

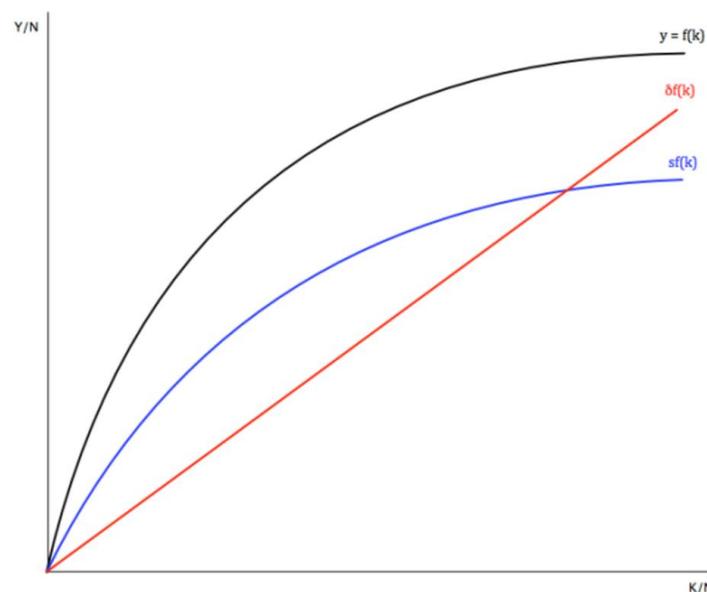
Question #69467 Economics / Macroeconomics

WHAT IS MEANT BY STEADY STATE IN THE SOLOW MODEL? DERIVE CONDITIONS FOR STEADY STATE IN AN ECONOMY. WHAT IS THE SIGNIFICANCE OF DECREASING RETURNS IN THE SOLOW MODEL?

The idea of an economy reaching steady state is central to the Solow growth model. This means a point where the diminishing returns to factor have kicked in to an extent that the economy can't become any more productive in per capita terms by simply adding more capital, instead it reaches a maximum limit where output per capita will stay constant.

The reason this happens in the Solow model is because of the concept of depreciation in capital accumulation. The rate at which capital depreciates is usually modelled as being constant. So the more capital you have in any one year, the more depreciation you are going to get, and the more investment (new capital) you will need just to sustain the amount of capital you had last year – break even investment.

Steady state is often illustrated on a diagram, so you need to get familiar with diagrams looking like this:

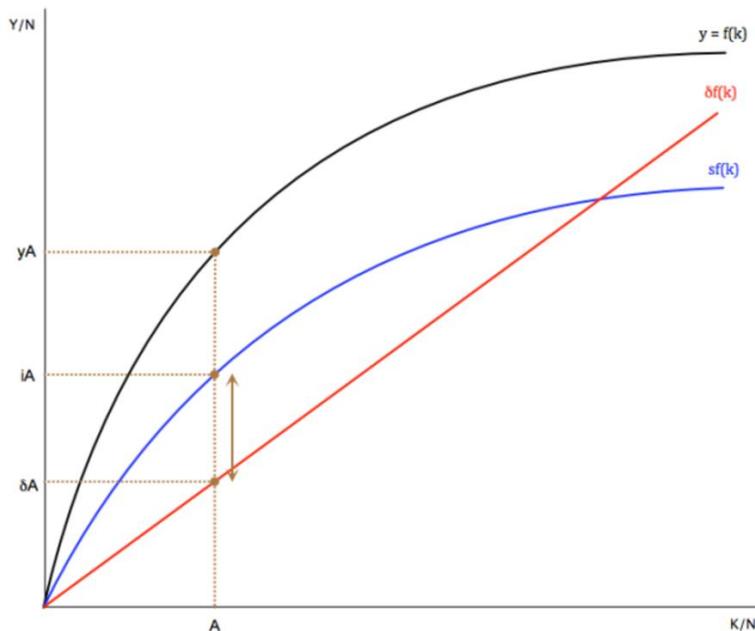


The black curve is the production function, it gives output per worker. I am using small letters here to illustrate 'per worker' (not all the population are workers so this isn't exactly 'per capita', but we can deal with that aspect of the model later). So the production function is written as $y=f(k)$, ie output per worker is a function of capital per worker, which is saying that the amount of output each worker produces is a function of the amount of capital each worker has.

The blue curve is investment per worker. This is basically the production function multiplied by the saving rate, it is saying that at a given level of output per worker, this amount will be saved, so it tells us the amount of saving per worker. As we equate saving with investment (savings provide loanable funds which firms use to invest) this gives us the amount of investment per worker going on in the economy. This is important as investment shows us the amount of new capital we are adding.

