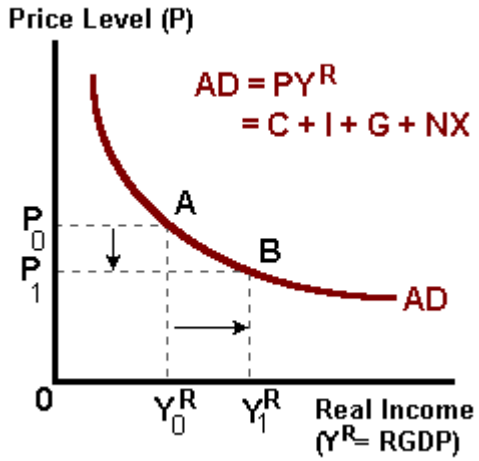
AGGREGATE DEMAND AND EXPENDITURE

Aggregate demand *is a measure the ability to spend or the level of expenditure necessary to command varying quantities of goods and services at different price levels. This concept is a measure of purchasing power such that when prices increase with a given level of nominal income, fewer goods or services can be purchased.*

In understanding the behavior of aggregate demand we must take a close look at its individual components:

AD: Nominal Income = $P_t Y^R_t = (C_t + I_t + G_t + NX_t)$

Figure 1, Aggregate Demand



note:
AD = $\{Y^R_t, P_t \varepsilon \mathbf{R}^2 \mid Y^R_t = NGDP_t / P_t\}$

For a given level of nominal expenditure, an inverse relationship exists between the price level 'P' and Real Income 'Y^R'. Aggregate demand represents this relationship between r in a particular macroeconomy.

Any factor that affects consumption, investment, government, or export-import decisions will translate in to a change in nominal expenditure and, at an existing price level, a change in purchasing power. These factors may include changes in interest rates, exchange rates, wealth, taxes, public spending, expectations, or monetary policy targets.

Consumption Expenditure
Of the four components of aggregate demand, consumption expenditure C is the largest contributing to between 60% and 70% of total expenditure. For this reason, we often start our analysis with this particular component. This category of expenditure includes private spending on durable goods (*automobiles, electronic goods, appliances, ...*), non-durable goods (*food, clothing, books and magazines,...*), and services (*housing, health-care, education, entertainment,...*).

Special attention must be given to the service component of consumption expenditure for several reasons. First, services represent the largest component representing at least 50

percent of this type of spending. Second, services include housing services measured directly by rents being paid from tenant to landlord, in the case of rental housing, or indirectly as imputed rent that an individual would pay to himself in the case of owner occupied housing. In the latter case the homeowner acts as both tenant and landlord with no actual payment changing hands but imputed expenditure being included in the services category to reflect the value of the housing services received from the owner-occupied home. Third, services, unlike durable and some non-durable goods, are difficult to accumulate as inventory. Thus any changes in the demand for services (*due to changing preferences or the general level of economic activity*) must be immediately matched with changes in production. This is not always an easy task in any economy.

Consumption expenditure decisions are strongly influenced by household disposable (after-tax) income, household wealth, savings needs and plans, confidence in the future direction of the economy, and interest rates (in the case of durable-goods purchases).

Investment Expenditure

Investment expenditure I represents a smaller share of the total but tends to be the most volatile component leading to the cyclical behavior of aggregate demand. This category of expenditure includes fixed nonresidential investment (*factories, machines, transport equipment*), fixed residential investment (*new houses and apartments*), and business inventories. Often the volatility in investment results from fluctuation in inventory levels due to changing expectation about business conditions.

Fixed residential and nonresidential investment refers to the creation of income-producing assets. Assets that will generate net-benefits (*benefits - costs from housing services*) in the case of owner-occupied housing or generate profits as part of the production process. These net-benefits and profits depend on the expected revenue or gross benefits generated by the asset as well as the costs of acquiring, maintaining and replacing these assets.

Demand for the production of the asset will directly affect the revenue generated. Strong demand based on preferences, optimism, purchasing power, or demographics will lead to the desire for more investment expenditure.

Acquisition costs include both the purchase price of the asset and the borrowing costs involved both which are highly sensitive to changes in interest rates. Higher interest rates lead to higher borrowing costs and thus lower net-benefits or profits such that the level of aggregate investment expenditure may be reduced. Maintenance and replacement costs depend on the useful life of an asset and its rate of depreciation. Assets that wear out very quickly or become obsolete in a short period of time have higher costs with the same effect as rising interest rates. Because of the sensitivity of investment decisions to changing interest rates, this category of expenditure is easily affected by monetary policies and activity in the financial sector of an economy.

Government Expenditure
Government expenditure G is a reflection of the fiscal needs and policies of the public sector in a given economy. This type of expenditure might be in reaction to the demand for public goods and services by private households and businesses through voting or other types of political activity. In addition, government expenditure could be used as a deliberate policy tool to increase nominal incomes in the hope of stimulating aggregate demand.

Net Export Expenditure
Finally, Net export expenditure NX reflects the international linkages based directly on service and merchandise flows across borders in addition indirectly reflecting capital flows into and out of a particular country. Merchandise flows are sensitive to domestic income levels and preferences for foreign-made goods. In addition these flows are influenced by exchange rates which determine the domestic price of goods and services produced abroad. Capital flows depend on interest rate (*yield*) differentials among nations as well as exchange rates which affect the domestic price of a foreign asset both at the time of purchase of that asset and at the time of sale.

Specific spending components may be influenced by the following variables:

$\mathbf{C_t}$ = f{income (Y_t), wealth (W), taxes (T) , interest rates (r) , and prices (P_t)}

$\mathbf{I_t}$ = f{interest rates (r), capital productivity and longevity, and income (Y_t)}

$\mathbf{G_t}$ = f{fiscal policies, budgetary needs and borrowing constraints}

$\mathbf{NX_t}$ = Exports - Imports = f{exchange rates(e.r.), interest rates (domestic& foreign), income (domestic & foreign)}

In addition, interest rates and exchange rates are affected by activity in the financial sector of the economy. This activity may include changes in monetary policy as administered by central banking authorities and changes in expectations of future economic activity, inflation, and credit risk.

Aggregate Expenditure, Income and the Multiplier

From our discussion of National Income Accounting, one method of calculating nominal GDP ($\mathbf{Y^N}$) was through the expenditure approach such that:

$$NGDP = \Sigma P_i Q_i = \mathbf{Y}^{Nominal}$$

or

$$\mathbf{Y}^{Nominal} = C + I + G + NX$$

where the variables on the right-hand side represent the four expenditure categories that make up GDP. What is important is that certain expenditure decisions are proportional to the level of income such that as aggregate income increases, expenditure increases by some fraction of this income change. This expression representing an equilibrium

condition ($\mathbf{Y_e}$) such that for one unique level of income, expenditure is exactly equal to that level of income:

$\mathbf{Y_e}$: Aggregate Income = Aggregate Expenditure

Note: Holding the price level constant we treat **Nominal GDP** as being equal to **Real GDP**:

$(\mathbf{Y_e \equiv Y^N = Y^R})$.

