Assumptions and Simplifications:

We will build up the aggregate expenditures model in simple stages. Let's first look at aggregate expenditures and equilibrium GDP *in a private closed economy* –one without international trade or government ($G = Xn = 0$). Then we will "open" the "closed" economy to exports and imports and also convert our "private" economy to a more realistic "mixed" economy that includes government purchases (or, more loosely, "government spending") and taxes.

سنقوم ببناء نموذج إجمالي النفقات في مراحل بسيطة. سيتم في البداية افتراض أن الاقتصاد خاص ومغلق اي اقتصاد بدون تجارة دولية او حكومة .ثم سنفتح الاقتصاد "المغلق" أمام الصادرات والواردات ونحول اقتصادنا "الخاص" إلى اقتصاد "مختلط" أكثر واقعية يتضمن المشتريات الحكومية (أو "الإنفاق الحكومي") والضرائب.

In addition, until we introduce taxes into the model, we will assume that real GDP equals disposable income (DI). And finally, we will assume that the economy has excess production capacity and unemployed labor so that an increase in aggregate expenditures will increase real output and employment but not raise the price level.

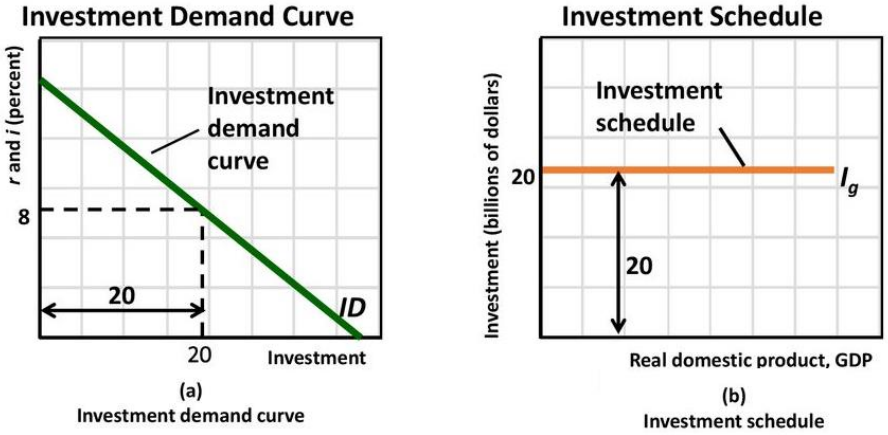
بالإضافة إلى ذلك ، حتى ندخل الضرائب في النموذج ، سنفترض أن الناتج المحلي الإجمالي الحقيقي يساوي الدخل المتاح .(DI) وأخيرًا ، سنفترض أن الاقتصاد لديه طاقة إنتاجية زائدة وعمالة عاطلة عن العمل بحيث تؤدي الزيادة في إجمالي النفقات إلى زيادة الإنتاج الحقيقي والعمالة ولكن لا ترفع مستوى السعر.

Consumption and Investment Schedules

Investment demand vs. Investment schedule

Investment demand curve is as show a negative relationship between the amount of investment and interest rate

The investment schedule shows the amount of investment forthcoming at each level of GDP.



The level of investment spending (here, $20 billion) is determined by the real interest rate (here, 8 percent) together with the investment demand curve ID. (b) The investment schedule Ig relates the amount of investment ($20 billion) determined in (a) to the various levels of GDP.

Investment schedule is independent of level of GDP, since the rate of return and the interest rate together determine the amount of investment.

output and income	Investment (Ig)
$370	$20
390	20
410	20
430	20
450	20

Equilibrium GDP

Aggregate Expenditures Schedule (AE)

In privet close economy the aggregate expenditures consist of consumption plus investment.

$AE = C + Ig$

Equilibrium GDP

Is the level at which the total quantity of goods produced (GDP) equals the total quantity of goods purchased (AE)

$At\ equilibrium\ GDP\colon\ GDP = AE \ \rightarrow \ GDP = C + Ig$

If levels of GDP less than equilibrium level of GDP, spending exceeds production (AE > GDP) → unplanned changes in inventories negative (shortage).

If levels of GDP greater than equilibrium level of GDP, production exceeds spending (GDP > AE) → unplanned changes in inventories positive (surplus).

At equilibrium level of GDP (GDP = AE) unplanned changes in inventories equal zero. Unplanned change in inventories = GDP – AE

Tabular Analysis:

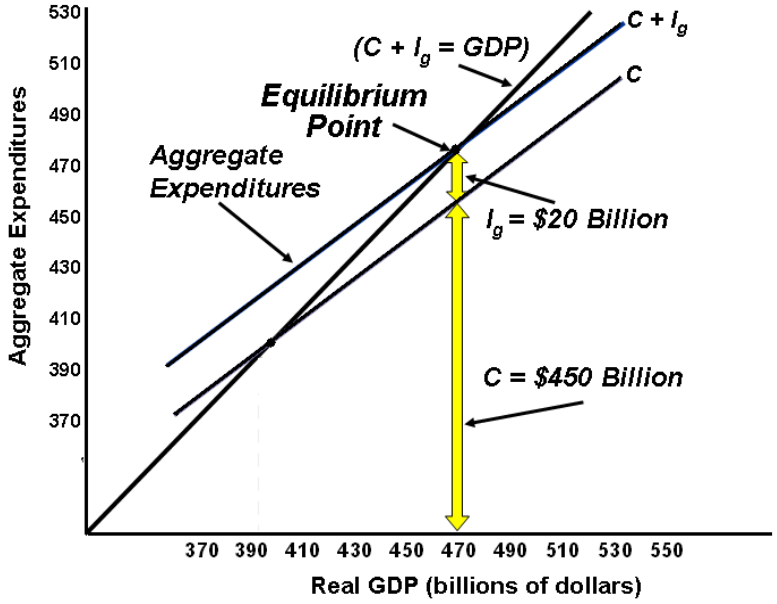
(1) Possible Levels of Employment, Millions	(2) Real Domestic Output (and Income) (GDP = DI),*Billions	(3) Consumption (C), Billions	(4) Saving (S), Billions	(5) Investment (I_g), Billions	(6) Aggregate Expenditure ($C+I_g$), Billions	(7) Unplanned Changes in Inventories, (+ or -)	(8) Tendency of Employment, Output, and Income
(1) 40	$370	$375	$-5	$20	$395	$-25	Increase
(2) 45	390	390	0	20	410	-20	Increase
(3) 50	410	405	5	20	425	-15	Increase
(4) 55	430	420	10	20	440	-10	Increase
(5) 60	450	435	15	20	455	-5	Increase
(6) 65	470	450	20	20	470	0	Equilibrium
(7) 70	490	465	25	20	485	+5	Decrease
(8) 75	510	480	30	20	500	+10	Decrease
(9) 80	530	495	35	20	515	+15	Decrease
(10) 85	550	510	40	20	530	+20	Decrease

The equilibrium level of GDP is the level at which the total quantity of goods produced (GDP) equals the total quantity of goods purchased (C + I g), at $470.

