Credit Shocks and Macroeconomic Fluctuations in Emerging and Low Income Economies

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\textsuperscript{2}University of Namur

\textsuperscript{3}University of Missouri and Federal Reserve Bank of St Louis
Introduction

- Consumers are risk averse and thus prefer a smooth consumption path
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The welfare cost of fluctuation are relatively large in developing countries (Pallage and Robe, 2003 and Houssa, 2013).
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- The welfare cost of fluctuation are relatively large in developing countries (Pallage and Robe, 2003 and Houssa, 2013).

- Such that successful stabilization policies are more than need in developing countries.
This paper

- Role of *credit shocks* in macroeconomic fluctuations in EMEs & LICs

Supply shocks:
- Specific credit market shocks
- Changes in the risk perception about potential borrowers
- Changes in bank funding: bank runs
- Financial liberalization
- Changes in bank capital available for loans: regulatory

Credit demand:
- Endogenous response of credit to macroeconomic shocks
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- Study their importance in specific times: e.g. in 2007 – 2009
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Cetorelli and Goldberg (2010)
Introduction

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   - emerging markets across Europe, Asia, and Latin America

2. Tamási and Világi (2011) sign restrictions on Hungary: large importance of credit supply shocks

3. IMF (2009) causal ordering: "bank default probability reduces real activity in South Africa"
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   - emerging markets across Europe, Asia, and Latin America
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Outline

1. Methodology
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2. Empirical Results
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3. Conclusion
We estimate a series of \textit{VAR models} (Sims, 1980)

\begin{equation}
Y_t = B_0 + B_1 Y_{t-1} + \cdots + B_p Y_{t-p} + \epsilon_t;
\end{equation}

where $Y_t$ is a $n \times 1$ vector of economic and financial indicators, $B_i$ are $n \times n$ autoregressive coefficients, $B_0$ contains the constant terms, and $\epsilon_t$ is a $n \times 1$ vector of the one-step ahead prediction error with $\epsilon_t = E(\epsilon_t | t)$. While Eq. 1 is a purely statistical model, it is the reduced of a typical Dynamic Stochastic General Equilibrium (DSGE) model when the endogenous state variables of the DSGE model are observed (Ravenna, 2007).
Model

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South Africa and the G7 countries: 1988:1-2010:3

Lag length fixed to 3 in all cases

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G7 block and commodity prices are exogenous to South Africa: SOE
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From Reduced Form VAR to Structural VAR (SVAR)

- Reduced form VAR model

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- Impulse response function (IRF) is defined as:

\[ \text{IRF} = (IBLP)^{-1}AP\varepsilon_t; \]
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(3) \hspace{1cm} (4)

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- Sign restrictions using penalty function: Uhlig (2005) and Mountford and Uhlig (2009)

- Before introducing the penalty function approach note that

- Impulse response function (IRF) is defined as:

\[
IRF = (I - BL)^{-1} AP\varepsilon_t,
\]  

(5)

- Sign restriction amounts to choose elements of \( P \) such that
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- **Reduced form VAR model**

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Before introducing the penalty function approach note that
- Impulse response function (IRF) is defined as:

\[
IRF = (I - BL)^{-1} AP\varepsilon_t, \tag{5}
\]

- Sign restriction amounts to choose elements of \(P\) such that
- The sign of a variable to a certain shock has a theoretical justifiable sign
From Reduced Form VAR to Structural VAR (SVAR)

- Pure sign restriction (Uhlig (2005, and Canova and De Nicolo, 2002)
From Reduced Form VAR to Structural VAR (SVAR)

- Pure sign restriction (Uhlig (2005, and Canova and De Nicolo, 2002)
- Draw $P$ from a normal distribution

Penalty function define the following non-linear function

$$f(x) = \begin{cases} 
  x & \text{if } x \leq 0 \\
  100x & \text{if } x > 0 
\end{cases}$$

for finding a negative response

$$f(x) = \begin{cases} 
  100x & \text{if } x \leq 0 \\
  x & \text{if } x > 0 
\end{cases}$$

for finding a positive response

where $x$ are elements of the IRF, which depend on $P$
From Reduced Form VAR to Structural VAR (SVAR)

- Pure sign restriction (Uhlig (2005, and Canova and De Nicolo, 2002)
- Draw $P$ from a normal distribution
- If IRFs satisfy the sign imposed keep the draw otherwise draw another until the researcher finds

<table>
<thead>
<tr>
<th>$x$</th>
<th>$f(x)$</th>
</tr>
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<tbody>
<tr>
<td>$x &gt; 0$</td>
<td>$100x$</td>
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- Penalty function define the following non-linear function

\[
\begin{align*}
  f(x) &= x & \text{if } x \leq 0 \\
  f(x) &= -100x & \text{if } x > 0
\end{align*}
\]

where $x$ are elements of the IRF, which depend on $P$.

