A Non-Standard Monetary Policy Shock: The ECB’s 3-Year LTROs and the Shift in Credit Supply

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European Central Bank

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The Issue: Identifying non-standard measures

- An extensive literature has discussed the various policy alternatives, when the policy rate hit the zero lower bound.
- The identification of non-standard monetary policy shocks is still an uncharted territory.
- A number of empirical papers have focused on the impact of non-standard measures on asset prices through portfolio balance effects, particularly successful when they are announced.
- However, the first-order objective of the non-standard measures is to support the financial intermediation process to avoid the mistake of the early 1930s and the success of a policy ought to be measured in terms of macroeconomic implications.
The Issue: Identifying non standard measures

Bernake et al. (2004) and Cecioni et al. (2011) provide and extensive survey of the theoretical and empirical literature.

VAR methods for the euro area:

- Lenza, Pill and Reichlin (2010) and Giannone, Lenza, Pill and Reichlin (2012) study the impact of non standard measures by using counterfactual simulations.

- Peersman (2011) and Gambacorta, Hofmann and Peersman (2012) use SVAR with sign restrictions based on bank loans and central bank balance sheets.
3-years LTROs and bank lending standards

We focus on the impact of the 3-year long-term refining operations (LTROs), which amounts to 10.8% of euro area GDP in 2011:

- On 21 Dec. 2011, the ECB allotted EUR 489 billion to 500 banks
- On 29 Feb. 2012, the ECB allotted EUR 530 billion to 800 banks
### 3-years LTROs and bank lending standards

<table>
<thead>
<tr>
<th>Activity</th>
<th>Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-yr LTROs announcement</td>
<td>8 Dec. 2011</td>
</tr>
<tr>
<td>First 3-yr LTROs allotment</td>
<td>21 Dec. 2011</td>
</tr>
<tr>
<td>Ad-hoc BLS on 3-yr LTROs</td>
<td>8 - 14 Feb. 2012</td>
</tr>
<tr>
<td>Second 3-yr LTROs allotment</td>
<td>29 Feb. 2012</td>
</tr>
</tbody>
</table>
Panel VAR: Characteristics

1. Real GDP growth
2. Deflator inflation
3. BLS demand factor
4. BLS supply factor
5. Cost of lending minus 3-month OIS
6. 3-month OIS
7. Loan growth to NFCs

Panel based on 8 or 11 countries
Sample period: 2003Q1 – 2011Q4
The model is similar in spirit to Ciccarelli et al. 2010
Method

**Nickel (1981) bias:**

The presence of fixed effects renders least square estimation inconsistent. \((y\text{ and } y(-1)\text{ are both function of the fixed effects})\)

**Solution of the problem:**


Panel VAR is estimated in first difference using as instrument lagged levels of the dependent variable.
Identification of the credit supply shock

Two alternative methods:

- Recursive (Sims, 1980): GDP, INF, BLS-D, BLS-S, r-i, i, L
- Sign restriction (Uhlig, 2005; Rubio-Ramirez et. Al. 2010).

<table>
<thead>
<tr>
<th></th>
<th>Credit supply</th>
<th>Monetary policy</th>
<th>Aggregate Demand</th>
</tr>
</thead>
<tbody>
<tr>
<td>GDP Growth</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Inflation</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Credit demand factor</td>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Credit supply factor</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Cost of lending</td>
<td>+</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Interest rate</td>
<td>-</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>Loan growth</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Impact of credit supply shock

Panel with 8 countries - recursive

Panel with 11 countries - recursive

Panel with 11 countries – sign restrictions
Historical decomposition of the Credit Supply shocks on the macroeconomy: Recursive method

Real GDP growth (yoy, %)

GDP deflator inflation (yoy, %)

Loan growth to NFCs (yoy, %)

Lending spread to NFCs (yearly average, pp)
Historical decomposition of the Credit Supply shocks on the macroeconomy: Sign restriction method

Real GDP growth (yoy, %)

GDP deflator inflation (yoy, %)

Loan growth to NFCs (yoy, %)

Lending spread to NFCs (yearly average, pp)
April 2012 BLS provides BLS supply and demand factor for 2012Q1 and expected for 2012Q2. Kalman filter is used to forecast the other variables of the system needed to extract the underlying credit supply shock.