Tendency of employment, output, and income: when GDP > AE → businesses can adjust to accumulation of unsold goods by cutting back on the rate of production. The resulting decline in output would mean fewer jobs and a decline in total income.

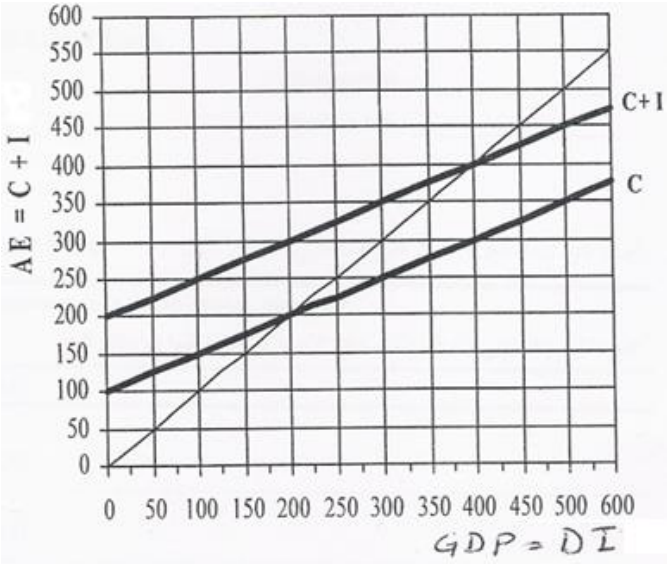
Graphical Analysis:

The aggregate expenditures schedule, C + Ig, is determined by adding the investment schedule Ig to the up-sloping consumption schedule C. Since investment is assumed to be the same at each level of GDP, the vertical distances between C and C + Ig do not change. Equilibrium GDP is determined where the aggregate expenditures schedule intersects the 45° line (GDP = AE), in this case at $470 billion.



Example

Consider the following graph which represents the AE curve for a closed economy. Answer the following questions based on the above graph.



A. What is the break-even level of disposable income?

   At a break-even: C = DI (intersection 45° and C)

   Break even income = $200

B. What is the equilibrium GDP for this economy?

   At equilibrium GDP: AE = GDP (intersection 45° and C +Ig).

   At equilibrium GDP = 400

C. What is the amount of investment (Ig) for this economy?

   Ig = the vertical distance between C and C + Ig (the difference between the intercepts)

   Ig = 200 - 100 = $100

D. At the $400 level of disposable income, what is the APC?

   When DI = 400 → C = 300 → APC = C/DI = 300/ 400 = 0.75

E. At the $500 level of DI, what is the amount of saving?

When DI = 500 → C = 350 but S = DI – C = 500 – 350 = $150

F. What is the MPC for this economy?

MPC = $\frac{\Delta C}{\Delta DI}$ = $\frac{(300-200)}{(400-200)} = \frac{100}{200}$ = 0.5

Example

GDP = DI	Saving	Consumption	Investment	AE
600	-150		150	
700	-75		150	
800	0		150	
900	75		150	
1000	150		150	
1100	225		150	
1200	300		150	

Consider the table above which represents aggregate expenditure (AE) for a private closed economy.

A. Complete the above table.

GDP = DI	Saving	Consumption C = DI - S	Investment	AE AE = C + Ig
600	-150	750	150	900
700	-75	775	150	925
800	0	800	150	950
900	75	825	150	975
1000	150	850	150	1000
1100	225	875	150	1025
1200	300	900	150	1050

B. What is the break-even level of income?

At a break-even income: S =0 ⇨ when DI = $800

C. What is the equilibrium level of GDP?

At equilibrium GDP: AE = GDP ⇨ when GDP = 1000

D. What is MPC for this economy?

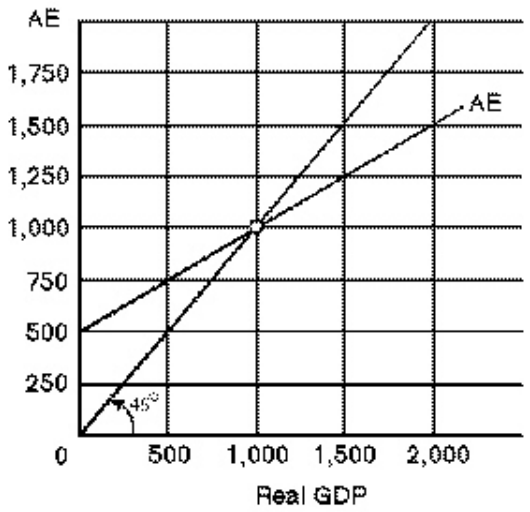
MPC = $\frac{\Delta C}{\Delta DI}$ = $\frac{(775-750)}{(700-600)} = \frac{25}{100}$ = 0.25

E. *At equilibrium, what is the APC?*

APC = $\frac{C}{DI}$, At equilibrium C = 850 → APC = $\frac{850}{1000}$ = 0.85

Example

Consider the following graph which represents the AE curve for a closed economy. Answer the following questions based on the above graph.



1. What is MPC for this economy?

   MPC = the slope of the AE

   MPC = $\frac{\Delta \text{ AE}}{\Delta \text{ GDP}} = \frac{(1000 - 750)}{(1000 - 500)} = \frac{250}{500} = 0.5$

2. What is the equilibrium GDP for this economy?

   At equilibrium GDP: AE = GDP (intersection 45° and AE).

   At equilibrium GDP = 1,000

3. At a real GDP of $500 billion, what is the economy unplanned inventory?

   At a real GDP of $500 billion: AE = 750

   Unplanned change in inventories = GDP – AE = 500 – 750 = −250

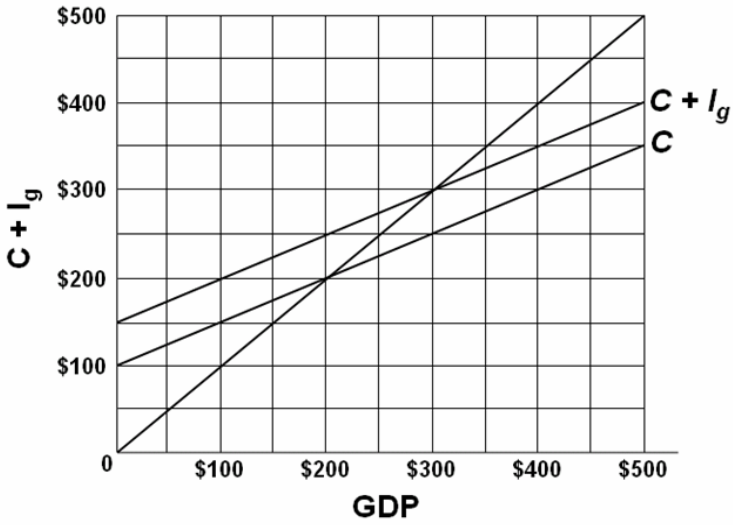
Example

Refer to the above diagram for a private closed economy. Answer the following questions based on the graph.

