Are bank lending shocks important for economic fluctuations?

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Motivation

- The worldwide financial crisis has directed considerable attention towards financial intermediation and its influence on real economic activity.
- In the system of financial intermediation, banks play for many countries a vital role.
- The bank lending channel of monetary policy clarifies the particular role of banks' balance sheets in propagating and amplifying monetary policy shocks (Bernanke and Gertler 1995).
- Recently, not only the importance of the bank lending channel for monetary policy is discussed; but also whether the banking sector itself creates shocks that are important for fluctuations in economic activity.

The main focus of the paper

- Research question: *Are bank lending shocks important for economic fluctuations?*
- The empirical analysis is applied to Norway and UK using quarterly data for the past 21 years.
- The sample therefore includes the Norwegian banking crisis (1988-1993) and the resent period of banking failures in the UK.
- Empirical methodology: Structural vector autoregressive (SVAR) model.

The MIX variable

- We want to investigate the significance of bank lending shocks on economic activity.
- A variable called mix is introduced (Kashyap and Stein and Wilcox 1993) in our VAR model with the intention of capturing bank lending shocks.
- $mix \equiv \frac{\text{Total bank lending to households and non-financial firms}}{\text{Total credit to households and non-financial firms}}$

Bank lending shocks

- How do we interpret bank lending shocks?
  Bank lending shocks can be thought of as changes in credit standards that are not caused by shifts in macro variables.
- What will we expect such shocks to comprise?
  We expect that alterations in banks' risk assessment, which are not in line with changes in macro fundamentals, will be identified as structural shocks. Mainly capturing:
  - Financial innovations.
  - Extensive changes in regulation.
  - Banks' misjudgment of the economic outlook.

Empirical analysis

- Estimated on quarterly data for Norway and UK from 1988Q2/Q3 to 2009Q1.
- Structural vector auto regressive (SVAR) model.
- Exogenous variable:
  - Foreign short term (trade weighted) interest rate.
- Endogenous variables:
  - Output gap, (y).
  - Inflation, (π).
  - Bank supply divided by total credit supply, (mix).
  - Real property prices (p).
  - Real exchange rate, (e).
  - Domestic short term interest rate, (i).

The VAR model

Let $X_t = [\pi, ygap, mix, e, ph, i]_t$ be a (6x1) vector of covariance stationary processes.

- The VAR(p) representation
  $B(L)X_t = e_t,\ e_t \sim N(0, \Sigma_e)$.
- The MA(∞) representation
  $X_t = C(L)e_t$, where $B(L)^{-1} = C(L)$.

$$C(L)Z_t = e_t, \text{ with } \Sigma_e = E(e_t e_t') \tag{1}$$

Assume that a linear relationship exists between e_t and the structural shocks ε_t, given as $e_t = A\varepsilon_t$. The structural shocks $\varepsilon_t \sim N(0, \Sigma_\epsilon = I_m)$.

- The MA(∞) representation in terms of the structural shocks
  $X_t = D(L)\varepsilon_t$, where $D(L) = C(L)A$.

We know that $AA' = \Sigma_e$. However, since there are many different decompositions satisfying this equation, we do not have an unique MA representation in terms of the structural shocks.

However, for two different decompositions, it must be the case that $A = \tilde{A}Q$, with Q being a orthogonal matrix with the properties:

1. $< q_i, q_j >= 0$ for $i, j = 1, 2, ..., 6$ and $i \neq j$
2. $||q_i||$=1

- Partition the A matrix into $A = [A' A'']$
- Let A'' be a (6x2) matrix containing the immediate impact from the structural shocks we would like to identify.
- Finally, restriction the contemporaneous impulse response matrix A'' with the following zero and sign restrictions:

$$A'' : \begin{bmatrix} \overset{\mathbf{a}^{BL}}{\downarrow}, & \overset{\mathbf{a}^{MP}}{\downarrow} \\ 0 & 0 \\ - & - \\ -1 & - \\ + & - \\ - & - \\ - & 1 \end{bmatrix} \begin{bmatrix} \leftarrow \pi \\ \leftarrow ygap \\ \leftarrow mix \\ \leftarrow e \\ \leftarrow ph \\ \leftarrow i \end{bmatrix}$$

Technically, we can describe our numerical process as follows.

- We start by fixing $\tilde{A}$, by selecting $\tilde{A} = A^{chol}$ (i.e. the lower triangular matrix of the Cholesky decomposition).
- The two vector of our A'' matrix can now be written as

$$\mathbf{a}^{BL} = A^{chol}\mathbf{q}^{BL} \text{ and } \mathbf{a}^{MP} = A^{chol}\mathbf{q}^{MP}$$

- To find candidate draws for the A'' matrix, draws for $\mathbf{q}^{BL}$ and $\mathbf{q}^{MP}$ must be made. We do this using the following two step procedure:

- Step 1: The following vector of numerical draws are made:

  $\mathbf{v}^{BL} \sim i.i.d.N(0, diag(\text{œ}^{BL}))$ and $\mathbf{v}^{MP} \sim i.i.d.N(0, diag(\text{œ}^{MP}))$

  Where $\sigma^{BL} \equiv (0, 1, 1, 1, ..., 1)$ and $\sigma^{PS} \equiv (0, 1, 1, ..., 1)$.

