

## MEASURES of ECONOMIC ACTIVITY

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*In order to perform macroeconomic analysis in support of economic policy, it is necessary to collect data over time on key economic variables related to income, employment of resources, price levels, and other indicators of the direction of the business cycle. This collection and analysis of data is called National Income Accounting and represents the tools and methods by which economists and policy-makers measure economic activity and economic growth over time.*

### National Income Accounting – Gross Domestic Product

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There are two types of economic variables used to understand the performance of the macroeconomy: **flow variables**--economic activity measured per unit of time and **stock variables**--measures of economic activity at a point in time. For example:

#### Flow Variables

- Income (Household, Per-Capita, National)
- Budget Deficits
- Investment Expenditure
- Consumption Expenditure
- Any Income Statement measures (Sales Revenue, Gross Profit, Expenses)

#### Stock Variables

- Wealth (an accumulation of Savings over time)
- Debt (an accumulation of borrowing over time)
- Capital Stock (Factories, Machinery, Inventory, Infrastructure)
- The Money Supply
- Any Balance Sheet measures (Assets, Liabilities, Owner's Equity)

Typically most of the common, although not all, measures of economic activity are flow variables. It is important to note that in order to interpret the magnitude of any flow variable, a corresponding time period must be attached (i.e., consumption spending per month, quarter, or year).

The evaluation of economic activity is really about measures of output or changes in output in a given period of time. The expectation is that any past additions to the wealth of a nation, whether it be physical capital or human capital, will lead to growth in current output. These output measures, when stated on a per-capita basis (output per person) can be interpreted as a measure of regional or national **Standard of Living**. (SoL) If the growth rate in output exceeds the growth rate in population then living standards are assumed to be rising

$$\text{SoL} = \text{Output per Capita} = \text{Output} / \text{Population}$$

such that if:

**$\% \Delta \text{Output} > \% \Delta \text{Population}$ ,**  
then,  
**SoL  $\uparrow$ .**

There are difficulties in the attempt to measure output in the aggregate. It is impossible to add different quantities of goods and services, with different units of measure, together as a single aggregate measure. The quantity of autos produced added to the quantity of apples and quantity of houses gives a meaningless measure:

$$Q_{\text{autos}} + Q_{\text{apples}} + \dots + Q_{\text{houses}} + \dots + Q_n = \sum_{[i=1, n\text{-goods}]} Q_i = ???$$

To overcome this problem of aggregation, economists transform the above sum to a common unit of measure in currency terms. This is accomplished by pre-multiplying each item by its current market price 'P<sub>i</sub>'. Thus, instead of adding individual quantities together, economists sum the **expenditure** for each i<sup>th</sup> good together:

$$P_{\text{autos}}Q_{\text{autos}} + \dots + P_{\text{houses}}Q_{\text{houses}} + \dots + P_nQ_n = \sum P_iQ_i$$

**= Aggregate Expenditure**

As will be seen below, the use of market prices and expenditure measures to evaluate economic activity causes other problems in attempts to accurately measure growth in a nation's output over time.

The topic of National Income Accounting begins with the use of two methods to determine this measure of aggregate expenditure:

- directly via the expenditure approach (through spending on final goods and services) or
- indirectly via the compensation approach (through payments made to the factors of production in producing goods and services).

The **Expenditure Approach** involves collecting data on the major components of spending in a given time period. This spending is in the form of consumption expenditure 'C', investment expenditure 'I', government expenditure 'G', and net-export expenditure 'NX'.

When added together these four forms of spending make up what is known as the Gross Domestic Product or GDP for a given economy:

$$C + I + G + NX = \sum P_i Q_i = \mathbf{GDP}$$

Formally defined, **GDP** represents a measure of *the market value of all final goods and services produced and purchased in a given year*. In the table below, data are provided for the time period 1960-2000 (in billions of \$):

**Table 1**, Expenditure Categories

<b>Year</b>	<b>Consumption Expenditure</b>	<b>Investment Expenditure</b>	<b>Government Expenditure</b>	<b>Net Export Expenditure</b>	<b>Nominal GDP</b>
1960	332.3	78.9	113.8	2.4	527.4
1965	444.3	118.2	153.7	3.9	720.1
1970	648.9	152.4	237.1	1.2	1,039.6
1975	1,030.3	230.2	361.1	13.6	1,635.2
1980	1,762.9	477.9	569.7	-14.9	2,795.6
1985	2,712.6	736.3	878.3	-114.2	4,213.0
1990	3,831.5	861.7	1,181.4	-71.4	5,803.2
1995	4,969.0	1,143.8	1,372.0	-84.3	7,400.5
2000	6,728.4	1,767.5	1,741.0	-364.0	9,872.9

*Source: Economic Report of the President 2002*

The **Compensation Approach** involves measuring the amount of compensation paid to the various factors of production (land, labor, capital, entrepreneurship) used as inputs in the production process. For example in 2000 (est.):

