

Problem Set + Homework

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June 10, 2016

[1] Basic properties of growth rates.

Romer 4e, Problem 1.1. The growth rate of a variable equals the time derivative of its log, i.e. $\dot{X}(t)/X(t) = \frac{d}{dt}[\ln X(t)]$, where $\dot{X}(t) = \frac{dX}{dt}(t)$. Use this fact to show:

- (a) The growth rate of the product of two variables equals the sum of their growth rates. That is, if $Z(t) = X(t)Y(t)$, then $\dot{Z}(t)/Z(t) = [\dot{X}(t)/X(t)] + [\dot{Y}(t)/Y(t)]$.
- (b) The growth rate of the ratio of two variables equals the difference of their growth rates. That is, if $Z(t) = X(t)/Y(t)$, then $\dot{Z}(t)/Z(t) = [\dot{X}(t)/X(t)] - [\dot{Y}(t)/Y(t)]$.
- (c) If $Z(t) = X(t)^\alpha$, then $\dot{Z}(t)/Z(t) = \alpha \dot{X}(t)/X(t)$.

[2] Effective interest rate.

Assume that a bank offers an annual interest rate of 6% **compounded monthly** and that you make a deposit of one thousand dollars (\$1,000) at the bank today.

- (a) **How much do you expect to have in the bank account in one year from now?** (There is no other engagement with the bank before and after that deposit.)
- (b) **Compute the effective rate of interest.**
- (c) **How do the above results change if the interest is compounded daily?**

You may use a function calculator or smartphone app. If you don't have a calculator with you, write down the formula.

[3] Homework

Visit <http://mybinder.org/repo/kenjisato/macroeconomics> and open "S0 Introduction to Jupyter notebook.ipynb." Follow the instructions given therein. This homework is due next Tuesday (14th).