Minimize $f(x)$ to obtain elements of $P$. 
From Reduced Form VAR to Structural VAR (SVAR)

- Pure sign restriction (Uhlig (2005, and Canova and De Nicolo, 2002)
- Draw \( P \) from a normal distribution
- If IRFs satisfy the sign imposed keep the draw otherwise draw another until the researcher finds
- A number of preferred signs for IRF of variables of interest
- Penalty function define the following non-linear function

\[
f(x) = \begin{cases} 
  x & \text{if } x < 0 \\
  -100x & \text{if } x > 0 
\end{cases}
\]

where \( x \) are elements of the IRF, which depend on \( P \).
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$$f(x) = \begin{cases} 
  x & \text{if } x \leq 0 \\
  100x & \text{if } x > 0
\end{cases} \quad \text{for finding a negative response}$$

$$f(x) = \begin{cases} 
  -100x & \text{if } x \leq 0 \\
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Methodology

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### Identifying restrictions imposed on the first 4 quarters

<table>
<thead>
<tr>
<th></th>
<th>G7 Credit</th>
<th>G7 Prod.</th>
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Tools

- After identification of the shocks
Tools

- After identification of the shocks
- We employ three tools
Methods

- After identification of the shocks
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  - Impulse response functions
Tools

- After identification of the shocks

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  1. Impulse response functions

  2. Variance Decomposition
**Tools**

- After identification of the shocks
- We employ three tools
  1. Impulse response functions
  2. Variance Decomposition
  3. Counterfactual Analysis
Data and transformations

- Derive data from 4 sources: Haver Analyst, Macrobond, Datastream, SARB

- Real GDP
- CPI
- Real Credit
- Exchange Rate
- Export
- Import
- Number of insolvent firms (SA)
- Commodity Price: Coal, gold & Platinum

- Other series are in level
- G7 series are estimated as the first PC (Stock & Watson, 2002)
- SA-Credit spread: yield on Eskom bond and baa US private corporate bond
- G7 spread: US baa-aaa corporate spread
- SA-Default: Insolvency
- G7-default: Moody’s default probability on US corporate bonds
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Data and transformations

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Credit Shocks

G7-credit

SA-Credit
Productivity Shocks

G7-productivity

SA-Productivity
Demand Shocks

**G7-Demand**

**SA-Demand**
Responses to G7 Shocks

G7-Demand

G7-GDP

G7-Inflation

G7-Credit

G7-Tbil

US-Spread

US-Default

SA-Inflation

SA-Credit

SA-commodity Price

SA-Repo Rate

SA-Spread

SA-Import

SA-Export

SA-Real Eff. Ex. Rate

SA-Default

SA-GDP

SA-Inflation

SA-Credit

SA-Tbil

SA-Spread

SA-Import
Responses to G7 Shocks

G7-productivity

G7-GDP
G7-Inflation
G7-Credit
G7-Tbli
US-Spread
US-Default
SA-commodity Price
SA-GDP
SA-inflation
SA-Credit
SA-Repo Rate
SA-Spread
SA-Default
SA-Real Eff. Ex. Rate
SA-Export
SA-Import
Empirical Results

Impulse Response Function (IRF)

Responses to G7 Shocks

G7-credit

G7-GDP

US-Spread

SA-Inflation

SA-Default

G7-Inflation

US-Default

SA-Credit

SA-Real Eff. Ex. Rate

G7-Credit

SA-commodity Price

SA-Repo Rate

SA-Export

G7-Tbil

SA-GDP

SA-Spread

SA-Import

Houssa/Mohimont/Otrok (CSAE)
Empirical Results

Impulse Response Function (IRF)

Responses to SA Shocks

SA-Demand

G7-GDP

US-Spread

SA-Inflation

SA-Default

G7-Inflation

US-Default

SA-Credit

SA-Real Eff. Ex. Rate

G7-Credit

SA-commodity Price

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Empirical Results

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G7-Tbil

SA-GDP

SA-Spread

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Empirical Results

Impulse Response Function (IRF)

