Rational Inattention, Communication Policy and the Blissful Ignorance

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Introduction

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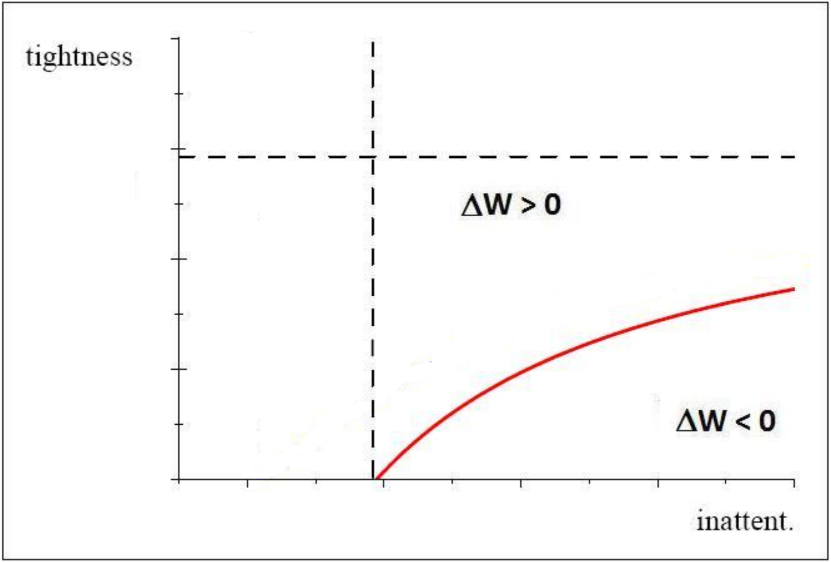
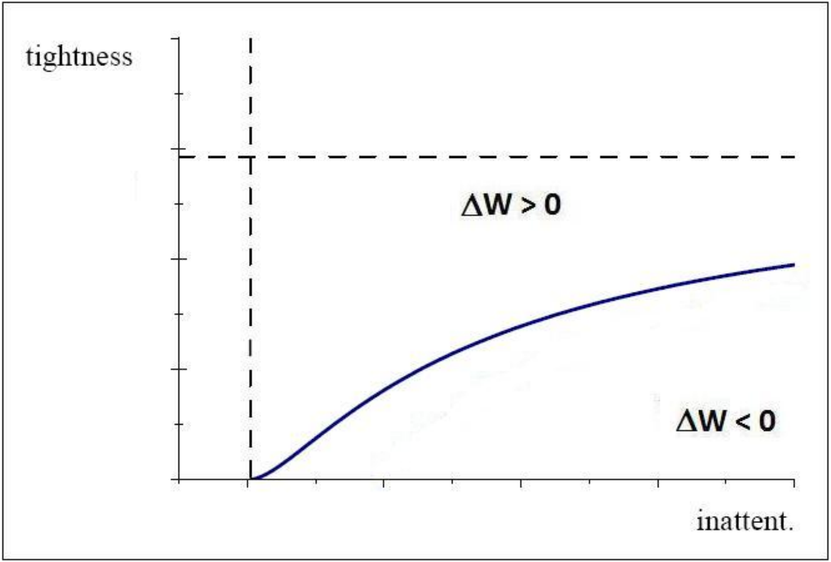
  - Does this choice is independent of the conduct of the monetary policy?
- What is the social value of information about future shocks?
- I solve a dynamic OLG monetary model where the CB sees the next T shocks and releases this information to rational inattentive agents.

Results



Results: a shorter T



Why?

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- A tighter monetary policy reduces the sensitivity of price volatility to information.
- A shorter horizon (a smaller T) reduces the ability to forecast the future price.

Connections with the literature

- The social value of public information.

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- Transparency and Monetary Policy.