1. What is the equilibrium level of GDP?

   At equilibrium GDP: AE = GDP (intersection 45° and AE).

   At equilibrium GDP = 300



2. At the equilibrium level of GDP, what is the value investment and saving

   I_g = the vertical distance between C and C + I_g (the difference between the intercepts)

   I_g = 150 – 100 = $50

   Saving = DI – C

   At the equilibrium level of GDP: C = 250

   Saving = DI – C = 300 – 250 = 50

Other Features of Equilibrium GDP:

In the private closed economy C + I_g = GDP. There are two more characteristics of equilibrium GDP:

- *Saving and planned investment (I_g) are equal ($S = I_g$).*
- *There are no unplanned changes in inventories (GDP = AE).*

GDP = DI	Saving	Consumption C = DI - S	Investment	AE AE = C + Ig
600	-150	750	150	900
700	-75	775	150	925
800	0	800	150	950
900	75	825	150	975
1000	**150**	**850**	**150**	**1000**
1100	225	875	150	1025
1200	300	900	150	1050

Saving equals Planned Investment:

As shown by row 6 in table above, saving and planned investment is both $150 at the $1000 equilibrium level of GDP.

Saving is a leakage or withdrawal of spending from the economy's circular flow of income and expenditures.

التسرب: الجزء الغير منفق من الدخل على الانتاج المحلى

Investment is an injection of spending into the income expenditure stream.

الحقن: انفاق ياتي من مصدر اخر غير الدخل المحلي لعناصر الانتاج

If the leakage of saving at a certain level of GDP exceeds the injection of investment, then AE will be less than GDP. If the injection of investment exceeds the leakage of saving, then AE will be greater than GDP.

At equilibrium: Leakage = injection

If leakage > injection → GDP > AE

If injection > leakage → AE > GDP

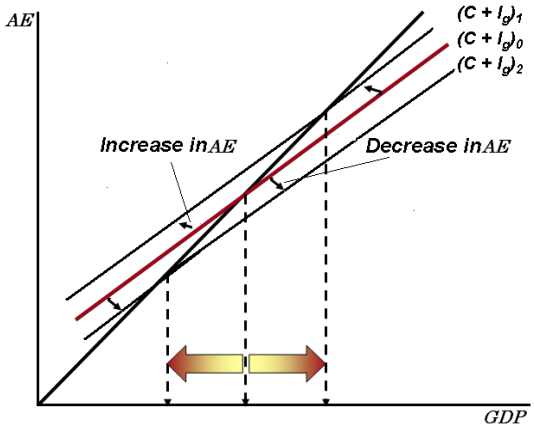
No unplanned changes in inventories

Unplanned changes in inventories = GDP - AE, but at equilibrium GDP = AE → no unplanned changes in inventories (unplanned changes in inventories = 0).

At equilibrium GDP: the amounts of goods produced equal the amounts of goods purchases.

Changes in the Equilibrium GDP and the Multiplier

Changes in the Equilibrium GDP



In the private closed economy, the equilibrium GDP will change in response to changes in either the investment schedule or the consumption schedule.

C ↑ or Ig ↑ ⇨ AE will shift upwards as from $(C + Ig)_0$ to $(C + Ig)_1$.

C ↓ or Ig ↓⇨ AE will shift downwards as from $(C + Ig)_0$ to $(C + Ig)_2$.

- An upward shifts of AE schedule from $(C + Ig)_0$ to $(C + Ig)_1$ will increase the equilibrium GDP.
- A downward shifts of AE schedule from $(C + Ig)_0$ to $(C + Ig)_2$ will decrease the equilibrium GDP.

An increase in the interest rate (i) leads to decrease investment → shift AE schedule downwards → decrease in equilibrium GDP.

An increase in the expected rate of return (r) leads to increase investment → shift AE schedule upwards → increase in equilibrium GDP.

The multiplier Effect

More spending results in a higher GDP; less spending results in lower GDP (C↑ = GDP↑, I↑ = GDP↑). A change in spending (C or I_g), changes output and income by more than the initial change in spending.

Multiplier effects: a change in a component of total spending leads to a larger change in GDP.

$$Multiplier(m) = \frac{Change\ in\ real\ GDP}{Initial\ chnage\ in\ spending}$$

Change in GDP = multiplier (m) x initial change in spending.

Initial change in spending is associated with change in investment, consumption, government spending, and net exports.

The multiplier and the Marginal Propensities:

$$Multiplier\ (m) = \frac{1}{1 - MPC} \quad or\ Multiplier\ (m) = \frac{1}{MPS}$$

The MPC and the multiplier are directly related and the MPS and the multiplier are inversely related.

MPC ↑ ⇨ multiplier ↑ and MPS ↑ ⇨ multiplier ↓

Example
Suppose that a certain country has an MPC of 0.9 and a real GDP of $400 billion. If its investment spending decreases by $4 billion, what will be its new level of real GDP?

Change in GDP = multiplier (m) x change in investment

Δ GDP = m * Δ I

Multiplier (m) = $\frac{1}{1 - \text{MPC}}$ = $\frac{1}{1 - 0.9}$ = $\frac{1}{0.1}$ = 10

Δ GDP = 10 * 4 = $40 billion decrease in GDP (I ↓ ⇨ GDP↓)

New level of real GDP = 400 – 40 = $360 billion.

Example
If the marginal propensity to save is 0.2 in an economy, a $20 billion rise in investment spending will increase GDP by how much?

Multiplier (m) = $\frac{1}{\text{MPS}}$ = $\frac{1}{0.2}$ = 5

Δ GDP = m x Δ I = 5 x 20 = 100 billion rise GDP

Example

1. What is the equilibrium level of GDP?

   At equilibrium: GDP = AE = $300

2. If investment increased to $180 million, what is the new equilibrium GDP?

   Δ GDP = m * Δ I

   MPC = $\frac{\Delta C}{\Delta GDP}$ = $\frac{200 - 150}{200 - 100}$ = $\frac{50}{100}$ = 0.5

   Multiplier (m) = $\frac{1}{1 - \text{MPC}}$ = $\frac{1}{1 - 0.5}$ = $\frac{1}{0.5}$ = 2

   Δ I = (180 – 150) = 30

   Δ GDP = m * Δ I = 2 * 30 = 60 million increase in GDP (investment increased ⇨GDP increase)

   New GDP = 300 + 60 = $360 million.

Adding International Trade

International trade is the exchange of goods and services between two countries.

Net exports and aggregate expenditures

We move from a closed economy to an open economy.

Net exports: The value of a country's total exports minus the value of its total imports ($X_n = X - M$)

Exports (X): are the total amount of goods and services produced in the home country that are bought by foreigners.

