

Model Thinking

Scott E Page

Solow Growth Model



www.wallstreetcheatsheet.com

L_t = labor at time t

K_t = Capital at time t

A_t = Technology at time
t

O_t = Output

$$O_t = A_t K_t^\beta L_t^{1-\beta}$$

If $\beta = \frac{1}{2}$ then this is just the square root
function.

$$O_t = A_t K_t^\beta L_t^{1-\beta}$$

$$\beta = 1/2 \quad \sqrt{LJK}$$



Output = $10vM$

Investment = $0.3 \times 10 vM = 3vM$

Depreciation = $0.25M$

Equilibrium: $0.25M = 3vM$

$M = 12vM$

$M = 144$

$$\text{Output} = 2 \times 10 \sqrt{M} = 20 \sqrt{M}$$

$$\text{Investment} = (0.3) 20 \sqrt{m} \quad 6 \sqrt{m}$$

$$\text{Depreciation} = \frac{1}{4}(m) = m/4$$

$$\text{Equilibrium: } m = 496$$

$$0 = 2 \times 10 \sqrt{496} = 480$$

$$6 \sqrt{m} = m/4$$

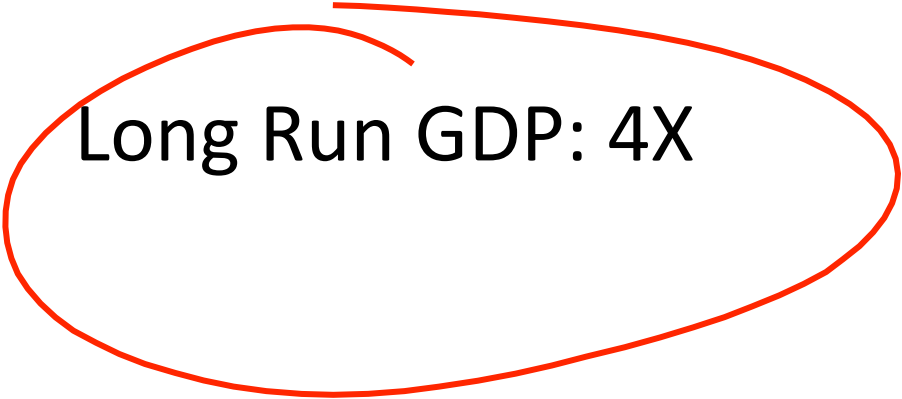
$$24 \sqrt{m} = m$$

$$24 = \sqrt{m}$$

$$496 = m$$

Productivity: 2X

Long Run GDP: 4X

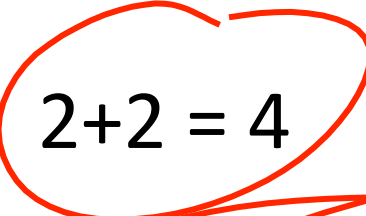


The Innovation Multiplier

Labor and capital more
productive

Incentives to invest in
more capital.

Additive or Multiplicative?


$$2+2=4$$

6


$$2^2=4$$

9

$$\text{Output} = 10\sqrt{M}$$

$$\text{Investment} = 0.3 \times 10 \sqrt{M} = 3\sqrt{M}$$

$$\text{Depreciation} = 0.25M$$

$$\text{Equilibrium: } 0.25M = 3\sqrt{M}$$

$$M = 12\sqrt{M}$$

$$M = 144$$

$$\text{Output} = 120$$

$$\text{Output} = 3 \times 10 \text{ VM} = 30 \text{ VM}$$

$$\text{Investment} = (0.3) 30 \sqrt{m} = 9 \sqrt{m}$$

$$\text{Depreciation} = m/4$$

$$\text{Equilibrium: } m = 36^2$$

$$3 \times 10 \sqrt{36} = 1080$$

$$94$$

$$9 \sqrt{m} = m/4$$

$$36 \sqrt{m} = m$$

$$36 = \sqrt{m}$$

$$36^2 = m$$

Simple Growth Model:

growth stops, GDP
depends on savings
rate

Solow Model:

Growth can continue
with changes to
technology

Endogenous Growth:

Labor can go to
output or
technology/idea
creation

Growth ceases
without innovation,
so nearly everyone
should be pro
innovation

Quote A: "In America, innovation doesn't just change our lives. It is how we make our living."

Quote B: "The remarkable thing is that although basic research does not begin with a particular practical goal, when you look at the results over the years, it ends up being one of the most practical things government does.."

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