Outline

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2. Benchmark case: $T = \infty$

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3. Finite horizon
4. Equivalent communication policies
5. Conclusions

Model

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- For each generation $t > 1$ there is a continuum of agents $i \in (0,1)$ having a two period endowment

$$\left(w_{t,0}, w_{t,1}\right) \equiv \left(\ 2,\ 2w\ \right) \quad \text{with } w \in (0,1)\,,$$

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which perishes in one period.
- Preferences over consumption are

$$u\left(c_{i,t,0}, c_{i,t,1}\right) = \ln\left(c_{i,t,0}\right) + \ln\left(c_{i,t,1}\right),$$

s.t.

$$c_{i,t,0} = w_{t,0} - \frac{M^d_{i,t}}{P_t} \quad \text{and} \quad c_{i,t,1} = w_{t,1} + \frac{M^d_{i,t}}{P_{t+1}}.$$

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- Money supply follows

$$m^s_t = \frac{1}{1-w}\left(u_t + \phi\left(\pi_t - u_t\right)\right),$$

where $\phi \leq 0$ measures the degree of tightness of the monetary policy with

$$u_t \sim N\left(0,1\right) \text{ i.i.d.}$$

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  - *I show that $\varpi_t = \{u_t, \pi_{t+1}^T\}$ or $\varpi_t = \{u_t, \mathbf{u}_t^{t+T}\}$ are equivalent cases.*

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- The distribution of the noisy signals are determined in equilibrium to satisfy

$$H\left(\pi_{t+1}^{T} | \pi_t\right) - H\left(\pi_{t+1}^{T} | \ \pi_t, \omega_{i,t}\right) \leq K$$

Model: Equilibrium

Definition For given $\{w, K, T\}$ and CB policies (ϕ, ϖ), an equilibrium is a series of prices and agents' expectations

$$\{\pi_\tau, \{E^i_\tau \pi_{\tau+1}\}_I\}_{\tau=0}^{\infty}$$

such that individual expected consumption is Bayesian optimal, all markets clear and the agents' allocation of attention is optimal.

Model: optimization and market clearing

- Utility maximization implies

$$m^d_{i,t} - \pi_t = -\frac{w}{1-w}\left(E^i_t \pi_{t+1} - \pi_t\right)$$

where small cases denote log-deviations and $E^i_t \pi_{t+1} \equiv \mathbf{E}[\pi_{t+1}|\Omega_{i,t}]$.

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- Market clearing implies

$$\pi_t = \beta \bar{E}_t \pi_{t+1} + u_t$$

where $\beta \equiv w/\left(1-\phi\right)$, and

$$\bar{E}_t \pi_t \equiv \int_0^1 \mathbf{E}[\pi_{t+1}|\Omega_{i,t}]\ di$$

is the average expectation across agents.

Individual Loss Function

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- This specification implies that the signals agents get are normally distributed with $\eta_{i,t} \sim N\left(0, \sigma\right)$.

Infinite-PF Benchmark

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- Notice that $\pi^{\infty}_{t+1} = \pi_{t+1}$.
- Agents forecasting strategy is

$$E^i_t \pi_{t+1} = \underset{\text{public signal}}{\underset{\downarrow}{a_i \pi_t}} + b_i \left(\beta^{-1} - a_i\right) \underset{\text{private signal}}{\underset{\downarrow}{\left(\pi_{t+1} + \eta_{i,t}\right)}}$$

where a_i and b_i are constant weights to be determined in equilibrium.

Derivation of the current price

- Aggregation across agents gives

$$\bar{E}_t \pi_{t+1} = \mathbf{a}\pi_t + \mathbf{b}\left(\beta^{-1} - \mathbf{a}\right)\pi_{t+1}$$

where $\mathbf{b} \equiv \int b_i \; di$ and $\mathbf{a} \equiv \int a_i \; di$.

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- Substituting for $\pi_{t+1} = \beta \bar{E}_{t+1} \pi_{t+2} + u_{t+1}$ we have

$$\bar{E}_t \pi_{t+1} - \mathbf{a}\pi_t = \mathbf{b}(\bar{E}_{t+1}\pi_{t+2} - \mathbf{a}\pi_{t+1} + \beta^{-1} u_{t+1})$$

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- Iterating we get

$$\bar{E}_t \pi_{t+1} - \mathbf{a}\pi_t = \beta^{-1}\mathbf{b}\sum_{\tau=0}^{\infty}\mathbf{b}^{\tau}u_{t+1+\tau}.$$

The current price

- The current price reflects the *"fundamental"* value

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$$\pi_t = \mathbf{b} \pi_{t+1} + (1 - \beta \mathbf{a})^{-1} u_t,$$

with $\mathbf{b} \in (0, 1)$.

