The Epidemiology of Expectations in A DSGE Model

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Highlights

- Households and firms are NOT econometricians. They simply believe the economic forecasts that they hear from the news media.
- The news media reports the forecasts made by a professional forecaster, who runs a statistical model.
- The spread of news is similar to the spread of infectious disease that has a common source.
- The economy reaches a restricted perceptions equilibrium.
- If the spread of news is instantaneous, the economy is identical to one in which all agents are econometricians (adaptive learning).

Introduction

Most real-life "agents" learn about the economy from the media and the people that they are associated with. Goodhart (2003): "you ask your uncle." - the most important characteristic of learning is that it is *social*.

- The spread of beliefs follows Kermack and McKendrick (1927)'s model of epidemiology. A susceptible individual who is exposed to the disease in a given period has a fixed probability of catching the disease. The disease is not spread person-to-person, but through contact with a common source of infection.
- A professional forecaster serves as the common source. He uses statistical models to make forecasts. He can be a fundamentalist who believes economic dynamics are functions of shocks, or a pure statistician who run ARMA models.
- The forecaster updates his estimate every period. He does NOT take into account how his forecast is transmitted across the population.

Environment

- The probability that an agent is "infected" by a new forecast in each period is λ.
- If a forecast is broadcasted in period 1, then after t periods, the proportion of people who have heard the forecast is $\lambda \sum_{s=0}^{t}(1-\lambda)^s$.
- If a new economic forecast is broadcasted to the population in each period, then in every period, different proportions of the population are using different forecasts to make decisions.
- If the professional forecaster is a fundamentalist, his model is:
$$Y_t = \beta_0 + \beta_1 a_t,$$
where a_t is a vector of shocks.
- The professional forecaster can also run a VAR model:
$$Y_t = \sum_{j=1}^{\infty} \beta_j Y_{t-j} + e_t.$$

