# Alternative Indicator of Monetary Policy for a Small Open Economy

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Indicator of monetary policy

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Method of monetary policy identification

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VectorAutoRegression

↓

Structural VAR econometrically identified with operating procedures

↓

Applied to a small open economy

↓

Alternative indicator of Swiss monetary policy



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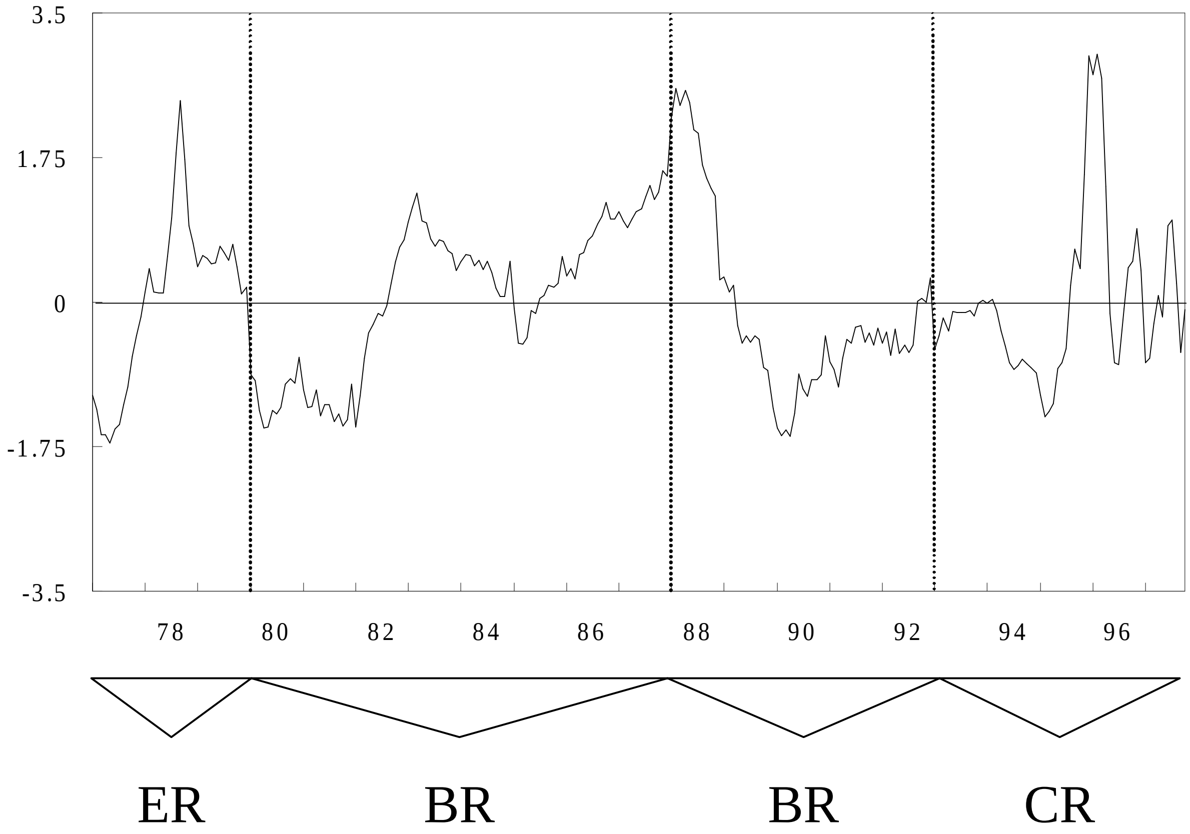
# Indicator (Swiss Data)




- (Swiss) indicator based on

  exchange rate strategy before 1980 (ER)

  bank reserves strategy during the 1980s (BR)

  interest rate strategy since 1993 (CR)

# Motivations

- Look for an alternative overall indicator of monetary policy for small open economies

- Apply this indicator to Swiss data

- Apply new methods of monetary policy identification and transform them for a small open economy setup
  - Clarida Gertler (97) D
  - Bernanke Mihov (97, 98) D, US

- Construct a nesting model enabling to compare these new methods

- Focus on some econometric problems linked with indicator construction

# Methodology

2-step VAR → $1^{st}$ step common (ECONOMY)

2-step VAR → $2^{nd}$ step distinct (RESERVES)

- VAR $1^{st}$ step (Model 1/3)
  i. 8 variables
  ii. 3 policy variables (CB): interest rate $\underline{z}_t^{cr}$, money $\underline{z}_t^{mon}$, exchange rate $\underline{z}_t^{exr}$

$$\mathbf{z}_t = \sum_{i=0}^{k} \mathbf{A}_i \mathbf{z}_{t-i} + \mathbf{B}\boldsymbol{\varepsilon}_t$$

- VAR $2^{nd}$ step (Model 2/3)
  i. Residuals reduced form $1^{st}$ step = Data $2^{nd}$ step
  ii. Operating procedures on reserves market
  iii. Estimation under different scenarios
     - Bank reserves targeting (BR)
     - Interest rate targeting (CR)
     - Exchange rate targeting (ER)

- Mechanical build up (Model 3/3)