We will begin with consumption expenditure 'C' defined as being proportional to disposable income (*gross income less taxes paid*) with this proportional relationship being defined by the marginal propensity to consume '**b**':

$$C = C_o + \mathbf{b}(Y-T), \qquad 0 < b < 1$$

Tax revenue 'T' is defined to be some fraction of income via the tax rate 't':

$$T = tY, \qquad 0 < t < 1$$

For algebraic simplicity we will define the other expenditure categories; investment 'I', government 'G', and net exports 'NX' as being autonomous with respect to income (i.e., spending decisions remain independent of the level of national income). We will combine these values with autonomous consumption 'C_o' and summarize this via a single variable '$\mathbf{A_o}$' known as **autonomous expenditure**:

$$\mathbf{A_o} = C_o + I_o + G_o + NX_o$$

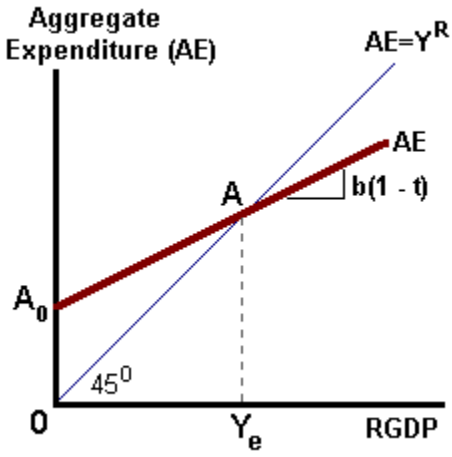
Thus, the expenditure equation can be written as:

$$AE = \mathbf{A_o} + \mathbf{b}(1 - t)\mathbf{Y}$$

as shown in the diagram below:

Note: In the following diagram, the **45^o line** represents a one-to-one relationship between **aggregate income** and **aggregate expenditure**. Any point on this line would represent an equilibrium combination of these two variables:

Figure 2, Aggregate Expenditure



and in equilibrium:

$\mathbf{Y_e}$: $\mathbf{Y} = \mathbf{A_o} + \mathbf{b}(1 - t)\mathbf{Y}$

Solving for 'Y_e', the equilibrium value of income, we have

$\mathbf{Y_e} = \alpha'[\mathbf{A_o}]$,

where $\boldsymbol{\alpha'} = [1 - b(1 - t)]^{-1}$ and represents, what is commonly known as, the **simple spending multiplier**.

See: The Digital Economist: http://www.digitaleconomist.com/ae_4020.html#1
To experiment with changes to the parameters of the expenditure model.

The Multiplier Process

Any time new spending is introduced into the economy (*or if spending is removed*), it will cause GDP (*and other measures of national income*) to change by some multiple of that spending shock. This takes place through the multiplier process in aggregate spending largely via changes in consumption expenditure. For example, suppose that the marginal propensity to consume is equal to 0.75 and the tax rate is equal to 33%. These values result in a marginal propensity to spend (changes in spending induced by changes in income) equal to 0.50:

$\textit{Expenditure} = \mathbf{A_o} + 0.75(\mathbf{Y} - 0.333\mathbf{Y})$

$= \mathbf{A_o} + 0.50\mathbf{Y}$

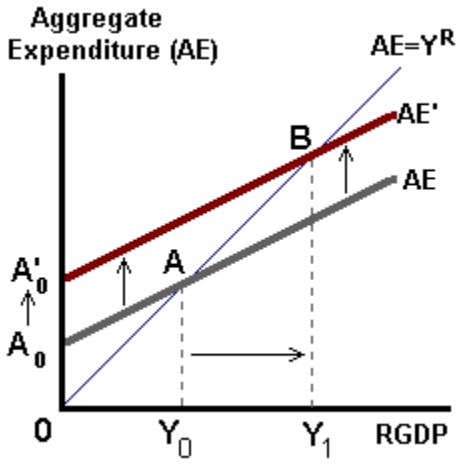
Given our equilibrium condition: $\mathbf{Y}$ = AE (*Aggregate Expenditure*)

$\mathbf{Y} = \mathbf{A_o} + 0.50\mathbf{Y}$

Since $[1-b(1-t)] < 1$, the spending multiplier α' will be greater than one such that:

$\mathbf{Y_e} = 2.0[\mathbf{A_o}]$ and $\Delta\mathbf{Y_e} = 2.0[\Delta\mathbf{A_o}]$

Figure 3, An Spending Shock and the Multiplier



$\Delta\mathbf{Y} = \mathbf{Y_1} - \mathbf{Y_0}$, $\Delta\mathbf{A} = \mathbf{A'_o} - \mathbf{A_o}$

The initial change in autonomous spending (*for example, a shock in the form of an increase in government spending equal to $20*) is received as income by some person or business in the aggregate economy. This spending translates into an increase in income for that person who, for a given propensity to spend, will increase his expenditure by $10. This $10 in additional spending is received by someone else as income who spends 50% of that amount.

iteration	**ΔIncome**	**ΔExpenditure**
0	Δ $\mathbf{A_o}$= $20 (billion)	10
1	10	5
2	5	2.5
3	2.5	1.25
4	1.25	0.625
5	0.625	0.313
6	0.313	0.157
7	0.157	0.079
8	0.079	0.040
:	:	:
n	0.001	-

Total Change in Income '**ΔY**': $40 (billion)

See: The Digital Economist: http://www.digitaleconomist.com/s_mult.html
to practice with the effects of changing parameter values on the spending multiplier.

The spending flows through the aggregate economy such that when we total up all of the increases in income we find that aggregate income has increased by $40 billion -- 2.0 times the initial spending shock. This is known as the multiplier process.

If we extend the model to include: 1) the relationship between *investment expenditure* and the **real interest rate** as seen in the flow of funds model:

$$I = f_{[-]}(r)$$

and, 2) the relationship between **Import Expenditure** and National Income:

$$IM = f_{[+]}(Y)$$

This second relationship highlights the notion that changes in domestic income has a positive effect on Import expenditure. As income rises, individuals spend a fraction of this increase on domestically produced goods and, in addition, foreign goods.

