Discussion of:

“Monetary Policy Implementation in an Interbank Network: Effects on Systemic Risk”
by M. Bluhm, E. Faia and J. P. Krahnen

ECB Workshop on Non-Standard Monetary Policy Measures

Albert Queralto

Federal Reserve Board

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The views expressed in this presentation are my own and do not necessarily reflect those of the Board of Governors of the Federal Reserve System
This Paper

- **Question:** what are the effects of monetary policy on systemic risk?

- The paper answers this question within a network model of the interbank market.
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Discussion Outline:

1. Summary
2. Comments / Questions
3. An alternative model of systemic risk
Summary
Model Overview: Key Elements

- **N banks** maximize (static) profits \( s.t. \) capital and liquidity requirements
  - Invest in non-liquid asset
  - Heterogeneous in returns to non-liquid assets
  - Trade funds against each other in interbank market

- \( t^\text{attement} \) process first in interbank market, then in market for non-liquid asset
- Network determined by closest matching partner: bank who wants to borrow is matched with bank who wants to lend the closest amount

- Central Bank modeled as the \( N + 1 \)th bank trading funds in the interbank market
- Borrows/lends funds until target interest rate is reached
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Systemic Risk
## Systemic Risk

**Figure:** Bank $i$’s balance sheet

<table>
<thead>
<tr>
<th>ASSETS</th>
<th>LIABILITIES</th>
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<tbody>
<tr>
<td>$c^i$</td>
<td>$d^i$</td>
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<td>Cash</td>
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<tr>
<td>$p \times e^i$</td>
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Systemic Risk (1): Interconnectedness

Figure: Bank $i$’s balance sheet

$$l^i = \sum_{j \neq i} l^{i,j}$$

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| $p \times e^i$  
  Non-liquid assets     | $q^i$  
  Equity               |
Systemic Risk (1): Interconnectedness

Figure: Bank $i$’s balance sheet

\[ l_i = \sum_{j \neq i} l_{i,j} \]

If bank $j$ defaults, equity loss for bank $i$
Systemic Risk (2): Fire sales

**Figure:** Bank $i$’s balance sheet

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Interbank borrowing

Interbank lending

Deposits

Equity
Systemic Risk (2): Fire sales

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other banks sell non-liquid assets $\rightarrow p \downarrow$
Systemic Risk (2): Fire sales

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equity loss for bank $i$
Main Result: Monetary policy increases systemic risk

- When capital requirements are low, interbank interest rates are high
- Given a central bank target rate, central bank lends in the interbank market in the low-capital-requirement region
  → higher investment and leverage in the low-capital-requirement region → higher systemic risk
Comments / Questions
Paper studies a fixed central bank target $r^{\text{rf}}$ for a range of capital and liquidity requirements.
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Another interesting question is how the results change when considering a range for $r^{rf}$.

Are there cases in which the intervention reduces systemic risk? Under what conditions does this happen?
Comments (1): Central Bank Intervention & Dynamics

- Paper studies a fixed central bank target $r^{rf}$ for a range of capital and liquidity requirements.

- Another interesting question is how the results change when considering a range for $r^{rf}$.
  - Are there cases in which the intervention reduces systemic risk? Under what conditions does this happen?

- Further step: what are the \textit{dynamic} effects of a movement in the central bank’s target $r^{rf}$?
Comments (2): Endogeneity of $p$ to Monetary Policy

- In the model, the price of the non-liquid asset $p$ is determined by market clearing.
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- In reality, $p$ potentially affected by prices of assets like housing or stock
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In reality, $p$ potentially affected by prices of assets like housing or stock.

These prices likely *rise* in response to monetary easing:
- stronger balance sheets, everything else equal
- benign effect on systemic risk
Effects of monetary shock in an estimated DSGE model
Estimated Effects of Monetary Policy on Real House Prices
(Iacoviello, 2005)

Figure: Effects of monetary shock in VAR with Choleski ordering $R, \pi, q, Y$ ($q \equiv$ real house price)
Estimated Effects of Monetary Policy on Stock Prices
(Rigobon and Sack, 2004)

In all the results that follow, we report two heteroskedasticity-based estimates—one implemented using the IV approach ($\hat{\alpha}_{het}$) and the other implemented using the GMM approach ($\hat{\alpha}_{gmm}$). For the sake of comparison, we also report the estimates obtained under the event-study approach ($\hat{\alpha}_{es}$).

4.1. Stock market indexes

As can be seen in Table 2, the four stock indexes considered have a significant negative reaction to monetary policy. The estimate for the S&P 500 is $-6.81$, implying that an unanticipated 25-basis point increase in the short-term interest rate results in a 1.7% decline in the S&P index. A similar response is found for the broader market index, the Wilshire 5000. The Nasdaq index shows a considerably larger reaction, perhaps because the cash flows on those securities are farther in the future (making the share price more sensitive to the discount factor), while the DJIA has the smallest reaction, maybe because it includes companies that have current rather than back-loaded cash streams.

The estimates $\hat{\alpha}_{gmm}$ are very similar in magnitude to the estimates $\hat{\alpha}_{het}$: Indeed, the test statistic $d_{oir}$ cannot reject that they are equal, implying that the over-identifying restrictions of the model are easily accepted. The standard errors of the GMM-based estimates are slightly smaller than those for the IV-based estimates, indicating that there may be a marginal improvement in efficiency from incorporating the additional moment conditions into the estimation.

