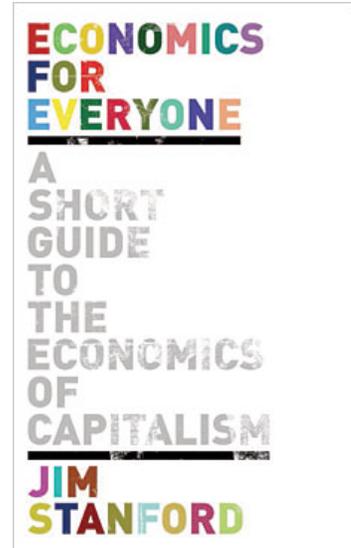


A “HOW-TO” GUIDE: UNDERSTANDING AND MEASURING INFLATION

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This guide provides a short introduction to the definition and measurement of inflation, and how to understand and analyze the impact of inflation on different economic variables.

Definitions:

Here are short definitions for some of the terms discussed below:

Price Level: The overall average level of nominal prices in the economy can be calculated, most often as a weighted average of the prices of individual goods and services. The weightings reflect the importance of each product in overall spending or output. Price levels can be calculated for consumer spending, for wholesale trade, for producer inputs, or for any other category of products or assets. The most common measures of the overall price level are the *consumer price index* and the *gross domestic product deflator*.

Inflation: A process whereby the average price level in an economy increases over time.

Deflation: A decline in the overall average level of prices. Deflation is the opposite of *inflation*.

Hyper-Inflation: A situation of extremely rapid inflation (reaching 100% per year or more), often resulting from a condition of economic or political breakdown.

Consumer Price Index: The consumer price index (CPI) is a measure of the overall *price level* paid by consumers for the various goods and services they purchase. Retail price information is gathered on each type of product, and then weighted according to its importance in overall consumer spending, to construct the CPI. Monthly or annual changes in the CPI provide a good measure of the rate of consumer price inflation.

Gross Domestic Product, Deflator: A price index which adjusts the overall value of GDP according to the average increase in the prices of all output. The GDP deflator equals the ratio of nominal GDP to real GDP. It is an alternative measure of inflation, to the CPI.

Real GDP: The value of total gross domestic product (that is, all the goods and services produced for money in the economy) adjusted for the effects of inflation. In theory, real GDP represents the physical quantity of output.

Real Interest Rate: The interest rate on a loan, adjusted for the rate of inflation. The real interest rate represents the real burden of an interest payment. Real interest rates must be positive for the lender to attain any real income from the loan.

Real Price: The price of any commodity, adjusted for changes in the overall price level. The real price reflects the relative economic burden of buying something, compared to the “going” level of prices in the economy.

Real Wages: The value of wages, adjusted for the level of consumer prices. If the nominal value of wages is growing faster than consumer prices, then real wages are growing, and hence the real consumption possibilities offered to workers are improving.

Concepts of Inflation:

Most national statistical agencies collect and report data on inflation every month. The most common reported measure is the consumer price index (CPI). Statisticians gather information each month on the going prices of all the various goods and services purchased by consumers in the economy. They then calculate a weighted index of those prices, with each product weighted according to its importance in overall consumer spending. (More important and common purchases, like food and housing, carry more weight in the index than unusual purchases like jewellery or specialized electronics.)

The CPI (like other price indices) must be stated in terms of a certain “base year” of prices. Typically, the index is set to an arbitrary value of 100 in that initial base year. The base year, and the composition of the representative basket of goods, is updated every few years.

Changes in the weighted index are then interpreted as a measure of the movement in the “overall” level of prices. Inflation is usually measured as an annual rate: for example, “prices rose, on average, 2.5 percent over the last year.” But inflation can also be measured over shorter (eg. month-to-month) or longer time periods.

The CPI can be broken down into sub-indices, which reflect price movements in the specific commodities or sub-groups of commodities that make up the overall consumer bundle (eg. clothing, food, energy, transportation, etc.). Separate CPI indices can also be calculated for different categories of consumers, to reflect differences between groups in the make-up of their typical consumer spending. For example, a CPI for working class consumers will have little

weighting placed on the prices of expensive restaurants, fine wine, or international luxury travel – but a CPI for very high-income consumers will include those factors.

Some more specialized adjusted CPI indices are also reported in many countries. For example, central bankers are often interested in various measures of what they call “core” inflation: this represents the change in the overall CPI, adjusted to exclude price changes in particularly volatile prices (such as energy or food costs, which regularly fluctuate significantly from one month to the next). In their judgment, these stripped-down CPI measures provide more accurate insight into the deeper, underlying inflationary pressures within the economy. The CPI can also be adjusted to exclude the impact of government taxes (such as changes in sales taxes) and other special factors. Many consumer goods demonstrate clear seasonal trends (becoming more expensive at certain times of the year), in which case seasonally-adjusted inflation data provides a more accurate picture of inflation. Another way to abstract from seasonal price variations is to focus on year-over-year comparisons of prices (comparing average prices in September to average prices in the previous September – rather than to prices in the immediately preceding month of August).