**Table 2**, Income Categories

<b>Category</b>	<b>Amount</b>	<b>(%)</b>
Compensation of Employees (labor)	\$5,715.2	(71.6%)
Proprietor's Income (entrepreneurship)	715.0	(9.0%)
Corporate Profits (capital)	876.4	(11.0%)
Net Interest (capital)	532.7	(6.7)
Gross Rental Income	202.5	
less depreciation expense	-61.0	
Net Rental Income (land)	141.6	(1.8%)
<b>National Income</b>	<b>\$7,980.9</b>	<b>(100%)</b>

*Source: Economic Report of the President 2002*

Note that about 70% of **National Income** represents the return to labor and the remaining 30% is known as the return to capital. Historically, the percentage of national income allocated between labor and the other factors of production has remained relatively constant over the past century.

The difference between gross domestic product and national income (\$1,892.00) is due to **depreciation expense, indirect business taxes** (sales and excise taxes), and business transfers to individuals (through donations to the United Way and the like). For example, some of the payments (expenditure) to capital and land are made to cover the consumption of capital and equipment (to allow for wear and tear on the equipment). However, these payments are not received directly by the owners of capital and land in that they must allow for eventual replacement of these items. In the case of indirect business taxes, expenditure on some items like gasoline, liquor, and telephone calls, include the provision for a per-unit tax in the price of these items. These per-unit or excise taxes are transferred to some government agency and do not represent direct compensation to the owners of factor inputs.

One goal of national income accounting is to measure growth in these income measures over time. Both the gross national product and national income measures are used to determine the rate of overall economic growth. However, the interest is with growth in output, not necessarily growth in expenditure.

Given that aggregate measures include both quantities and prices, changes in expenditure might come about either due to true changes in output, changing prices or both! As stated above, Gross Domestic Product represents the market value of all final goods and services produced. In an inflationary environment (one where the absolute price level is increasing) these market values will also increase and thus lead to an overstatement of the true rate of economic growth.

Any economic dollar variable may be expressed either in measured nominal terms (not adjusted for changes in the price level) or in real terms (calculated using constant prices). **Nominal GDP (NGDP)** may be expressed using the aggregate expression from above:

$$\text{NGDP} = \sum P_{i,t} Q_{i,t}$$

In contrast **Real GDP (RGDP)** is calculated using the same composition of goods and services  $Q_{i,t}$  evaluated at base-period (constant) prices  $P_{i,0}$ :

$$\text{RGDP} = \sum P_{i,0} Q_{i,t}$$

Measures of **economic growth** are measured by calculating the percentage change in real GDP (or in terms of output growth since the price term is held constant).

$$\begin{aligned} \text{Growth Rate} &= \% \Delta (\text{RGDP}) \\ &= \frac{(\text{RGDP}_t - \text{RGDP}_{t-1})}{\text{RGDP}_{t-1}} \end{aligned}$$

A comparison of nominal and real growth rates for GDP in the U.S. are given in the table below (note: the Implicit GDP Deflator is calculated as the ratio of NGDP and RGDP):

**Table 3, Economic Growth**

<b>Year</b>	<b>Nominal GDP</b>	<b>%-Change NGDP</b>	<b>Real GDP</b>	<b>%-Change RGDP</b>	<b>Implicit GDP Deflator</b>
1990	5,803.2	4.0	6,707.9	1.8	0.87
1991*	5,986.2	3.2	6,676.4	-0.5	0.90
1992	6,318.9	5.3	6,880.0	3.0	0.92
1993	6,642.3	5.1	7,062.6	2.7	0.94
1994	7,054.3	6.2	7,347.7	4.0	0.96
1995	7,400.5	4.9	7,543.8	2.7	0.98
1996	7,813.2	5.6	7,813.2	3.6	1.00
1997	8,318.4	6.5	8,159.5	4.4	1.02
1998	8,781.5	5.6	8,508.9	4.3	1.03
1999	9,268.6	5.6	8,856.5	4.1	1.05
2000	9,872.9	6.5	9,224.0	4.1	1.07

\**Recession years*

*Source: Economic Report of the President 2002*

As can be seen in the above numbers, what appears to be robust economic growth (5.0 – 6.0% per year in NGDP) may be largely due to inflation and corresponding change in market values. Over the past twelve years in real terms GDP in the U.S. has been growing on average by 2.5 to 4.0 percent annually.