# Model 1/3

- <u>VAR 1st step</u> (Economy)

$$\begin{pmatrix}\bar{\mathbf{z}}_t\\ \underline{\mathbf{z}}_t\end{pmatrix} = \sum_{i=0}^{k} \begin{pmatrix}\mathbf{A}_i^{\bar{z}\bar{z}} & \mathbf{A}_i^{\bar{z}\underline{z}}\\ \mathbf{A}_i^{\underline{z}\bar{z}} & \mathbf{A}_i^{\underline{z}\underline{z}}\end{pmatrix}\begin{pmatrix}\bar{\mathbf{z}}_{t-i}\\ \underline{\mathbf{z}}_{t-i}\end{pmatrix} + \begin{pmatrix}\mathbf{B}^{\bar{z}} & \mathbf{0}\\ \mathbf{0} & \mathbf{B}^{\underline{z}}\end{pmatrix}\begin{pmatrix}\boldsymbol{\varepsilon}_t^{\bar{z}}\\ \boldsymbol{\varepsilon}_t^{\underline{z}}\end{pmatrix}$$

- Shocks { supply, demand, exchange rate } $\begin{pmatrix}\varepsilon_t^{s}\\ \varepsilon_t^{d}\\ \varepsilon_t^{x}\end{pmatrix}$

- Reduced form after timing assumption

$\mathbf{A}_i^{\bar{z}\underline{z}}$ equals **0** for contemporaneous period

- $$\begin{pmatrix}\bar{\mathbf{z}}_t\\ \underline{\mathbf{z}}_t\end{pmatrix} = \sum_{i=1}^{k} \mathbf{\Pi}_i \begin{pmatrix}\bar{\mathbf{z}}_{t-i}\\ \underline{\mathbf{z}}_{t-i}\end{pmatrix} + \begin{pmatrix}\mathbf{r}_t^{\bar{z}}\\ \mathbf{r}_t^{\underline{z}}\end{pmatrix}$$

# Model 2/3

- VAR 2nd step (Reserves)

$$\begin{pmatrix} \mathbf{r}_t^{\bar{z}} \\ \mathbf{r}_t^{z} \end{pmatrix} = \begin{pmatrix} \boxed{\mathbf{A}_{0,-1}^{\bar{z}\bar{z}}\mathbf{B}^{\bar{z}}} & \mathbf{0} \\ \mathbf{A}_{0,-1}^{zz}\mathbf{A}_0^{z\bar{z}}\boxed{\mathbf{A}_{0,-1}^{\bar{z}\bar{z}}\mathbf{B}^{\bar{z}}} & \mathbf{A}_{0,-1}^{zz}\mathbf{B}^{z} \end{pmatrix} \begin{pmatrix} \boldsymbol{\varepsilon}_t^{\bar{z}} \\ \boldsymbol{\varepsilon}_t^{z} \end{pmatrix}$$

$$\mathbf{r}_t^{z} = \mathbf{A}_{0,-1}^{zz}\mathbf{A}_0^{z\bar{z}}\mathbf{r}_t^{\bar{z}} + \mathbf{A}_{0,-1}^{zz}\mathbf{B}^{z}\boldsymbol{\varepsilon}_t^{z}$$

**Without extraction**

$$\mathbf{r}_t^{z} = \mathbf{A}_0^{z\bar{z}}\mathbf{r}_t^{\bar{z}} + \mathbf{A}_0^{zz}\mathbf{r}_t^{z} + \boldsymbol{\varepsilon}_t^{z}$$

money supply
money demand
exchange rate determination

overidentified IV

Swiss data
Generated regressors
Generated instruments
Structural equations

Stopped!

**With extraction**

$$\mathbf{u}_t^{z} = \mathbf{A}_{0,-1}^{zz}\mathbf{B}^{z}\boldsymbol{\varepsilon}_t^{z}$$

$$u_s^{mon} = u_d^{mon}$$
$$u_s^{mon} = \lambda\varepsilon^{d} + \phi\varepsilon^{x} + \varepsilon^{s}$$
$$u_d^{mon} = \rho u^{cr} + \varepsilon^{d}$$
$$u^{exr} = \delta u^{cr} + \varepsilon^{x}$$

restricted GMM
different assumptions
overidentification tests

Indicator construction →

# Model 3/3

- Mechanical build up (possible for both setups, applied only with extraction)

  Rewrite policy functions

$$\underline{\mathbf{z}}_t = \sum_{i=1}^{k} \mathbf{\Pi}_i^{\underline{z}\overline{z}} \overline{\mathbf{z}}_{t-i} + \sum_{i=1}^{k} \mathbf{\Pi}_i^{\underline{z}\underline{z}} \underline{\mathbf{z}}_{t-i}$$
$$+ \left( \mathbf{A}_{0,-1}^{\underline{z}\underline{z}} \mathbf{A}_0^{\underline{z}\overline{z}} \mathbf{A}_{0,-1}^{\overline{z}\overline{z}} \mathbf{B}^{\overline{z}} \right) \boldsymbol{\varepsilon}_t^{\overline{z}}$$
$$+ \left( \mathbf{A}_{0,-1}^{\underline{z}\underline{z}} \mathbf{B}^{\underline{z}} \right) \boldsymbol{\varepsilon}_t^{\underline{z}}$$

  Construct indicator for each subsamples, with the corresponding matrix

$$\left( \mathbf{A}_{0,-1}^{\underline{z}\underline{z}} \mathbf{B}^{\underline{z}} \right)^{-1} \underline{\mathbf{z}}_t$$

  Select the indicator isolating policy shocks

# Conclusions

- Extraction needed for plausible construction (general)
- Overall indicator confirms narrative interpretation of monetary policy for 70s and 80s, not for 90s (with Swiss data)
- Difficulty to implement such an indicator (general)
- Poor dynamics (with Swiss data)
- Scope for further research

  (Above) Do we really need a single indicator instead of multiple indicators?

  (Below) Dynamics has to be improved, smaller VAR