Responses to SA Shocks

SA-Credit

Houssa/Mohimont/Otrok (CSAE)
G7-shocks contribution to

G7-Productivity

G7-GDP

G7-Inflation

G7-Credit

G7-Tbil

US-Spread

SA-Inflation

SA-Default

SA-Real Eff. Ex. Rate

SA-Commodity Price

SA-Repo Rate

SA-Export

SA-GDP

SA-Spread

SA-Import
G7-shocks contribution to

G7-Demand
Empirical Results
Variance Decomposition

G7-shocks contribution to G7-credit

G7-GDP
US-Spread
G7-Inflation
SA-Inflation
SA-Default
G7-Credit
US-Default
SA-Credit
SA-Real Eff. Ex. Rate
G7-Tbil
SA-commodity Price
SA-Repo Rate
SA-Export
SA-GDP
SA-Spread
SA-Import

Houssa/Mohimont/Otrok (CSAE)
SA-shocks contribution to

**SA-Productivity**

- G7-GDP
- US-Spread
- G7-Inflation
- US-Default
- G7-Credit
- SA-commodity Price
- G7-Tbil
- SA-GDP
- G7-Tbil
- SA-Spread
- G7-Tbil
- SA-Import
- G7-Tbil
- SA-Export

Houssam Mohimont Otok (CSAE) Credit Shocks 28 / 38
SA-shocks contribution to SA-Demand

Empirical Results

Variance Decomposition

Houssa/Mohimont/Otrok (CSAE)
SA-shocks contribution to

### SA-Credit

- **G7-GDP**
- **US-Spread**
- **SA-Inflation**
- **SA-Default**
- **G7-Inflation**
- **US-Default**
- **SA-Credit**
- **SA-Real Eff. Ex. Rate**
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- **SA-commodity Price**
- **SA-Repo Rate**
- **SA-Export**
- **G7-Tbil**
- **SA-GDP**
- **SA-Spread**
- **SA-Import**
Contributions of Shocks to G7 GDP in 2007-2010

- **SA-Demand to G7-GDP**
  - 2008: -20.00
  - 2009: -15.00
  - 2010: 0.00

- **G7-Demand to G7-GDP**
  - 2008: -20.00
  - 2009: -10.00
  - 2010: 5.00

- **SA-Productivity to G7-GDP**
  - 2008: -15.00
  - 2009: 0.00
  - 2010: 5.00

- **G7-Productivity to G7-GDP**
  - 2008: 0.00
  - 2009: 5.00
  - 2010: 10.00

- **SA-Credit to G7-GDP**
  - 2008: -15.00
  - 2009: 0.00
  - 2010: 5.00

- **G7-Credit to G7-GDP**
  - 2008: 0.00
  - 2009: 5.00
  - 2010: 10.00
Contributions of Shocks to SA GDP in 2007-2010

- **SA-Demand Shocks to SA-GDP**
- **G7-Demand to SA-GDP**
- **SA-Productivity Shocks to SA-GDP**
- **G7-Productivity to SA-GDP**
- **SA-Credit Shocks to SA-GDP**
- **G7-Credit to SA-GDP**
G7 Impacts on AS in 2007-2010: Trade Volume Channel

**G7-Demand to SA-Export**

**G7-Productivity to SA-Export**

**G7-credit to SA-Export**
Empirical Results  
Counterfactual Analysis

G7 Impacts on SA in 2007-2010: Trade Volume Channel

G7-Demand to SA-Import

G7-Productivity to SA-Import

G7-credit to SA-Import
G7 Impacts on SA in 2007-2010: Commodity Prices channel

G7-Demand to SA-commodity Price

G7-Productivity to SA-commodity Price

G7-credit to SA-commodity Price

Houssa/Mohimont/Otrok (CSAE)
Empirical Results

G7 Impact on AS in 2007-2010: Credit Channel

Houssa/Mohimont/Otrok (CSAE)

Credit Shocks
Conclusion

- We study the role of domestic and G7 credit supply shocks on macroeconomic fluctuations in EMEs.
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- Quarterly data on South Africa and G7 countries in 1988:1-2010
Conclusion

- We study the role of domestic and G7 credit supply shocks on macroeconomic fluctuations in EMEs
- Conditioning on traditional macroeconomic shocks and
- Examining the transmission channels of the shocks
- Quarterly data on South Africa and G7 countries in 1988:1-2010
- Indicate that external shocks are the main drivers of real activity in South Africa
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- We study the role of domestic and G7 credit supply shocks on macroeconomic fluctuations in EMEs.

- Conditioning on traditional macroeconomic shocks and

- Examining the transmission channels of the shocks.

- Quarterly data on South Africa and G7 countries in 1988:1-2010 indicate that external shocks are the main drivers of real activity in South Africa.

- Credit supply shocks play, on average, a less important role than credit demand shocks.
Real per capita Consumption Growth