

The Transmission Mechanism of Financial Shocks in the Global Economy

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Paper goals



Reasoning

Why Open Economy Model?

Part of European UnionStrong financial linksAdopt Euro currency in the near future

Why FAVAR model?



Literature Review

- 2005 Bernanke, Boivin and Eliasz Closed Economy FAVAR model Impulse response in the variables to a shock in FED rate
- 2007/9Surico P. and H. MumtazOpen Economy FAVAR modelQuantify dynamic effects felt by UK after a shock of short-term interest rates
- 2008 Boiving J. and M. Giannoni Open Economy FAVAR model
 Quantify changes in relation between international forces and US variables 1984-2005
 Analyze changes in the monetary policy transmission mechanism
- 2011Maier P. and G. VasishthaOpen Economy FAVAR modelAnalyze global developments affecting Canada's economy
- 2012 Benkovskis K., Bessonovs A. and J. Worz Feldkircher
 Open Economy FAVAR model Euro Area, Czech Republic, Poland and Hungary
 Estimate the cross-border effects of ECB contractionary monetary policy

FAVAR model – Factor model



X (n x 1) – observable variables Λ (n x r) – factor loadings F (r x 1) – vector of factors e (n x 1) – model residuals

Factor extraction

- 1. Extracting the first K principal components of X obtain Λ_0 and F_0
- 2. Intermediate step
- 3. Gibbs loop

• Obtain F^* , Λ^* , F and Λ

FAVAR model – Factor model

Database description

Frequency: monthly Span: June 2001 – March 2015 Adjusments: Seasonnally and by working days Source: Eurostat and NBR' website

Data preparation:

- First difference
- First logarithm difference

Unobservable factors

Number of factors:

- Euro Area r = 3
- Romania r = 3



Number of variables:

- Euro Area 20
- Romania 24

- Bai and Ng criterion
- Related articles

FAVAR model – Extracted factors





Euro Zone unobservable factors

Factor 2 România



Factor 3 România 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015



Romania unobservable factors

2002 2003 2004

2005 2006 2007 2008



2009 2010 2011 2012 2013 2014 2015

FAVAR model – VAR model

$$\begin{bmatrix} F_{t}^{*} \\ R_{t} \\ F_{t} \end{bmatrix} = A_{1} * \begin{bmatrix} F_{t-1}^{*} \\ R_{t-1} \\ F_{t-1} \end{bmatrix} + \dots + A_{p} * \begin{bmatrix} F_{t-p}^{*} \\ R_{t-p} \\ F_{t-p} \end{bmatrix} + u_{t}$$

$$F_{t}^{*} = \begin{bmatrix} F_{1t}^{*} & F_{2t}^{*} & F_{3t}^{*} \end{bmatrix}$$
$$F_{t} = \begin{bmatrix} F_{1t} & F_{2t} & F_{3t} & F_{4t} \end{bmatrix}$$

Reduced Form

$$\begin{bmatrix} F_t^* \\ R_t \\ F_t \end{bmatrix} = B \cdot \begin{bmatrix} F_{t-1}^* \\ R_{t-1} \\ F_{t-1} \end{bmatrix} + \begin{bmatrix} u_t^* \\ u_t^R \\ u_t \end{bmatrix}$$

Monetary policy instrument variable

R = 3 month EURIBOR (E3M)

FAVAR model – VAR model statistical tests

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1691.420	NA	0.531194	22.07039	22.22815	22.13447
1	-1192.859	938.8488	0.001882	16.42674	17.84661*	17.00349
(2)	-1083.854	193.9444	0.001056*	15.84225*	18.52424	16.93167*
3	-1036.837	78.76764	0.001337	16.06282	20.00691	17.66490
4	-992.7557	69.27084	0.001786	16.32150	21.52771	18.43625
5	-950.1933	62.46171	0.002484	16.59991	23.06823	19.22733
6	-869.5745	109.9348*	0.002164	16.38408	24.11451	19.52416
7	-819.2188	63.43512	0.002890	16.56128	25.55382	20.21403
8	-770.0310	56.85337	0.004090	16.75365	27.00829	20.91906

