$$\Delta Y / \Delta A = 1 / 1 - c(1 - t) + m$$

-m and t reduce the slope of AE

-lower AE slopes = smaller multiplier

### The Government Budget and Budget Balance

-Government Budget Balance (BB) = revenue - expenditure

$$BB = tY - G$$

BB depends on three variables

-Net tax rate (t) set by the government

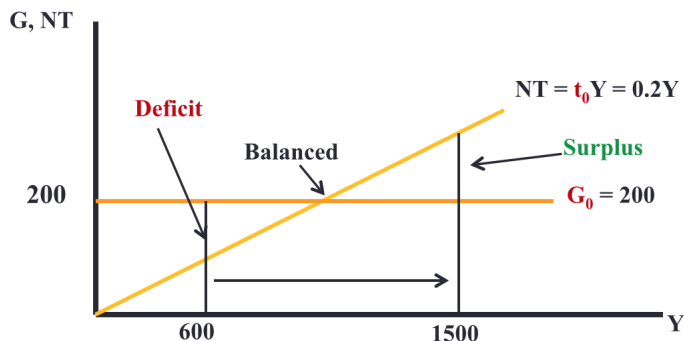
-Expenditure on goods and services (G)

-GDP(Y) determined by AE and AD

side note Net Tax Revenue (NT) = tY

•  $G_0$  &  $t_0$  set by govt's Budget Plan

• Then BB is determined by Y,  $\Delta Y \rightarrow \Delta BB$



A numerical example: The Government's fiscal plan sets  $t_0$  and  $G_0$

$$NT = t_0Y \quad G = G_0$$

Budget Function:  $BB_0 = t_0Y - G_0$

if  $BB_0 = 0.2Y - 200$

-for this fiscal plan the budget balance depends on  $Y$ . If  $Y$  rises from 200 to 1000 the budget balance increases from a deficit of 160 to a surplus of 0. A fall in  $Y$  would reduce the budget balance.

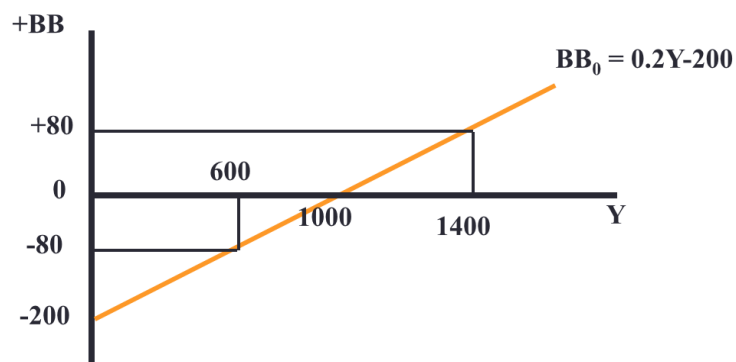
Y	NT	G	BB
200	40	200	-160
600	120	200	-80
1000	200	200	0
1600	320	200	120

A Government Budget Function:  $BB_0 = 0.2Y - 200$

-this fiscal program with  $t = 0.2$  and  $G = 200$

-the BB depends on  $Y$

$-\Delta BB / \Delta Y > 0$



**Fiscal Policy Objectives:**

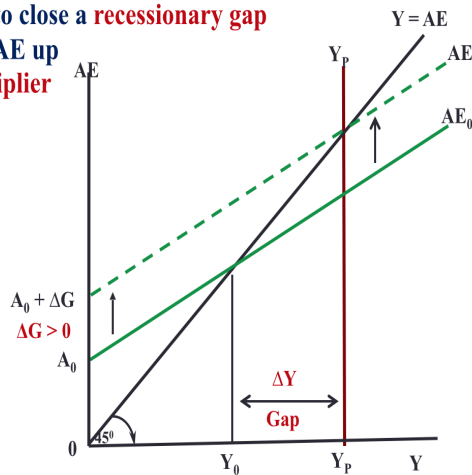
- Stabilize Equilibrium  $Y = Y_p$
- Manage budget deficits and public debt

