Aiyagari (1994): A Guide to Matlab Files

Supplement to Lecture 3b

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The Model

- Household's recursive problem

$$V(z) = \max_{\hat{a}_+ \geq 0} \left\{ u[z - \hat{a}_+] + \beta \sum_{i=1}^{n} \pi_i V(w\bar{e}_i + (1+r)\hat{a}_+ - r\Phi) \right\}$$

  where $\hat{a} \equiv a + \Phi$ and a $'+'$ denotes next-period values.

  - Let $\hat{a}_+ = A(z)$ be the policy function for the recursive problem. Write $C(z) = z - A(z)$ for consumption.
  - The policy function for next-period asset holdings is $a_+(z) = A(z) - \Phi$.

- Marginal factor pricing conditions:
  - $r = F_K(K, L) - \delta$
  - $w = F_L(K, L)$
- Market clearing for assets:
  - $K = \int a d\mu$

Calibration

- Remark: the following calibration is purely for illustrative purposes.
- $f(k) = k^{0.3}$, $u(c) = -c^{-2}/2$, $\delta = 0.1$, $\beta = 0.95$.
- 1000 grid points from $z_1 = 0.01$ to $z_{1000} = 50$.
- For $\hat{a}$, choose a grid of the same size from $\hat{a}_1 = 0$ to $\hat{a}_{1000} = z_{999}$.
- Two productivity states: $\bar{s}_1 = 0.2$, $\bar{s}_2 = 1.8$. Remark: i.i.d. is unrealistic in that there is too little persistence. Further, one needs quite high productivity fluctuations to generate enough precautionary savings.
- Obtain frequency distributions of assets from simulation over 100,000 periods.
- Compare two economies:
  - Zero borrowing, $\Phi = 0$.
  - Natural debt limit, $\Phi = w\bar{s}_1/r$.

