



Inflation Targeting in Emerging Economies  
National Bank of Ukraine, November 2021

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## Inflation targeting in Romania through the lens of a DSGE model

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The opinions expressed in this presentation are those of the author and do not necessarily reflect the views of the National Bank of Romania or of the IMF.

# Outline

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Literature review

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The environment

Estimation and main results

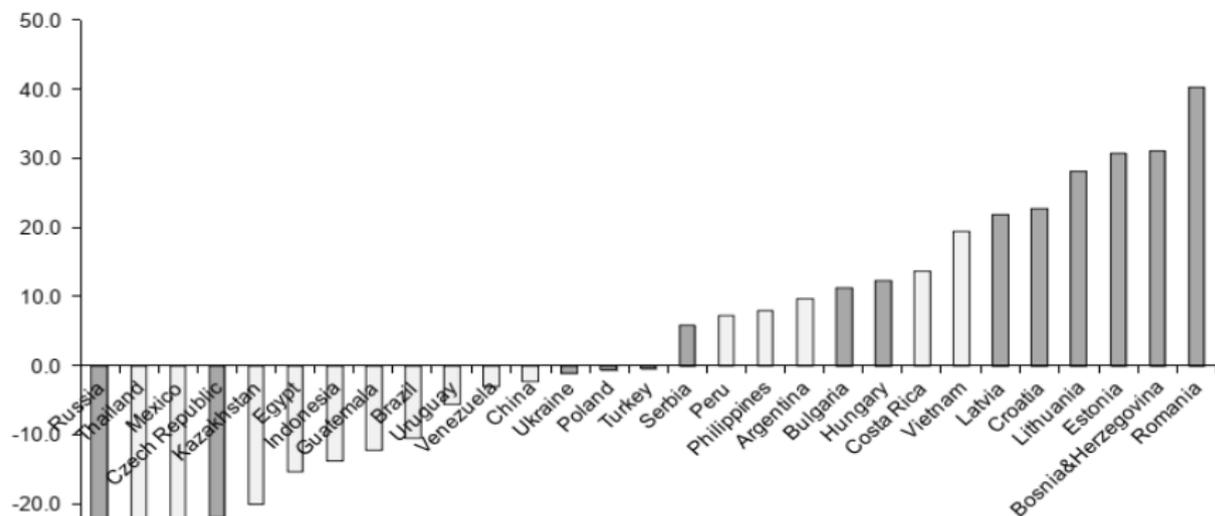
Day-by-day usage

Conclusions

# Motivation - empirical (1)

Very large currency mismatch for Romania before GFC

Currency Mismatch in Emerging Economies, 2008

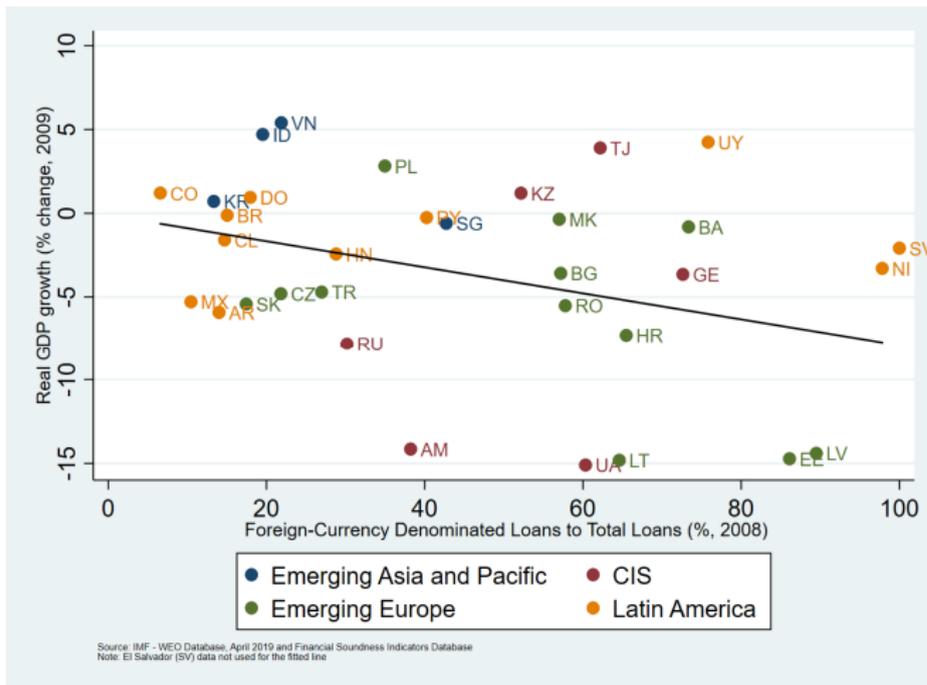


► Source: Ranciere et al. (2010)

# Motivation - empirical (2)

... and sharp economic contraction and nominal depreciation in 2009-2010

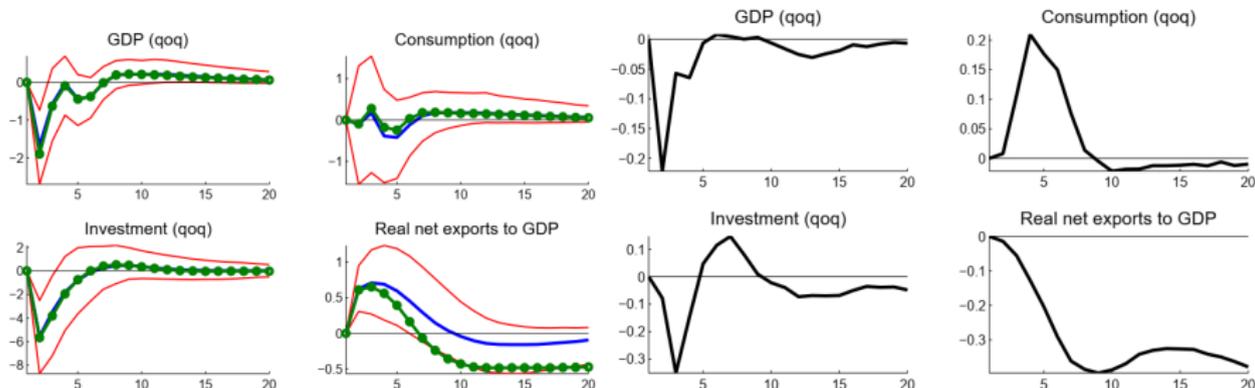
- ▶ Chițu (2012): for a sample of 60 emerging economies - a 10 percentage points higher loan dollarization rate resulted on average on a 0.84 percentage point lower GDP growth rate in the Great Recession.



# Motivation - empirical (3)

## Empirical evidence for contractionary effect of depreciation

- ▶ BVAR with GDP/Consumption/Investment/Net exports, core inflation, nominal EURRON exchange rate, (share of FC loans in total loans) and ROBOR3M interest rate - *IRFs following domestic currency depreciation.*



- ▶ Quarterly growth rates over the 2005Q1:2019Q1 period for GDP components, inflation rate and exchange rate; ordering based on Cholesky decomposition; normal inverse-Wishart conjugate priors. Reaction of GDP robust to change in the sample (i.e. starting in 2001Q1), series in log(level), HP gaps, different ordering, etc.

## Motivation - theoretical (4)

The importance of balance sheet effects and the need to incorporate it in macroeconomic models for EMEs

- ▶ *On the list of contractionary channels, the balance sheet effect is the one that has dominated in terms of attention from researchers, and I think appropriately so. (Frankel, 2005)*
- ▶ *Due to dollarisation, the exchange rate is also likely to play a much larger role in EMEs than in developed economies. For instance, in EMEs currency devaluations are frequently said to have contractionary effects on output due to financial dollarisation. This effect contrasts with standard theoretical modelling in advanced economies where currency devaluations are thought to have expansionary effects, say, due to the expenditure-switching effect. **As a result, in modelling EMEs, mechanisms need to be included allowing currency devaluations to have a potential contractionary role.** (Tovar, 2009)*