Informational choice

- The informational constraint is

$$H\left(\pi^{\infty}_{t+1}|\pi_t\right) - H\left(\pi^{\infty}_{t+1}|\pi_t,\omega_{i,t}\right) = \frac{1}{2}\log\left(\frac{\mathrm{Var}\left(\pi^{\infty}_{t+1}|\pi_t\right)}{\mathrm{Var}\left(\pi^{\infty}_{t+1}|\pi_t,\omega_{i,t}\right)}\right) \leq K,$$

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- In equilibrium we get

$$\sigma = \kappa\left(1-\mathbf{b}^2\right)\sigma_{\pi},$$

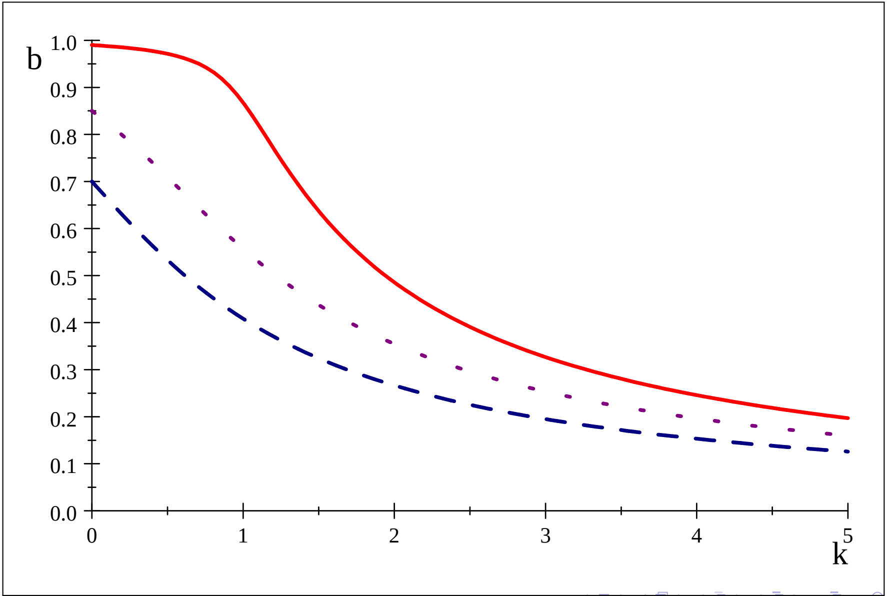
with $\kappa \equiv (e^{2K}-1)^{-1}$ being a measure of inattention.

The equilibrium

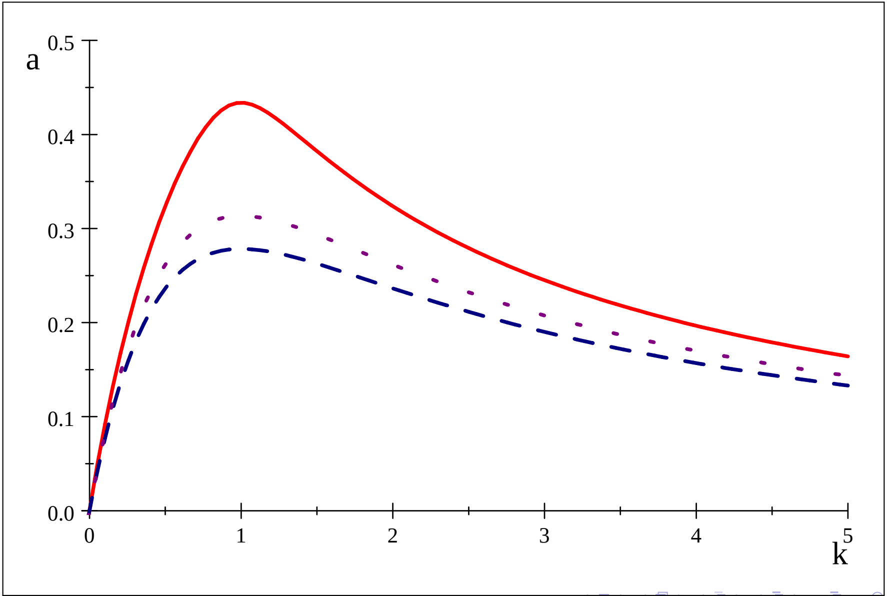
- **Proposition** *For given* $\{w, K, T\}$ *and CB's policies* $\phi, \varpi = \{\pi^{\infty}_{t+1}\}$, *a unique REE stationary price process exists with*