Zero borrowing

With $\Phi = 0$, the equilibrium interest rate is $r^\star = 0.87\%$

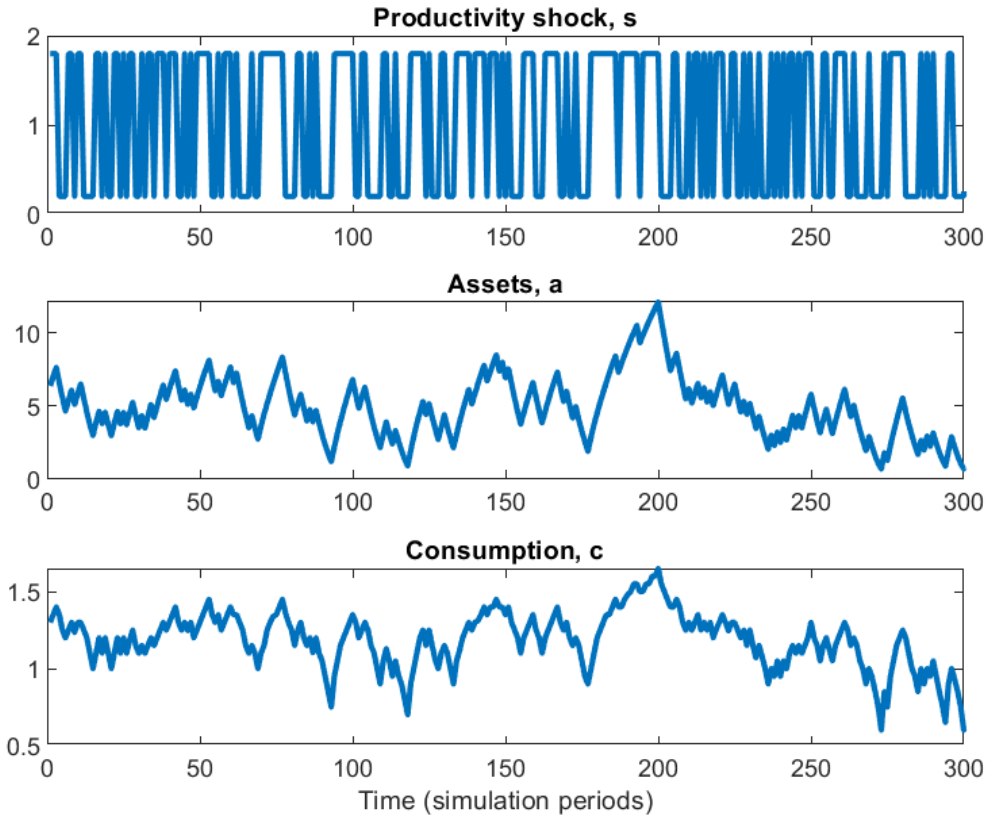

Figure: Simulated time series for productivity, assets and consumption

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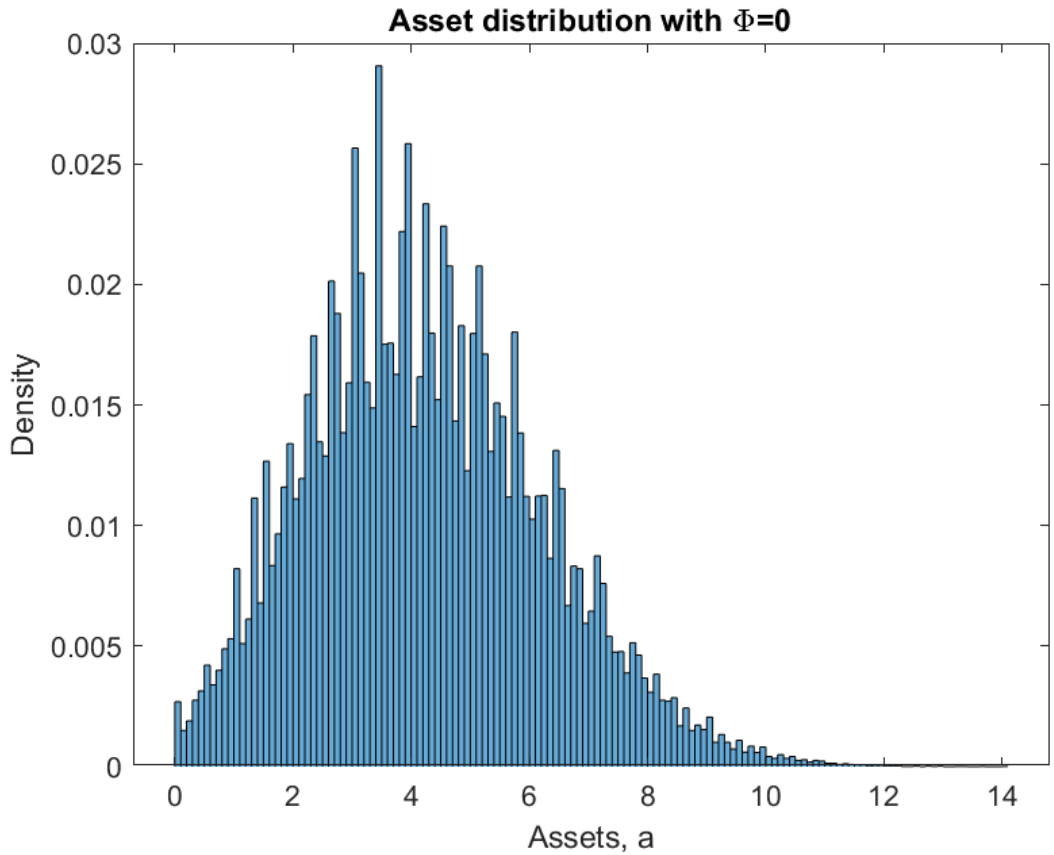
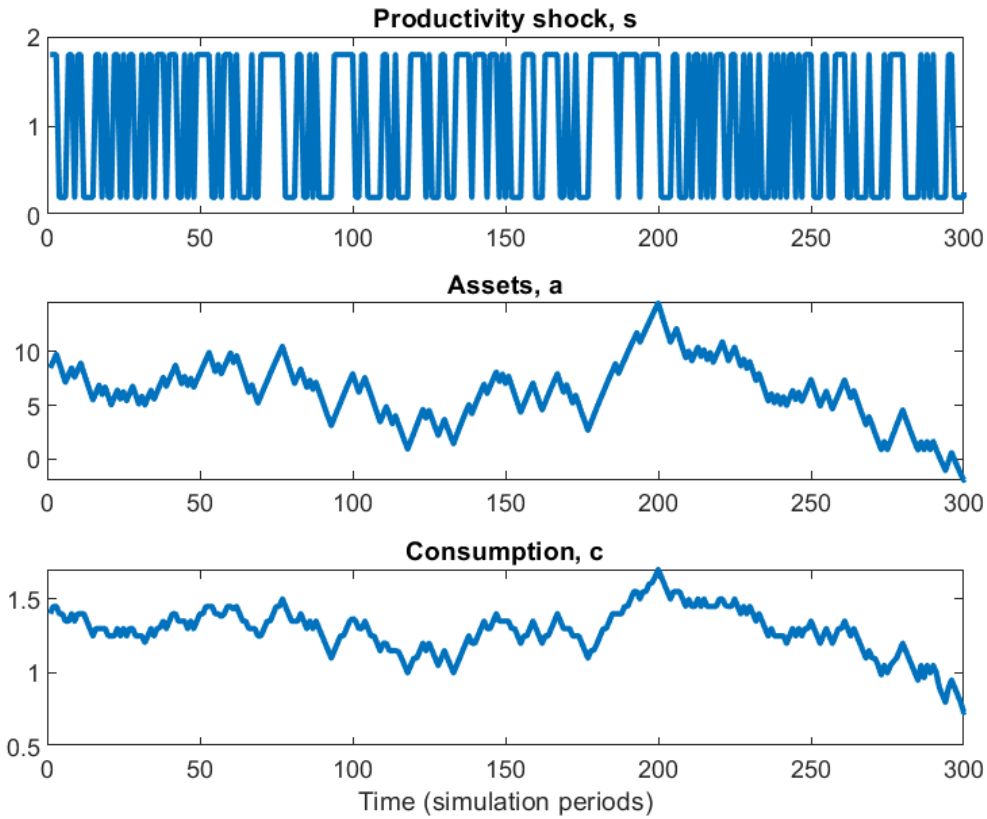


