Discussion

Tarek Hassan began the discussion by responding to several of the conceptual questions raised by the discussants, deferring questions about solution methods that may not be of general interest. He placed this paper in the context of a larger literature, both in macroeconomics and financial economics, which often uses constant absolute risk aversion (CARA) preferences and normally distributed shocks. He noted that one of the big themes in this literature is that the informativeness of asset prices is important for welfare. Hassan and his coauthor read the literature as lacking a justification for this claim. Their paper combines a “noisy rational expectations” model with a more standard quantitative model to answer questions about welfare. Hassan pointed out that there are obvious policy questions that depend on the importance of markets’ information aggregation, and that among policymakers there is an awareness of this issue, citing Alan Greenspan as an example. Their paper combines a canonical dynamic stochastic general equilibrium (DSGE) model with a noisy rational expectations model. Hassan acknowledged the discussants’ point that several of the technical problems in the model arise from the presence of noise traders. His preferred solution would be not to have noise traders. However, Hassan argued that there is significant value in first combining two standard models, whose predictions are well understood.

Hassan also addressed the relevance of the quantitative results. The question considered in the paper is, “What are the effects on business cycle moments and the level of economic activity if people can learn about the productivity shock one month in advance?” Because of the technical limitations pointed out by the discussants, the authors are not able to answer more complex questions and, in particular, to address
the quantitative importance of gradual learning. Despite these limitations, the two canonical models combined have interesting quantitative implications. The paper shows that the equity premium falls by 20% and there is an effect on the level of the capital stock and the dynamic behavior of the economy.

Next, Bob Hall pointed out that the paper uses a lot of “tricks.” He argued that there is a straightforward general approach to all recursive models, in which one writes down the state variables (which include distributions), approximates the distributions with a suitable number of parameters, writes down all the necessary conditions to describe behavior, and solves the Kolmogorov forward equations. This is in some sense a generalization of Krusell and Smith (1998), with multiple parameters for each distribution instead of just one. This procedure results in a system of equations involving all of the parameters of the approximations, of which there may be many, but Hall argued that computers are now capable of solving very large systems of equations. He pointed out that this sort of thing is done routinely in other sciences, and that it might be automated in a manner similar to Dynare (Adjemian et al. 2014).

Thomas Mertens responded by pointing out that their paper shuts down all forms of heterogeneity, except beliefs, and that beliefs are by assumption normally distributed with a constant variance. This approach implies that there is only one state variable, the mean belief, that must be tracked. Bob Hall stated that their model is a standard recursive problem, and Mertens concurred, arguing that this is an advantage of their approach. If Hassan and Mertens modified their model to have heterogeneity in wealth, they would need to keep track of the entire wealth distribution. Bob Hall suggested that they use the projection techniques developed by Ken Judd to explore this approach. Mertens agreed that this was possible, noting that their current approach is easier to use, and questioning whether there are additional economic insights to be gained by considering heterogeneity of wealth.

Next, Michael Woodford praised the authors’ work as an ambitious first step on an important question. He argued that the question was important not only for the reasons mentioned by Tarek Hassan earlier, but also because current macroeconomic models are inconsistent with what is known through survey evidence on the dispersion of individual forecasts. Woodford also noted that those models did not match a variety of asset-pricing facts. He asked whether it was possible to match those asset-pricing facts without changing the model’s implications for
macroeconomic time series, or whether matching those asset-pricing facts necessarily changed the model’s macroeconomic predictions. Woodford expressed doubt about how far the paper had gone in this direction, and felt that the most striking result thus far was the authors’ inability to find parameter values that match the degree of dispersion in forecasts, compared to survey evidence. Woodford suggested that perhaps any model that attempts to explain dispersion using rational expectations and private signals, which all agents correctly interpret, will not be able to account for the observed level of dispersion. He also suggested an alternative possibility, that the other restrictions the authors have imposed, for the sake of tractability, have limited the amount of dispersion that can be generated from the model. He then solicited the authors’ opinion on which of these two possibilities was most likely.

Tarek Hassan responded by stating that it was a robust result that, in equilibrium, people have differences of opinion that are much larger than they should be if they have common priors. He explained that assuming agents have dispersed priors makes the problem harder to interpret, and suggested that an overconfidence model could produce the kind of dispersion observed in the data. Woodford noted that this suggestion is a departure from rational expectations. Hassan offered a simple intuition for the mechanics of the model. The model says that if people truly believe what they write in the survey of economic forecasters, they should take positions in asset markets, and therefore stock prices should reflect that information. Awareness of this phenomenon pulls everyone’s ex post posterior expectations back together.

George-Marios Angeletos disputed this characterization, arguing that it depends on the source of variations behind those beliefs. In models where there is only once source of variation, an agent sees one price signal and learns everything he or she needs, but in models with a sufficiently rich state space, that is not the case. Angeletos recalled the paper by Allen et al. (1993) that highlights this issue. In some models where the uncertainty is only about the payoffs, the informativeness of the price is very powerful, but one can write models in which the agents are facing richer uncertainty because they are facing uncertainty about how other agents are going to speculate about future prices. In those models, the agents learn very little from current prices. Angeletos concluded that the mechanism highlighted by Hassan applies only to specific models. Hassan replied that it did apply to their combination of two standard models, an “off-the-shelf” DSGE model and the noisy rational expectations model.
Mark Gertler shifted the discussion to point out that the role of dispersed information is to slow down the movement of expectations, relative to a perfect information economy. He noted that in the survey of professional forecasters data, researchers have found exactly this phenomenon. Gertler encouraged Hassan and Mertens to attempt to match this fact, as opposed to the dispersion of beliefs. He also noted that they could build a model with more interesting forecast errors instead of using a simple real business cycle model.

Andrew Abel pointed out that in the authors’ model, the investment-output ratio was 30%, which is higher than is observed in data. The authors responded that they used the parameters from Croce (2014), which was the basis for their “off-the-shelf” DSGE model. Greg Mankiw noted that this merely raised the question of why that paper did not fit the data.

Andrew Abel then asked a second question about why their model seems to partially resolve the equity premium puzzle. He noted that the paper has adjustment costs, Epstein-Zin preferences, and leverage, but wondered if there was not some other element of the model that helped resolve the puzzle. Hassan responded by noting that this is a property of the Croce (2014) paper, which uses Epstein-Zin preferences and a “long-run-risks-”type process (Bansal and Yaron 2004) for total factor productivity (TFP). Martin Eichenbaum asked whether Croce compares this process to actual TFP, and Hassan replied that Croce estimated his process on the TFP data of Basu et al. (2006).