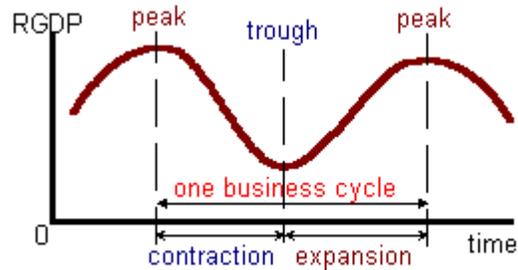
*See: The Bureau of Economic Analysis: <http://www.bea.gov> for official press releases about GDP and related data.  
The Digital Economist: [http://www.digitaleconomist.com/econ\\_data.html](http://www.digitaleconomist.com/econ_data.html) for annual updates to the data.*

## Real GDP and Business Cycles

**Business cycles** are recurring changes in the level of business and economic activity over time. This business activity is measured via measures of Real Income specifically Real GDP. Quite often these cycles occur because spending in the economy (as measured by RGDP) differs from the ability of the economy to produce goods and services. A prolonged period of growth in spending that exceeds the growth rate in output will lead to tight factor markets. The economy may transition into a period of decline (recession) simply because the current rate of spending cannot continue.

Business cycles are characterized by **expansions** or continued increases in Real GDP followed by shorter **contractions** or a decline in Real GDP. These contractions or **recessions** are officially defined as *two or more quarters of negative growth in Real GDP*. A full **business cycle** is measured from the peak of one cycle to the peak of the following cycle.

**Figure 1, A Business Cycle**

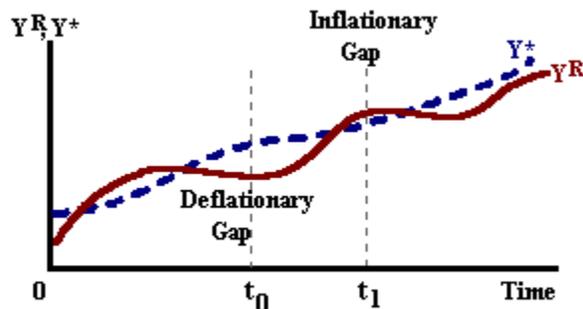


These cycles occur at regular intervals in a market economy as the rate of real economic growth exceeds the growth in the potential of the economy to produce goods and services. As resource limits are reached in an expansion credit is restrained, the cost of borrowing increases, and resource prices begin to rise. All of these factors put a squeeze on the profit margins of business firms that often leads to a curtailment of business activity.

Recessions may also occur or be prolonged as consumers and producers become more pessimistic about future economic events. This pessimism may lead to a decline in both consumption and investment spending resulting in an increase in inventory levels. Businesses respond to this unanticipated increase in inventory through cutbacks in production the corresponding layoffs of workers.

A more accurate description of cyclical economic activity would be with respect to long run trends. This trend is defined by growth in the **Potential Output** of the economy ' $Y^*$ '. Growth in output depends on growth factor-input availability (labor, materials, capital energy) and changes in technology. It will rarely be the case the **Real GDP** ' $Y^R$ ' will grow at exactly the same rate as potential output. Instead, it is more likely that due to demand-side shocks (changing expectations, changes in economic policy or, changes in the global geo-political situation), Real GDP will vary about the potential of the economy. This is shown in figure 2 below:

**Figure 2, Output Gaps**



The difference between Real GDP and Potential Output is known as the **Output Gap**:

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

When Real GDP exceeds the potential of the economy to produce, an **Inflationary Gap** is the result. This growth in spending is leading to depletion of inventories and tight factor markets as producers rush to replenish these inventories by hiring more inputs. These tight factor markets lead to higher factor prices and, depending on the degree of competitive pressure that exists in a given industry, higher prices to the customer of these products. If Real GDP is below the potential of the economy, a **Deflationary Gap** exists. In this case there is little upward pressure on factor or output prices. However, the economy is not operating to its full potential such that living standards are lower than what otherwise be possible.

*See: The National Bureau of Economic Research: <http://www.nber.org/cycles/>*

### **A History of Business Cycles**

Since World War II, most business cycles would last 3-5 years peak-to-peak. The average duration of an expansion has been 45 months and the average duration of a recession has been 11 months. As a comparison, the Great Depression which saw a decline in economic activity between 1929 and 1933, lasted 43 months peak-to-trough.

<b>Time Period,</b>	<b>(length) -- Reason</b>
1945-1945	( 8 months) -- Post W.W.II transitions
1948-1949	(11 months) -- Inter-war adjustments.
1953-1954	(10 months) -- Transition from the Korean War
1957-1958	( 8 months) -- Ike's Rolling Readjustment
1960-1961	(10 months) -- Lack of economic stimulus and investment opportunities.
1969-1970	(11 months) -- Early indications of stagflation (rising prices and unemployment).
1973-1975	(16 months) -- Oil price shocks, breakdown of the Bretton-Woods fixed exchange-rate regime, and perhaps the end of the Viet Nam War.
1980-1980	( 6 months) -- Second oil price shock and the "Energy Crisis"
1981-1982	(16 months) -- Recession induced in part by the Federal Reserve's reaction to the buildup of inflationary expectations of the 1970's
1990-1991	( 9 months) -- Savings and Loan crisis and the Iraqi invasion of Kuwait.
2001-Mid 2002	-- End of the 'Irrational Exuberance' in financial markets leading to a bursting of the asset bubble of the late 1990's and the telecommunications shake-out.