Ad hoc February 2012 BLS provides the credit supply shock for 2012Q1 and 2012Q2.
Credit supply shock and the Apr. 12 BLS: Recursive method

Panel with 8 countries

Panel with 11 countries

Sharp unexpected improvements in credit standards in 2012Q1
Credit supply shock and the Apr. 12 BLS: Sign restrictions method

Sharp unexpected improvements in credit standards in 2012Q1
Impact of the 3-year LTROs using the BLS – recursive method

Real GDP

GDP deflator

Loan to NFCs

Lending spread to NFCs
Impact of the 3-year LTROs using the BLS – sign restrictions method

Real GDP

GDP deflator

Loan to NFCs

Lending spread to NFCs
Impact of the 3-year LTROs using the ad-hoc BLS – recursive method

**Real GDP**

**GDP deflator**

**Loan to NFCs**

**Lending spread to NFCs**
On the exogeneity of the credit supply shock

Using lending rate minus 3m OIS

Using corporate credit spreads

Using financial innovations

Credit spread shocks ordered third in the panel VAR excluding BLS demand and supply factors (x-axis) versus credit supply shocks ordered seventh in the panel VAR including BLS demand and supply factors (y-axis)

Credit supply shocks ordered fourth in the panel VAR including BLS demand and supply factors (x-axis) versus credit supply shocks ordered seventh in the panel VAR including BLS demand and supply factors (y-axis)
On the exogeneity of the credit supply shock

Credit supply shocks identified using recursive method

\[ \text{Credit supply shock}(i,t) = a \cdot x(i,t) + b \cdot x(i,t-1) + c \cdot x(i,t-2) + d(i) + e(i,t) \]

<table>
<thead>
<tr>
<th></th>
<th>Coef (t)</th>
<th>s.e. (t)</th>
<th>Coef (t-1)</th>
<th>s.e. (t-1)</th>
<th>Coef (t-2)</th>
<th>s.e. (t-2)</th>
<th>R^2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lending rate spreads (i,t)</td>
<td>13.292***</td>
<td>(2.543)</td>
<td>-14.754***</td>
<td>(3.696)</td>
<td>2.472</td>
<td>(2.759)</td>
<td>0.074</td>
</tr>
<tr>
<td>Corporate spreads (i,t)</td>
<td>5.47***</td>
<td>(1.577)</td>
<td>-5.975**</td>
<td>(2.404)</td>
<td>2.254</td>
<td>(1.674)</td>
<td>0.040</td>
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<tr>
<td>Financial innovation (i,t)</td>
<td>5.402***</td>
<td>(1.473)</td>
<td>-1.509</td>
<td>(2.069)</td>
<td>-2.084</td>
<td>(1.734)</td>
<td>0.080</td>
</tr>
<tr>
<td>VIX (t)</td>
<td>0.594***</td>
<td>(0.178)</td>
<td>0.266</td>
<td>(0.202)</td>
<td>-0.504***</td>
<td>(0.192)</td>
<td>0.060</td>
</tr>
<tr>
<td>3-month EURIBOR-OIS (t)</td>
<td>13.38***</td>
<td>(2.71)</td>
<td>-8.346**</td>
<td>(3.465)</td>
<td>-0.786</td>
<td>(2.804)</td>
<td>0.068</td>
</tr>
<tr>
<td>Stock market returns (i,t)</td>
<td>-0.566***</td>
<td>(0.11)</td>
<td>0.201</td>
<td>(0.127)</td>
<td>-0.033</td>
<td>(0.114)</td>
<td>0.076</td>
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<tr>
<td>Long-short lending rates (i,t)</td>
<td>-2.907</td>
<td>(3.007)</td>
<td>-0.292</td>
<td>(3.546)</td>
<td>2.923</td>
<td>(3.095)</td>
<td>0.007</td>
</tr>
<tr>
<td>Yield curve (i,t)</td>
<td>4.072***</td>
<td>(1.57)</td>
<td>-8.525**</td>
<td>(3.333)</td>
<td>3.958</td>
<td>(2.462)</td>
<td>0.023</td>
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<tr>
<td>Lending rate spread shocks (5 var.) (i,t)</td>
<td>15.58***</td>
<td>(2.792)</td>
<td>0.983</td>
<td>(2.766)</td>
<td>1.495</td>
<td>(3.059)</td>
<td>0.088</td>
</tr>
<tr>
<td>Lending rate spread shocks (7 var.) (i,t)</td>
<td>16.478***</td>
<td>(2.818)</td>
<td>1.451</td>
<td>(2.811)</td>
<td>2.366</td>
<td>(3.068)</td>
<td>0.094</td>
</tr>
<tr>
<td>Corporate credit shocks (5 variables) (i,t)</td>
<td>6.853***</td>
<td>(1.784)</td>
<td>0.804</td>
<td>(1.895)</td>
<td>1.369</td>
<td>(1.961)</td>
<td>0.048</td>
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<tr>
<td>Corporate credit shocks (7 variables) (i,t)</td>
<td>6.599***</td>
<td>(1.83)</td>
<td>-0.049</td>
<td>(1.94)</td>
<td>1.41</td>
<td>(1.989)</td>
<td>0.042</td>
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<tr>
<td>Financial shocks (5 variables) (i,t)</td>
<td>5.742***</td>
<td>(1.523)</td>
<td>3.677**</td>
<td>(1.613)</td>
<td>-0.588</td>
<td>(1.74)</td>
<td>0.087</td>
</tr>
<tr>
<td>Financial shocks (7 variables) (i,t)</td>
<td>5.922***</td>
<td>(1.533)</td>
<td>3.662**</td>
<td>(1.616)</td>
<td>-0.899</td>
<td>(1.751)</td>
<td>0.091</td>
</tr>
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Credit supply shocks identified using sign restriction method

\[ \text{Credit supply shock}(i,t) = a \times x(i,t) + b \times x(i,t-1) + c \times x(i,t-2) + d(i) + e(i,t) \]