Forecaster is a fundamentalist

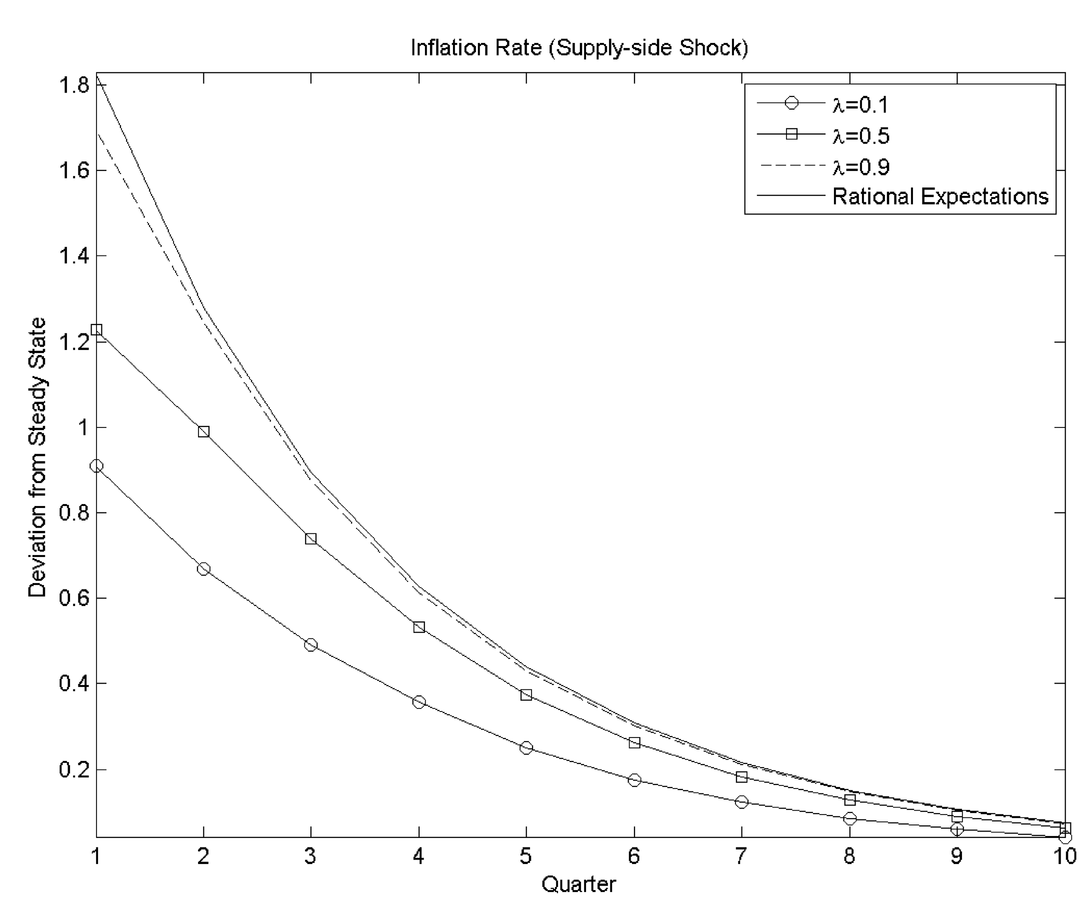

Figure 1: Response to a cost-push shock. λ: the probability that an agent is infected by a new forecast.

Equilibrium

- The Phillips curve:
$$\pi_t = \beta\lambda \sum_{i=1}^{\infty}(1-\lambda)^{i-1} E_t \pi_{i,t+1} + \kappa y_t + u_t.$$
- The IS curve:
$$y_t = \lambda \sum_{i=1}^{\infty}(1-\lambda)^{i-1} E_t y_{i,t+1} - \frac{1}{\sigma}\left(i_t - \lambda \sum_{i=1}^{\infty}(1-\lambda)^{i-1} E_t \pi_{i,t+1} - a_t\right).$$
- If the professional forecaster is a fundamentalist, the actual law of motion becomes
$$Y_t = a + ba_t ca_{t-1} + da_{t-1} + \ldots$$
- The model reaches a restricted perceptions equilibrium when
$$Ea_t(Y_t - \beta_0 - \beta_1 a_t)' = 0.$$
- If the professional forecaster runs VAR models, then the ALM is an infinite order VAR in Y.

Forecaster runs an VAR(1)