### **Unemployment**

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Over time labor markets are impacted in the long run by demographics, changes in productivity and the rate of growth in potential output. In the short run these markets will reflect volatility in the level of economic activity -- imbalances between the ability to spend and the ability to produce. In order to fully understand the employment picture we need to make use of two separate measures. One is the **Unemployment Rate** represents the ratio of those actively seeking work and the total number of people in the labor force. The other is the **Labor Force Participation Rate** which is a reflection of those entering or leaving the civilian labor force. The following table aids in the understanding of how these values are computed.

**Table 4**, Measures of Employment and Unemployment.(thousands)

<b>Category</b>	<b>1990</b>	<b>1995</b>	<b>2000</b>
A. U.S. Population:	249,973	263,082	275,372
B. less those not available for work (students, children, institutional population):	60,809	64,498	65,673
C. The Number of People available to the labor force:	189,164	263,082	209,699
D. less those not working (retired persons, home caretakers...):	63,324	66,280	68,836
E. The Labor Force:	125,840	132,304	140,863
F. less those currently seeking work (the unemployed):	7,049	7,404	5,655
G. Anyone working for pay in a given survey week (the employed):	118,793	124,900	135,208

*Source: Economic Report of the President 2002*

Calculating the above-mentioned common ratios:

	<b>1990</b>	<b>1995</b>	<b>2000</b>
(E)/(C) = the Labor Force Participation Rate:	66.4%	66.6%	67.2%
(F)/(G) = the Unemployment Rate:	5.6%	5.6%	4.0%

we find that over the past decade the Labor Force Participation Rate has been increasing. This has been true since the early 1950's when labor force participation rates stood at roughly 50%. As the baby-boom cohort approaches retirement over the next 20 years, this particular rate is expected to decline. Also over the past decade, the Unemployment Rate has been decreasing largely due to the strong economic growth since the recession of 1990-91 (see table 5 below). As of this writing the unemployment rate has increased to 6.0% has since been declining to the 5.6-5.7 range as the U.S. economy passes through the recession of 2001-2002.

**Table 5**, Labor Force Data

<b>Year</b>	<b>Unemployment Rate</b>	<b>Labor Force Part. Rate</b>	<b>Earnings (1982 dollars)</b>	<b>Productivity (1992=100.0)</b>
1990	5.6	66.5	259.5	95.2
1991	6.8	66.2	255.4	96.3
1992	7.5	66.4	255.0	100.0
1993	6.9	66.3	254.9	100.5
1994	6.1	66.3	256.7	101.9
1995	5.6	66.6	255.1	102.6
1996	5.4	66.6	255.7	105.4
1997	4.9	66.8	261.3	107.8
1998	4.5	67.1	268.3	110.7
1999	4.2	67.1	271.3	113.4
2000	4.0	67.2	272.2	117.3
2001	4.8	66.9	273.6	119.6

*Source: Economic Report of the President 2002*

### **Types of Unemployment**

**Frictional Unemployment** represents those individuals that have left one job but are certain to begin their new job within a relatively short period of time. Often this type of unemployment accounts for those in-between jobs and is the result of individuals responding to market forces in the economy.

**Structural Unemployment** exists when broad structural changes are taking place in an economy such that certain job categories or skills are eliminated from labor markets. These changes may be the result of technological change, changes in tastes or preferences for particular goods, changes in the regulatory environment with respect to certain products (pharmaceuticals, tobacco, pesticides), or changes in any barriers to trade. Structural unemployment tends to be a long term phenomenon addressed by education and new training of those who are structurally unemployed.

**Cyclical Unemployment** occurs when individuals suffer job losses due to changes in the economic (business) cycle. Often as growth in economic activity reaches its peak and begins transition to a contraction, employers will begin to curtail production, to avoid additions to accumulating inventories, and thus begin to furlough a fraction of their workforce. In the rebounding period, from contraction to expansion, the opposite occurs as employers add employees to their payrolls and increase the rate of production.

### **The Natural Rate of Unemployment**

The natural rate of unemployment is that rate where there is neither upward pressure nor downward pressure on the price level. If the actual rate of unemployment is below this natural rate, then labor markets are fairly tight making it difficult for firms to hire new workers. The quickest way to meet these hiring needs is to offer higher wages to either bid employees from other firms or to induce new workers to enter the labor force. However, since wages are a significant proportion of production costs, these costs will tend to rise putting upward pressure on output prices as firms attempt to protect profit margins. If the actual rate of unemployment is above the natural rate indicating a slack labor market, this pressure on wages does not exist.

