The Role of Term Structure in the U.S. Monetary Policy Rule: Revised and Real-time Data.

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Outline of the talk

1. Related literature, Motivation and Answers.


5. Evidence for a Model with Real-time Data.

6. Main Findings.
Term Structure and Monetary policy
What is the role of Term Structure?

Macro Variables and Financial Variables. How are they related? The case of NKM and Term Structure.

Hordhal, et.al (2006), among others. NKM is solved independently from term Structure. Feedback is not possible. (Causality?). (Rudebusch and Wu (2008), Ang, Dong, Piazzesi (2005), Ang and Piazzesi (2003), and Diebold et.al (2003).)

We estimate a NKM augmented with Term Structure.

Macroeconomic structure and the possibility of dynamic Feedback between NKM and term Structure.
Term Structure and Monetary policy
What is the role of Term Structure?

Omitted variables or the FED’s desire for stability. Policy Inertia and Persistency of Shocks.

Lagged interest rate and persistent policy shocks are important for understanding estimated policy rules. (English, et. al, 2003; and Gerlach-Kristen, 2004; Clarida, Gali and Gertler (2000)).

The FED is worried about stability. (Goodfriend, 1991).

Relevant variables are omitted. (Rudebusch, 2002).

We allow for both, policy inertia and persistent policy shocks following a structural approach.

We include Term structure (relevant omitted variables).
Term Structure and Monetary policy
What is the role of Term Structure?

Availability and Quality of Information.

Financial variables are available at a very high frequency and with a high quality. Revised data for output and inflation are available with a significant lag (if so).

- Aruoba (2008). Revision processes are not well-behaved.

We include a real-time dataset for the FED, while agents decisions generate revised data. We also include the revision processes for output and inflation.
Derivation of the Model.

NKM+Term Structure+Revision

Processes

Agents and firms optimization plans. Agents can invest in bonds with maturity \( j=1,\ldots,n \).

\[
x_t = E_t x_{t+j} - \tau(i_t^{(j)} - \frac{1}{j} \sum_{k=1}^{j} E_t \pi_{t+k}) - \phi(1 - \rho \chi_j) \chi_t + \xi_t
\]

\[
\pi_t = \beta E_t \pi_{t+1} + kx_t + z_t
\]

\[
i_t = \rho i_{t-1} + (1 - \rho) [\psi_1 \pi^r_{t} + \psi_2 x^r_{t} + \psi_3 (i_t^{(4)} - i_t)] + \nu_t
\]

\[
x_t \equiv x^r_t + r^x_t
\]

\[
\pi_t \equiv \pi^r_t + r^\pi_t
\]

\[
r^x_t \equiv b_{xx} x_t^r + b_{x\pi} \pi_t^r + b_{xsp} (i_t^{(4)} - i_t) + \varepsilon^r_{xt}
\]

\[
r^\pi_t \equiv b_{\pi x} x_t^r + b_{\pi\pi} \pi_t^r + b_{\pi sp} (i_t^{(4)} - i_t) + \varepsilon^r_{\pi t}
\]
Estimation Strategy
The Indirect Inference Principle

- We follow the IIP proposed by Smith (1993) that considers a VAR representation as an auxiliary model.
- We apply the Simulated Moments Estimator (SME, Lee and Ingram, 1991 and Duffie and Singleton, 1993) to obtain the structural and policy parameters.
  - We minimize the distance between the VAR parameters for actual data and average simulated data.
Data and preliminary Analysis

We use quarterly U.S. data for the post-volcker period from 1983 to 2008: GDP, GDP Deflator, 3 and 12 months treasury constant maturity rate, real-time data for GDP and GDP Deflator.

When only revised data are used....
- High Inertia and highly persistent policy shocks.

- Term Spread plays a minor role in estimated policy rule.
Data and preliminary Analysis

We use quarterly U.S. data for the post-volcker period from 1983 to 2008: GDP, GDP Deflator, 3 and 12 months treasury constant maturity rate, real-time data for GDP and GDP Deflator.

- When only revised data are used, we obtain a high Inertia and highly persistent policy shocks. Term Spread plays a minor role in estimated policy rule.
- When only real time data are used...
<table>
<thead>
<tr>
<th>Policy parameter</th>
<th>Estimate</th>
<th>Shock parameter</th>
<th>Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\rho$</td>
<td>0.4023</td>
<td>$\rho_x$</td>
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<tr>
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<td>-0.0846</td>
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<td>$\psi_3$</td>
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<tr>
<td>$\rho_v$</td>
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<td>$\sigma_v$</td>
<td>7.60E-04</td>
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<tr>
<td></td>
<td>-0.0267</td>
<td></td>
<td>-4.00E-04</td>
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</tbody>
</table>

- Policy rule shows less inertia.
- Policy shocks are more persistent.
- Term spread plays no role when only real-time data are used.
Data and preliminary Analysis

We use quarterly U.S. data for the post-volcker period from 1983 to 2008: GDP, GDP Deflator, 3 and 12 months treasury constant maturity rate, real-time data for GDP and GDP Deflator.

- When only revised data are used, we obtain a high Inertia and highly persistent policy shocks. Term Spread plays a minor role in estimated policy rule.
- When only real time data are used, policy rule shows less inertia, Policy shocks are more persistent, and Term spread plays no role.

What could be wrong with these specifications?

Evidence that revision processes are not well behaved.
### Evidence for a real-time dataset

<table>
<thead>
<tr>
<th>Policy parameter</th>
<th>Estimate</th>
<th>Shock parameter</th>
<th>Estimate</th>
<th>Revision parameter</th>
<th>Estimate</th>
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<tbody>
<tr>
<td>( \rho )</td>
<td>0.9313</td>
<td>( \rho_x )</td>
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<td>( b_{xx} )</td>
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<tr>
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<td>( \sigma_x' )</td>
<td>0.0072</td>
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<tr>
<td>( \sigma_x'' )</td>
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<td>( \sigma_x'' )</td>
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<td>-1.40E-04</td>
</tr>
</tbody>
</table>

- Policy rule still shows inertia but is less persistent.
- Term Spread plays a significant role in the monetary policy rule.
- Some revision process parameters are significant. (inflation over output revision and spread over both revisions)
Main Findings

- In a model with revised data, term spread information plays a minor role.

- Policy inertia and persistency of policy shocks show significant differences in models with only real-time or revised information.

- Term structure plays a role in a model where agents' decisions generate revised information but the FED only has access to real-time data.

- Revision processes for output and inflation are not well-behaved, and the informational content of term spread becomes relevant in this model.
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