

Ilir VIKÀ

Meri PAPAANGJELI

RESEARCH DEPARTMENT
BANK OF ALBANIA

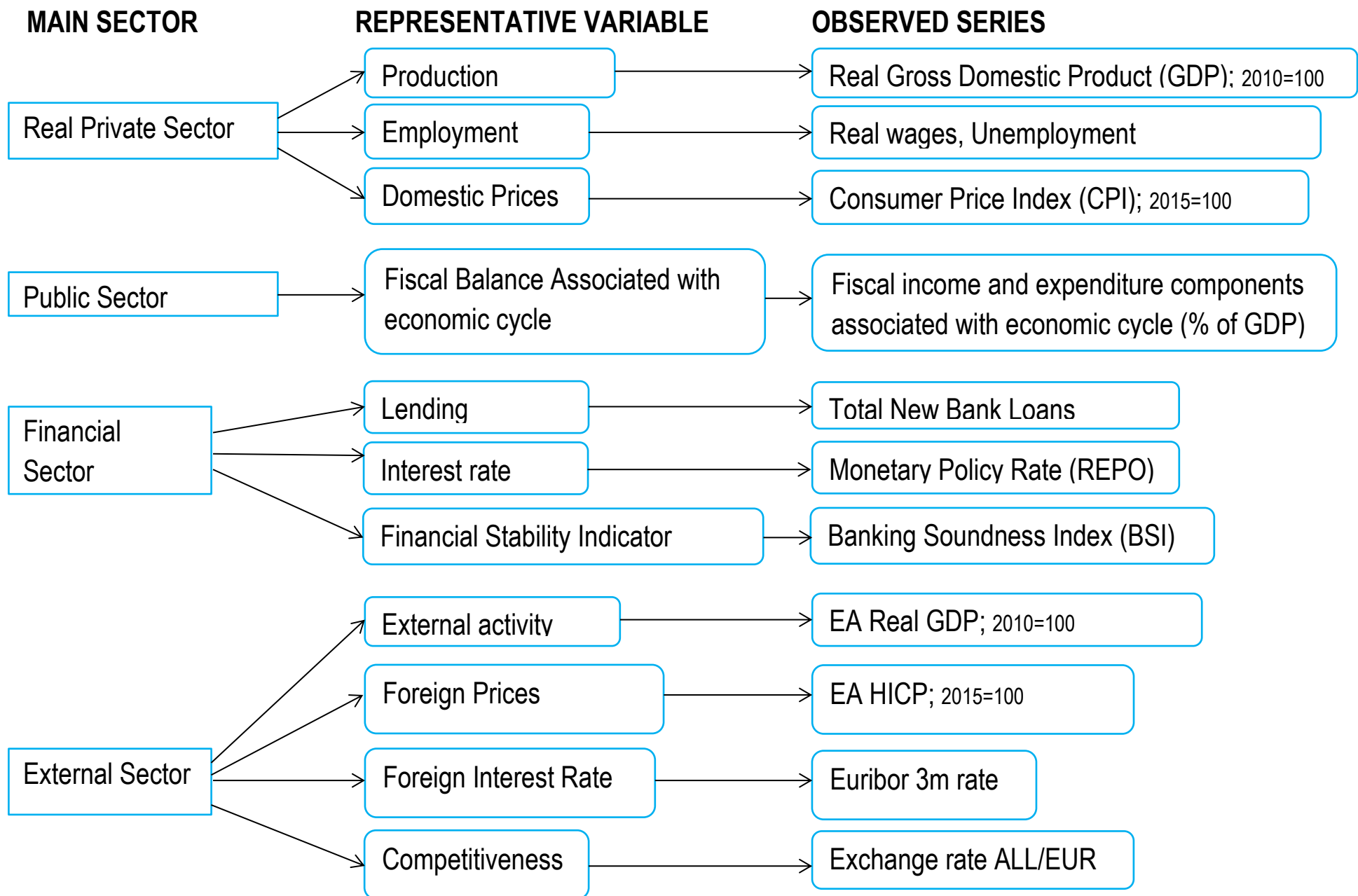
Motivation: Forecasting the economy is always an issue of primary importance for policy-making in the central banks. Having in place reliable economic forecasting models is a necessity to properly orient the policy-making debate towards the crucial issues needed to be tackled appropriately by the decision-makers.

