

Problem Set #3

MACS 40200, Dr. Evans

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1. MLE estimation of simple macroeconomic model.

- (a) Use the data (w_t, k_t) and equations (3) and (5) to estimate the four parameters $(\alpha, \rho, \mu, \sigma)$ by maximum likelihood. Report your estimates and the inverse hessian variance-covariance matrix of your estimates.

MLE estimate for $\alpha = 0.457477074054$

MLE estimate for $\rho = 0.720516972669$

MLE estimate for $\mu = 10.1865571199$

MLE estimate for $\sigma = 0.0919962218857$

Log-likelihood value = -96.7069080209

VCV = $\begin{bmatrix} 1. & 0. & 0. & 0. \\ 0. & 1. & 0. & 0. \\ 0. & 0. & 1. & 0. \\ 0. & 0. & 0. & 1. \end{bmatrix}$

- (b) Now we will estimate the parameters another way. Use the data (w_t, k_t) and equations (4) and (5) to estimate the four parameters $(\alpha, \rho, \mu, \sigma)$ by maximum likelihood. Report your estimates and the inverse hessian variance-covariance matrix of your estimates.

MLE estimate for $\alpha = 1e-10$

MLE estimate for $\rho = 0.25074887437$

MLE estimate for $\mu = 0.30025181993$

MLE estimate for $\sigma = 0.096985710088$

Log-likelihood value = -91.4253132108

VCV = $\begin{bmatrix} 1. & 8.25029459 & -5.62198726 & -0.72803545 \\ 8.25029459 & 70.01646074 & -44.06310322 & -5.88712085 \\ -5.62198726 & -44.06310322 & 34.37234784 & 4.22175443 \\ -0.72803545 & -5.88712085 & 4.22175443 & 0.58265255 \end{bmatrix}$

- (c) According to your estimates from part (a), if investment/savings in the current period is $k_t = 7,500,000$ and the productivity shock in the previous period was $z_{t-1} = 10$, what is the probability that the interest rate this period will be greater than $r_t = 1$.

$Pr(r_t > 1 | \hat{\theta}, k_t = 7,500,000, z_{t-1} = 10) = 1.$