Imports (M): are the total amount of goods and services consumed in the home country that are bought from foreigners.

When a country exports (X) more than it imports (M) it has a *trade surplus.*

When a country imports (M) more than it exports (X) it has a *trade deficit.*

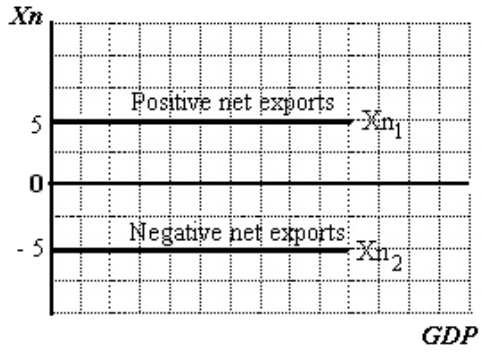
When a country exports (X) equal it imports (M) it has a *trade balance.*

In a *private open economy*, aggregate expenditure are :$AE = C + Ig + Xn$

Net exports schedule

A net exports schedule lists the amount of net exports that will occur at each level of GDP. Net exports schedule is independent of GDP (GDP change → X_n does not change)

Level of GDP	Net exports X_{n1} (X > M)	Net exports X_{n2} (X < M)
$370	+ 5	- 5
$390	+ 5	- 5
$410	+ 5	- 5
$430	+ 5	- 5



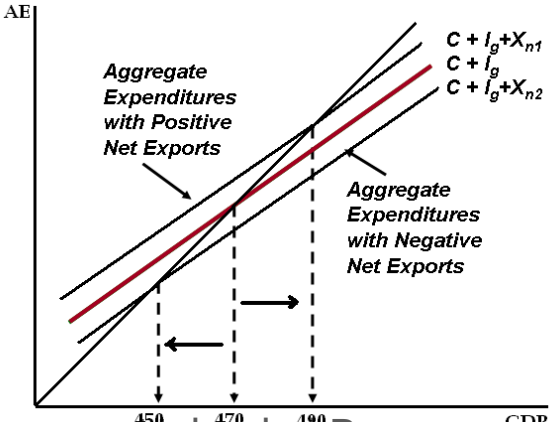
Net exports and equilibrium GDP

Positive net exports such as shown by the net exports schedule X_{n1}, grater the aggregate expenditure schedule from the closed economy level of $C + I_g$ to the open economy level of $C + I_g + X_{n1}$.

Negative net exports such as shown by the net exports schedule X_{n2}, lower the aggregate expenditure schedule from the closed economy level of $C + I_g$ to the open economy level of $C + I_g + X_{n2}$.

Positive net exports increase AE and equilibrium GDP.

Negative net exports decrease AE and equilibrium GDP



Example
Suppose in an open economy where MPC = 0.75, exports increase by 10 million and imports increase by 15 million. What is the effect of equilibrium GDP?

$\Delta\, GDP \;=\; m \;*\; \Delta Xn$

$Multiplier\ (m) \;=\; \frac{1}{1 - \ MPC} \;=\; \frac{1}{1 - \ 0.75} \;=\; \frac{1}{0.25} = 4$

$\Delta Xn \;=\; 10 - 15 \;=\; -5$

$\Delta\, GDP \;=\; 4 \;*\; -5 \;=\; -20\ million\ (fall\ by\ 20\ million).$

Example
Refer to the information provided in table below to answer the questions that follow.

GDP = DI	Consumption (C)	Investment (I_g)	Exports (X)	Imports (M)	Aggregate Expenditure (AE)
500	300	500	150	50	
1,000	600	500	150	50	
1,500	900	500	150	50	
2,000	1,200	500	150	50	
2,500	1,500	500	150	50	

1. Complete the following table

GDP = DI	Consumption (C)	Investment (I_g)	Exports (X)	Imports (M)	Aggregate Expenditure AE = C +I_g + X - M
500	300	500	150	50	300+500+150−50 = 900
1,000	600	500	150	50	600+500+150−50 = 1,200
1,500	900	500	150	50	900+500+150−50 = **1,500**
2,000	1,200	500	150	50	1,200+500+150−50 = 1,800
2,500	1,500	500	150	50	1,500+500+150−50 = 2,100

2. Refer to the above table. The economy shown is a: *(Chose the correct answer)*
   (a) Private economy. (b) Private open economy. (c) Mixed closed economy. (d) Mixed open economy.

3. What is the equilibrium GDP?

   At equilibrium GDP: AE = GDP ⇨ GDP = 1,500

4. What is the MPC?

$MPC \;= \frac{\Delta C}{\Delta GDP} = \frac{600 - \ 300}{1{,}000 - \ 500} = \frac{300}{500} \;=\; 0.6$

5. At equilibrium, what is the APC?

$APC = \frac{C}{DI} = \frac{900}{1500} = 0.6$

International economic linkages: (factors affected X_n)

- Prosperity Abroad (increase foreign income) الرفاهية في الخارج

  A rising level of real output and income among foreign trading partner enables the Palestine to sell more goods abroad, thus raising Palestine net exports and increasing its real GDP.

  Foreign income ↑ ⇨ exports ↑ ⇨ net exports ↑ ⇨ real GDP ↑

- Tariffs التعرفة الجمركية

  Suppose foreign trading partner impose high tariffs on Palestine goods to reduce their imports from the Palestine and thus increase production in their economies.

  الرسوم الجمركية هي ضرائب تفرض عادة على السلع المستوردة .قد تأخذ الرسوم شكل ضرائب قيمية تقدر بنسبة مئوية من قيمة السلعة، أو شكل مبلغ ثابت يفرض على السلعة مهما كانت قيمتها. الغرض من الرسوم الجمركية هو جمع إيرادات للحكومة وحماية للمنتجين المحليين من المنافسة الأجنبية. فعند زيادة الرسوم الجمركية يؤدي على ارتفاع سعرها مقارنة بالسلع المحلية وبالتالي يقل الطلب على السلع المستوردة

  Tariffs ↑ → imports ↓ → net exports ↑ → real GDP ↑

- Exchange rates سعر الصرف

  Depreciation of the dollar relative to shekel enables people in U.S. to obtain more shekels with each unit of dollar. The price of Palestine goods in terms of dollar will fall, this leads to increase of Palestine exports. Also, Palestine customer will fine they need more dollars to buy U.S. goods and, this will lead to reduce their spending on imports. The increase exports and decreased imports will increase domestic net exports and thus expand the real GDP.

  يمكن تعريف سعر الصرف على أنه السعر الذي يتم به مبادلة عملة بلد ما بعملة بلد آخر ، وسعر الصرف الأجنبي هو قيمة الوحدة من العملة الأجنبية مقومة بوحدات من العملة المحلية.

