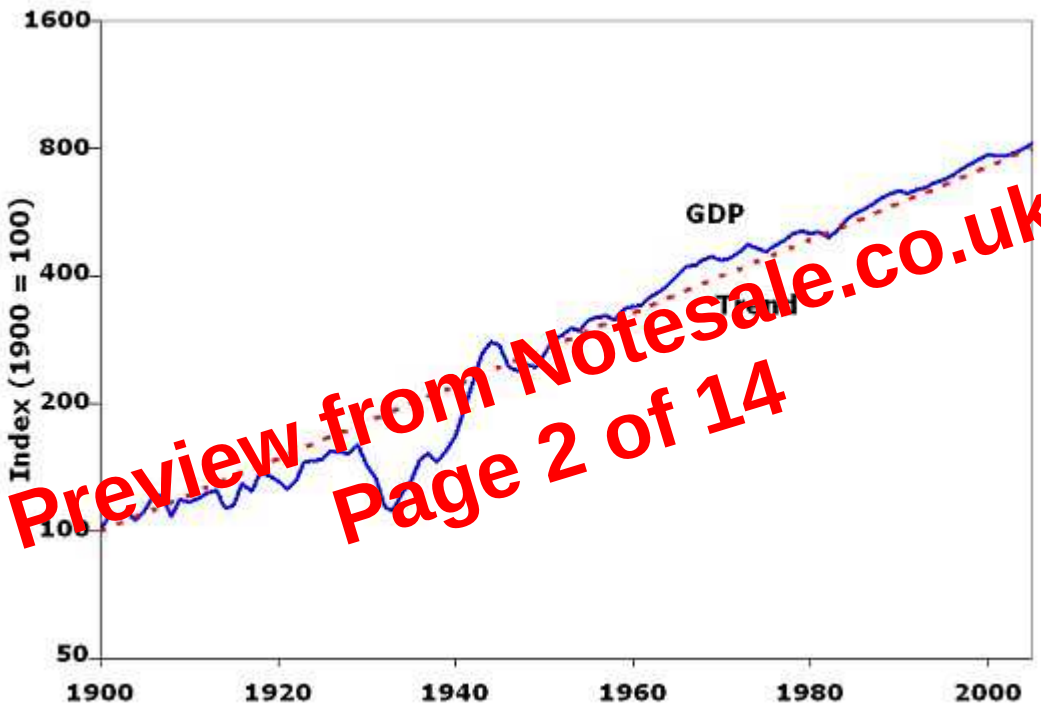
of the following statistical models:

$$y_t = \alpha + \beta t + \varepsilon_t \qquad 1)$$

Where y_t is the value of the real GDP at time t, α is a constant (also called the intercept), β is a constant, t is a time trend (t=1, 2, 3, …) and ε_t is a random shock uncorrelated with previous or future shocks. Equation 1) tells you that y_t has a trend and it differs from the trend in each period because of a random shock.

Look at the figure below that shows the real GDP series in US (the index of real GDP). The trend line in equation 1) is captured by the term βt (that is a straight line), any deviation from that line is due to ε_t.



The second model that can be used to model the real GDP series is:

$$y_t = \alpha + y_{t-1} + \varepsilon_t \qquad 2)$$

Model 2) is called a ***Random Walk with drift***.

What is the main difference between model 1) and model 2)? In model 1) a shock at time t (ε_t) has an effect on the level of y at time t and that's all. The shock is ***temporary*** because it disappears after one period.

In model 2) all the shocks are ***permanent***, their effect will never disappear.

technological progress. In the figure above we see periods in which growth of technological progress goes negative. How can it be?

All technological changes eventually increase productivity growth. However, if initially technological change makes most of the existing capital obsolete, then capital and labour productivity may go down initially and so output and then will recover after new capital (more advanced) is installed.

The second ingredient *is the assumptions that all markets are perfectly competitive and prices are always flexible and agents in the economy have Rational Expectations.* This means that markets always clear (they are always at the equilibrium). The idea is that we are in the "Classical case" all the time. So here we are at the antipodes of Keynes' ideas. Moreover the Policy Ineffectiveness Proposition we discussed in the previous lecture note about new classical macroeconomics will hold here. Even if RBC theory is a theory that tries to explain business cycles we can still draw some policy implications and those implications will be even stronger than the ones of the new classical macroeconomics.

The third ingredient *is the use of microfoundations to derive the macroeconomic behaviour of different variables*. This means that for example the aggregate consumption behaviour is derived explicitly from consumers maximising their lifetime utility, the capital accumulation in the economy depends on profit maximisation of firms etc. etc.

The fourth ingredient *is that the model is fully dynamic*. The problem faced by consumers and firms is a problem of intertemporal optimization.

The fifth ingredient *is the way those models are solved*. They use numerical methods and an approach called "calibration", to simulate numerically the models. The problem is that given the complexity of those models (some elements are linear and some elements are non linear and the combination of the two makes the model difficult to be solved analytically), analytical closed form solutions for the endogenous variables cannot be found (closed form solution = an explicit mathematical solution for the endogenous variables as a function of the exogenous variables).

Summary:

1) Economic fluctuations are driven by changes in total factor productivity. Those changes are driven by changes in technological progress;
2) Perfectly competitive markets, full flexibility of prices and rational