Measuring CPI inflation is a tricky and at times controversial task. Some economists believe that CPI measures actually overstate the true rate of inflation, because they do not take into account improvements in the quality of goods and services which may offset, in some cases, some of the rise in their prices. Other economists believe that CPI inflation may understate true inflation, due to inadequate allowances for changes in the cost of housing and other hard-to-estimate prices.

Consumer spending is only one part of the economy, however. Prices can change in other areas, as well, and alternative measures of inflation have been designed to reflect those other sectors. For example, a producer price index measures inflation in the materials and inputs which companies purchase for their own use in production. Specialized commodity price indices capture the ups and downs in prices of resource-based commodities (such as energy, minerals, and agricultural products).

A special measure of inflation is provided by the gross domestic product deflator. This is a special index designed to capture the overall level of inflation in everything that an economy produces. It is thus a broader measure of inflation than the CPI (which captures inflation only in consumer markets). However, the GDP deflator is harder to calculate than the CPI and hence is often considered a less reliable measure of inflation. The GDP deflator represents the ratio of nominal GDP to real (inflation-adjusted) GDP. Separate GDP-type deflators can also be calculated for each category of GDP expenditure (including consumption, investment, exports, and imports).

Inflation can occur in the prices of long-lived assets, not just the current production and sale of goods and services. For example, booming housing prices and rising stock markets reflect a process of inflation in asset prices (as opposed to the prices of produced output). It is strange that central bankers and other economic policy-makers are typically very focused on inflation in wages and prices, often taking severe actions (such as raising interest rates) to control that

inflation. But they generally turn a blind eye to inflation in asset prices (like housing markets or stock markets) – no doubt because well-off investors in those markets (who profit, for a while anyway, from asset inflation) aren't so worried about that kind of inflation!

Obtaining Data on Inflation:

Inflation data is readily available from the web sites of virtually all national statistical agencies. Here are the links to inflation data for the major Anglo-Saxon economies:

U.S.: Consumer price inflation data is produced by the Bureau of Labor Statistics, www.bls.gov. Data on GDP deflators is published by the Bureau of Economic Analysis, www.bea.gov, as part of its quarterly national accounts data.

U.K.: Consumer price and GDP inflation data is produced by the U.K. Statistics Authority, www.statistics.gov.uk.

Canada: Consumer price and GDP inflation data is produced by Statistics Canada, at www.statscan.ca.

Australia: Consumer price and GDP inflation data is produced by the Australian Bureau of Statistics, at www.abs.gov.au.

Nominal and Real Prices:

The nominal price of anything is simply its stated price, measured in the national currency (eg. in dollars or pounds or euros). The *real* price of that commodity, on the other hand, is its price adjusted to reflect changes in the overall price level. A commodity's real price is therefore its particular price, compared to the general level of *all* prices. A commodity's real price goes up, if its absolute price (measured in dollars) rises faster than the overall price level. Changes in real prices are a better measure of the real economic burden or significance of a price, than changes in nominal prices.

Many economic variables can be measured in real terms. For example, suppose that workers receive a 5 percent increase in their wages. But at the same time, suppose that overall consumer prices also grew by 5 percent. Real wages – that is, the purchasing power of wages – haven't changed at all. Workers might feel richer – but when they go shopping, they realize that they aren't. Wages measured in dollars (known as nominal wages) must grow faster than consumer prices, for workers to experience any improvement in real purchasing power.

Interest rates, too, should be measured in real terms, as the difference between the nominal interest rate (in percent) and the rate of inflation. If a bank charges 5 percent annual interest for a loan, when overall prices are also growing at 5 percent, the bank's wealth doesn't change – because the loaned money, once repaid with interest, has no more purchasing power than it did when it was loaned out. If interest rates are *lower* than inflation, then the real interest rate actually becomes *negative*: the borrower, not the lender, is better off at the end of the loan,

because the money they pay back is worth less than the money they borrowed. The higher is inflation, therefore, the lower is the real interest rate. That's why financial institutions hate inflation more than any other sector of society.

To calculate the change in the real price of any particular commodity, first assemble a time series showing how that commodity's nominal price has changed over time. Compare that to a time series of overall inflation (for example, as measured by the CPI). You can choose any arbitrary "base year" in which to ground your analysis. Set the CPI equal to 1 for that year (by dividing each year's value for the CPI by the specific value for that base year). Then "deflate" the nominal series of the commodity of interest, by dividing the nominal prices by the series of CPI values ("grounded" in whatever base year you have chosen). The result will reveal the change over time in the real price of that item.

For example, changes in real wages over time indicate the growth (or decline) in workers' real purchasing power. To analyze changes in real wages, collect data indicating average nominal wages over time. Compare that to a series of CPI data (choosing whatever base year you think is most appropriate for your analysis). Deflate the nominal wages by the CPI index, and you have constructed a data series on changes in real wages. If real wages rise over a specified period, then nominal wages have outstripped the growth of average prices, and workers have more purchasing power. The opposite is true if real wages have declined.