  فعند ارتفاع سعر صرف الدولار مقابل الشيكل تعني تمكين الناس في الولايات المتحدة للحصول على مزيد شيكل مع كل وحدة من الدولار. وبالتالي فإن أسعار السلع فلسطينية بالدولار تنخفض ، وهذا يؤدي إلى زيادة الصادرات فلسطين. كذلك فإن المواطنين الفلسطينين يحتاجون الى المزيد من الدولارات لشراء البضائع الأمريكية ، وهذا بدوره يؤدي إلى انخفاض الإنفاق على الواردات. فإن الزيادة الصادرات وتراجعت الواردات يؤدي الى زيادة صافي الصادرات المحلية، وبالتالي زيادة الناتج المحلي الإجمالي الحقيقي.

  Depreciation of domestic currency → exports ↑ and imports ↓ → net exports ↑ → real GDP ↑
  Appreciation of domestic currency → exports ↓ and imports ↑ → net exports ↓→ real GDP ↓

Adding the Public Sector

The final step in construction the full AE model is to move the analysis from a private open economy to an economy with a public sector that is called *"Mixed Economy"*. Public sector includes government purchases (G) and taxes (T).

In private closed economy, $AE = C + I_g$.

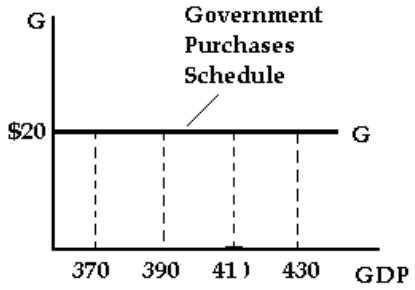
In private open economy, $AE = C + I_g + X_n$.

In mixed closed economy, $AE = C + I_g + G$.

In mixed open economy, $AE = C + I_g + G + X_n$.

Government Purchases Schedule

We assume that the government purchases are independent of the level of GDP. GDP change → G does not change.



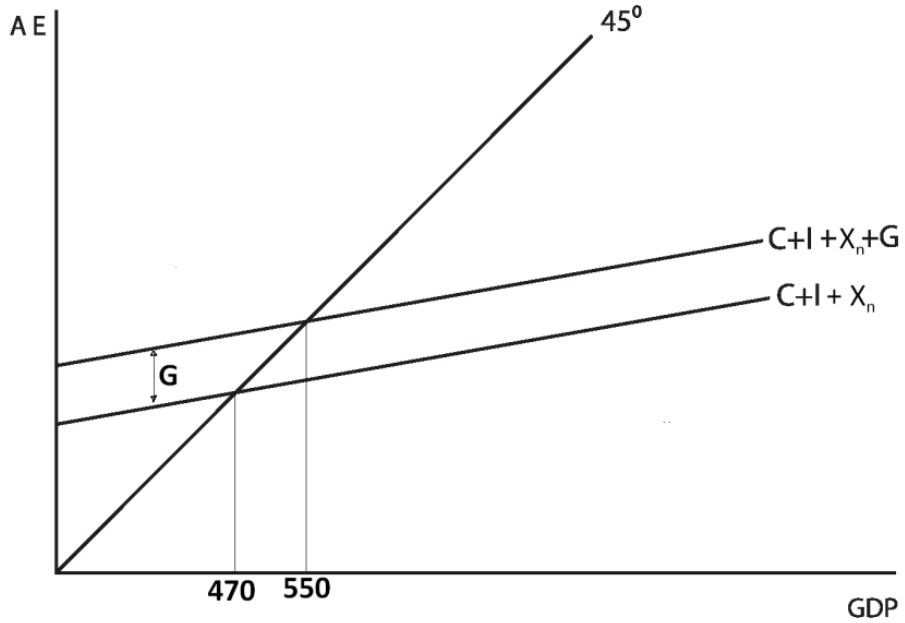
Government Purchases and Equilibrium GDP

The addition of government expenditures (G) raises the AE schedule and increases the equilibrium level of GDP. A decline in government purchases (G) will lower the AE schedule and result in a decline in equilibrium GDP.

$If\ G\ \uparrow\ \rightarrow\ GDP\ \uparrow\ (\Delta\ GDP\ =\ m\ x\ \Delta\ G)$

$If\ G\ \downarrow\ \rightarrow\ GDP\ \downarrow\ (\Delta\ GDP\ =\ m\ x\ \Delta\ G)$

Government spending is determined by a political process and is not based on the level of the GDP; it is graphed as a horizontal line when GDP is on the horizontal axis. When this horizontal line is added to the upward sloping Aggregate Expenditures line, it simply shifts Aggregate Expenditure upward by the amount of the government spending. See the two graphs below for an illustration. The equilibrium GDP will be determined by where the $C + I + Xn + G$ line intersect the 45-degree line in our standard model.



Tabular Example

GDP = DI	Consumption	Savin g	Investment	Exports	Imports	Government Purchases	AE
450	435	15	20	10	10	20	475
470	450	20	20	10	10	20	490
490	465	25	20	10	10	20	505
510	480	30	20	10	10	20	520
530	495	35	20	10	10	20	535
550	**510**	**40**	**20**	**10**	**10**	**20**	**550**

AE = C + Ig + G + Xn

Equilibrium level of GDP = 550 (GDP = AE).

Example

Consider the following table for a given economy:

GDP = DI	C	I_g	G	X_n
400	450	15	25	10
500	525	15	25	10
600	600	15	25	10
700	675	15	25	10
800	750	15	25	10
900	825	15	25	10

1. What is the MPS?

   $MPC = \frac{\Delta C}{\Delta GDP} = \frac{525 - 450}{500 - 400} = \frac{75}{100} = 0.75$

   MPS = 1 - MPC = 1 - 0.75 = 0.25

2. What is the equilibrium GDP?

GDP = DI	C	I_g	G	X_n	AE = C+I_g+G+X_n
400	450	15	25	10	500
500	525	15	25	10	575
600	600	15	25	10	650
700	675	15	25	10	725
800	**750**	**15**	**25**	**10**	**800**
900	825	15	25	10	875

   At equilibrium: GDP = AE = $800

3. If DI = $1000, what is APC?

   When DI = 1000, C =?

   MPC = 0.75 ⇨ $0.75 = \frac{X - 825}{1000 - 900}$ ⇨ 0.75 (100) = X - 825 ⇨ X = 825 + 75 = 900

   When DI = 100, C =900

   APC = $\frac{C}{DI} = \frac{900}{1000} = 0.9$

4. Suppose that gross investment decrease by 5 million, what would happen to real GDP? What is the new GDP?

$\Delta GDP = m\, x\, \Delta Ig$ $\qquad m = \frac{1}{MPS} = \frac{1}{0.25} = 4$

$\Delta GDP = 4\, x - 5 = -20\, million$

$New\ GDP = 800 - 20 = \$780\, million$

Example
If real GDP is $600 million below full employment level, by how much should government spending be increased to reach full employment, assuming that MPC is 0.8?