- Step 2: the vector of numerical draws are used as input to determine $\mathbf{q}^{BL}$ and $\mathbf{q}^{MP}$.

$$\mathbf{u}^{BL} = \mathbf{v}^{BL} \qquad \mathbf{q}^{BL} = \frac{\mathbf{u}^{BL}}{||\mathbf{u}^{BL}||}$$

$$\mathbf{u}^{MP} = \mathbf{v}^{MP} - proj_{\mathbf{u}^{BL}}(\mathbf{v}^{MP}) \qquad \mathbf{q}^{MP} = \frac{\mathbf{u}^{MP}}{||\mathbf{u}^{MP}||}$$

- By repeating the two steps above $n2$ times determines all the candidate draws for $\mathbf{a}^{BL}$ and $\mathbf{a}^{MP}$ needed to implement the second part of our numerical procedure.

Impulse responses

Figure: Responses to a contractionary monetary policy shock. Norway left hand column. UK right hand column.

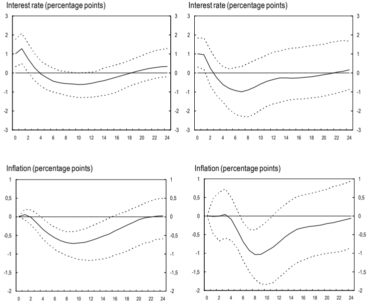


Figure: Responses to a contractionary monetary policy shock. Norway left hand column. UK right hand column.

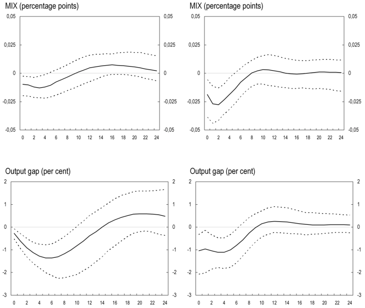


Figure: Responses to a contractionary monetary policy shock. Norway left hand column. UK right hand column.

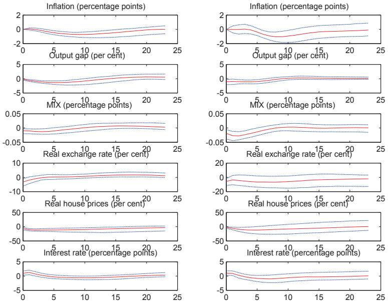


Figure: Responses to a negative bank lending shock. Norway left hand column. UK right hand column.

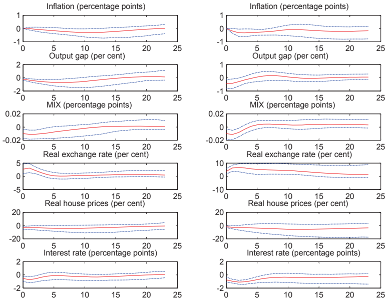


Figure: Responses to a negative bank lending shock. Norway left hand column. UK right hand column.

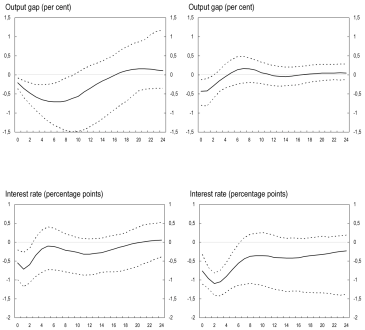
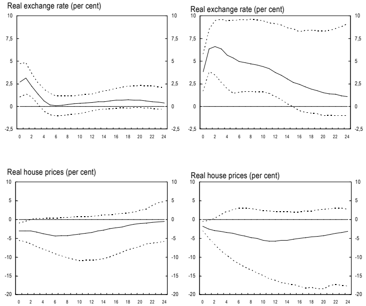
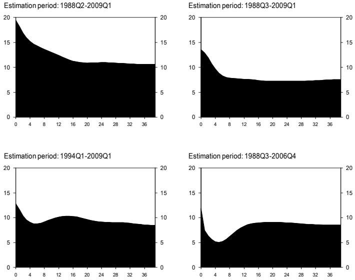


Figure: Responses to a negative bank lending shock. Norway left hand column. UK right hand column.



Variance decomposition

Figure: Variance decomposition: contribution from bank lending shocks to output gap variance. Per cent. Norway left hand column. UK right hand column.



Conclusions

- We have analyzed the importance of bank lending shocks on real activity in Norway and the UK.
- The significance of bank lending shocks seems evident as they explain a substantial share of output gap variability (15-20 per cent in Norway and 10-15 per cent in the UK).
- This results are clearly non-negligible also when omitting periods of systemic banking distress from the sample.