Aim: To present a relatively simple econometric model, which can be conveniently used to forecast the main economic indicators, easily conditioned on expectations about external developments.

Contribution: Build a simple, inexpensive and practical forecasting model for the Albanian economy.

Methodology: A Bayesian Vector Autoregressive (BVAR) model estimated via OLS

BVAR MODEL STRUCTURE: SELECTED VARIABLES



- **Period:** 2002Q1-2016Q4
- **Frequency:** quarterly
- **Variables:** 12 indicators: 9 endogenous (**domestic variables**), 3 exogenous (**foreign variables**)
- **Source:** INSTAT, BoA, Ministry of Finance and Economy, ECB & EUROSTAT

ESTIMATION PROCEDURE:

- BVARX estimation in levels & differences
- Optimal Lag Length using forecast performance and Lag length Criteria (**5 lags**)
- Model estimation through OLS for the period 2002Q1-2016Q4
- In-sample forecasts for different time horizons (**2012Q1-2016Q4; 2013Q1-2016Q4; 2014Q1-2016Q4; 2015Q1-2016Q4; 2016Q1-2016Q4**)

EMPIRICAL FINDINGS (1)

Table 1. Testing the relevance of labor market, fiscal gauge, and financial indicators in baseline BVARX

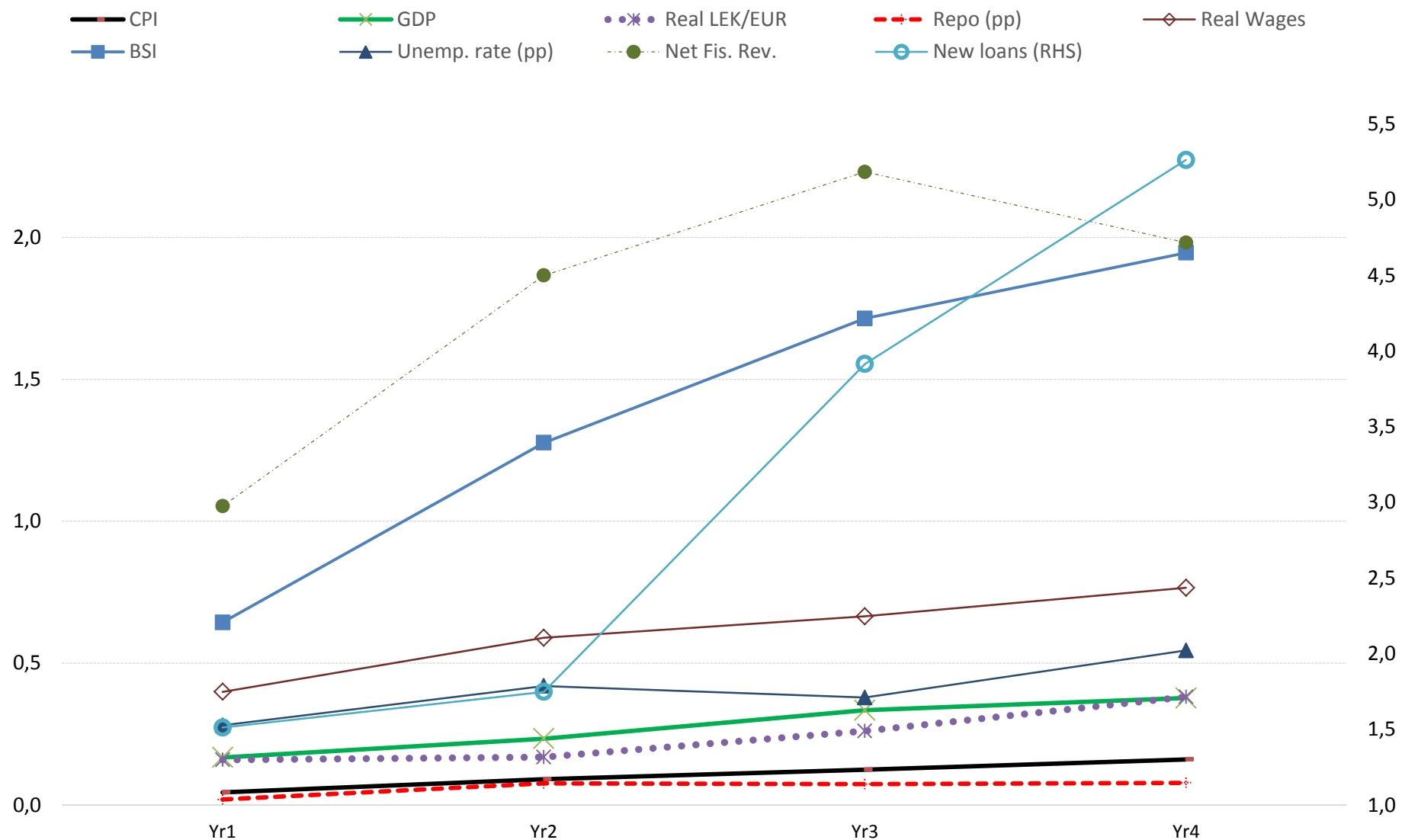
Estimation period 2002Q1:2016q4, total of 60 observations

