Replication of ‘The Power of Forward Guidance Revisited’

November 28, 2018

Outline

1. Motivation
2. MNS's heterogenous agent NK model
3. Steady state
4. Dynamics: forward guidance

Motivation

- In the basic NKM, output/inflation response to forward guidance is implausibly large.
- A potential reason is the complete markets assumption.

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- In the basic NKM, output/inflation response to forward guidance is implausibly large.
- A potential reason is the complete markets assumption.
- Is the output response to forward guidance smaller in a model with idiosyncratic income risk and incomplete markets?

Forward guidance in the basic NKM

Consider the plain vanilla NKM studied in class

$$y_t = \mathbb{E}_t[y_{t+1}] - \sigma(i_t - \mathbb{E}_t[\pi_{t+1}] - r_t^n) \qquad \text{`NK IS curve'}$$
$$\pi_t = \beta\mathbb{E}_t[\pi_{t+1}] + \kappa y_t \qquad \text{`NKPC'}$$

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with monetary policy rule:

$$r_t = i_t - \mathbb{E}_t[\pi_{t+1}] = r_t^n + \epsilon_{t,t-j},$$

where $\epsilon_{t,t-j}$ is a monetary shock in period t that is announced in period $t-j$.

AIM implementation

$$\tilde{r}_t = a_1 MA_t^1 + a_2 MA_t^2 + a_2 MA_t^3 + a_4 MA_t^4 + a_5 MA_t^5$$

with

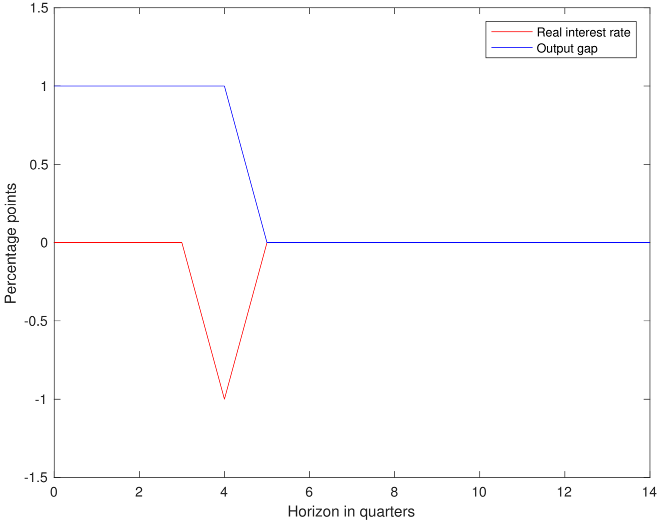
$$MA_t^1 = \epsilon_{t+5,t} = \begin{cases} 1 & \text{if } t = 1 \\ 0 & \text{otherwise.} \end{cases}$$

and

$$MA_t^j = MA_{t-1}^{j-1}$$

and $a_1 = a_2 = a_3 = a_4 = 0, \ a_5 = 1$

Forward guidance in the basic NKM



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Why is the output response so big?

$\Longrightarrow$ Euler equation ($\sigma = 1$):

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No borrowing constraint $\Longrightarrow$ agent takes full advantage of intertemporal substitution.

MNS's HANK model

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Household's problem

$$\max_{\{c,\ell,b_{t+1}\}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left(\frac{c_{h,t}^{1-\gamma}}{1-\gamma} - \frac{\ell_{h,t}^{1+\psi}}{1+\psi} \right)$$

$$\text{s.t. } c_{h,t} + \frac{b_{h,t+1}}{1+r_t} = b_{h,t} + W_t z_{h,t} \ell_{h,t} - \tau_t \bar{\tau}(z_{h,t}) + D_t$$

$$\& \ b_{h,t+1} \geq 0.$$

Calibration

$z_{h,t}$ follows a 3-point Markov chain with transition matrix

$$\mathbf{\Gamma} = \begin{bmatrix} 0.966 & 0.0338 & 0.00029 \\ 0.017 & 0.966 & 0.017 \\ 0.0003 & 0.0337 & 0.966 \end{bmatrix}$$

Other parameter values are standard.

Solving for steady state

- Solve for the household's policy function using the 'endogenous grid method'.