We can build the expenditure equation as follows:

C	$= C_o + \mathbf{b}(Y - T)$	--	**b** = *the Marginal Propensity to Consume*
T	$= \mathbf{t}(Y)$	--	**t** = *the Tax Rate*
I	$= I_o - \mathbf{h}(r)$	--	**h** = *the Interest Sensitivity of Investment*
G	$= G_o$		
NX	$= EX_o - IM$		
IM	$= \mathbf{m}(Y)$	--	**m** = the Marginal Propensity to Import
AE	$= C + I + G + NX$		
	$= \mathbf{A_o} + [\mathbf{b}(1 - \mathbf{t}) - \mathbf{m}]Y - \mathbf{h}(r)$ *with* $\mathbf{A_o} = C_o + I_o + G_o + EX_o$		

In equilibrium:

$$Y_e: \mathbf{Y} = AE$$

$$\mathbf{Y_e} = \alpha'[\mathbf{A_o} - \mathbf{h}(r)] \qquad \textit{where } \alpha' = [1 - \mathbf{b}(1 - \mathbf{t}) + \mathbf{m}]^{-1}$$

The addition of the **Marginal Propensity to Import** (*the fraction of each additional dollar of income devoted to import spending*) has modified the derivation of the multiplier with the provision that: $[1 - \mathbf{b}(1 - \mathbf{t}) + \mathbf{m}] < 1.0$.

The addition of the **Interest Sensitivity of Investment** (*a measure of how investment expenditure responds to changes in the real rate of interest*) allows for modeling the effects of changes in the real rate of interest 'r' on the equilibrium level of income:

$$\mathbf{\Delta Y_e} = \alpha'[-h(\mathbf{\Delta r})] \qquad \text{such that as r } \uparrow, Y_e \downarrow.$$

This examination of aggregate expenditure helps us understand how changes in other economic variables can affect spending, income and aggregate demand. These variables include the real interest rate '**r**', real exchange rates '**ε**', tax rates '**t**', and government spending '**G**'. Changes in any of these variables will translate in to changes in spending decisions and, working through, the spending multiplier, changes in nominal income. For a given value of the price level, these changes would cause a change in aggregate demand

modeled as an inward or outward shift in the **AD** curve. As shown in figure 4a below, an increase in autonomous expenditure '$\mathbf{A_o}$' leads to an increase in Nominal GDP and, holding the price level constant, and increase in Real GDP (**A** → **B**). In figure 4b, we see that same change as an outward shift in Aggregate Demand '**AD**'.When matched with the potential output of the economy, modeled via aggregate supply '**AS**' we find that in the short term changes in aggregate demand lead to either an *excess supply* of goods and services or an *excess demand*. In the long term the price level will adjust to eliminate these differences.

Figure 4a, Income and Expenditure

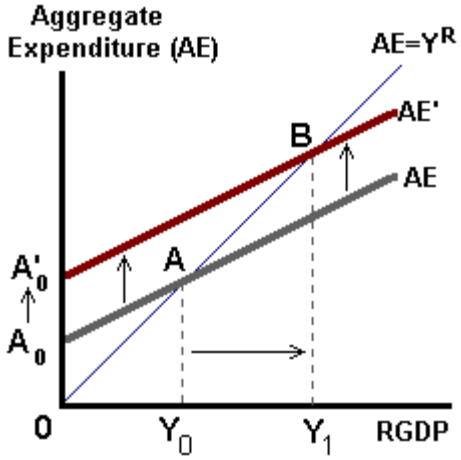
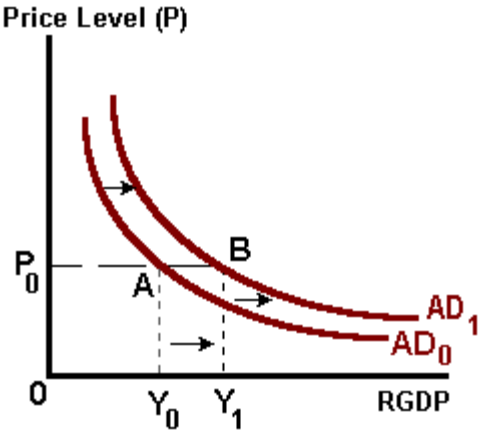


Figure 4b, Income and the Price Level



Be sure that you understand the following concepts and terms:

- Aggregate Demand
- Nominal Income (GDP)
- Real GDP
- Purchasing Power
- Consumption Expenditure
- Investment Expenditure
- Government Expenditure
- Net Export Expenditure
- Marginal Propensity to Consume
- Private Savings
- Public Savings
- Foreign Savings
- Current Account Balance
- Capital Account Balance
- National Savings
- Real Rate of Interest
- Flow of Funds
- Aggregate Expenditure
- Autonomous Expenditure
- Marginal Propensity to Spend
- The Multiplier

Problem Set #7: The Algebra of Demand-Side Equilibrium

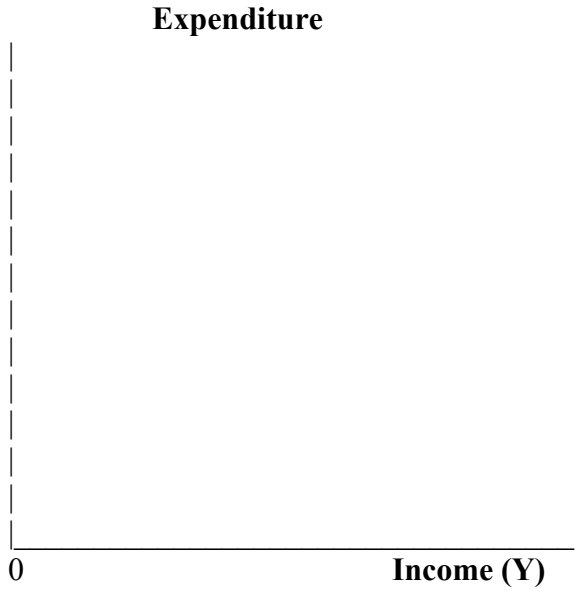
1. Given the following equations:

$C_t = 0.75(Y_t - T)$	*Consumption Expenditure*
$I_t = 200$	*Investment Expenditure*
$G_t = 250$	*Government Expenditure*
$NX_t = 50$	*Net-Export Expenditure*
$T = 0.20Y_t$	
$Y_t = C_t + I_t + G_t + NX_t$	*Equilibrium Condition*

a. Determine the following:

i. the Marginal Propensity to Consume:_____
ii. the (Income) tax rate:_____
iii. the level of Autonomous Expenditure A_o:_____
iv. the Spending multiplier: {1/[1-b(1-t)]}:_____

b. find the level of equilibrium income and graph this relationship in the diagram below:



c. Given this equilibrium level of income, calculate the level of tax revenue collected:_____ Is the government running a surplus or deficit:?_____

d. Calculate the level of savings:_____ and investment expenditure:_____ at the equilibrium level of income. Is there a funds (savings-investment) surplus or deficit?_____ How are these surplus or deficit funds being used?_____

Problem Set 7, page 2

2. Suppose that Income is fixed at **$1000**. Using the equations of page 1, substituting in the following investment equation:

$$I = 200 - 100(r),$$

calculate the corresponding value of the real interest rate, investment expenditure, savings, and the budget deficit.

