ECON 815

Calibration

Winter 2014

Parameter Values

How do we pick our parameters for the model?

1) Inspection and sensitivity analysis

- γ
- η

We start off with the case $\gamma = \eta = 1$ – or $\gamma = 1$ and the indivisible labour model.

2) Match steady state to moments in the data

- β
- α
- δ
- θ

3) Estimate shocks

- ρ
- σ

Matching Moments

Discount Factor β:

- We match the long-run return of capital.
- For example, R long-run average annual return on stock market index (TSX)
- since we deal with quarterly data, $\beta = \frac{1}{1+R/4}$

Labour Share $1-\alpha$:

- from the income side of the national accounts
- roughly between 50% and 67% of total income
- α falls in between 1/3 and 1/2

Depreciation δ:

- between 5% and 10%
- quarterly we have $\delta = 0.025$

Weight on labour in utility function θ:

- average people spend about 20-30% of their (available) time working
- set θ so that $1 - n$ corresponds to that number in steady state

Estimating Productivity Shocks

We can normalize $\bar{z} = 1$, since we are not interested in matching the size of the economy. Thus, we are back to an AR(1) process on TFP shocks.

Step 1:

Calculate Solow Residuals

$$\log SR_t = \log Y_t - \alpha \log K_t - (1 - \alpha) \log N_t$$

Step 2:

Fit a linear trend to the Solow Residual. This captures productivity growth $\gamma^t X_0$.

Step 3:

Take out the residuals from fitting the linear trend and use them to estimate ρ and σ.

Detrending Labor Productivity

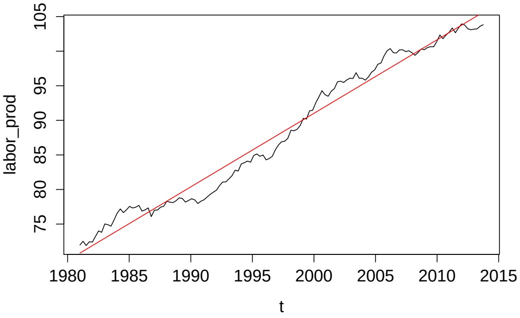

Figure: Labor Productivity – 1981:1 - 2013:3

Issue: no data off the shelf for multifactor (incl. capital) productivity

Next, we fit the residuals from the detrended series to an AR(1) process (with intercept).

We obtain

- $\rho = 0.9562$
- $\sigma = 0.004805$

For US data, people usually assume that

- $\rho_{US} \in [0.95, 0.98]$
- $\sigma_{US} \in [0.005, 0.01]$

A "heroic" assumption is that the properties of TFP shocks are constant across different economies (but not TFP levels).

Why are we off w.r.t. to the shocks in the AR(1) process?

Obtaining Productivity Shocks Directly

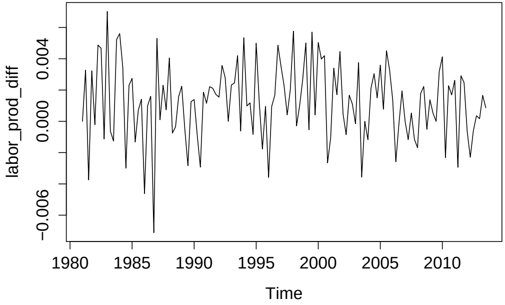

Figure: Log-differences Labor Productivity – 1981:1 - 2013:3

This yields as an estimate $\sigma = 0.00246$.

Calculating the Steady State

From the intertemporal Euler equation we have that

$$1 = \beta \left(f_k + (1 - \delta) \right)$$

which yields k/n and k/y.

Then, from the law of motion and the feasibility constraint, we obtain

$$\begin{aligned} k/y &= x/y + (1-\delta)k/y \\ 1 &= c/y + x/y. \end{aligned}$$

Finally, we can use the labour-leisure choice to pin down θ

$$\left(\frac{\bar{c}^{-\gamma}}{\theta(1-\bar{n})^{-\eta}} \right) = \frac{1}{w}.$$

Remark: It is good practice to recalibrate θ when changing γ or η.