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Comment on Jeffrey D. Amato and Hyun Song Shin

"Public and Private Information in Monetary Policy Models"[1]

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Jeff Amato and Hyun Shin have produced a very fine paper, Amato and Shin [1]. It is a pleasure to discuss it. The main message is that central-bank information may have bad consequences. It could degrade the information value of private signals, and it could increase the volatility of inflation. This makes the paper something of an anti-transparency paper, a somewhat rare thing in this age of central-banking transparency. However, I do not believe that the anti-transparency flavor stands up to scrutiny. Indeed, I will argue that the paper's main result can rather be interpreted as a pro-transparency one.

The paper discusses difficult issues with the help of a very elegant and powerful framework, modeling differential information with the help of Markov chains and related matrix algebra. First, the authors provide a simple static example of their analysis. Then they provide a more elaborate intertemporal model of a newkeynesian model of a monetary economy.

In the simple example, a typical firm i $(i = 1, 2, ..., N)$ sets the (log) price p_i of its product according to

$$p_i = \mathrm{E}^i p + \xi \mathrm{E}^i (y - \bar{y}), \tag{0.1}$$

where E^i denotes the firm's expectation or estimate conditional on its private information; $p \equiv \frac{1}{N} \sum_{i=1}^{N} p_i$ denotes the aggregate (log) price level; ξ $(0 < \xi < 1)$ is a parameter; and $y - \bar{y}$ denotes the output gap, the difference between (log) output, y, and (log) potential output, $\bar{y}$. This pricing equation can be rewritten as

$$p_i \equiv (1 - \xi)\mathrm{E}^i p + \xi \mathrm{E}^i (p + y - \bar{y}),$$

where $p + y - \bar{y}$ can be interpreted as (log) nominal GDP adjusted for potential output. By taking the average of this equation, we get

$$p = (1 - \xi)\bar{\mathrm{E}} p + \xi \bar{\mathrm{E}} (p + y - \bar{y}),$$

[1] Presented at the conference "Monetary Stability, Financial Stability and the Business Cycle," Bank for International Settlements, Basel, March 28-30, 2003. The comments borrow a few points from my comments on Woodford [5] in Svensson [3]. I thank Kathleen Hurley for editorial and secretarial assistance.

where $\bar{\mathrm{E}}[\cdot] \equiv \bar{\mathrm{E}}^1[\cdot] = \frac{1}{N}\sum_{i=1}^{N} \mathrm{E}^i[\cdot]$ denote the average (first-order) expectations operator. Since $0 < \xi < 1$, by recursive substitution of the term $\bar{\mathrm{E}}p$, we can write the average price equation as

$$p = \xi \sum_{k=1}^{\infty} (1-\xi)^{k-1} \bar{\mathrm{E}}^k (p + y - \bar{y}), \tag{0.2}$$

where $\bar{\mathrm{E}}^k$ denotes kth-order average expectations defined as

$$\bar{\mathrm{E}}^k[\cdot] \equiv \frac{1}{N}\sum_{i=1}^{N} \mathrm{E}^i \left[\bar{\mathrm{E}}^{k-1}[\cdot]\right] \qquad (k \geq 2).$$

Equation (0.2) shows that the average price level depends on an infinite sum of higher-order expectations of nominal GDP adjusted for the output gap, with the weight on higher-order expectations being larger the smaller the parameter ξ. The smaller the parameter ξ, the stronger the strategic complimentarity of the individal firms' pricing decisions are.

The paper shows that, if there is public information, higher-order expectations converge to public expectations,

$$\bar{\mathrm{E}}^k[\cdot] \to \bar{\mathrm{E}}[\cdot|\text{Public information}] \qquad (k \to \infty).$$

The paper then shows that the outcome depends on the relative precision of private and public information. When private precision is good, introducing bad public information may increase the volatility of inflation in the newkeynesian model. If the precision of public information improves, however, the the volatility of inflation falls, as seen in figures 2 and 3 of the paper.

Indeed, I believe that it is this latter result that makes the paper a pro-transparency paper. In the real world, there is already considerable public information, for instance, data and forecasts published by various government agencies and private forecasters. Since there is already public information, the results of the paper indicate that central banks should provide as good *additional* public information as possible, to improve the precision of the public information. Looked at this way, the results of this paper become pro-transparency rather than anti-transparency.

The parameter ξ is crucial for the relative importance of public information (recall that a lower ξ implies more weight on higher-order expectations). The paper shows how ξ is determined in a rather complex way in the newkeynesian model. However, ξ could also depend on monetary policy. This can be illustrated in the simple example above. Suppose that monetary policy results in a targeting rule of the form

$$p + \lambda(y - \bar{y}) = q, \tag{0.3}$$

where $\lambda \geq 0$ is a parameter related to the monetary-policy regime and q is some exogenous error term. The case $\lambda = 0$ could be interpreted as strict price-level targeting, $\lambda > 0$ could be interpreted as flexible price-level targeting, $\lambda = 1$ could be interpreted as a kind of nominal-GDP targeting (where nominal GDP is adjusted for potential output), and $\lambda \to \infty$ could be interpreted as strict output-gap targeting.