### **Inflation and the Consumer Price Index**

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**Inflation** (or **Deflation**) is a macroeconomic concept referring to an increase (decrease) in the absolute price level over some defined time period. An increase in the price of all goods has the effect of reducing the purchasing power of money and money incomes and thus must be taken into account when planning future economic activity. Inflation is difficult to measure because it represents the percentage change over time of a nonexistent economic variable--the price level 'P<sub>t</sub>'.

$$\% \Delta P_t = (P_t - P_{t-1}) / P_{t-1}$$

Unlike GDP or other national income measures, no single observable measure exists to represent the aggregate price level. Thus, economists rely on a price index based on some

well-defined market-basket of goods as a proxy to measure the level of prices and changes in prices over time.

The most common measure of inflation is that of changes to the **Consumer Price Index** or '**CPI**' as calculated by the Bureau of Labor Statistics (the BLS). This particular index is based on the prices of a basket of goods which represents the purchasing behavior of some average urban consumer. The CPI, also known as the Laspeyres Index, is calculated using a weighted average of current to past price ratios for this basket of goods:

$$CPI_t = \sum_{[i=1, n\text{-goods}]} w_{i,0} [P_{i,t} / P_{i,0}] \quad (1)$$

These weights ' $w_{i,0}$ ' are based on the expenditure patterns of the consumer in a base period (currently 1982-84) reflecting the importance of each  $i^{\text{th}}$  good relative to the overall level of consumer expenditure in that base period or:

$$w_i = \frac{P_{i,0} Q_{i,0}}{\sum_{[i=1, n\text{-goods}]} [P_{i,0} Q_{i,0}]} \quad (2)$$

thus

$$CPI_t = \frac{\sum_{[i=1, n\text{-goods}]} [P_{i,t} Q_{i,0}]}{\sum_{[i=1, n\text{-goods}]} [P_{i,0} Q_{i,0}]} \quad (3)$$

where ' $Q_{i,0}$ ' represents the quantity of the  $i^{\text{th}}$  good consumed in the base time period ( $t = 0$ ), ' $P_{i,0}$ ' represents the price of the  $i^{\text{th}}$  good in the base time period, and ' $P_{i,t}$ ' represents the price of the same good in the current time period ' $t$ '.

A measure of **inflation** is then developed by computing the percentage change in the CPI from one time period to the next:

$$\pi_t = \% \Delta . CPI = \frac{CPI_t - CPI_{t-1}}{CPI_{t-1}} \quad (4)$$

It is important to note that the CPI is not a perfect measure of the price level or changes in the price level. Because this index is computed using base-period quantities (reflecting buying behavior and preferences in the base year), it does not allow for substitution among goods as **relative prices** change. For example, it might be that the overall rate of inflation is 5%. However, within that value some goods might be rising by 3-4% and other goods by 6-7%. Consumers will attempt to soften the effects of increasing prices on household budgets by substituting away from the relatively more expensive goods and towards the relatively cheaper good. This behavior is not captured in the CPI.

A second problem with the CPI is that it does not allow for changes in product quality over time. It may be that prices are rising due to improved quality of the good being purchased such that this good does not have to be replaced as often. Quality changes can also show up in the size of the good in question. Over the past generation, housing prices have been rising. But during this same period of time, the average size of a housing unit (in terms of square footage, number of bedrooms and baths, size of the garage and lot) have also increased.

Finally, the CPI does not allow for the inclusion of new goods and services as they emerge into the market place. A fixed basket of goods based on 1982/84 preferences ignores DVD players, PDA's, cell phones, audio CD's and many other goods that perhaps lead to improvements in living standards or life style.

*See: The Bureau of Labor Statistics <http://www.bls.gov> for frequent updates to labor force and price data.*

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**Note:** **The GDP Deflator** A different price index, known as the GDP Deflator or the Paasche Index, is constructed using current expenditure shares [to represent the spending habits as reflected in current GDP via  $Q_{i,t}$  ] and is defined by the following equation:

$$P_t = \frac{\sum [P_{i,t}Q_{i,t}]}{\sum [P_{i,0}Q_{i,t}]}$$

where ' $Q_{i,t}$ ' represents the quantities produced and sold of the  $i^{\text{th}}$  good in the current time period ' $P_{i,t}$ ' represents the current price of that  $i^{\text{th}}$  good and ' $P_{i,0}$ ' represents the base (1996) price of that same good. This measure can be interpreted as the ratio of actual spending in the current year (NGDP) and the level of expenditure on that same quantity of goods if prices had not changed (RGDP) -- spending in base-year prices. See **Table 3**.