$$
\begin{aligned}
a_i &= \mathbf{a} = \frac{\kappa}{1+\kappa}\mathbf{b}, \\
b_i &= \mathbf{b} = \frac{1+\kappa-\sqrt{(1+\kappa)^2-4\kappa\beta^2}}{2\kappa\beta}.
\end{aligned}
$$

b



a



Welfare analysis

- A second-order approximation of welfare loss is

$$\mathrm{W} \simeq -\frac{1}{2}\left(\theta_m \mathrm{Var}\left(\Delta\pi^e_{t+1}\right) + \theta_{\pi,m}\mathrm{Cov}\left(\Delta\pi^e_{t+1}, \Delta\pi_t\right) + \theta_\pi \mathrm{Var}\left(\Delta\pi_t\right)\right)$$

where $\Delta\pi^e_{t+1}$ is the individual forecasting mistake and $\Delta\pi_t$ is inflation.

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- $\mathrm{var}\left(\Delta\pi^e_{t+1}\right)$ is the dominant effect: it should compensate welfare loss from aggregate volatility (see Roca 2010).

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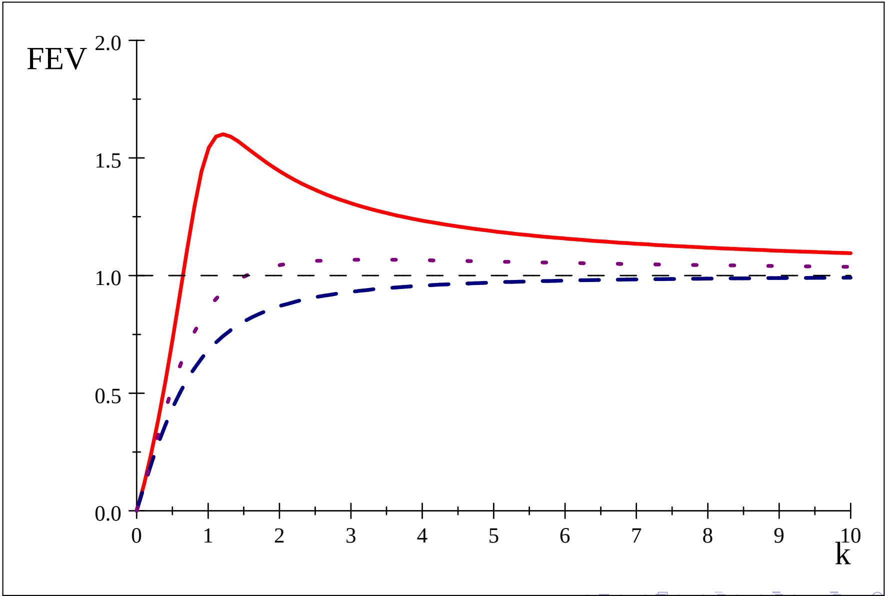
- $\mathrm{var}\left(\Delta\pi^e_{t+1}\right)$ is the dominant effect: it should compensate welfare loss from aggregate volatility (see Roca 2010).

