Assessing the Transmission of Monetary Policy Shocks Using Dynamic Factor Models

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Abstract

This paper extends the current literature which questions the stability of the monetary transmission mechanism. I use a Dynamic Factor Model with time-varying parameters, which allows fast and efficient inference based on hundreds of explanatory variables. Different specifications are compared, where parameters may change gradually in every period or be subject to small breaks, or varying over time periods? The presence of time-varying parameters complicates identification. Another contribution is to successfully extend the current literature which questions the stability of the monetary transmission mechanism. I use the algorithm of Gerlach, Carter and Kohn (2000) for dynamic mixture models in order to estimate the factor-augmented VAR (TVP-FAVAR) for the Federal Funds Rate. This system can be written as an MA model for the original 157 variables, which allows to extract impulse responses for all of them: $g_t = \lambda_t y_t + \nu_t$, where $g_t = [x_t', r_t', y_t']$ contains 157 variables, $f_t$ are the 4 factors (principal components) and $r_t$ is the monetary policy tool (Federal Funds Rate). This paper extends the current literature which questions the stability of the monetary transmission mechanism. I use the algorithm of Gerlach, Carter and Kohn (2000) for dynamic mixture models in order to estimate the factor-augmented VAR (TVP-FAVAR) for the Federal Funds Rate. This system can be written as an MA model for the original 157 variables, which allows to extract impulse responses for all of them: $g_t = \lambda_t b_t(L)^{-1}(x_t', r_t', y_t') + \nu_t$, where $b_t(L) = I - b_1 L - \ldots - b_J L^J$ and $\nu_t$ is the error term.

Evidence on time-variation

<table>
<thead>
<tr>
<th>Parameter $\theta$</th>
<th>Informative prior (few breaks)</th>
<th>Uninformative prior</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\lambda_t$</td>
<td>0.0 - 0.108</td>
<td>0.571 - 0.686</td>
</tr>
<tr>
<td>$\log h_{1,t}$</td>
<td>0.032 - 0.091</td>
<td>0.325 - 0.542</td>
</tr>
<tr>
<td>$B_t$</td>
<td>0.3366</td>
<td>0.9181</td>
</tr>
<tr>
<td>$\alpha_t$</td>
<td>0.2138</td>
<td>0.8731</td>
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<tr>
<td>$\log \sigma_1$</td>
<td>0.6254</td>
<td>0.9781</td>
</tr>
</tbody>
</table>

Impulse Responses

Figure: Impulse responses (medians) to a 25 basis point innovation to the Fed Funds Rate, and differences between the responses for three time periods from Benchmark FAVAR(4,2): i) 1975-Q1 (blue line), ii) 1981-Q3 (green line) and iii) 1996-Q1 (red line).

Figure: Impulse responses from Benchmark FAVAR(4,2): (a) 1st factor, (b) 2nd factor, (c) 3rd factor, (d) 4th factor and (e) Federal Funds Rate, from the Benchmark FAVAR(4,2)).

Figure: Time-varying standard deviations of errors on (a) 1st factor, (b) 2nd factor, (c) 3rd factor, (d) 4th factor and (e) Federal Funds Rate, from the Benchmark FAVAR(4,2)).

Conclusions

One of the main contributions of this paper is the support for the fact that by using large data-sets we are able to better understand the nature of correlations and comovements between macroeconomic variables by using factors. Another contribution is to successfully extend Dynamic Factor Models in order to account for time-varying parameters. Sensible impulse responses for the 157 US variables.

Main references