p = 2

The system is stable





VAR model

$$\begin{bmatrix} F_{1,t}^{*} \\ F_{2,t}^{*} \\ F_{3,t}^{*} \\ E3M_{t} \\ F_{1,t} \\ F_{3,t}^{*} \end{bmatrix} = B_{1} \begin{bmatrix} F_{1,t-1}^{*} \\ F_{2,t-1}^{*} \\ F_{3,t-1}^{*} \\ E3M_{t-1} \\ F_{1,t-1}^{*} \\ F_{2,t-1}^{*} \\ F_{3,t-1}^{*} \end{bmatrix} + B_{2} \begin{bmatrix} F_{1,t-2}^{*} \\ F_{2,t-2}^{*} \\ E3M_{t-2} \\ F_{3,t-2}^{*} \end{bmatrix} + \begin{bmatrix} u_{1,t}^{*} \\ u_{2,t}^{*} \\ u_{3,t}^{*} \\ u_{3,t}^{*} \end{bmatrix}$$

FAVAR model – VAR model restrictions

V

 \mathcal{V}

Identification scheme

$$Au_t = B\varepsilon_t$$

$$ec(A) = R_A \gamma_A + r_A$$
$$ec(B) = R_B \gamma_B + r_B$$

u – equations residuals

 $\boldsymbol{\epsilon}$ - pure innovations

R_A, **R**_B –suitable fixed matrices r_A , r_B – vectors of fixed parameters γ_A , γ_B – vectors of free parameters

Restrictions

$$\begin{bmatrix} 1 & 0 & 0 \\ \alpha_{R^{*},F^{*}} & 1 & 0 \\ \alpha_{F,F^{*}} & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} u_{t}^{F^{*}} \\ u_{t}^{R^{*}} \\ u_{t}^{F} \end{bmatrix} = \begin{bmatrix} \lambda_{F^{*}} & 0 & 0 \\ 0 & \lambda_{R^{*}} & 0 \\ 0 & 0 & \lambda_{F} \end{bmatrix} \cdot \begin{bmatrix} \varepsilon_{t}^{F^{*}} \\ \varepsilon_{t}^{R^{*}} \\ \varepsilon_{t}^{F} \end{bmatrix}$$

FAVAR model - Factors impulse responses



FAVAR model – Scheme

- 1. Extract the unobservable factors from the set of variables specific to the Euro Area Matlab
- 2. Extract the unobservable factors from the set of variables specific to Romania Matlab
- 3. Creat a matrix consisting in the extracted factors and add the monetary policy variable
- 4. Import the matrix into Eviews
- 5. Estimate the optimal VAR model Eviews
- 6. Impose restrictions under economic reasoning Eviews
- 7. Obtain the impulse response function for the unobservable factors Eviews
- 8. Import the impulse response function in Matlab
- 9. Multiply with the loadings matrices, obtained in the same time with the extraction of factors Matlab

10. Obtain the impulse responses for the economic variables of interest to a shock in 3M Euribor

Total Industrial production



Manufacturing Industrial production



Total Construction Index

Construction Index: Civil Engineering





Retail Trade

Total HICP





Unemployment rate

Economic Sentiment







Exports





Manufacturing Industrial production



Consumer Goods Industrial production



Total Construction Index

Construction Index: Civil Engineering









ROBOR 1Y



Retail Sales food, beverages and tobacco



Retail Sales of non-food products



Unemployment rate

Economic sentiment





HICP ALL

HICP food and non-alcoholic





Conclusions

	Quantitative
Euro Zone	 Increase in funding cost Industrial production and construction indicators suffer an impairment Decrease in consumption Increase in unemployment Depreciation of economic sentiment indicator
Romania	 Exchange rate appreciation Exports increase and Imports decrease Increased industrial production levels Consumption rises Unemployment rate reduces ROBOR reacts in the same direction Economic sentiment indicator improves

Conclusions

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Qualitative

- Ability of using large number of economic variables by embedding them in a limited number of unobservable factors that describe a particular economy
- The possibility of analyzing the impulse responses of many economic variables, unlike standard VAR-SVAR models which are limited
- The possibility of imposing restrictions, according to economic reasoning
- Some results (their amplitude) are not according to economical theory
- Model based on a difficult methodology of factor extraction

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Used Software:

- 1. Microsoft Office 2013
- 2. Matlab 2012a
- 3. Eviews 8 Student Version

Thank you!