Δ GDP = m x Δ G

$m = \frac{1}{1 - MPC} = \frac{1}{0.20} = 5$

Δ GDP = 600

600 = 5 x Δ G ⇨ Δ G = $\frac{600}{5}$ = 120 million.

Example
Assume the current equilibrium level of income (GDP) is $200 billion as compared to the full-employment income level of $240 billion. If the MPC is 5/8, what change in aggregate expenditures is needed to achieve full employment?

Δ GDP = m x Δ AE

$m = \frac{1}{1 - MPC} = \frac{1}{1 - \frac{5}{8}} = \frac{1}{\frac{3}{8}} = \frac{8}{3}$

Δ GDP = 240 - 200 = 40

40 = $\frac{8}{3}$ x Δ G ⇨ Δ G = $\frac{40\ x\ 3}{8}$ = 15 billion

Increase aggregate expenditures by 15 billion

Taxation and Equilibrium GDP

Lump-sum tax: is a tax of a constant amount or a tax yielding the same amount of tax revenue at each level of GDP.

The tax lowers the consumption and saving.

$T \uparrow \rightarrow C \downarrow$ *by (MPC x T)*

$T \uparrow \rightarrow S \downarrow$ *by (MPS x T)*

Increase taxes leads to lower consumption leads to lower AE; shift AE downward and decrease the equilibrium GDP.

Decrease taxes leads to higher consumption leads to higher AE; shift AE upward and increase the equilibrium GDP.

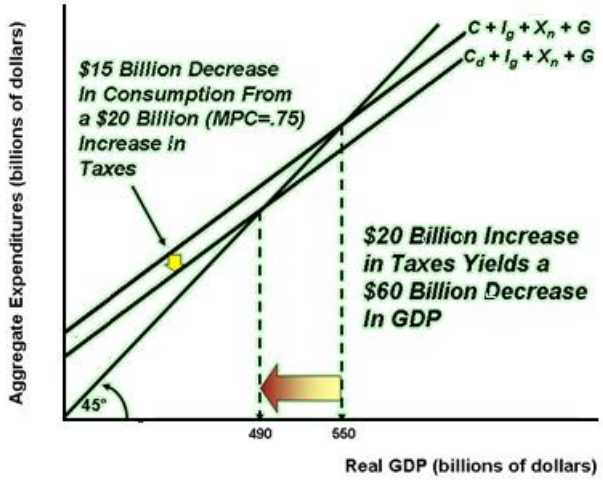
Tabular Example

GDP	T	DI (DI = GDP - T)	C	S (S = DI - C)	Ig	X	M	G	AE (AE = C+Ig+G+X−M)
450	20	430	420	10	20	10	10	20	**460**
470	20	450	435	15	20	10	10	20	**475**
490	20	470	450	20	20	10	10	20	**490**
510	20	490	465	25	20	10	10	20	**505**
530	20	510	480	30	20	10	10	20	**520**
550	20	530	495	35	20	10	10	20	**535**

The equilibrium level of GDP = 490

Graphical Analysis

Taxes will lower the consumption and AE. Shifts the AE downward ⇨ decrease equilibrium level of GDP.



If MPC = 0.75, a $20 billion of taxes will lower the consumption schedule by $MPC * T = 0.75 * 20 = 15$ billion. And lower saving by $MPS * T = 0.25 * 20 = 5$ billion. And cause a decline in the equilibrium GDP by the amount equal ($m\ x\ \Delta\ C = 4 * 15 = 60\ billion$) decrease in equilibrium GDP.

In the open mixed economy, equilibrium GDP occurs where $GDP = C + Ig + G + Xn$

Example

Suppose the MPC is 0.8 and the government cuts taxes by $40 billion. What is the effect on the equilibrium GDP?

T ↓ → C ↑ → Shifts the AE schedule upward → increase equilibrium GDP.

T ↓ → C ↑ by (MPC * T) = 0.8 * 40 = 32 billion. *(Consumption increase by 32 billion)*

C ↑ → GDP ↑

Δ GDP = m x Δ C

$m = \frac{1}{1-MPC} = \frac{1}{1-0.8} = \frac{1}{0.2} = 5$

Δ GDP = 5 x 32 = 160 billion increase in GDP

by using tax multiplier

$m_t = \frac{-MPC}{1-MPC} = \frac{-0.8}{1-0.8} = \frac{-0.8}{0.2} = -4$

Δ GDP = $mt * \Delta T = -4 * (-40) = 160$ billion increase in GDP (T↓ ⇨ C↑ ⇨ GDP↑)

Example

Consider the following table for a given economy:

GDP	T	DI	C	I_g	G	AE
400	100		500	25	50	
500	100		575	25	50	
600	100		650	25	50	
700	100		725	25	50	
800	100		800	25	50	
900	100		875	25	50	

1. What is the equilibrium output (GDP)?

   At equilibrium: GDP = AE

GDP	T	DI DI = GDP - T	C	I_g	G	AE AE = C + Ig + G
400	100	300	425	25	50	500
500	100	400	500	25	50	575
600	100	500	575	25	50	650
700	100	600	650	25	50	725
800	100	700	725	25	50	800
900	100	800	800	25	50	875

The equilibrium level of GDP = 800

2. What are the MPC and multiplier?

   $MPC = \frac{\Delta C}{\Delta GDP} = \frac{500-425}{500-400} = \frac{75}{100} = 0.75$

   $m = \frac{1}{1-MPC} = \frac{1}{1-0.75} = \frac{1}{0.25} = 4$

3. Suppose the government wishes to increase equilibrium GDP to 1000. (1) By how much would they have to increase G to do this? (2) By how much would they have to decrease T to do this?

   (1) Δ GDP = m x Δ G → (1000 - 800) = 4 x Δ G → Δ G = $\frac{200}{4}$ = 50 *(Increase G by 50)*

   (2) Δ GDP = m_t x Δ T

$m_t = \frac{-MPC}{1-MPC} = \frac{-0.75}{1-0.75} = \frac{-0.75}{0.25} = -3$

$\Delta GDP = m_t * \Delta T \Rightarrow (1000 - 800) = -3 * \Delta T \Rightarrow \Delta T = \frac{200}{-3} = -66.67$ (*Decrease T by 66.67)*

Example

The table below gives data about the economy of country X, answer the questions below given the provided information.