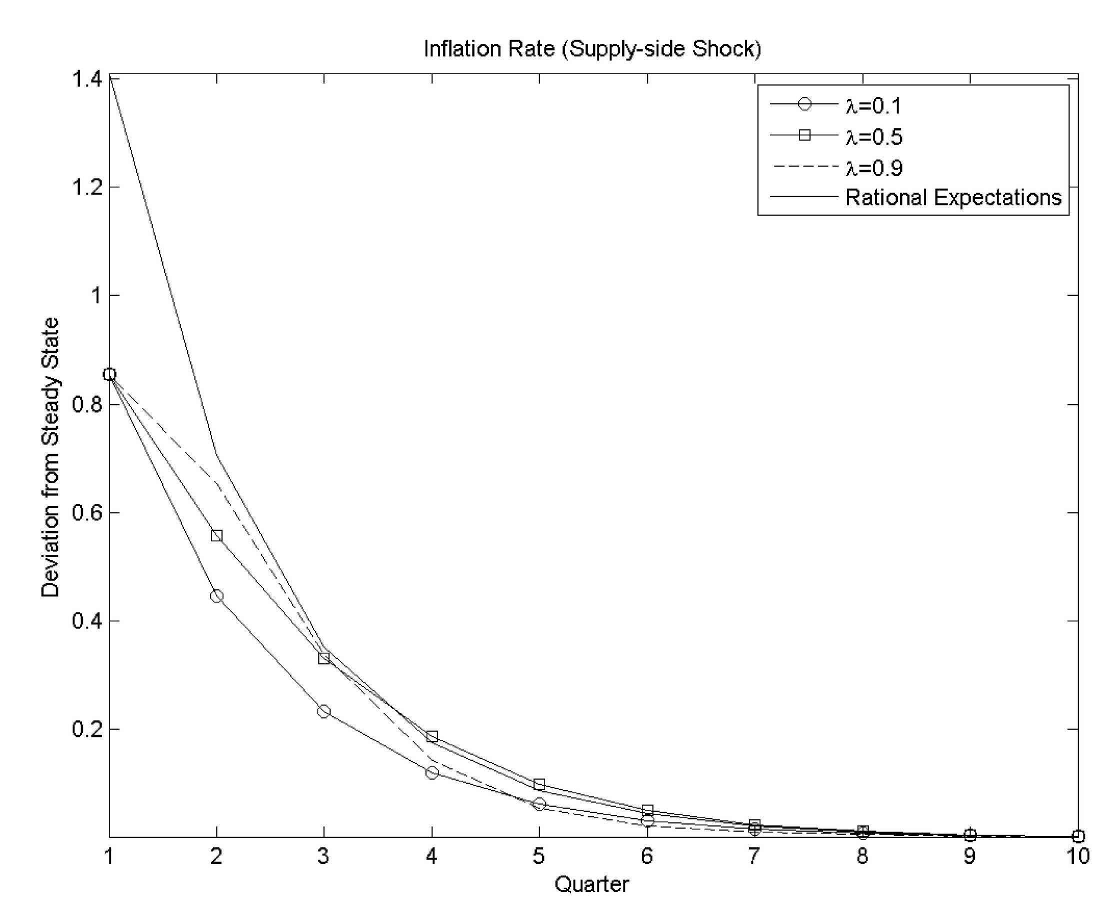

Figure 2: Response to a cost-push shock. λ: the probability that an agent is infected by a new forecast.

Policy Experiment

- In period 1, the central bank announces that a zero-interest-rate policy will be implemented in periods 1-4.
- In the PLM: $Y_t = \beta_0 + \beta_1 a_t$, a_t now includes anticipated policy shocks.

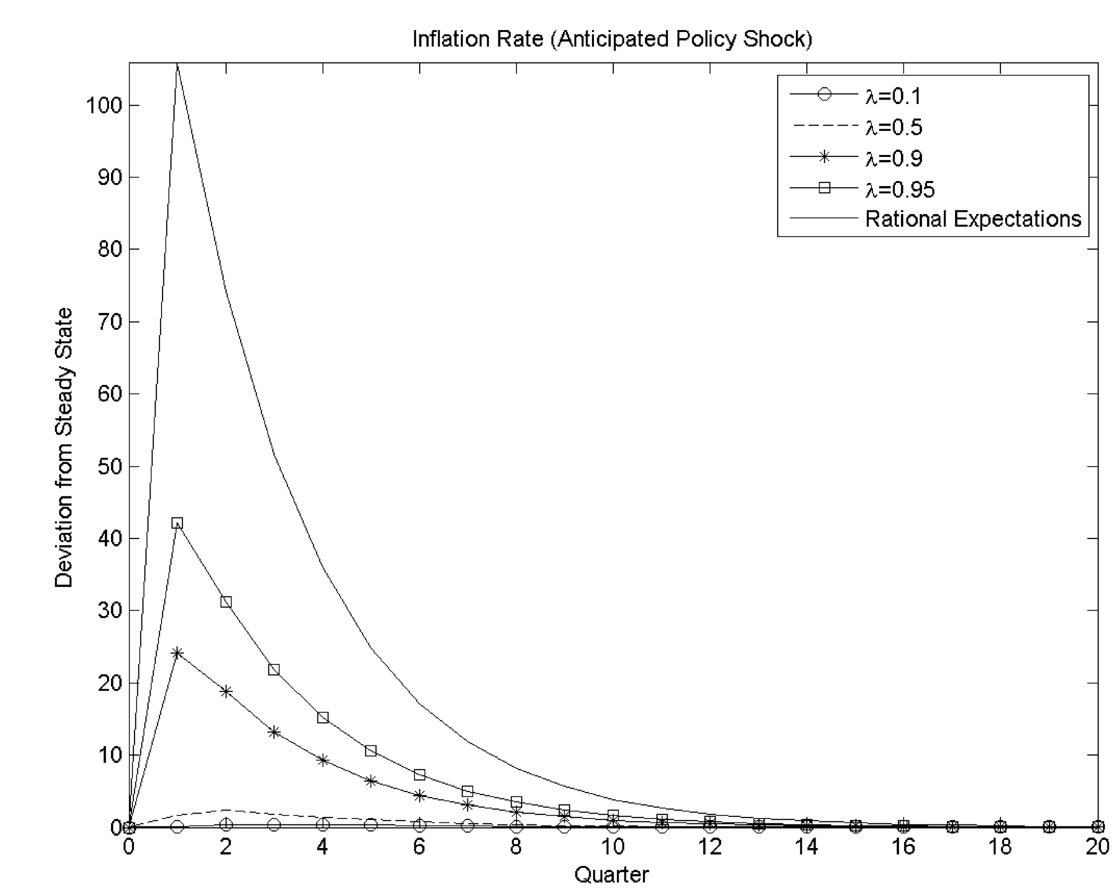

Figure 3: Response to anticipated policy shocks.

Conclusion

- Social learning significantly changes model dynamics.
- Under REE, agents respond strongly to anticipated policy shocks. There is "overshooting."
- With social learning, the model's response depends on the degree of social learning. With slow information transmission, the response of the model is significantly dampened.

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