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- Solve for the household's policy function using the 'endogenous grid method'.
- Basic idea is to iterate on the Euler equation:

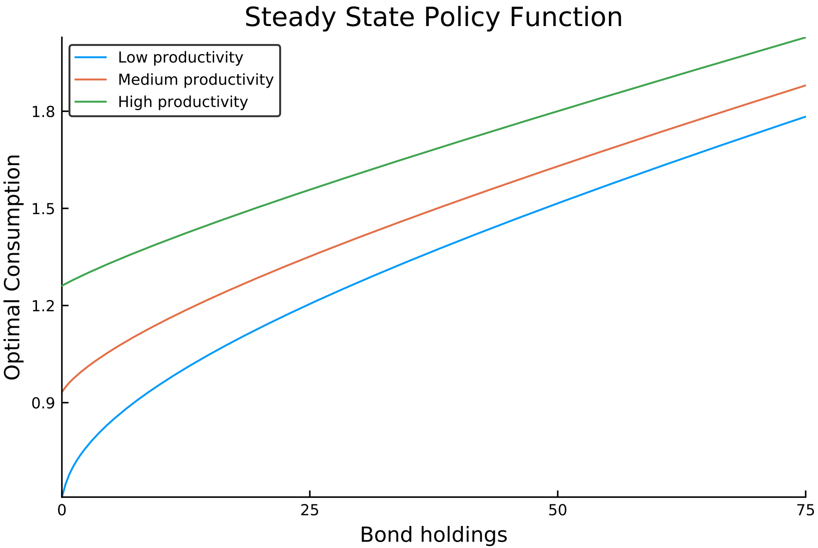
$$c^{-\gamma} = \beta(1+\bar{r})\sum_{z'} \Pr(z'|z)(g^0(z',b'))^{-\gamma}$$

  and use the budget constraint to back out today's bond holdings.

Solving for steady state

1. Guess an initial level of s.s dividends $\bar{D}^0 = 0$.
2. Using this guess and other steady state prices, compute the HH's policy function.
3. Simulate the distribution of bond holdings, using the policy function.
4. Compute aggregate consumption, $\bar{C}^0$.
5. Compute the implied level of dividends, $\tilde{D}^0 = \bar{C}^0 \times (1 - \bar{W})$.
6. Update the guess of dividends: $\bar{D}^1 = \omega\tilde{D}^0 + (1-\omega)\bar{D}^0$. I set $\omega = 0.5$.
7. Iterate until convergence: $\bar{D}^n = \bar{D}^{n-1}$.

Some results



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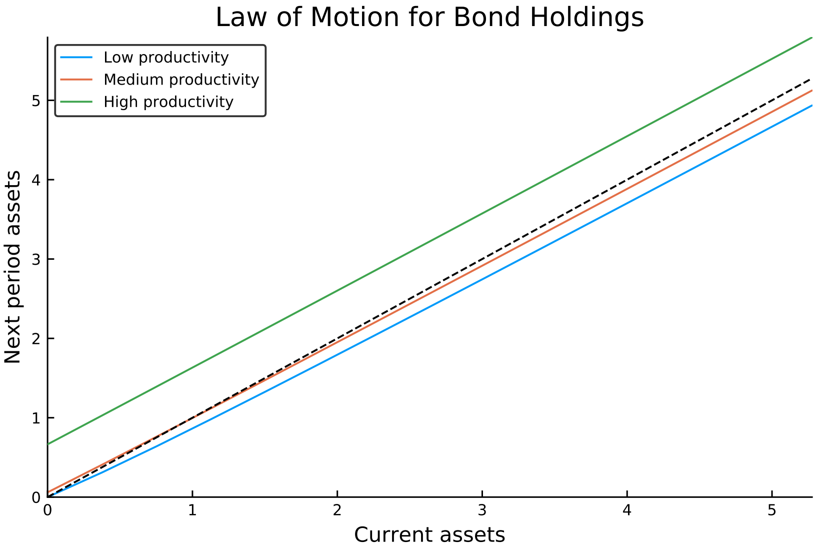

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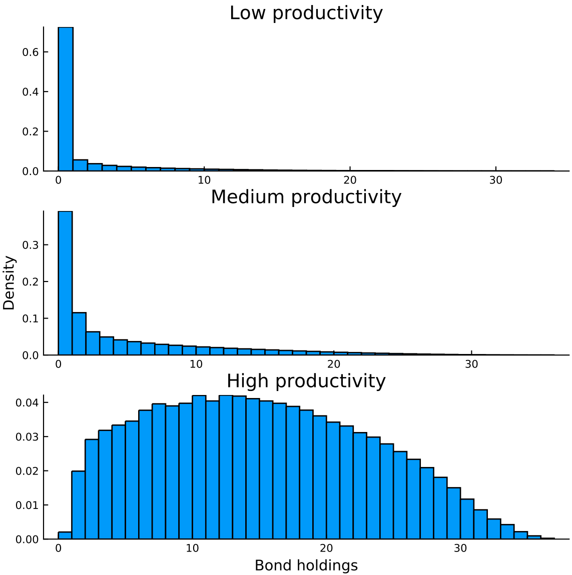

Problems with my ‘solution’