GDP = Y	DI	C	Ig	G	X	M	AE
40			10	30	15	15	
60			10	30	15	15	
80			10	30	15	15	
100			10	30	15	15	
120			10	30	15	15	
140			10	30	15	15	
160			10	30	15	15	

1. Fill in the blanks in the table if *T = 20* and *C = 10 + 0.75 (Y - T).*

GDP = Y	DI = Y -T	C	Ig	G	X	M	AE = C+Ig+G+X-M
40	40 - 20 = 20	10 + 0.75(20) = 25	10	30	15	15	25+10+30+15-15 = 65
60	60 - 20 = 40	10 + 0.75(40) = 40	10	30	15	15	40+10+30+15-15 = 80
80	80 - 20 = 60	10 + 0.75(60) = 55	10	30	15	15	55+10+30+15-15 = 95
100	100 - 20 = 80	10 + 0.75(80) = 70	10	30	15	15	70+10+30+15-15 = 110
120	120 - 20 = 100	10 + 0.75(100) = 85	10	30	15	15	85+10+30+15-15 = 125
140	140 - 20 = 120	10 + 0.75(120) = 100	10	30	15	15	100+10+30+15-15 = 140
160	160 - 20 = 140	10 + 0.75(140) = 115	10	30	15	15	115+10+30+15-15 = 155

2. What is the equilibrium level of income (GDP)?

   At equilibrium: GDP = AE = $140 million.

3. What are the equilibrium values of consumption and saving?

   At equilibrium: C = 100, DI = 120

   S = DI - C = 120 - 100 = $20 million.

4. If taxes increase to 30, what is the new equilibrium GDP?

   $MPC = \frac{\Delta C}{\Delta GDP} = \frac{40-25}{40-20} = \frac{15}{20} = 0.75$

   $m = \frac{1}{1-MPC} = \frac{1}{1-0.75} = \frac{1}{0.25} = 4$

   $T\uparrow \rightarrow C\downarrow$ by MPC x Δ T = 0.75 * (30 - 20) = 0.75 * 10 = 7.5

   $C\downarrow \rightarrow$ GDP ↓ by (m x Δ C)

   Δ GDP = m x Δ C = 4 x (− 7.5) = −30 million

   New GDP = 140 - 30 = 110 million.

Injections, Leakages, and Unplanned Changes in Inventories

- *At equilibrium GDP: Injections = Leakages*

  For the private closed economy, $S = I$. For the expanded economy, imports (M), and taxes (T) are added leakages. Exports (X) and government spending are added to injection.

  At the equilibrium GDP, the sum of the leakages equals the sum of injection.

  $$\begin{Bmatrix} S + M + T \\ Leakages \end{Bmatrix} = \begin{Bmatrix} Ig + X + G \\ Injections \end{Bmatrix}$$

- *At equilibrium GDP: no unplanned changes in inventories*

  At equilibrium $GDP = AE$ *(total amount of goods produced equal total amount of goods purchases)*

  Unplanned changes in inventories = $GDP - AE$, but at equilibrium $GDP = AE$ (Unplanned changes in inventories = 0)

Example
Use the table below to answer the following questions:

GDP = DI	C	I_g	G	X	M	AE
200	150	50	40	10	20	**230**
225	165	50	40	10	20	**245**
250	180	50	40	10	20	**260**
275	**195**	**50**	**40**	**10**	**20**	**275**
300	210	50	40	10	20	**290**
325	225	50	40	10	20	**305**

a. What is the equilibrium level of GDP?

   At equilibrium: GDP = AE = $275

b. Calculate the leakages and injections at equilibrium.

   Leakages = S + M + T

   At equilibrium: S = DI – C = 275 – 195 = 80

   M = 20, T = 0

   Leakages = S + M + T = 80 + 20 + 0 = 100

   Injections = I_g + X + G = 50 + 10 + 40 = 100

   At equilibrium: injections = leakages

Balance Budget multiplier

If both G and T increase by the same amount, then GDP increase by the same amount

For example, if G ↑ by 20 million and T ↑ by 20 million → GDP ↑ by 20 million

And if G ↓ by 20 million and T ↓ by 20 million → GDP ↓ by 20 million

The balance budget multiplier = 1

Example
Suppose that a certain country has an MPC of 0.8 and real GDP of 800 billion. If both government spending and taxes increase by 15 billion, what will be its new level of real GDP?

G ↑ by 15 billion → GDP ↑

Δ GDP = m x Δ G = $\frac{1}{0.2}$* 15 = 5 * 15 = $75 billion increase in GDP

T ↑ by 15 billion → GDP↓

Δ GDP = m_t * Δ T

$m_t = \frac{-MPC}{1-MPC} = \frac{-0.8}{1-0.8} = \frac{-0.8}{0.2} = -4$

Δ GDP = m_t * Δ T = −4 * 15 = − 60 billion decrease in GDP

Net effect = 75 - 60 = 15 billion increase in GDP

Equilibrium versus Full Employment GDP

The equilibrium GDP and the full employment GDP is not the same.

إن تحقيق توازن الدخل لا يعنى بالضرـورة أن الاقتصـاد يعمل عند مسـتوى التوظيف الكامل ،بل قد يحدث أن يتحقق التوازن عند نقطة أقل من مسـتوى التوظيف الكامل وهنا نقول أن هناك فجوة انكماشية ،أو يتحقق التوازن عند نقطة أعلى من مستوى التوظيف الكامل وهنا نقول أن هناك فجوة تضخمية .

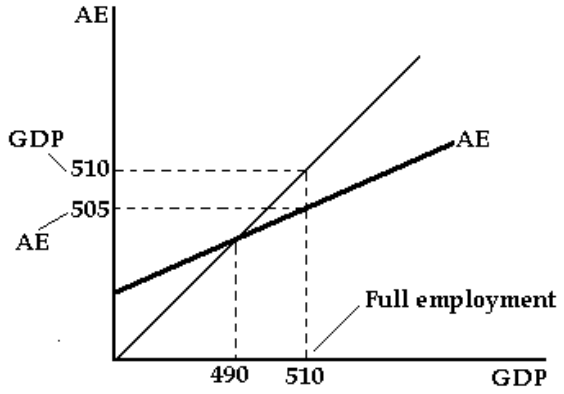
Recessionary Expenditure Gap حالة الفجوة الانكماشية

The amount by which AE at the full employment GDP falls short of those needed to achieves the full employment GDP.

If at full employment, GDP > AE → recessionary gap

The size of the gap = GDP - AE (the vertical distance between AE and 45° line).

Recessionary Gap causes cyclical unemployment.



Keynes' Solution to a Recessionary Gap:

Keynes pointed to different policies that a government might pursue to close a recessionary gap and achieve full employment. The first is to increase government spending. The second is to lower taxes.

Inflationary Expenditure Gap

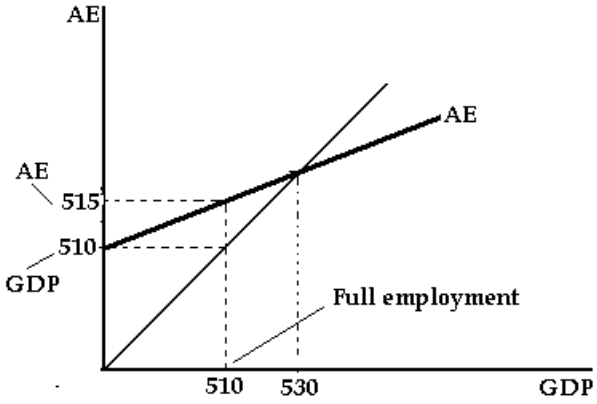
the amount by which AE at the full employment GDP exceed those just sufficient to achieve the full employment GDP.