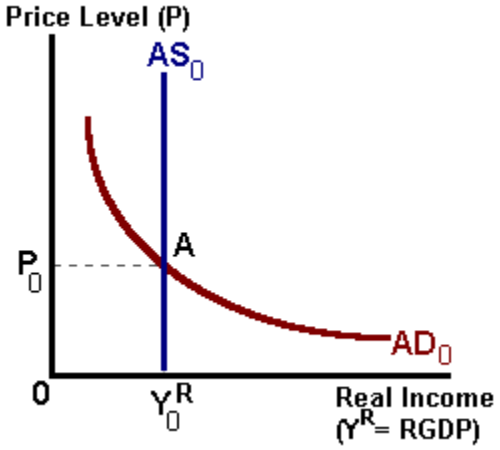
How will a $50 ($\Delta G = 50$) increase in government spending impact the real interest rate?

How does this shock affect: savings, investment expenditure, and the budget surplus/deficit.

PRICE LEVEL DETERMINATION

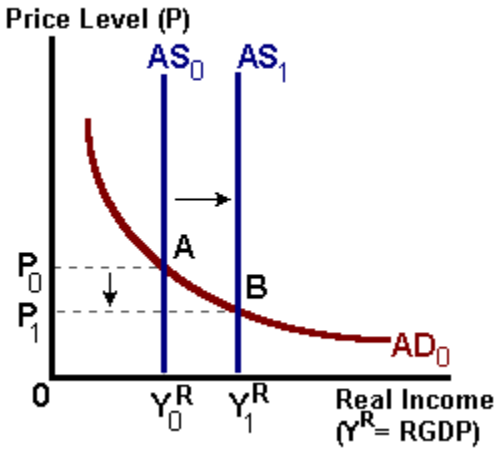
In the aggregate economy the price level is determined by the balance (*or imbalance*) between the *ability to produce* goods and services and the ability to spend to acquire those same goods (see Figure 5). The ability to produce is summarized by the long run **Aggregate Supply** (**AS_{LR}**) function based on the level of technology and availability of factor inputs. The *ability to spend* is summarized by **Aggregate Demand** (**AD**) that represents combinations of price and output levels for a given level of Nominal GDP. As prices rise, purchasing power falls, and thus the quantity of goods and services that can be acquired with a given nominal income declines. Aggregate Demand represents this inverse relationship between the price level and purchasing power.

Figure 5, Aggregate Supply and Aggregate Demand



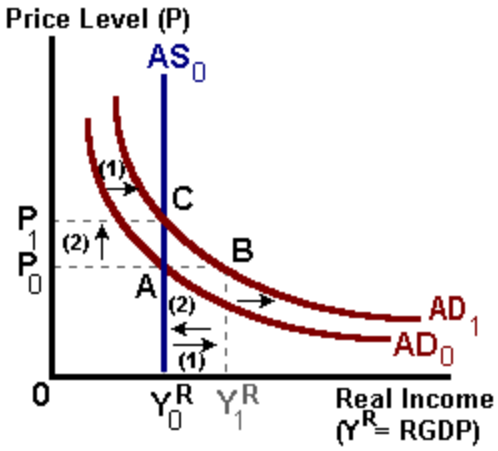
A supply-side shock, such as an increase in labor productivity, would shift **AS_{LR}** outward demonstrating a greater potential to produce at each and every price level. We can see this change in figure 6. This shock, over a sufficient period of time, creates an excess supply of goods ($Y^* > Y^R$) and exerts downward pressure on the price level. As prices fall, purchasing power increase reflecting an increase in the ability to spend (i.e., a movement from **A** to **B**). The net result is an increase in output and a lower aggregate price level.

Figure 6,A Supply-side Shock



In figure 7, we have a demand-side shock perhaps the result of an increase in government spending (*a fiscal expansion*). This shock shifts the **AD** relation outward. Initially there is an **excess demand for goods** (**A** to **B**) evidenced by a depletion of inventories. Given that potential output has not changed, in time this excess demand will cause the price level to increase. As prices increase, purchasing power falls and the ability to spend decreases (**B** to **C**). The net result of this shock is an increase in the price level with no change in output or real spending.

Figure 7, A Demand-side (Fiscal) Shock



Graphically the reaction of the price level to demand-side or supply-side shocks is easy to model. However the actual process of adjustment is a bit more complicated. In cases where the *ability to spend* exceeds the *ability of the economy to produce goods*, depleted inventories are only replenished through the acquisition of scarce factor inputs -- factor inputs that are fully employed elsewhere in the economy. Attempts to replenish these inventories will require attracting resources from alternative uses by bidding up wages and factor prices. It is this process of bidding for resources and the impact on the price level that requires additional discussion.

Price Adjustment and the Real GDP / Output Gap

In the short term, it is possible for the Potential Output of an economy '**Y***' and Real GDP '$\mathbf{Y^R}$' to differ.

$$\text{Output Gap} = \mathbf{Y^R} - \mathbf{Y^*}$$

This difference is known as the output gap and often occurs over the business cycle. This gap may be modeled in figures 10 and 11 above in term of the excess supply or excess demand for goods and services. Long term adjustments will include changes in the price level in reaction to these gaps.

The Markup

Given that the wage bill (**wL**) is a large part of national income and thus represent the bulk of production costs, changes in prices are often strongly related to changes in wage rates.

$$\text{Costs} = f(\text{wages})$$

and

$$\text{Prices} = \alpha[\text{Costs}]$$

where 'α' is some **markup** factor ($\alpha > 1.0$) depending on the degree of competition in different industries. If business firms attempt to increase production such that, in the aggregate, production levels exceed the potential of the domestic economy, wages will be bid upward as firms attempt to attract labor from other firms. These wage increases will be passed on to the consumer via the markup in the form of higher prices. Or as:

$$\mathbf{Y^R} > \mathbf{Y^*} \rightarrow w\uparrow \text{ and thus } P\uparrow.$$

The above two relationships allow for the establishment of a relationship between the level of output and changes in the price level.