We can use equation (0.3) to eliminate the output gap in equation (0.1). This results in the new pricing equation

$$p_i = (1 - \tilde{\xi})\mathrm{E}^i p + \tilde{\xi} q,$$

where the new parameter, $\tilde{\xi}$, is given by

$$\tilde{\xi} \equiv \frac{\xi}{\lambda}.$$

If $\lambda > \xi$, we have $\tilde{\xi} < 1$, and we can still do the recursive substitution leading to equation (0.2), where $\tilde{\xi}$ replaces ξ and the higher-order expectations refer to q rather than $p + y - \bar{y}$. Thus, λ affects the size of $\tilde{\xi}$ for given ξ, and thereby the relative weight on higher-order expectations. However, if $\lambda < \xi$, we have the $\tilde{\xi} > 1$, and the recursive substitution no longer makes sense. Indeed, firms' indiviual pricesetting decisions are then no longer strategic complements but strategic substitutes.

What order k of firms' expectations are sensible? How rational and sophisticated are the firms? In principle, one could find out via the surveys of inflation expectations that many central banks undertake these days. One could ask questions of the following form to individual firms: (1) What do you think the average price level is?; (2) What do you think other firms think the average price level is?; (3) What do you think other firms think other firms think the average price level is?; and so forth. These questions are obviously constructed such that averaging the responses to the kth question gives the kth-order average expectations. It would be very interesting to see whether firms could give sensible answers to higher-order questions. I would certainly have to think a while myself before answering such questions, and I am not sure how many high-order questions I would have an answer to.

One possibility is that agents would display bounded rationality and simplify the formation of higher-order expectations. Two alternatives immediately present themselves. One is that higher-order expectations beyond some fixed order K are set equal to the Kth-order expectations, $\bar{\mathrm{E}}^k[\cdot] = \bar{\mathrm{E}}^K[\cdot]$ for $k > K$. Another is that higher-order expectations beyond some fixed order K are set equal to a constant expectations operator, for instance, the expectations conditional on

the public information, $\bar{\mathrm{E}}^k[\cdot] = \bar{\mathrm{E}}[\cdot|\text{Public information}]$ for $k > K$. Clearly, these two alternatives have very different consequences. The first would reduce the weight on public information; the second would increase that weight. It is not clear that one case is more plausible than the other.

These comments indicate that there remain quite a few interesting issues for future research, and I very much hope the authors will address them in their future research.

Finally, let me voice a complaint on this otherwise so fine paper. The authors present a model in which they model firms' pricing and households consumption not as following ad hoc rules of behavior but those of rational and goal-directed agents; thus, by specifying objectives and constraints and then deriving optimal first-order conditions that describe private-sector behavior with a structural relation. But when the authors model monetary policy, they don't follow the same healthy principles of analysis. Instead, they model the central bank as following an ad hoc reaction function, an instrument rule, either a Taylor rule or a so-called forecast-based instrument rule. There is no reason to believe that such an ad hoc reaction function would be structural. As I have argued elsewhere, for instance, in Svensson [4], good central banks are at least as goal-directed and rational as the average household and firm (and they certainly employ more PhDs). Therefore, it makes a lot of sense to model good monetary policy as optimizing, by using optimal targeting rules instead of ad hoc instrument rules. Indeed, Charles Bean's paper at this conference, Bean [2], shows very pedagogically how this can be done and how helpful such an approach is in sorting out some common confusion about the role of asset prices regarding objectives and responses in monetary policy.

References

[1] Amato, Jeffrey D., and Hyun Song Shin (2003), "Public and Private Information in Monetary Policy Models," working paper, BIS, Basel.

[2] Bean, Charles (2003), "Asset Prices, Financial Imbalances and Monetary Policy: Are Inflation Targets Enough?", working paper, Bank of England.

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[4] Svensson, Lars E.O. (2003b), "What Is Wrong with Taylor Rules? Using Judgment in Monetary Policy through Targeting Rules," *Journal of Economic Literature*, forthcoming.

[5] Woodford, Michael (2003), "Imperfect Common Knowledge and the Effects of Monetary Policy," in Philippe Aghion, Roman Frydman, Joseph Stiglitz and Michael Woodford, eds., *Knowledge, Information and Expectations in Modern Macroeconomics: In Honor of Edmund S. Phelps*, Princeton University Press, 2003, 25–58.