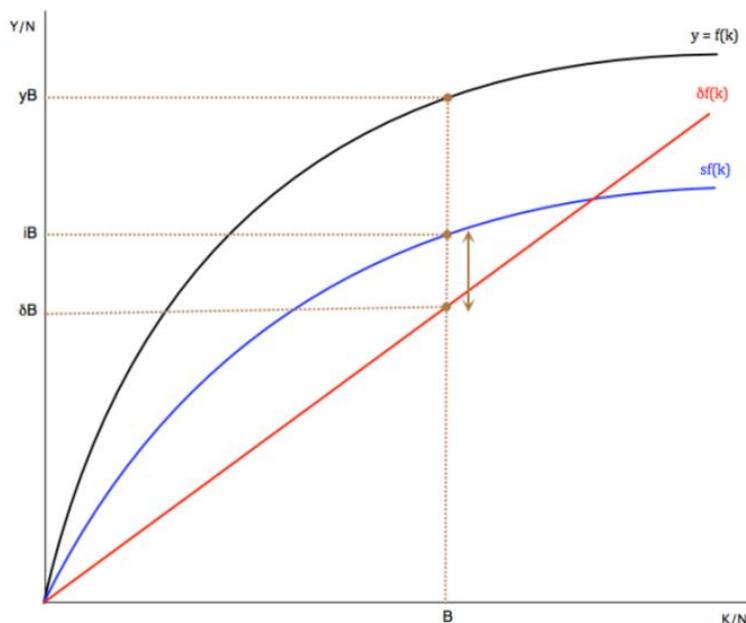
The red line is depreciation per worker, it is a straight line because the depreciation rate is modelled as being constant. The more capital per worker we have, the more wears out every year, so this line basically tells us the amount of capital we need to add to break even (replace the worn out capital).

At any value of capital per worker where investment per worker is above depreciation per worker (ie the blue curve is above the red line) then you are continuing to add to your capital stock. Here's an example:

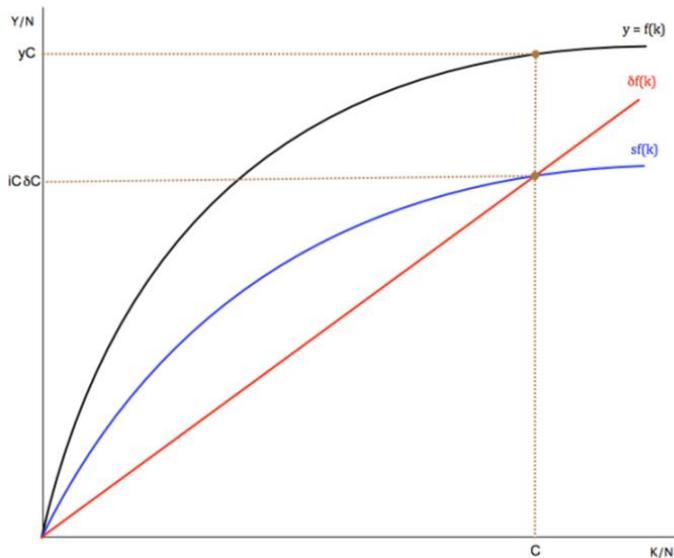


At point A here in terms of capital per worker, we can see the level of output per worker that corresponds to it (y_A). Here the blue curve is above the red line, the brown arrow shows how much new capital we are adding to the economy when we are at this point.

Of course as we are adding new capital to the economy, we will move to a new point where there is more capital per worker available.



Now we are at point B, with more capital per worker than we had at point A and more output per worker as well. But notice how the brown arrow is smaller this time, it is showing a smaller gap between the blue curve and the red line. This is because although we are adding more investment at point B than we did at point A, we are also facing much more depreciation because we have more capital to maintain, so a lot more of the investment will be taken up in just replacing worn out old stock, and less is left over for adding new capital.



Eventually we get to point C. Here we have reached a point where the amount of investment is equal to the break even point of investment, ie we are just investing enough to cover depreciation and aren't adding any new stock. This is the steady state. We can't break ahead of this because attempting to add new capital would mean that our investment fell below depreciation, so we would have more depreciation than investment next year and would fall back to the steady state point. So the level of output per worker, y_C , that corresponds to the steady state level of capital per worker that we have reached, is the maximum level of output per worker that we are going to get.

The economy, under this simple version of the model, is stuck at this steady state point.

Note that when you get to the steady state of output per worker, it means that your economy will still grow, just that it will only grow at the rate of growth of the labour force (which we are modelling here as being equal to the rate of population growth). If you are in steady state and have population growth of 3% then you will have output growth of 3%, but that won't raise living standards, all it will mean is you are growing enough output to maintain the living standards for the population as it gets bigger.

Source:

- <https://mnmeconomics.wordpress.com/2011/07/17/the-concept-of-steady-state/>
- <https://www.mruniversity.com/courses/principles-economics-macroeconomics/solow-model-and-steady-state>