The Phillips Curve

In 1958 A.W. Phillips established an empirical relationship between wage inflation and the gap between the actual level of unemployment 'u' and the natural rate of unemployment 'u*' The **natural rate of unemployment** is defined as that rate where there is no upward nor downward pressure on wage rates. A rate of unemployment '$\mathbf{u_{high}}$' above this natural rate would imply slack in labor markets such that wages would be expected to fall or, at least, not rise. A rate of unemployment '$\mathbf{u_{low}}$' below the natural rate would signal tight labor markets such that wages are being bid upwards as employers attempt to fill out the ranks of their required labor force. The parameter 'β' represents that rate at which wages adjust to tightness or slack in labor markets.

$$\%\Delta w = -\beta(u-u^*)$$

if $u > u^*$ then

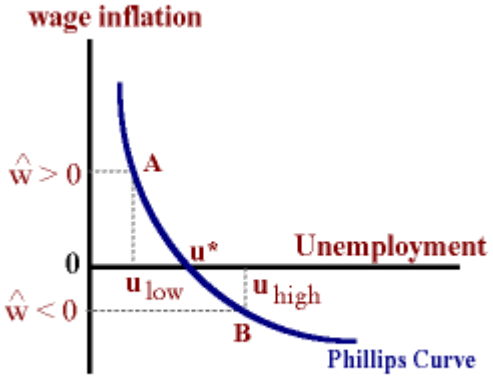
$$\%\Delta w < 0$$

and wage deflation exists.
Otherwise if $u < u^*$,

$$\%\Delta w > 0,$$

we have wage inflation.

Figure 8, The Phillips Curve



Okun's Law

A third empirical relationship is **Okun's law** which states that for every percentage point 'u' exceeds 'u*', growth in Real GDP is 2.5% below the rate of growth in Potential Output in the U.S. economy.

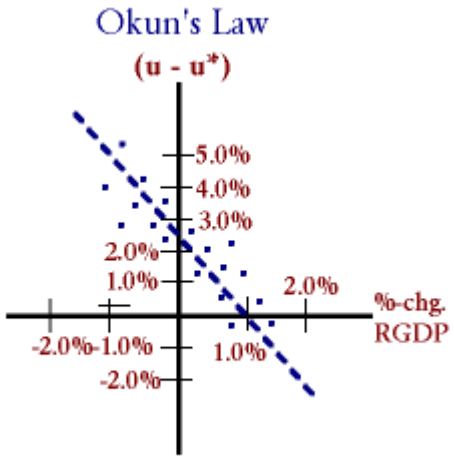
$$\%\Delta Y^R - \%\Delta Y^* = -2.5(u - u^*)$$

This expression can be rewritten as:

$$(u - u^*) = \Phi(\%\Delta Y^R - \%\Delta Y^*)$$

where $\Phi = -(1 / 2.5)$.

Figure 9, Okun's Law



Finally given our markup equation:

$$\text{Prices} = \alpha(\text{wages})$$

and combining the following three expressions:

- $\%\Delta P = \alpha\%\Delta w$
- $\%\Delta w = -\beta(u-u^*)$ and
- $(u-u^*) = -\Phi(\%\Delta Y^R - \%\Delta Y^*)$

we have,

$$\%\Delta P = [\alpha\,(-\beta)(-\Phi(\%\Delta Y^R - \%\Delta Y^*)]$$

defining: $\theta = \alpha(-\beta)\Phi$,

$$\%\Delta P = \theta(\%\Delta Y^R - \%\Delta Y^*)$$

In this final expression, we find that changes in the price level are related to the difference between the ability to buy goods and services in a particular economy $\mathbf{Y^R}$ and the ability to produce those goods and services **Y*.**

If:

$$\%\Delta Y^R_t > \%\Delta Y^*$$

then

$$\%\Delta P > 0$$

and inflationary pressure exists in the economy. If the opposite is true, we will then observe deflationary pressure in the economy.

Price Expectations and Short Run Aggregate Supply

A different approach to understanding aggregate supply is in the form of the **Lucas Aggregate Supply** equation. This equation is derived from individual firm supply equations (for 'n' different goods) for different economic agents based on actual prices and expected prices:

$$Y^i_t = Y^*_t + b(P^i_t - E[P^i_t]) \text{ -- } \textit{for } i = 1 \textit{ ... } n \textit{ goods.}$$

Expectations about the market price of a particular good are derived by the firm based on observations about the general price level: $E[P^i_t] = f(P_t)$. If the firm's actual price 'P^i_t' exceeds the expected price value $E[P^i_t]$ then this is situation is characterized by the firm as an increase in the relative price for the firms's product or services (*the agent perceives that the market is placing a higher value on its product*) and thus this firm will devote more resources to production such that $Y^i_t > Y^*_0$ where Y* represents some normal level of output by that firm.

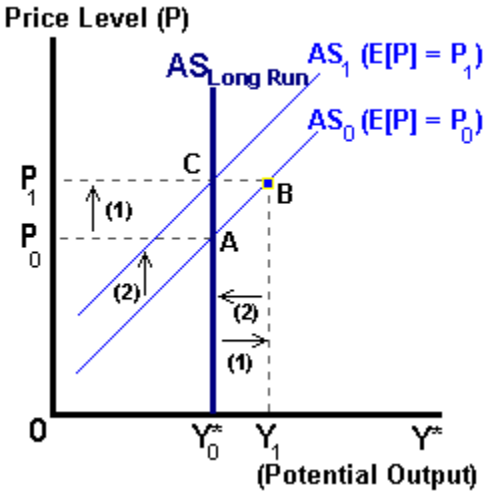
Aggregating over all firms in the economy, we have a **short run** aggregate supply function that states that actual output will exceed the normal level of output ($\mathbf{Y_1 > Y^*_0}$ *in*

the diagram below) when the actual price level exceeds the expected price level ($\mathbf{P_1} > \mathbf{P_0}$) perhaps due to some unanticipated shock to the economy or monetary system. An equation for short-run Aggregate Supply (**AS**) can be defined as:

$$\mathbf{Y_t} = \mathbf{Y^*_0} + \beta(\mathbf{P_t} - E[\mathbf{P_t}])$$

and shown in the diagram below:

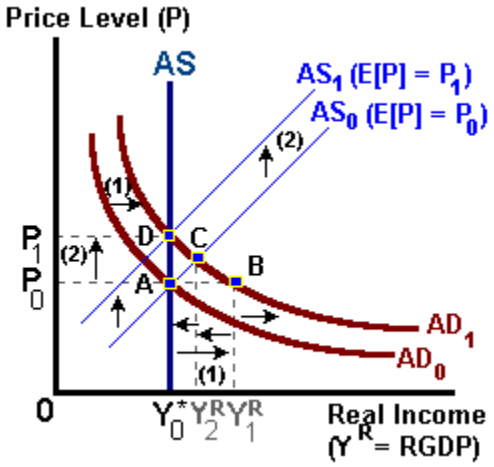
Figure 10 -- Lucas Aggregate Supply



In time these economic agents will observe that the price of their particular good has not changed relative to the price of other goods in the economy. These agents will discover that they have made incorrect production decisions (*i.e., overproduced*) and make the necessary corrections. This involves an upward revision of their price expectations ($P_t = E[P_t]$) and a reduction in output (**B** to **C** *in the above diagram*). Even though output temporarily exceeded the potential of the economy, in the long run the level of output will return to this potential level ($\mathbf{Y_t} = \mathbf{Y^*_0}$).