- *But in this setup it is not the case: A blissful ignorance effect arises!*

Welfare analysis: the forecast error variance



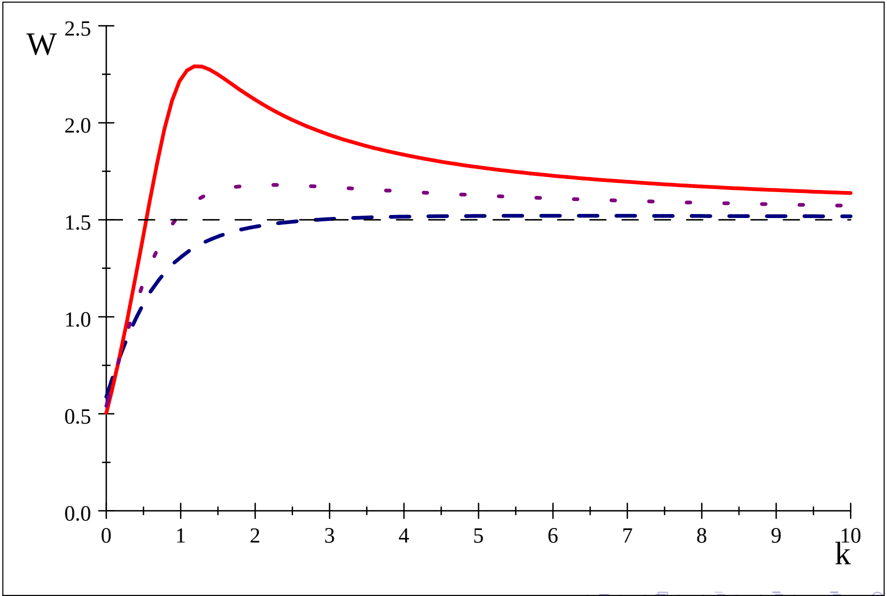
Welfare analysis: the forecast error variance

Proposition *In the case the CB has infinite-horizon perfect foresight, that is with* $\pi_{t+1}^{\infty} = \pi_{t+1}$*, there exists a unique threshold value* $\kappa^* > 1$ *such that*

$$\mathrm{Var}\left(\pi_{t+1}|\omega_{i,t},\pi_t\right)|_{\hat{\kappa}} > \lim_{\kappa\to\infty} \mathrm{Var}\left(\pi_{t+1}|\omega_{i,t},\pi_t\right)|_{\kappa} = 1$$

for any $\hat{\kappa} > \kappa^*$ *if and only if* $\beta > 1/\sqrt{2}$*, whereas* $\sup_{\kappa}\{\mathrm{Var}(\pi_{t+1}|\omega_{i,t},\pi_t)\,|_{\kappa}\} = 1$ *otherwise.*

Welfare analysis: the full case



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- Agents now forecast the future price according to

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and choose volatility of $\eta_{i,t+\tau}$.

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- The ALM of the current price is

$$\pi_t = \mathbf{b}\pi_{t+1} + (1 - \beta\mathbf{a})^{-1} u_t - (1 - \beta\mathbf{a})^{-1} \mathbf{b}^{T+1} u_{t+1+T}$$

Finite horizon: the current price

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- The current price is now a *public signal* of the *T-PF* forecast

$$\pi_t = \mathbf{b} \pi_{t+1}^{T} + (1 - \beta \mathbf{a})^{-1} u_t$$

Finite horizon: forecast error variance

- The informational constraint is

$$H\left(\pi_{t+1}^{T}|\pi_t\right) - H\left(\pi_{t+1}^{T}|\pi_t,\omega_{i,t}\right) = \frac{1}{2}\log\left(\frac{\mathrm{Var}\left(\pi_{t+1}^{T}|\pi_t\right)}{\mathrm{Var}\left(\pi_{t+1}^{T}|\pi_t,\omega_{i,t}\right)}\right) \leq K,$$

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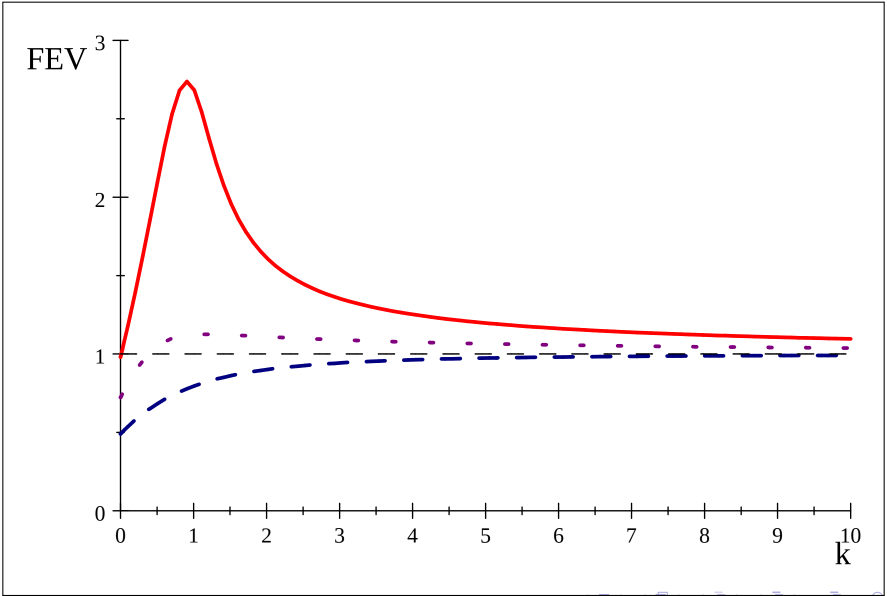
- Equilibrium **a** and **b** are the same as before!
- But the conditional variance of prices is now