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## The Balance of Payments

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The Balance of Payments 'BOP' is an account of all transactions between one country and all other countries--transactions that are measured in terms of receipts and payments. From the U.S. perspective, a receipt represents any dollars flowing into the country or any transaction that require the exchange of foreign currency into dollars. A payment represents dollars flowing out of the country or any transaction that requires the conversion of dollars into some other currency. The three main components of the Balance of Payments are:

- The **Current Account** including Merchandise (Exports Imports), Investment income (rents, profits, interest)
- The **Capital Account** measuring Foreign investment in the U.S. and U.S. investment abroad, and
- The **Balancing Account** allowing for changes in official reserve assets (SDR's, Gold, other payments)

U.S. **Exports** are any goods or services produced in the U.S. and sold to other countries in the international market. U.S. **Imports** are goods or services produced by other countries and bought by individuals in the United States. An increase in U.S. receipts (i.e., increased U.S. exports, investment income inflows, or more foreign investment in the U.S.) will lead to increased demand for dollars and an increased supply of foreign currency on foreign exchange markets (individuals and businesses are selling foreign currency and buying dollars). This increased demand will lead to a stronger dollar relative to other currencies. An increase in U.S. payments (i.e., U.S. imports, investment income outflows, or more U.S. investment abroad) will lead to an increase in the supply of dollars and thus a weaker dollar relative to foreign currencies.

**Table 6, BOP Data -- yr: 2000 (\$millions)**

<b>Category</b>	<b>Receipts</b>	<b>Payments</b>	<b>Net</b>
<b>I. Current Account</b>			
A. Merchandise Account (Exports/Imports)	848,678	-1,224,417	-375,739
B. Income Account (Rents, Interest, Profits)	352,866	-367,658	-14,792
C. Transfers			-54,136
<b>Current Account Balance</b>			<b>-444,667</b>
<b>II. Capital Account</b>			
A. Foreign Investment in the U.S.	1,024,218		
B. U.S. Investment Abroad		-580,952	
C. Statistical Discrepancy			1,401
<b>Capital Account Balance</b>			<b>444,667</b>
<b>III. Balancing Account</b>			
(Official Reserve Transfers)			0

*Source: Economic Report of the President 2002*

Currently, the U.S. maintains a deficit in merchandise trade-- the trade deficit and, in the absence of strong net investment income inflows, a current account deficit. These deficits are offset by the current account surpluses--the purchase of U.S. assets by foreign individuals and institutions such that net flow of receipts and payments is in balance (allowing for statistical discrepancy) without the need for any type of official transfers.

### **The History of the U.S. Balance of Payments**

The history of the balance of payments in the U.S. can be divided up into five stages

Stage I: The U.S. is a young debtor nation (1770-1870) -We have a current account deficit due to the need to import most goods and inability to produce many goods for export. -We have a capital account surplus due to a great deal of foreign investment in the U.S. in the areas of roads, farming, cattle ranches, railroads, and canals.

Stage II: The U.S. is a mature debtor nation (1870-1920) - There is still a current account deficit due to large investment income being paid back to foreign investors based on the investment of stage I. The merchandise account is in surplus -- exports > imports.

Stage III: The U.S. is a young creditor nation (1920-1945) -There is a huge surplus in the current account due to large volume of post-war (WWI) exports. -The capital account is now in deficit due to a great deal of U.S. investment in Europe for post-war reconstruction.

Stage IV: The U.S. is a mature creditor nation (1945-1980) -The current account has a merchandise deficit -- exports < imports but an investment income surplus with a slight net surplus overall. -The capital account is in deficit largely due to post-war (WW II) reconstruction in Europe and Japan.

Stage V: (1980- ) -There is a large (and growing) deficit in the merchandise accounts (The Trade Deficit) and a slight surplus in the investment income accounts. -There is a large surplus in the capital account partially to finance the above merchandise deficit (foreign individuals and banks lending money to individuals in the U.S.) Additionally, since the U.S. has had a low inflation rate since 1982 and consistent economic growth , the U.S. has been a good place to invest relative to the rest of the world. However the current inflow of capital investment could eventually lead to large investment income payments in the near future. The investment income surplus we now enjoy may soon be eroded thus worsening the current account deficit.

## Exchange Rates

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Exchange rates represent the linkage between one country and its partners in the global economy. They affect the relative price of goods being traded (exports and imports), the valuation of assets, and the yield on those assets. In the period of fixed or constant exchange rates these prices, values, and yields were predictable over time. However, since 1973 we have been living in a world of flexible rates where foreign exchange markets determine these rates based on trade flows, interest rate differentials, differing rates of inflation, and speculation about future events.