Given an unanticipated expansionary fiscal or monetary policy shock, aggregate demand will shift outward as defined in traditional demand-side models (**A** to **B** below). This increase in demand-side spending will put upward pressure on the general price level and the shift in demand leads to a movement along the upward-sloping aggregate supply schedule '$\mathbf{AS_0}$' (**A** to **C**). As prices increase, purchasing power declines (**B** to **C**). This increase in the price level is interpreted by different economic agents as an increase in the relative price for their product or service. These agents respond by increasing their level of output. As time passes, these economic agents find that the price increase represented an increase in the absolute price level rather than an increase in relative prices. They adjust their price expectations accordingly as shown by an inward shift in aggregate supply ($\mathbf{AS_0}$ to $\mathbf{AS_1}$). Output declines, prices increase and purchasing power is further reduced. (**C** to **D**):

Figure 11, a Demand-Side Expansionary Shock



These agents were "tricked" into producing more output such that they find that they have overproduced. The response to this information about the absolute price level leads to an updating in the agents' expectation about general prices (i.e., $E[P^i_t]$ are adjusted upwards). Given this update in price expectations, the aggregate supply function shifts upwards such that over time the actual level of output **Y*** remains unchanged. However, the general price level has increased. The outward demand-side shift leads to a temporary increase in output until price expectations are updated to allow for a reactionary upward shift in aggregate supply.

In summary, the only way a change in the price level can affect supply (*production*) decisions in an aggregate economy is if the actual price level '**P**' exceeds that expected '**E[P]**' by individual producers. Ultimately changes in (*potential*) output are the result of changes in the available of resources or productivity (and technology).

Be sure that you understand the following concepts:

- Real GDP
- Aggregate Demand
- Inventory Depletions / Accumulation
- Output Gap
- the Price Level
- Supply-side Shocks
- Demand-side Shocks
- the Markup
- the Rate of Unemployment
- the Natural Rate of Unemployment
- The Phillips Curve
- Okun's Law
- Lucas Aggregate Supply
- Price Expectations

ECONOMIC POLICY

There is still great debate about the degree to which a government or policy makers should intervene in the affairs of a market economy. At one extreme are those who believe that the market when left alone will generate stable economic growth, rising living standards, low levels of unemployment and inflation, and continue to use resources in the most efficient manner possible. The other extreme is characterized by those who believe in rigorous planning, policy implementation, and in some cases, national ownership of key industries.

This debate is the thesis of The Commanding Heights: www.pbs.org/commandingheights

This work will take more of a middle road; identifying situations where policy might be desirable or where the lack of policy actions will cause aggregate harm.

Macroeconomic policy can be divided into two broad categories:

- **Demand-side** policies designed to affect *the ability to spend* and
- **Supply-side** policies designed to affect *the ability to produce*.

Further, Demand-side policies can be broken down into:

- **Fiscal Policy** (*changes in Government Spending or Taxes collected*) and
- **Monetary Policy** (*changes to the money supply engineered by the Central Bank*)

Expansionary policies will be defined as those designed to stimulate economic growth via changes in Real GDP, the potential output of the economy or both. On the demand-side these policies would be implemented through one of the four expenditure categories that make up GDP. These policies are designed to stimulate spending in a **recessionary** economy -- one where Real GDP 'Y^R' falls short of Potential Output 'Y*' such that there is excess capacity to produce goods and services. **Contractionary policies** designed to reduce spending in an **inflationary** economy -- one where there is an excess demand for goods.

For example, a legislated tax cut (*a fiscal expansion*) is designed to increase disposable income thus leading to greater **consumption expenditure**. In addition, this tax cut may make certain investment project more profitable thus leading to more **investment expenditure** and capital accumulation in the future. Changes in government spending are designed to affect the **government expenditure** category directly.

Monetary policy is designed to affect **investment expenditure** through lower interest rates that accompany increases in the money supply and perhaps **net export expenditure**. In this latter case, we might observe that a monetary expansion could lead to more dollars being available on Foreign Exchange markets. This surplus of dollars will weaken the exchange rate between dollars and other trading currencies. In addition the lower interest rates will make the U.S. a less attractive place to invest relative to yields

that are available in other countries. Thus, with lower interest rates, there will be an outflow of capital resulting in the sale of domestic assets and then dollars on Exchange markets. Again, we end up with a weaker dollar. This weaker dollar makes U.S. exports relatively cheaper to foreign buyers and thus stimulates the demand for U.S. produced goods. Also, the weaker dollar makes foreign goods more expensive to domestic buyers reducing the demand for imported goods. The net result is an increase in net Export expenditure.

On the supply-side, policies would be designed to add to the productive capacity of the economy through: labor policies (*education, immigration, retirement*), capital accumulation, research and development (*seeking technological improvements*), or promoting a greater availability of resources.

Demand-side policies may be expansionary or contractionary in nature. However, supply-side policies will always be expansionary--the goal to increase the productive capacity of the economy allowing for increases in living standards.

Monetary Policy

The most active set of tools for managing the demand-side of the economy is through monetary policy. We begin by noting that there is an asymmetry to the implementation of these policies. Monetary expansions are often less effective and less predictable as compared to monetary contractions. For example, suppose that the Federal Reserve is concerned about weak economic growth or relatively high rates of unemployment. The policy reaction would be to increase bank reserves (*excess reserves*) through open market purchases. Banks would then be expected to convert these excess reserves into loans with their customers – an availability of loans signaled via lower borrowing rates. However, if bankers are somewhat pessimistic about their future reserve position (expecting higher than usual withdrawal activity or fewer new deposits), they might just sit on these reserves with no change in lending rates. Even if bankers want to convert these reserves into loans, potential customers may not have the incentive to borrow at any rate. A sluggish economy could be matched with sluggish demand for goods and services thus eliminating the incentive for investment in inventories or productive capacity. A common saying in this case is that "*you can't push a rope*" meaning that it is difficult to push interest rates down and push borrowing up.

In contrast, contractionary monetary policy is always effective. Open market operations that remove reserves from the banking system (*an open market selling of securities*), will require that these banks curtail lending activity and allowing competition for fewer available loans to push interest rates upward. Higher interest rates will always make certain investment projects unprofitable thus leading to the abandonment of these projects. In this case we find that the Fed "*can pull a rope*" – pull reserves out of the banking system and pull interest rates up.

Expansionary Monetary policy may be used to stimulate an economy operating below its potential. The Federal Reserve will only be comfortable using this type of policy if there is little chance that inflation will not become a future problem because of these policies (i.e., $\pi \rightarrow 0$).