$$\mathrm{Var}\left(\pi_{t+1}|\boldsymbol{\omega}_{i,t}^{T},\pi_t\right) = \mathrm{Var}\left(\pi_{t+1}^{T}|\boldsymbol{\omega}_{i,t}^{T},\pi_t\right) + (1-\beta\mathbf{a})^{-2}\,\mathbf{b}^{2\,T}$$

Welfare analysis: forecast error variance for T=2



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Proposition *In the case the CB has finite-horizon T perfect foresight there exists a unique threshold value $\kappa^*(T)$ such that*

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for any $\hat{\kappa} > \kappa^*(T)$ if and only if $\beta > 1/\sqrt{2}$, whereas $\sup_\kappa\{\mathrm{Var}(\pi_{t+1}|\omega_{i,t},\pi_t)|_\kappa\} = 1$ *otherwise. In particular, given a certain* $\beta > 1/\sqrt{2}$ *then $\kappa^*(T) < \kappa^*(T+1)$.*

Extensions

Equivalent communication policies: I

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and chose volatility of $\eta_{i,t}$ and $\phi_{i,t}$.

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- Notice that $u_t + \phi_{i,t}$ only refines the public information conveyed by the current price. Now agents choose the precision of the private information about the noise blurring the public information.

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- Entropy constraint fixes the posterior conditional volatility on π_{t+1} irrespective of the source of the mistake.

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$$E_t^i \pi_{t+1} = \bar{a}_i \pi_t + \left(\bar{c}_i + \beta^{-1}\right) \sum_{\tau=1}^{\infty} \bar{b}_{\tau,i} \left(u_{t+\tau} + \eta_{i,t+\tau}\right) + \bar{c}_i \left(u_t + \eta_{i,t}\right)$$

  and chose volatility of $\eta_{i,t+\tau}$.

- Now agents choose the precision about each single noise composing the state π_{t+1}. At the end this is equivalent to knowing π_{t+1} with a certain precision.

Equivalent communication policies: II

- The CB announces $\varpi = \{\mathbf{u}_t^\infty\}$.

- Agents now forecast the future price according to

$$E_t^i \pi_{t+1} = \bar{a}_i \pi_t + \left(\bar{c}_i + \beta^{-1}\right) \sum_{\tau=1}^{\infty} \bar{b}_{\tau,i} \left(u_{t+\tau} + \eta_{i,t+\tau}\right) + \bar{c}_i \left(u_t + \eta_{i,t}\right)$$

and chose volatility of $\eta_{i,t+\tau}$.

- Now agents choose the precision about each single noise composing the state π_{t+1}. At the end this is equivalent to knowing π_{t+1} with a certain precision.

- Again, the entropy constraint fixes the posterior conditional volatility on π_{t+1} irrespective of the source of the mistake. I find an equivalence fixing $\bar{b}_{\tau,i} = \bar{\mathbf{b}} \bar{b}_{\tau+1,i}$.

Conclusions

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Conclusions

- What is the social value of information about the future?
- This paper develops a simple recursive machinery to study informational frictions in dynamic models.
- Information about the future can be welfare detrimental if agents are not *attentive enough* and the monetary policy is not *tight enough*.
- As less information is available (a shorter horizon) then the notion of *attentive enough* becomes more stringent.

Thank you