Exchange rates can be expressed as the foreign price of a domestic currency (i.e., the Euro price of a U.S. dollar) or its reciprocal -- the domestic price of foreign currency. We will express these values using the following notation:

the Euro price of a Dollar: €P/\$  
or  
the Dollar price of a Euro: \$P/€

Currently this particular ratio of currencies is near parity (1:1) and thus numerically not very interesting. The following represents the foreign-exchange value of a U.S. dollar as of October 2002 (from here on out, exchange rates will be expressed as the Foreign Price of a Dollar 'FP/\$'):

**Table 7, Exchange Rates (10/2002)**

<b>Country / Region</b>	<b>Currency</b>	<b>Rate</b>
Britain	Pound '£'	0.6402
Canada	Dollar 'C\$'	1.59
China	Yuan 'RMB'	8.278
Europe	Euro '€'	1.013
Indonesia	Rupiah 'Rp'	9007.0
Japan	Yen '¥'	124.1
Mexico	Peso	10.12
Russia	Ruble	31.69
Singapore	Dollar 'S\$'	1.79
South Korea	Won	1260.0
Switzerland	Franc 'F'	1.48

All of the above rates represent Nominal Exchange Rates in that they are the actual posted trading rates on foreign exchange markets. These particular rates can be used to find the domestic price of foreign goods. For example, suppose that we are interested in the price of a portable CD player manufactured in Japan:

$$P_{\text{Japan}} = ¥ 8060$$

if the exchange rate is:

$$¥124 = \$1$$

then the domestic (U.S.) price of this same good is:

$$P_{\text{U.S.}} = \$65 \quad (8060/124)$$

As exchange rates fluctuate, the domestic prices of foreign goods will often be affected:

New exchange rate: ¥140 = \$1 (a weaker Yen)

Price of CD player in Japan:  $P_{\text{Japan}} = ¥ 8060$  (unchanged)

Price of CD player in the U.S.:  $P_{\text{U.S.}} = \$57.60$  (less expensive)

The weaker yen (it now takes more yen to buy a U.S. dollar) or stronger dollar (a dollar now buys more yen), has led to a reduction in the price of Japanese exports and U.S. imports. We would expect that this change will lead to an increase in the flow of goods from Japan to the U.S. However, trade flows are affected not by nominal exchange rates, but instead, Real Exchange Rates

### **Purchasing Power Parity**

In order to understand the determination of real exchange rates, we need to examine the concept of Purchasing Power Parity or PPP.

Suppose that we compare the price of a common good in two different countries. The Economist magazine often uses a McDonald's Big Mac™ for this purpose. McDonald's operates in many countries around the world selling products governed by strict specifications and standards. The presentation and taste of a Big Mac™ (based on this author's experience) is identical in Beijing, Denver, Jakarta, Singapore, and Seoul. Using this homogeneous worldwide product, we expect the following to be true:

Exchange rate: ¥124 = \$1  
Price of a Big Mac™ in the U.S.:  $P_{U.S.} = \$2.25$   
Price of Big Mac™ in Japan:  $P_{Japan} = ¥279$

If Purchasing Power Parity holds then the nominal exchange rate should be:

$$¥P(\text{Big Mac}^{\text{TM}}) / \$P(\text{Big Mac}^{\text{TM}}) = ¥279 / \$2.25 = ¥124 : \$1$$

But what if we had the following:

Exchange rate: ¥124 = \$1  
Price of a Big Mac™ in the U.S.:  $P_{U.S.} = \$2.25$   
Price of Big Mac™ in Japan:  $P_{Japan} = ¥300$

In this case,

$$¥P(\text{Big Mac}^{\text{TM}}) / \$P(\text{Big Mac}^{\text{TM}}) > \textit{nominal exchange rate}.$$

We could therefore take \$1000 and buy 444 Big Macs™; export the Big Macs™ to Japan and sell them for ¥300 each. This would generate ¥ 133,200 in revenue. We then sell yen on foreign exchange markets and buy dollars. At the current exchange rate, this would allow us to buy \$1074 (¥133,200/¥124) and earn a profit of \$74.

However, this process of arbitrage (on a larger scale) should affect Big Mac™ prices and the nominal exchange rate. The buying of Big Macs™ in the U.S. should push the domestic price upwards. The selling of Big Macs™ should drive prices down in Japan. The selling of Yen on foreign exchange markets should weaken the Yen and the buying of Dollars should strengthen the dollar. This activity will continue until the ratio of Big Mac™ prices is just equal to the nominal exchange rate.

### **The Real Exchange Rate**

This information between nominal exchange rates and foreign/domestic prices of a common good can be expressed as a single value -- the Real Exchange Rate ' $\epsilon_r$ '.

$$\epsilon_r = e.r.\textit{nominal}[P_{\text{domestic}} / P_{\text{foreign}}]$$

or

$$\epsilon_r = (\text{¥P}/\$)[\$P(\text{Big Mac}^{\text{TM}}) / \text{¥P}(\text{Big Mac}^{\text{TM}})]$$

