

## Empirical Overview: Key

1. Consider the following regression result:

$$GDPGrowth_t = .02 - 0.01Fertility_t + 0.03EDUCATION_t + \mu_t \quad (1)$$

a. All else equal, a unit unit increase in education (possibly measures in years of schooling) corresponds to a 0.03 unit increase in GDP growth (possibly a 3% increase in GDP if growth is measured in these units). Here, “all else equal” means that we are holding fertility rates constant.

b. Not at all. First, we are surely not controlling for many other factors that affect growth beyond education and fertility. Barro’s paper listed many other factors that should be included. Second, a regression by itself can never establish causation.

c. Usually this means that the sum of the squared error terms ( $\sum \mu_t^2$ ) is minimized. It can be shown that any other set of regression coefficient yields a larger sum of squared errors.

d. No. The problem is that very large negative errors could cancel out very large positive errors.

e. Yes. This avoids the problem from 1d. It is perfectly reasonable to argue that this approach is as appealing or more than minimizing the sum of squared errors. Mathematically, however, minimizing the sum of squared errors is easier.

2. True, at least for the interesting ones. There are many reasons. The most important being that every regression equation suffers from some omitted variable bias.

3. In the 2008 Olympics, Usain Bolt broke the world record by running 100 meters in 9.69 seconds. In 2012, he again won this race with a time of 9.63 seconds. Discuss the validity of the following predictions:

a. This calculation represents a simple extrapolation. Between 2008 and 2012, the winning time decreased by 0.06 seconds. So I am guessing that it will decline by the same amount over the next four years. I argue that this is a reasonable estimate because the timeframe is fairly narrow.

b. Making such a simple extrapolation over such a long time does not result in good forecasts. Humans are clearly incapable of running at such speeds.

4. You would obtain perfect fit with all the regression coefficients equaling one. But this does not imply that the results are interesting. This is an accounting relationship, hence the perfect fit, It tells us nothing about macroeconomic behavior.