	Baseline VARX	...excl. BSI	...excl. Loans	...excl. Unemp.	...excl. R.Wage	...excl. Fis.Rev.	...excl. LaborMkt	...excl. FinSys	...excl. FinSys & LaborMkt	...excl. FinSys & LaborMkt & Fiscal
RMSE, 2014q1:2016q4 (3 years)										
Inflation	0.076	0.120	0.133	0.151	0.115	0.133	0.180	0.155	0.263	0.262
Growth	0.417	0.348	0.757	0.640	0.271	0.455	0.464	0.554	0.530	0.412
LEK/EUR	0.303	0.323	0.567	1.153	0.172	0.388	0.886	0.494	1.357	0.998
real ER	0.305	0.275	0.573	1.071	0.151	0.463	0.743	0.427	1.236	0.840
Repo	0.039	0.033	0.057	0.122	0.056	0.045	0.109	0.060	0.148	0.154
BSI	1.549		1.894	3.862	1.405	3.218	3.124			
New Loans	3.136	3.321		3.653	1.579	2.670	3.636			
Unemp. Rate	0.149	0.182	0.316		0.233	0.268		0.321		
Real Wages	0.616	0.623	0.553	1.128		1.073		1.009		
Net Fis. Rev.	1.210	1.336	1.614	1.697	1.403		1.538	2.050	1.789	
RMSE, 2015q1:2016q4 (2 years)										
Inflation	0.052	0.133	0.127	0.176	0.120	0.108	0.258	0.115	0.190	0.219
Growth	0.259	0.152	0.633	0.418	0.206	0.297	0.214	0.483	0.364	0.183
LEK/EUR	0.300	0.351	0.272	0.919	0.241	0.250	0.636	0.192	1.031	0.827
real ER	0.293	0.253	0.365	0.791	0.334	0.174	0.414	0.192	0.970	0.729
Repo	0.041	0.074	0.051	0.090	0.044	0.042	0.079	0.038	0.091	0.094
BSI	0.812		1.273	2.744	1.483	2.825	2.626			
New Loans	2.645	2.760		2.556	1.892	3.757	2.771			
Unemp. Rate	0.112	0.132	0.372		0.231	0.221		0.334		
Real Wages	0.581	0.431	0.579	1.640		1.081		0.872		
Net Fis. Rev.	1.150	0.720	1.104	0.737	1.770		0.902	1.088	0.993	

Note: Shadow green cells indicate RMSE lower than baseline model; i.e. the more green cells the less preferable to include the variable(s) in the overall set.