Figure: Asset distribution

Natural debt limit

With $\Phi = w\bar{s}_1/r$, the equilibrium interest rate is $r^\star = 3.6\%$



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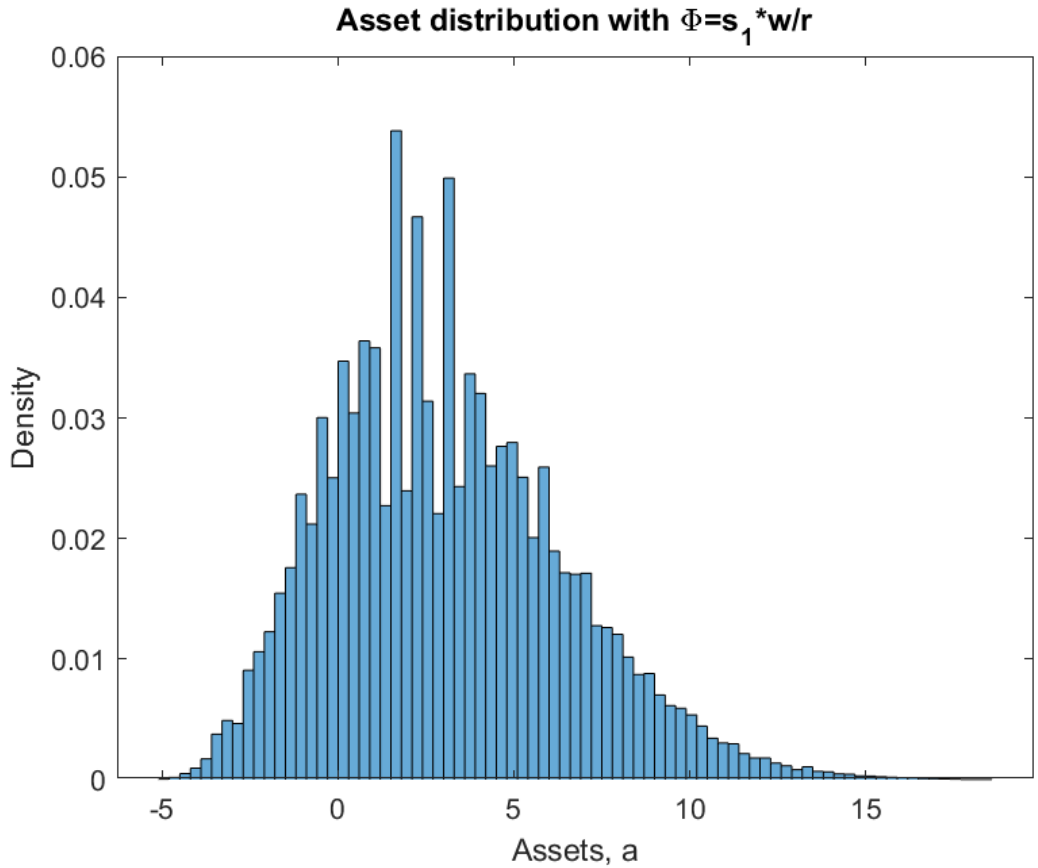

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