Note: Since inflationary pressure does not exist, as nominal interest rates change real interest rates will change in the same direction: $i \downarrow \Rightarrow r \downarrow$ given $r = i - \pi$.

In this instance, the Fed will use **open market operations to purchase** Government securities from Treasury dealers paying for those securities with newly created reserves. In the purchase of these securities, the Federal Reserve N.Y. trading desk will put upward pressure on these bond prices thus driving their yield downward ($\Psi \downarrow$).The reserves finding their way into the banking system as excess reserves will be converted by bankers into new loans – loans available to borrowing customers at lower interest rates. In the diagram below left this increase in reserves is shown as an outward shift in the money supply line. As interest rates fall, the opportunity cost of holding cash balances also falls. The public will be willing to hold larger cash balances in the form of new deposits. In the diagram on the right we find that as interest rates fall, borrowing to support investment expenditure increases thus shifting the **AE** line upwards. This is similar to an autonomous shock in spending (note: in the diagram below-right, $\mathbf{Z} = [\mathbf{A_o} - h(r)]$):

Reserves ↑, *Excess Supply of Money*, .i ↓, M_d ↑,

as i ↓; r ↓, $[\mathbf{A_o} - h(r)] \uparrow \Rightarrow I\uparrow$, *and* $\Delta_{[+]}Y = \alpha[\mathbf{A_o} - h(\Delta_{[-]}r)]$.

Expansionary Monetary Policy

Figure 1a, A Monetary Shock

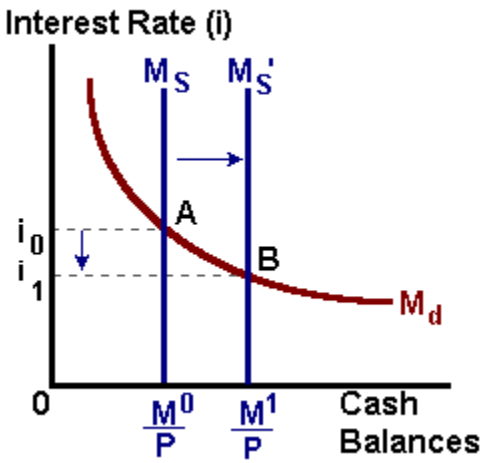
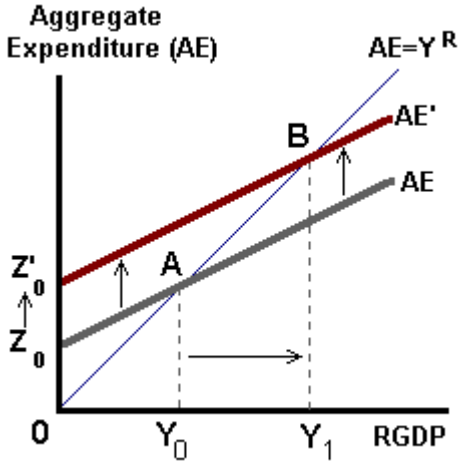


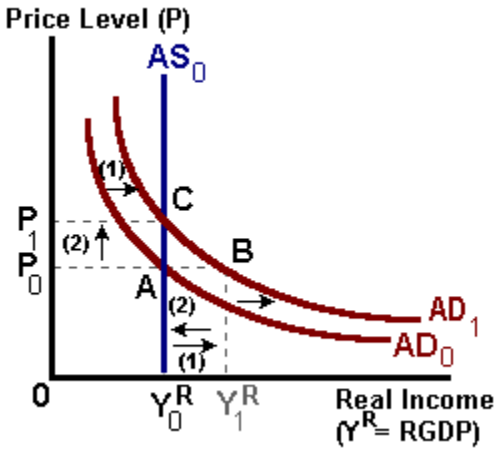
Figure 1b, Changes to Expenditure and Income



In the case of contractionary monetary policy; the Federal Reserve is reacting to inflationary pressure in the economy due to an increase in aggregate demand *(more purchasing power*), as shown by the shift from $\mathbf{AD_0}$ to $\mathbf{AD_1}$ in the diagram below. A

different possibility would be a reduction in potential output perhaps due to an adverse productivity shock or an increase in factor prices (*this would shift* ***Aggregate Supply*** *inward*). In both cases, the economy's *ability to spend* exceeds its *ability to produce* leading to upward pressure on output prices.

Figure 2, An Increase in Aggregate Demand
putting upward pressure on the Price Level



The Fed will combat this increase in demand-side spending by pushing interest rates upward and increasing the costs of borrowing to weaken investment spending and shifting aggregate demand back near **AD_0**.

This contractionary monetary policy would therefore require changes opposite to those described above:

Reserves ↓, *Excess Demand for Money*, .i ↑, M_d ↓,

as i ↑; r↑, $[A_o - h(r)] \downarrow \Rightarrow I\downarrow$, *and* $\Delta_{[-]}Y = \alpha[A_o - h(\Delta_{[+]}r)]$.

The **open market sale** of government securities would create a surplus of these securities in secondary bond markets thus driving their price down and yields up ($\Psi \uparrow$).

In reality the directive to the N.Y. trading desk from the Federal Open Market Committee will be to buy and sell securities until a particular interest rate (Federal Funds) target has been met. Because of day to day changes in the money multiplier, withdrawal and deposit activity, and other forces; the actual Federal Funds rate will hover around this target. However, if the goal of the Fed is to increase this short-term rate, other market-determined interest rates *(i.e., the Prime Lending Rate*) are likely to follow with the consequent reduction of Investment expenditure decisions and ultimately Real GDP.

The Fed may also use monetary policy to affect international trade in goods and services or capital flows via changes to the exchange rate. For example, if the policy was to "weaken" the dollar which would make domestic goods relatively cheaper for our trading

partners and make foreign goods relatively more expensive to domestic consumers. This weakening might be a coordinated effort with other central banks to mitigate capital flows into or out of the United States as these other countries engage in specific monetary policy actions of their own.

An effort to reduce the foreign exchange value of the dollar is similar to the expansionary monetary policy discussed above. The Fed would engage in an open market purchase of securities, increasing bank reserves, and expanding the money supply. These additional dollars could then be sold on foreign exchange markets in the purchase of foreign currencies or assets. This selling of dollars would begin to weaken the dollar. Or it might be the case that the Fed, by putting downward pressure on interest rates with this increase in the money supply reduced the yield on domestic financial assets relative to similar foreign assets. Institutions and individual investors would then sell the domestic assets for dollars, sell the dollars on foreign exchange markets, buy foreign currencies in order to purchase higher yielding foreign assets:

$$\text{Reserves} \uparrow, \textit{Excess Supply of Money}, .i \downarrow, \Psi_{domestic} \downarrow, E[\Psi_{domestic}] < \Psi_{foreign;}$$
$$\textit{Capital Outflows}, \varepsilon \downarrow.$$

Fiscal Policy Budget Deficits and the Debt

When discussing fiscal policy, we find that there is a bias towards expansionary policies. Fiscal expansions tend to be politically popular (*i.e., more spending and/or less taxes*) and thus easy to legislate. However, in times of budget deficits, these fiscal expansions make existing deficits worse and add to the national debt -- debt that at some ratio to GDP may not be sustainable. High levels of Government debt can result in fiscal expansions being seldom used for economic policy purposes. Contractionary policies (*spending cuts or higher taxes*) tend to be politically unpopular and less likely to be used even if dictated by economic conditions.