EMPIRICAL FINDINGS (2)

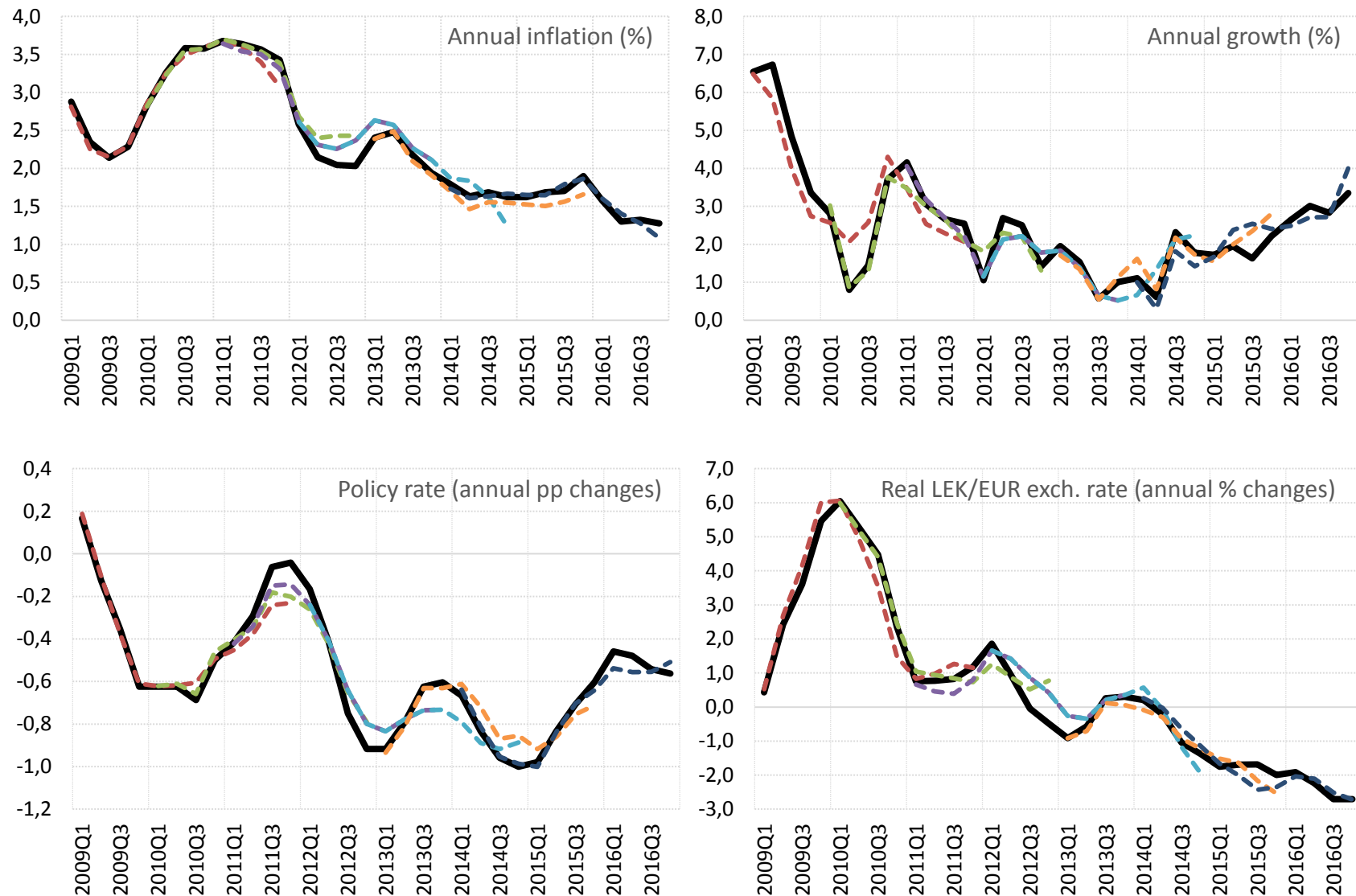
Figure 1. Evolution of RMSEs in BVARX(5) with L/M (μ : 0, L1: 0.99, L2: 0.99, L3: 1) in levels
(calculated on annual percent changes, 2013Q1:2016Q4)