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<tr>
<td>Lending rate spreads (i,t)</td>
<td>1.222***</td>
<td>(0.06)</td>
<td>-1.407***</td>
<td>(0.087)</td>
<td>0.37***</td>
<td>(0.065)</td>
<td>0.548</td>
</tr>
<tr>
<td>Corporate spreads (i,t)</td>
<td>0.444***</td>
<td>(0.046)</td>
<td>-0.58***</td>
<td>(0.07)</td>
<td>0.277***</td>
<td>(0.048)</td>
<td>0.238</td>
</tr>
<tr>
<td>Financial bond premium (i,t)</td>
<td>0.326***</td>
<td>(0.048)</td>
<td>-0.237***</td>
<td>(0.067)</td>
<td>0.008</td>
<td>(0.056)</td>
<td>0.160</td>
</tr>
<tr>
<td>VIX (t)</td>
<td>0.029***</td>
<td>(0.006)</td>
<td>0.012*</td>
<td>(0.007)</td>
<td>-0.027***</td>
<td>(0.006)</td>
<td>0.122</td>
</tr>
<tr>
<td>3-month EURIBOR-OIS (t)</td>
<td>1.136***</td>
<td>(0.072)</td>
<td>-0.993***</td>
<td>(0.092)</td>
<td>0.115</td>
<td>(0.074)</td>
<td>0.420</td>
</tr>
<tr>
<td>Stock market returns (i,t)</td>
<td>-0.034***</td>
<td>(0.003)</td>
<td>0.009**</td>
<td>(0.004)</td>
<td>0.001</td>
<td>(0.003)</td>
<td>0.261</td>
</tr>
<tr>
<td>Long-short lending rates (i,t)</td>
<td>-0.142</td>
<td>(0.1)</td>
<td>0.084</td>
<td>(0.118)</td>
<td>0.176*</td>
<td>(0.103)</td>
<td>0.025</td>
</tr>
<tr>
<td>Yield curve (i,t)</td>
<td>0.405***</td>
<td>(0.047)</td>
<td>-0.75***</td>
<td>(0.1)</td>
<td>0.402***</td>
<td>(0.074)</td>
<td>0.219</td>
</tr>
</tbody>
</table>
Lower interbank credit risk after the 3-year LTROs

Lower interbank credit risk despite negative news in 2012Q2:

1. Bank solvency in Spain
2. Negative unexpected macroeconomic releases
3. Higher political risk (political elections in Greece, referendum in Ireland on the fiscal compact, discussion on banking union, etc.)
Conclusions

• We can identify the impact of the 3-yr LTROs using the BLS.

• The impact of the 3-years LTROs is treated as a shift in credit supply.

• The 3-year LTROs are found to be expansionary associated with an increase in real GDP, inflation, loan volumes and a compression of lending rate spreads.

• The identified credit supply shock contains additional information with respect to other financial variables.
Impact of monetary policy shock

Panel with 8 countries

Panel with 11 countries

GDP

DEFLATOR
Historical decomposition of CS shock on the macro: Recursive

Real GDP growth (yoy, %)

GDP deflator inflation (yoy, %)

Loan growth to NFCs (yoy, %)

Lending spread to NFCs (yearly average, pp)
Impact of the 3-year LTROs using BLS and VIX – recursive method

Real GDP

GDP deflator

Loan to NFCs

Lending spread to NFCs
Rubio-Ramirez, Waggoner and Zha algorithm

- Let \( U \) denote a draw from the uniform distribution.
- Draw a set of unrestricted parameters \( U \) from the posterior distribution (inverse Wishard for the covariance matrix \( \Sigma = AA' \), where \( A \) is the Choleski decomposition of \( \Sigma \), and Normal for the reduced form parameters \( B \)).
- For each draw of \( U \), compute \( \Sigma \) and \( B \).
- Compute the eigenvectors of \( \Sigma \) normalized.
- Draw \( N \) independent standard normal vectors of length \( N \) from a uniform distribution.
- Generate impulse responses.
- If these impulse responses satisfy the sign restrictions, keep the draw; otherwise, repeat all the steps.

Prior for the reduced-form VAR: \( \Sigma \) and \( B \) estimated using the Arellano-Bond GMM estimator.