**Fiscal Policy Instruments:**

- set net tax rate( $t$ ), both taxes and transfers
- set government expenditure( $G$ )
- $\Delta$ Fiscal Policy =  $\Delta$ Fiscal Plan =  $\Delta$ BB function

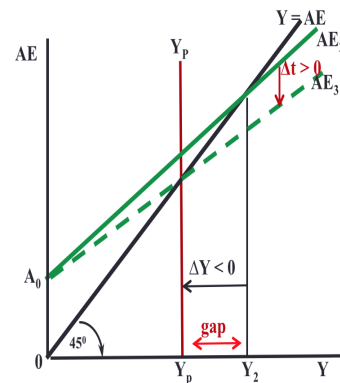
**Fiscal stimulus to close a recessionary gap**

$\Delta G > 0 \rightarrow$  shift AE up  
 $\Delta Y = \Delta G \times \text{multiplier}$



**Fiscal austerity to close an inflationary gap**

$\Delta t > 0 \rightarrow$  reduces slope of AE and the multiplier  
 $\Delta t \rightarrow$  lowers  $Y_e$



**The Structural Budget Balance; An indicator of Fiscal Policy Stance**

- Actual BB: an ambiguous fiscal indicator  $\Delta Y$  and/or  $\Delta$ Fiscal Program =  $\Delta$ BB
- Structural Budget Balance (SSB) = BB estimated and  $Y_p$

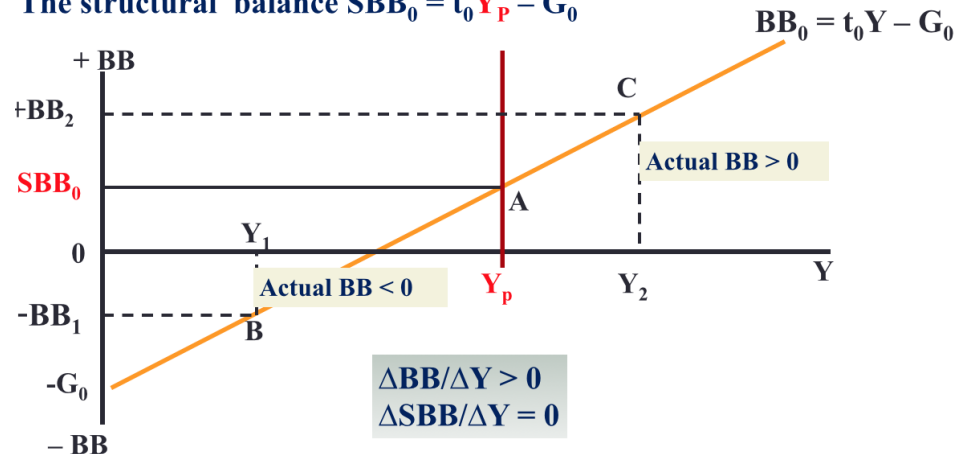
$$SBB = t_0 Y_p - G_0$$

- $\Delta$ Fiscal program ( $\Delta t_0$  and/or  $\Delta G_0$ ) =  $\Delta$ SBB
- $\Delta$ SBB = shift BB function =  $\Delta$ Fiscal Policy Stance

**Actual & Structural Budget Balances**

**The budget plan:**  $BB_0 = t_0 Y - G_0$

**The structural balance**  $SBB_0 = t_0 Y_p - G_0$



## Automatic and Discretionary Fiscal Policy

### Automatic Fiscal Stabilizer

- reduce slope of AE = reduce  $\Delta Y/\Delta A$  (the multiplier)
- $(NT = tY) = (\Delta AE/\Delta Y) = [(1 - t)(c - m)]$
- Built into budget program by setting  $t$  in  $NT = tY$
- $\Delta BB$  changes with  $\Delta Y$  moving along  $BB$  function

