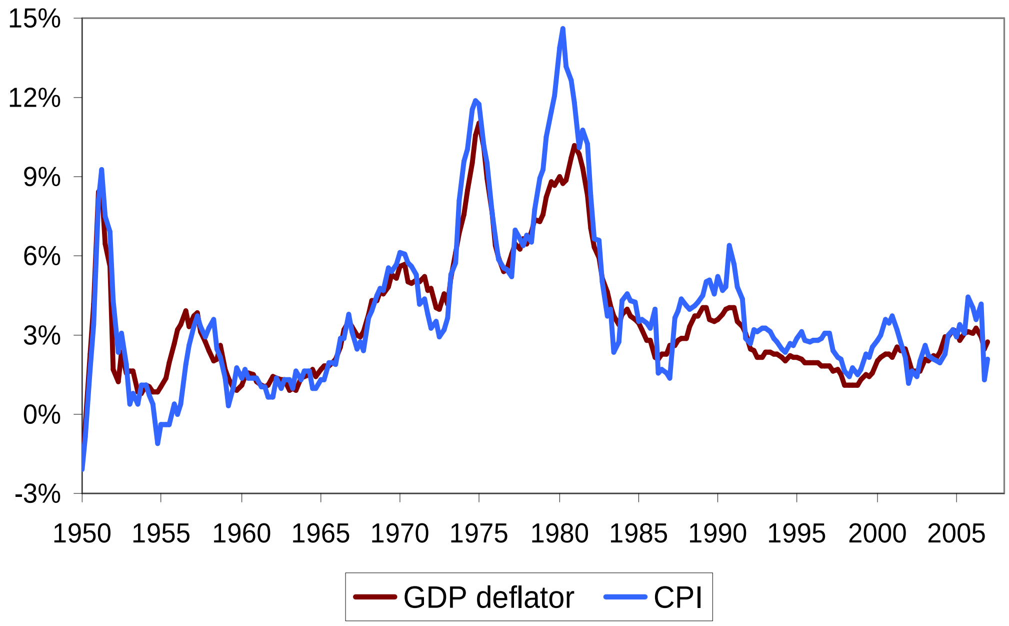

Although the two series display a similar pattern, there are some relevant differences in some years. Those differences are due to the elements we listed in the previous page. In general the CPI index is the most common way to measure inflation. This is because it is based on the consumption of households and therefore is a better measure of the cost of living in an economy.

By its construction the CPI index may overstate the rate of inflation:

Introduction of new goods: The introduction of new goods makes consumers better off but it does not reduce the CPI, because the CPI uses fixed weights.

Unmeasured changes in quality: Quality improvements increase the value of the dollar, but are often not fully measured.

<u>Unemployment Rate</u>

Categories of the population (POP)

- **Employed (E):** working at a paid job
- **Unemployed (U):** not employed but looking for a job
- **Labour Force (L):** the amount of labour available for producing goods and services; all employed plus unemployed persons
- **not in the labour force (NILF):** not employed, not looking for work (for example, full-time students)

unemployment rate: percentage of the labour force that is unemployed.

U.S. adult population by group, June 2007

$$\frac{\partial f(X,Y)}{\partial X} = Y \text{ and } \frac{\partial f(X,Y)}{\partial Y} = X$$

Therefore, our total differential can be written as:

$$df(X,Y) = YdX + XdY$$

Using the fact that $f(X,Y) = XY$, we can rewrite the above expression as:

$$d(XY) = YdX + XdY$$

Dividing each side of the above expression by (XY) we obtain:

$$\frac{d(XY)}{XY} = \frac{dX}{X} + \frac{dY}{Y} \qquad \text{A1)}$$

The expression $\frac{d(XY)}{XY}$ is the instantaneous growth rate of (XY), while $\frac{dX}{X}$ and $\frac{dY}{Y}$ are the instantaneous growth rates of X and Y respectively.

Expression A1) says that the growth rate of XY is equal to the growth rate of X plus the growth rate of Y. This is true if the change in variables is small (remember: *d* denotes a very small change). However, when we consider discrete changes (when we use Δ instead of *d*) expression A1) still hold approximately.

End of the proof.

Example: suppose that the real GDP has increased by 2% from 2005 to 2006. Suppose that inflation measured by the GDP deflator has increased by 3% in the same period. What is the growth rate of nominal GDP between 2005 and 2006?

We know that:

Nominal GDP = Real GDP $\times$ GDP Deflator

Therefore:

Percentage change in Nominal GDP ≈ 2 + 3 ≈ 5%.

c) For any variables *X* and *Y*:

*the percentage change in (**X /Y**) ≈ percentage change in **X** − percentage change in **Y***

Example. Suppose that population has increased by 1% between 2005 and 2006, while real GDP has increased by 2% during the same period. What is the percentage change of the real GDP per capita?

We know that:

Real GDP per capita = (real GDP)/Population

Therefore:

Percentage change in real GDP per capita ≈ 2 – 1 ≈ 1%.

3) Euler's Theorem Example

Consider a simple function of a single variable: $f(x) = x^2$. Is this function homogeneous? To see that: $f(rx) = (rx)^2 = r^2 x^2 = r^2 f(x)$

You can see that $f(x) = x^2$ is homogenous of degree 2 (*k=2* using the notation in the note). From the Euler's Theorem we know that a homogeneous function of degree *k* can be written as:

$$kf(x) = x\frac{df(x)}{dx}$$

(*Notice that we don't use the partial derivative notation because* $f(x)$ *here is a function of a single variable, but the idea is the same*)

Here $k = 2$, $f(x) = x^2$ and $\frac{df(x)}{dx}$ is the derivative of x^2 with respect to x, that is $\frac{df(x)}{dx} = 2x$. Apply the Euler's Theorem: $2x^2 = x(2x)$. This implies $2x^2 = 2x^2$ as the Theorem says.