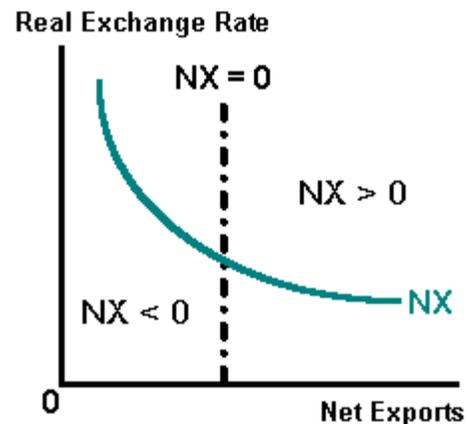
This real exchange rate ' $\epsilon_r$ ' is a unit-free measure where, in the case of a single good, its value can be interpreted relative to 1.0 (PPP). In our above example where ' $\text{¥P}/\$ = 124:1$ ', the  $\text{¥P}(\text{Big Mac}^{\text{TM}}) = 300$ , and the  $\text{\$P}(\text{Big Mac}^{\text{TM}}) = 2.25$  we would calculate the real rate to be:

$$\epsilon_r = (124)[2.25 / 300] = 0.93$$

or 1 Big Mac<sup>TM</sup> in the U.S. is equivalent to 0.93 Big Macs<sup>TM</sup> in Japan allowing for arbitrage opportunities. Either the Yen must weaken, the price of Big Macs<sup>TM</sup> in the U.S. must increase, or the price of Big Macs<sup>TM</sup> in Japan must fall. However, other economic events or conditions (capital flows, trade barriers, price-making power) may prevent this from happening. These real exchange rates do provide a foundation for the direction of trade flows such that:

**Figure 3, Net Exports**

Net Exports ' $\text{NX}' = f_{(-)}(\epsilon_r)$



The above rate of 0.93 would lead to the export of Big Macs<sup>TM</sup> from the U.S. and imported into Japan.

The calculation of real exchange rates are more-likely based on a basket of goods rather than a single homogeneous commodity. Thus price indices in different countries are used such that:

$$\epsilon_r = e.r_{\text{nominal}}[\text{CPI}_{\text{domestic}} / \text{CPI}_{\text{foreign}}]$$

In constructing the real exchange rate this way we can then think about how differences in rates of inflation among nations either affect this real rate and thus trade flows or perhaps leads to changes in nominal exchange rates:

$$\text{if } \% \Delta P_{\text{U.S.}} > \% \Delta P_{\text{Japan}} \text{ then either: } \epsilon_r \text{ or } e.r_{\text{nominal}}$$

In using these indices, we can no longer interpret the real exchange rate relative to a unit value (1.0). Instead we are forced to look at the direction of change in the real rate to understand the effect on exports and imports.

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*Be sure that you understand the following concepts and terms:*

- Flow Variable
  - Stock Variable
  - Gross Domestic Product 'GDP'
  - Expenditure Approach
  - Compensation Approach
  - Nominal GDP
  - Real GDP
  - Output Gap
  - Potential GDP
  - Economic Expansion
  - Economic Contraction / Recession
  - Business Cycle
  - Peak / Trough
  - Implicit Price Deflator
  - National Income
  - Depreciation
  - Indirect Business Taxes
  - Inflation / Deflation
  - Disinflation
  - Unemployment Rate
  - Natural Rate of Unemployment
  - Frictional Unemployment
  - Cyclical Unemployment
  - Structural Unemployment
  - Labor Force Participation Rate
  - Inflationary Expectations
  - Consumer Price Index 'CPI'
  - Balance of Payments
  - Current Account
  - Capital Account
  - Exchange Rate
  - Real Exchange Rate
  - Purchasing Power Parity
-

**Problem Set #1: Macroeconomic Data**

See: [http://www.digitaleconomist.com/macro\\_data\\_tutorial.html](http://www.digitaleconomist.com/macro_data_tutorial.html) for help with these calculations.

1. Given the following data for a three good economy:

Good	Base Year		1998		1999		2000	
	P	Q	P	Q	P	Q	P	Q
Apples	1.50	100	1.60	120	1.60	150	1.75	150
Bread	1.00	200	1.25	225	1.25	230	1.40	230
Milk	1.25	150	1.40	140	1.40	180	1.60	180

a. Calculate the following:

	Nominal GDP (NGDP)	Real GDP (RGDP)
<b>1998</b>	_____	_____
<b>1999</b>	_____	_____
<b>2000</b>	_____	_____

b. Calculate the rate of Economic Growth between:

1998 & 1999: \_\_\_\_\_ and 1999 & 2000: \_\_\_\_\_

c. Calculate (to three decimal places) the value of the **Consumer Price Index (CPI)** for the following years:

	CPI
Base Year:	_____
<b>1998:</b>	_____
<b>1999:</b>	_____
<b>2000:</b>	_____

d. What are some of the weaknesses of using the CPI to measure changes in the price level over time?

e. Calculate the annual rate of inflation between:

1998 & 1999: \_\_\_\_\_ and 1999 & 2000: \_\_\_\_\_