وهى عكس الفجوة الانكماشية وتحدث عندما يكون مستوى التوازن للناتج الإجمالي عند نقطة أكبر من مستوى التوظيف الكامل،فالفجوة التضخمية عبارة عن الفرق بين المستوى المتحقق من الناتج المحلى الإجمالي والمستوى الذي يمكن تحقيقه عند توظيف جميع الموارد المتاحة.

If at full employment, GDP < AE → Inflationary Gap

The size of the gap = AE – GDP (the vertical distance between AE and 45° line).

Inflationary gap causes demand pull inflation.



From the graph, full employment level of GDP:
GDP = 510
AE = 515

AE > GDP → Inflationary gap

The size of the gap = $AE - GDP = 515 - 510 = 5$

Example

Use the data in the table to answer the questions below:

Level of Employment	Real output (GDP)	AE
90	500	520
100	550	560
110	600	600
120	650	640
130	700	680

a. If full employment is 130 million, will there be an inflationary gap or a recessionary gap? By how much would AE have to change at each level of GDP to eliminate this gap? What is the multiplier in this example?

If full employment is 130 million: GDP = 700; AE = 680 ⇨ GDP > AE ⇨ recessionary gap

The size of the gap = GDP - AE = 700 - 680 = 20 million.

Multiplier $= \frac{\Delta \text{GDP}}{\Delta \text{AE}} = \frac{700-600}{700-680} = \frac{100}{20} = 5$

Or MPC $= \frac{\Delta AE}{\Delta GDP} = \frac{680-600}{700-600} = \frac{80}{100} = 0.80$

$m = \frac{1}{1-MPC} = \frac{1}{1-0.8} = \frac{1}{0.20} = 5$

b. Will there be an inflationary gap or recessionary gap if the full employment level of output is $500 billion? What is the size of this gap?

At full employment level of output of $500 billion: AE = 520 ⇨ AE > GDP ⇨ inflationary gap

The size of the gap = AE – GDP = 520 – 50 = 20 billion

c. Assuming that investment, net exports, and the government expenditures do not change with the changes in real GDP, what are the sizes of the MPC, the MPS, and the multiplier?

MPC = slope of the consumption function = slope of the AE schedule

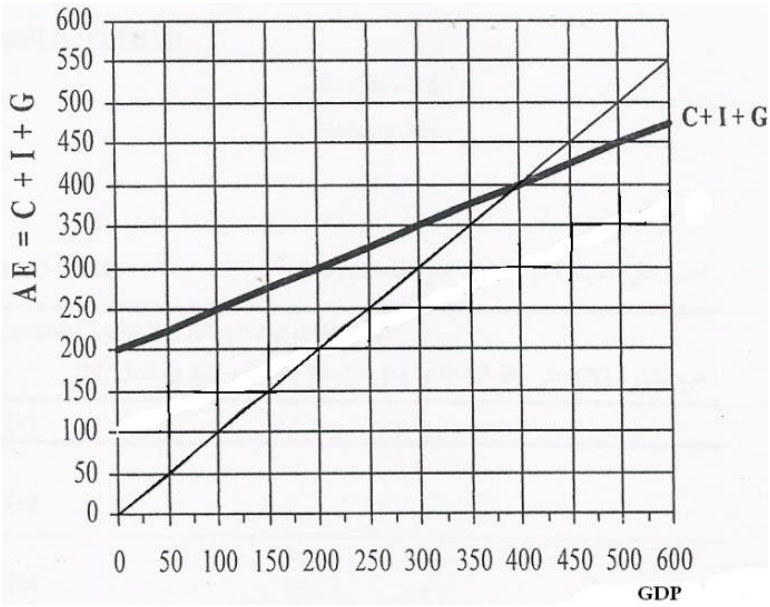
$MPC = \frac{\Delta AE}{\Delta GDP} = \frac{680-600}{700-600} = \frac{80}{100} = 0.80$

MPS = 1 - MPC = 1 - 0.8 = 0.20

$m = \frac{1}{1-MPC} = \frac{1}{1-0.8} = \frac{1}{0.20} = 5$

Example

Consider the following graph which represents the AE schedule for an economy. Suppose net exports are zero and investment is $60 million dollars and government spending is $40 million dollars.



1. What is the equilibrium GDP for this economy?

At equilibrium GDP = AE = C+I+G = $400 million

2. What is the amount of consumption (C) at 300 level of output (GDP)? Show your work.

At GDP = 300 → AE = 350

AE = C+I+G → 350 = C + +60 + 40 → C = 350 - 100 = 250

3. At the 400 level of output (GDP), what is the APC? Show your work.

   At GDP = 400 → AE = 400

   AE = C+I+G → 400 = C + +60 + 40 → C = 400 - 100 = 300

   APC = $\frac{C}{DI}$ = $\frac{300}{400}$ = 0.75

4. Suppose that the full employment GDP equals $300 million, would there be a recessionary gap or inflationary gap? Why? How much is the size of this gap? Show your work.

   At full employment GDP, AE = 350 → AE > GDP → inflationary gap

   The size of this gap = AE - GDP = 350 - 300 = 50 million.

5. What are the MPC and multiplier for this economy? Show your work.

   MPC = slope of the AE schedule

   MPC = $\frac{\Delta AE}{\Delta GDP}$ = $\frac{300-250}{200-100}$ = $\frac{50}{100}$ = 0.5

   m = $\frac{1}{1-MPC}$ = $\frac{1}{1-0.5}$ = $\frac{1}{0.5}$ = 2

6. Suppose government spending is decreased by $15 million, by how much would GDP increase or decrease? What is the new equilibrium GDP?

   G ↓ ⇨ GDP ↓, Δ GDP = m x Δ G = 2 x 15 = 30 million decrease in GDP

   New GDP = 400 - 30 = $370 million.

Example

Assume that the full employment GDP of an economy is $1250 million, government expenditure on goods and services are $300 million, tax revenue is $320 million, and the economy is currently producing (GDP) $850 million. Assume also that MPS were 0.25.

1. Would there be a recessionary gap or inflationary gap? Why? How much is the size of this gap? Show your work.

   Full employment GDP of an economy is $1250 million, AE = 850 → GDP > AE → recessionary gap

   The size of this gap = 1250 - 850 = 400

2. By how much should government spending be increased or decreased to reach full employment?

   Δ GDP = m x Δ G

   Multiplier = 1 / 0.25 = 4

   To reach full employment actual GDP must increase by 400 (from 850 to 1250)

   Δ GDP = m x Δ G

   400 = 4 x Δ G ⇨ Δ G = 400/4 = 100 million. (Increase by 100 million).