### Discretionary Fiscal Policies

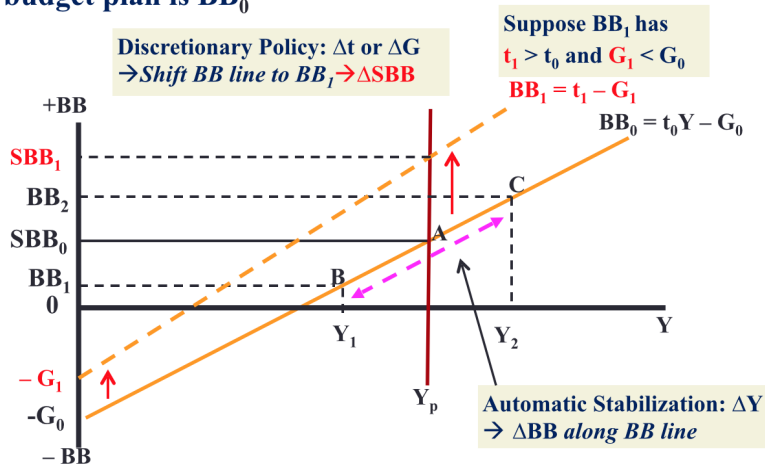
- $\Delta t$  and/or  $\Delta G$  shift  $BB$  function =  $\Delta SBB$
- shift  $AE$  and  $AD$  functions and  $\Delta$ Slopes =  $AE = \Delta Y$

The budget plan sets  $t_0$  and  $G_0$  to give  $BB = t_0Y - G_0$

-Automatic Fiscal Stabilization: The Net Tax Rate  $t$  reduces the size of the multiplier and the effects of transitory fluctuations is autonomous expenditures on equilibrium GDP

-Discretionary Fiscal Policy: changes in net tax rates  $\Delta t$  and government expenditures  $\Delta G$  introduced in a new budget plan to offset persistent autonomous expenditure shifts and stabilize equilibrium GDP at  $Y_p$

### Initial budget plan is $BB_0$



Public Debt(PD) = government bonds issued to finance  $BB < 0$

The outstanding PD =  $\Sigma$  (past BB, + and -)

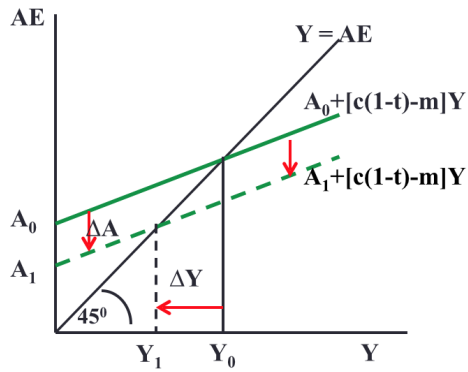
Annual  $\Delta PD = -BB$

Public Debt Ratio =  $PD/Y$

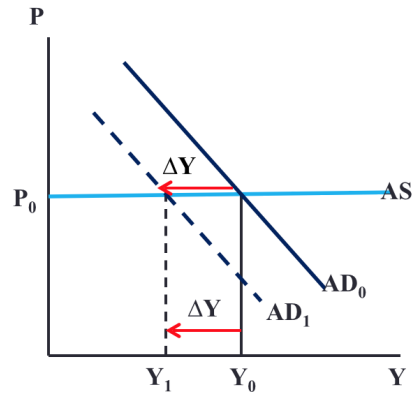
**Equil**  $Y = AE$

$$AE = A_0 + [c(1-t) - m]Y$$

$$Y = A_0 / (1 - c(1-t) + m)$$



**Equil Y & P: AD = AS**



$\Delta A \rightarrow \text{Shift AE} \rightarrow \Delta Y \rightarrow \text{Shift AD} = \Delta Y \rightarrow \Delta Y_e @ P_0$

Multiplier =  $\Delta Y / \Delta A = 1 / (1 - [c(1-t) - m])$

Estimates for Canada:  $c(1-t) = 0.54$

$$m = 0.34$$

The multiplier for Canada:  $\Delta Y / \Delta A = 1 / (1 - 0.54 + 0.34)$

$$= 1 / 1 - 0.2$$

$$= 1.25$$

△