Table 1, Budget Deficits and the Debt

Year	NGDP	Budget Deficit[1]	Debt	Interest on the Debt	Ratio Debt-NGDP	Ratio Interest-NGDP
1978	2,295.9	57.2	706.4	35.5	0.308	0.015
1980	2,795.6	73.8	909.1	52.5	0.325	0.019
1982	3,259.2	128.0	1,137.3	85.0	0.349	0.026
1984	3,932.7	185.4	1,564.7	111.1	0.398	0.028
1986	4,452.9	221.2	2,120.6	136.0	0.476	0.031
1988	5,108.3	155.2	2,601.3	151.8	0.509	0.030
1990	5,803.2	221.2	3,206.6	184.4	0.553	0.032
1992	6,318.9	290.4	4,002.1	199.4	0.633	0.032
1994	7,054.3	203.3	4,643.7	203.0	0.658	0.029
1996	7,813.2	107.5	5,181.9	241.1	0.663	0.031
1998	8,781.4	-69.2	5,478.7	241.2	0.624	0.027
2000	9,872.9	-236.4	5,629.0	223.0	0.570	0.023
2001	10,250.0	-127.3	5,770.3	206.2	0.563	0.020
2002	10,506.3	157.8	6,137.1	332.0	0.584	0.031

Source: Economic Report of the President 2003

[1]**Note**: Positive values here represent deficits, negative values are surpluses.

Looking at table 1, we find that in the U.S. the ratio of the Federal Debt to Nominal GDP increased from roughly 30% in 1978 to a high of 66% in 1996. Over the past five years this ratio has fallen as the budget moved from deficit to surplus. However, deficits are projected over the next 10 years such that this ratio could increase. Additionally, as the Debt/NGDP ratio increases, the interest burden on the debt (expressed as proportion of NGDP) also increases.

See: U.S. Treasury--the Public Debt online http://www.publicdebt.treas.gov/opd/opdpenny.html

Changes in the Debt-NGDP ratio is best understood by analyzing the following expression:

$$Debt_t = Deficit_t + (1 + i)Debt_{t-1}$$

In words, the Debt (a stock variable) at the end of time period 't' is equal to the Deficit that occurred during that time period (a flow variable) plus the interest expense on past Debt that accrues at some nominal rate 'i'.

The future value of this debt will be equal to:

$$Debt_N = \Sigma_{[t = 1,N]}(Deficit_t) + Debt_0(1 + i)^N$$

as a ratio to Nominal GDP (growing as some rate 'g'):

$$d_N = \frac{\Sigma_{[t = 1,N]}(Deficit_t) + Debt_0(1 + i)^N}{\mathbf{NGDP}_0(1 + g)^N}$$

Even if the sum of future deficits were to equal zero , we will find that the Debt/NGDP ratio 'd_t' will decline only if:

$$(1 + i) < (1 + g)$$

That is if the nominal borrowing rate is less than the growth rate in Nominal GDP. With a series of future deficits, the Debt/NGDP ratio is likely to increase even if the above condition holds between nominal interest rates and Nominal GDP growth. There is some debate about the ratio where by the Debt is no longer sustainable. This would occur is lenders were no longer will to finance future deficits or if the interest burden of existing debt begins to dominate the budget.

As a matter of fiscal policy some will argue that growth in the Debt/NGDP ratio will, at some level, begin to "*crowd out*" private investment spending as the federal government competes with the private sector for loanable funds pushing the real cost of borrowing upwards. Two counter-arguments to this result do exist. First, some policy makers believe that if the government is engaging in deficit finance, private individuals will

realize that at some point in the future taxes will need to be increased to satisfy accumulating debt obligations. These individuals will engage in more private savings ($S_{private} \uparrow$) perhaps to such a degree that decline in public savings is completely offset. The result is no change in national savings and thus no crowding out takes place. A second argument is the deficit finance resulting from current tax cuts will stimulate future economic growth. These tax cuts reduce the cost of acquiring capital thus allowing for more investment and provide greater incentives for labor to be more productive via greater after-tax earned income. Tax cuts therefore lead to an increase in the economy's potential to produce resulting in supply-side growth to more than offset the growth rate in the nation's debt.

Supply-Side Policies

Supply-side are designed to work through the aggregate production function by affecting the availability of factor inputs or their productivity:

$$X^* = f(L, K, M).$$

These policies can be categorized via each of the three factors of production listed in the above function.

Labor Policies

Policy makers have attempted to increase the potential output of an economy via the labor-input component. These policies represent an attempt to increase labor supply via relaxed immigration policies, population (encouraging greater birth rates) policies, or increasing labor force participation rates. Policies can also attempt to increase the productivity of labor (*an increase in Human Capital*) through improved access to education and policies designed to make educational activities more effective.

Capital Accumulation

The capital stock of a nation, so important for rising living standards, can also be affected by different policies. Governments are often involved in the direct creation of necessary infrastructure that complements and enhances the movement of goods and services as well as reducing the transaction costs associated with market activities. This infrastructure may include new roads (i.e., the U.S. Interstate system), bridges and dams, airports, and improvements to waterway shipping. In addition this infrastructure may include legal systems, courts and police to help make market transactions more efficient.

Policy makers can also encourage capital accumulation through the private sector through grants and subsidies for research, development, and capital creation. Tax laws can also favor capital by lowering the real cost of borrowing thus encouraging investment spending -- spending on new capital and the replacement of existing capital.

Availability of Raw Materials

Policies may also be developed to improve access to and the general availability of raw materials. These types of policies would include different land-use/land-management policies allowing for resource extraction, logging, oil exploration, and urbanization.

Often these types of policies run counter to efforts at environmental protection leading to strong debate in the political arena.

Be sure that you understand the following:

- Aggregate Demand
- Aggregate Supply
- Aggregate Expenditure
- Potential Output
- Purchasing Power
- Inflation
- Recession
- Fiscal Policy
- Monetary Policy
- Expansionary Policies
- Contractionary Policies
- Open Market Operations
- Nominal Interest Rates
- Real Interest Rates
- Spending Multiplier
- Money Multiplier
- Labor Force Participation Rate
- Government Debt
- Budget Deficits/Surpluses
