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# Commentary

In their paper, Jean Boivin and Marc Giannoni ask whether the monetary transmission mechanism has changed. More precisely, they ask whether the macroeconomic effects of monetary policy shocks in the United States were different in the 1980s and 1990s relative to the 1960s and 1970s. The authors conclude that these effects have changed and that the primary cause of this change has been a shift in monetary policy. They carry out their empirical analysis using reduced-form and structural vector autoregressions (VARs). In a companion paper, Boivin and Giannoni (2002) address the same question using a small-scale structural model, and arrive at the same general conclusion.

Their paper in this volume begins by carefully documenting the instability in a typical VAR estimated using quarterly macro data for the United States over 1963-97. They examine instability from two potential sources: the VAR coefficients and the covariance matrix of the VAR errors. They find instability from both sources. As the authors note, these results are consistent with a large and growing body of empirical evidence on instability in macroeconomic relations.

The paper then investigates two distinct but related questions. First, several researchers (see, for example, McConnell and Perez-Quiros [2000]) have documented a substantial decrease in the variability of real macroeconomic activity (for instance, GDP growth rates) and inflation in the 1980s and 1990s relative to the 1960s and 1970s. Boivin and Giannoni ask whether this decrease in variability is associated with changes in the reduced-form VAR coefficients or with changes in the VAR error covariance matrix. They conclude that both are important. Second, using a structural VAR, the authors document changes in the impulse response function of output and inflation to monetary policy shocks. They ask whether these changes are associated with changes in the coefficients of the interest rate equation (the structural VAR's monetary policy rule) or with the coefficients in the other equations. They conclude that changes in the monetary policy rule are responsible for the change in the impulse responses. I will now discuss both questions.

## The Relative Stability of the Macroeconomy

Boivin and Giannoni's Table 3 summarizes the study's conclusion about this question. It presents the implied variability of output and inflation computed from a reduced-form VAR with coefficients $A$ and covariance matrix $\Sigma_u$. In the 1963-79 sample period, output and inflation are much more variable than in the 1980-97 sample period. Can this change in variability be accounted for by a change in $A$, a change in $\Sigma_u$, or are changes in both needed? The authors conclude that changes in both $A$ and $\Sigma_u$ are necessary, and their rationale is

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evident in the top panel of Table 3. However, the bottom panel tells a somewhat different story: comparing the 1963-78 and 1984-97 sample periods, it shows that nearly all of the fall in the variability of output is associated with a change in $\Sigma_u$, although changes in $A$ and $\Sigma_u$ are needed to explain the fall in the variability of inflation.

Several authors (see, for example, McConnell and Perez-Quiros [2000], Chauvet and Potter [2001], and Kim, Nelson, and Piger [2001]) estimate a break in the variability of GDP around the first quarter of 1984. Using this break date, it seems fair to conclude from the authors' Table 3 that nearly all of the change in output variability is associated with changes in the reduced-form VAR error covariance matrix. This is the conclusion reached in several other recent papers (Ahmed, Levin, and Wilson 2001; Simon 2000; Stock and Watson 2002). For example, the table below shows the standard deviation of four-quarter changes in the logarithm of GDP and GDP inflation from a VAR like the one used by Boivin and Giannoni for two samples: 1960-83 and 1984-2001. It presents results like those in the bottom panel of Boivin and Giannoni's Table 3. That is, nearly all of the change in the variability in GDP growth is associated with a change in the error covariance matrix.

Thus, the answer to the question appears to depend on the date that breaks the early and later sample periods. If the break date is 1980, then both $A$ and $\Sigma_u$ are important. If the break date is 1984, then only $\Sigma_u$ is important. As mentioned above, estimates of the date of the reduction in output volatility generally point to 1984. However, as Stock and Watson (2002) show, this break date is very imprecisely estimated. They find confidence intervals for the break date that encompass essentially all of the 1980s. Thus, it seems that there is not a definitive answer to this question.

### Implied Standard Deviation from Sample-Specific Vector Autoregressions (VARs)

$X_t = A(L)X_{t-1} + u_t, Var(u_t) = \Sigma$

| Variable | Sample Standard Deviation | | Standard Deviation Implied by VAR | | | |
|---|---|---|---|---|---|---|
| | 1960-83 | 1984-2001 | $\sigma(\hat{A}_1,\hat{\Sigma}_1)$ | $\sigma(\hat{A}_2,\hat{\Sigma}_2)$ | $\sigma(\hat{A}_1,\hat{\Sigma}_2)$ | $\sigma(\hat{A}_2,\hat{\Sigma}_1)$ |
| Output | 2.71 | 1.59 | 2.76 | 1.43 | 1.48 | 2.63 |
| Inflation | 1.49 | 0.59 | 1.50 | 0.54 | 0.95 | 0.85 |

Source: Stock and Watson (2002).

Note: The first sample period is 1960-83 (estimated parameters: $\hat{A}_1(L)$ and $\hat{\Sigma}_1$); the second sample period is 1984-2001 (estimated parameters: $\hat{A}_2(L)$ and $\hat{\Sigma}_2$).

## Changes in the Impulse Response of Monetary Policy Shocks

Boivin and Giannoni find that monetary policy shocks have changed in two important ways: first, they are smaller in the 1980s and 1990s than in the earlier period (Table 4 of their paper); second, their dynamic response on output (the impulse response function) is attenuated in the later sample period (Chart 1 of the paper). Mechanically, this second change must arise from a change in the structural VAR coefficients, and the authors conclude that the major source of the change is a change in the coefficients in the interest rate equation. While the answer to the first question depends on the break date used to split the sample, the answer to this question does not. The paper's Charts 2 and 3 suggest that this conclusion is robust to the sample splitting date.

## Relationship between the Questions

Is there a tight relation between the two questions addressed in the paper? That is, are changes in the monetary policy shock or its impulse function an important cause of the change in the variability in output? Tables 3 and 4 in the paper suggest that changes in monetary policy shocks cannot be a major cause of the reduction in output volatility. The variance of output fell from 5.1 in 1963-79 to 1.13 in 1984-97. The variance decomposition in Table 4 suggests that monetary policy shocks were responsible for roughly 20 percent of the variance in 1963-79, and, as Leeper, Sims, and Zha (1996) and Bernanke and Boivin (forthcoming) argue, this is probably an overestimate of the importance of monetary policy shocks for the variance of output. But, even using this value, a complete elimination of monetary policy shocks would have resulted in a fall in the variance of output from 5.1 to 4.1; this is a long way from the fall to 1.13 observed in the data. Thus, it seems that monetary shocks cannot be an important part of the story.

But this is not to say that monetary policy cannot be behind the drop in variability. The primary role of monetary policy is not to add new shocks to the macroeconomy, but rather to react to shocks arising from other sources (for example, supply shocks and fiscal shocks). As several authors have noted (Boivin 2000; Clarida, Galí, and Gertler 2000; Taylor 1999), monetary policy appears to have changed in a way that may help stabilize both output and inflation. Unfortunately, the

structural VAR used in this paper, which isolates only the monetary policy shock, is not well suited for investigating this question, which requires isolating all of the important structural shocks. A complete structural model seems to be required, and a promising candidate for this purpose is developed in Boivin and Giannoni (2002).

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