The estimated responses of the stock indexes under the heteroskedasticity-based method are almost always larger (in absolute value) than the corresponding estimates under the event-study approach. This difference likely reflects the bias in the event-study estimates. Shocks to the stock market generally cause short-term interest rates to respond in the same direction (Rigobon and Sack, 2003), while many

Table 2
The response of stock prices to monetary policy (1 percent increase in SR interest rate)

<table>
<thead>
<tr>
<th></th>
<th>Estimator: $\hat{\alpha}_{het}^i$</th>
<th>Estimator: $\hat{\alpha}_{het}^{gmm}$</th>
<th>Estimator: $\hat{\alpha}_{es}$</th>
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<tbody>
<tr>
<td></td>
<td>Point</td>
<td>Std dev</td>
<td>Point</td>
</tr>
<tr>
<td>SP500</td>
<td>$-6.81$</td>
<td>$2.83$</td>
<td>$-7.19$</td>
</tr>
<tr>
<td>WIL5000</td>
<td>$-6.50$</td>
<td>$2.77$</td>
<td>$-6.91$</td>
</tr>
<tr>
<td>NASDAQ</td>
<td>$-9.42$</td>
<td>$5.01$</td>
<td>$-10.06$</td>
</tr>
<tr>
<td>DJIA</td>
<td>$-4.85$</td>
<td>$2.82$</td>
<td>$-5.39$</td>
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</tbody>
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Test of O.I. rest.: $d_{oir}$ 0.997
Test of E.S. rest.: $d_{es,iv}$ 0.721
Test of E.S. rest.: $d_{es,gmm}$ 0.455
An Alternative Model of Systemic Risk
Akinci and Queralto (2014)

- A macroeconomic model with banks, as in Gertler and Karadi (2009)
  - Banks’ incentive constraint occasionally binding → captures systemic risk
  - Banks can issue equity as well as short-term debt → captures banks’ precautionary behavior
- Banking sector integrated into standard small open economy
Banks: Period-\( t \) Timeline

\[ n_{t+1} = R_{K,t+1} Q_t s_t - R_t d_t + e_t \]

- \( n_{t+1} \): Ending net worth in period \( t+1 \)
- \( R_{K,t+1} \): Returns on period \( t+1 \)
- \( Q_t s_t \): Quantum of assets
- \( d_t \): Dividend paid
- \( e_t \): Random variable

\[ \begin{align*}
  &\text{beginning-of-period net worth } n_t \\
  &Q_t s_t \leq n_t + d_t \\
  &\text{divert} \\
  &\theta Q_t s_t \text{ (\& exit)} \\
  &honor \\
  &\text{exit shock realized} \\
  &\text{survive (prob. } \sigma\text{)} \\
  &\text{Pay cost } C(e_t, Q_t s_t) \\
  &\text{Exit (prob. } 1 - \sigma\text{)} \\
  &\text{Pay household } R_{K,t+1} Q_t s_t - R_t d_t \\
  &n_{t+1}
\end{align*} \]
Banks: Balance Sheet and Net Worth

- Balance Sheet

\[ Q_t s_t \leq n_t + d_t \]

where

\[ d_t = b_t + b^*_t \]

- Evolution of Net worth

- Surviving Banks: \( n_t = R_{K,t} Q_{t-1} s_{t-1} - R_{t-1} d_{t-1} + e_{t-1} \)

- Exiting Banks: \( n_t = R_{K,t} Q_{t-1} s_{t-1} - R_{t-1} d_{t-1} \)
Banks: Agency Problem & Equity Issuance

- Banks’ incentive constraint: \( V_t(n_t) \geq \theta Q_t s_t \)
  - When the constraint binds, systemic financial crisis
  - Can compute ex-ante probability of crisis
Banks: Agency Problem & Equity Issuance

- Banks’ incentive constraint: \( V_t(n_t) \geq \theta Q_t s_t \)
  - When the constraint binds, systemic financial crisis
  - Can compute ex-ante probability of crisis

- Banks’ optimal equity issuance:
  \[
  C_1(e_t, Q_t s_t) = \mathbb{E}_t \left\{ \Lambda_{t,t+1} \left[ V'_{t+1}(n_{t+1}) - 1 \right] \right\}
  
  \text{Marginal Cost} \quad \text{Marginal Benefit}
  
  \]
Figure: Decrease in Country Interest Rate (x ≡ e^{Q_S})
Figure: Average Systemic Financial Crisis
**Government Policy**

**Figure:** Subsidy of $\tau^s$ per unit of equity issued (financed by tax on bank assets)
Comparing Approaches

Advantages of the authors’ approach:

- Very empirically accurate account of the interbank market
- Captures systemic risk via (endogenous) interconnectedness of the financial system, a salient real-world phenomenon
- Natural framework to analyze liquidity provision by the Central Bank

Advantages of our approach:

- Explicit agency friction leading to financial crises and systemic risk
- Captures banks’ precautionary behavior
- More easily integrated into a macro model
Final Comments

- Great paper!
- It represents a micro approach to systemic risk, based on (endogenous) networks in interbank markets
- The model I outlined represents a macro approach to systemic risk, with a stylized banking sector embedded into a NDSGE
- An interesting research agenda is to combine the two approaches