724 Macroeconomic Theory: Investment Adjustment Costs

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April 30, 2017

Introduction

- Outline models being compared (no equations)
- Overview of analysis and results

Description

- Description of standard RBC model
- Description of investment adjustment costs
- Methods used to solve RBC model
- Methods used to solve investment adjustment costs
- How was RBC model simulated
- How was investmnet adjustment costs model simulated

Analysis

- Compare the two models
- table of moments reporting sd, sd relative to Y, and autocorrelations, correlation with output for all variables of interest.
- Highlight difference in the moments of the two models
- What is causing these differences?
- Key economic forces driving these results
- Use impulse response functions to clarify explanations and illustrate economics of the system.
- Check sensitivity of results to key parameter choices
- Compare your results to one published article using related models.

Conclusion

- A brief conclusion

Matlab Code

- Provide matlab code

Appendix

- Derivations of first order conditions
- Derivation of steady state.

Rough Work

RBC model

$$
\begin{aligned}
\max E_0 \sum_{t=0}^{\infty} \beta^t [\ln(c_t) + \psi \ln(1-n_t)] \text{ s.t.}\\
y_t &= c_t + i_t \\
y_t &= A_t k_t^{\alpha} n_t^{1-\alpha} \\
k_{t+1} &= i_t + (1-\delta) k_t \\
\ln(A_{t+1}) &= \rho \ln(A_t) + \epsilon_{t+1} \text{ where } \epsilon_{t+1} \sim iid(0, \sigma_{\epsilon}^2) \\
k_0 \text{ and } A_0 &\text{ are given and } > 0
\end{aligned}
$$

with $\psi > 0, \beta, \delta, \rho \in (0,1)$

What are the choice variables

Solve through optimal control. Using the constraints for y_t and k_t

$$
\begin{aligned}
A_t k_t^{\alpha} n_t^{1-\alpha} &= c_t + i_t \\
A_t k_t^{\alpha} n_t^{1-\alpha} &= c_t + k_{t+1} - (1-\delta) k_t \\
0 &= A_t k_t^{\alpha} n_t^{1-\alpha} - c_t - k_{t+1} + (1-\delta) k_t
\end{aligned}
$$

Setting up Lagrange

$$
\begin{aligned}
L &= E_0 \sum_{t=0}^{\infty} \beta^t [\ln(c_t) + \psi \ln(1-n_t)] + \beta^t \lambda_t [A_t k_t^{\alpha} n_t^{1-\alpha} - c_t - k_{t+1} + (1-\delta) k_t] \\
\frac{\partial L}{\partial c_t} &: \frac{1}{c_t} = \lambda_t \\
\frac{\partial L}{\partial n_t} &: \frac{\psi}{(1-n_t)} = \lambda_t \\
&: \frac{\psi}{(1-n_t)} = \frac{1}{c_t}[(1-\alpha)\frac{y_t}{n_t}] \\
\frac{\partial L}{\partial k_{t+1}} &: \lambda_t = \lambda_{t+1} \beta [\alpha \frac{y_{t+1}}{k_{t+1}} + (1-\delta)] \\
&: \frac{1}{c_t} = \frac{1}{c_{t+1}} \beta [\alpha \frac{y_{t+1}}{k_{t+1}} + (1-\delta)]
\end{aligned}
$$

This doesn't work says intial values are too far from steady state

Solving the investment adjustment costs model. The model will follow the same specification as “Shapiro (86) The Dynamic Demand for Capital and Labor” This model has a change in the production in that changing the capital stock now incurss costs.

$\ln(y_t) = \ln(f(k_t, n_t, A_t)) - \frac{\alpha_k}{2}[\frac{\delta k_t}{k_{t-1}}]^2$