EMPIRICAL FINDINGS (3)

Figure 2. Actual data vs. 3-years ahead dynamic forecasts (starting at the beginning of each year)

– Main economic indicators –



EMPIRICAL FINDINGS (4)

Table 1. Comparing forecast ability between unrestricted VARX and Bayesian VARX
Estimation period 2002q1 2016q4 (60 obs)

	VAR	BVAR(5), prior type:		VAR	BVAR(5), prior type:	
		Litterman/Minnesota ($\lambda_1=0.99$; $\lambda_2=0.99$; $\lambda_3=1$)	Sims-Zha ($\lambda_1=0.99$; $\lambda_2=0.99$; $\lambda_3=1$)		Litterman/Minnesota ($\lambda_1=1$; $\lambda_2=0.99$; $\lambda_3=1$)	Sims-Zha ($\lambda_1=0.99$; $\lambda_3=0.99$; $\lambda_0=1$)
Initial resid. cov.:						
Dynamic forecast 2013q1 2016q4 (16 quarters)				... 2014q1 2016q4 (12 quarters)		
BSI	1.95	2.82	2.80	1.55	2.82	2.80
Inflation	0.16	0.12	0.13	0.14	0.12	0.11
Growth	0.38	0.36	0.35	0.42	0.40	0.35
LEK/EUR	0.49	0.39	0.32	0.30	0.30	0.29
Real ER	0.38	0.37	0.26	0.30	0.28	0.26
Loans	5.26	5.22	4.81	3.14	5.22	4.81
Repo	0.08	0.12	0.09	0.04	0.12	0.09
Net. Fis. Rev.	1.98	2.94	2.71	1.21	2.94	2.71
Unemp. Rate	0.54	0.53	0.50	0.15	0.53	0.50
Real Wage	0.77	0.59	0.59	0.62	0.59	0.59
Dynamic forecast 2015q1 2016q4 (8 quarters)				... 2016q1 2016q4 (4 quarters)		
BSI	0.81	2.13	2.09	0.78	0.79	0.81
Inflation	0.11	0.09	0.05	0.07	0.06	0.06
Growth	0.27	0.26	0.19	0.18	0.12	0.13
LEK/EUR	0.33	0.32	0.18	0.09	0.07	0.06
Real ER	0.30	0.29	0.16	0.08	0.04	0.06
Loans	2.64	1.73	1.70	1.78	1.49	1.50
Repo	0.05	0.08	0.04	0.02	0.02	0.02
Net. Fis. Rev.	1.15	1.85	1.41	0.73	0.81	0.74
Unemp. Rate	0.11	0.38	0.33	0.11	0.19	0.16
Real Wage	0.58	0.54	0.69	0.35	0.35	0.33

Note: Highlighted cells indicate RMSE lower than the VAR model used as a benchmark.

SOME CONCLUDING REMARKS...

- Our findings are not crystal-clear in giving preference to one specification over the other between the BVARX(5) in levels and in differences.
- The in-sample forecast performance of BVARX models (with L/M and Sims and Zha priors) is satisfactory for the main macroeconomic indicators, such as: annual growth, real exchange rate and annual inflation, compared to the others variables.
- Excluding labour market, fiscal gauge and financial sector indicators does not improve distinctly the forecast performance of the BVARX model.
- The BVARX model performs better in the short-term and medium-term (1-3 years) compared to longer-term horizons.

FURTHER:

- Evaluation of out-of-sample forecast performance of the BVARX models
- Estimation of IRFs and the ability of the model for economic analysis