## Our contribution

- ▶ The paper proposes a novel way to incorporate partial dollarization/euroization in a DSGE model with financial frictions à la Bernanke et al. (1999);
- ▶ The model is suitable for forecasting and monetary policy analysis for any emerging economy (Romania in this case).
  - ▶ Used by IMF since 2016 as a study case for the *Monetary and Fiscal Policy Analysis with DSGE Models Course*;
  - ▶ Used by NBR since 2015Q1 for quarterly analysis and forecasting.
- ▶ An extended modelling of the external sector allows for the analysis of the impact of (potentially) divergent monetary policies in advanced economies.

# Findings

- ▶ The model is able to efficiently match the moments displayed by the (highly volatile) Romanian data;
- ▶ With around 45% of new loans to non-financial corporations being granted in foreign currency (i.e. great majority in euro) to mostly unhedged borrowers:
  - ▶ a depreciation of the RON vis-a-vis of EUR generates a contraction, with negative balance sheet effects out-weighting the positive ones on net exports. The effects are increasing with the degree of loan dollarization;
  - ▶ domestic monetary policy is less efficient the more dollarized the economy is. Moreover, dollarization increases following an increase in the domestic interest rate;
  - ▶ divergent monetary policies in advanced economies may have net positive effects in terms of output, depending on the degree of euroization for CEE economies.

# Literature review - drivers of dollarization/currency mismatches

- ▶ Exchange rate regime: Mishkin (1996), Obstfeld (1998), Burnside, Eichenbaum and Rebelo (1999), Goldstein and Turner (2004), Allen et al. (2002), Cowan et al. (2011), Martinez and Werner (2002), Arteta (2002), Tobal (2013) ;
- ▶ Exchange rate volatility: Eichengreen and Hausmann (1999), McKinnon (2001), Hake et al. (2014) ;
- ▶ Weak economic policies and institutions: Goldstein and Turner (2004), Hake et al. (2014);
- ▶ Banks funding in foreign currency: Brown et al. (2010), Hake et al. (2014) ;
- ▶ Interest rate differential: Hake et al. (2014);
- ▶ Larger firms, foreign owned, involved in international trade: Barajas et al. (2016), Pratap et al. (2003) .

# Literature review - effects of dollarization/currency mismatches

- ▶ Balance sheet effects on investment/sales/profits/share prices of (sampled) firms following depreciation:
  - ▶ Positive: Bleakley and Cowan (2002), Luengnaruemitchai (2003);
  - ▶ **Negative:** Barajas et al. (2016), Endresz and Harasztosi (2014), Aguiar (2005), Pratap et al. (2003), Hardy (2018), Gilchrist and Sim (2007), Kim et al. (2015), Kesriyeli et al. (2011), Bonomo et al. (2003), Caballero (2018);
  - ▶ No effect: Alvarez and Hansen (2017), Kofanova et al. (2015);
- ▶ Competitiveness effect following depreciation:
  - ▶ **Small positive/ out-weighted by balance sheet effect:** Pratap et al. (2003), Endresz and Harasztosi (2014);
  - ▶ **Negative:** Agustinus (2017);
- ▶ Asymmetric effect of exchange rate changes:
  - ▶ Only/Stronger for depreciations: Cowan et al. (2011), Bonomo et al. (2003).

## Literature review - policies to attenuate the negative effects of dollarization/currency mismatches

- ▶ Higher interest rates during the crisis (Chițu, 2012);
- ▶ Limit the speculative currency position of banks prior to the crisis (Disyatat, 2001);
- ▶ Robust macro policies, independent monetary policy, macroprudential policies aimed at limiting currency mismatches and a more flexible exchange rate (Kesriyeli et al., 2011; Rennhack and Nozaki, 2006; Levy Yeyati, 2005);
- ▶ Macroprudential policies (Brown et al., 2010; Goldstein and Turner, 2004, Allen et al. 2002).

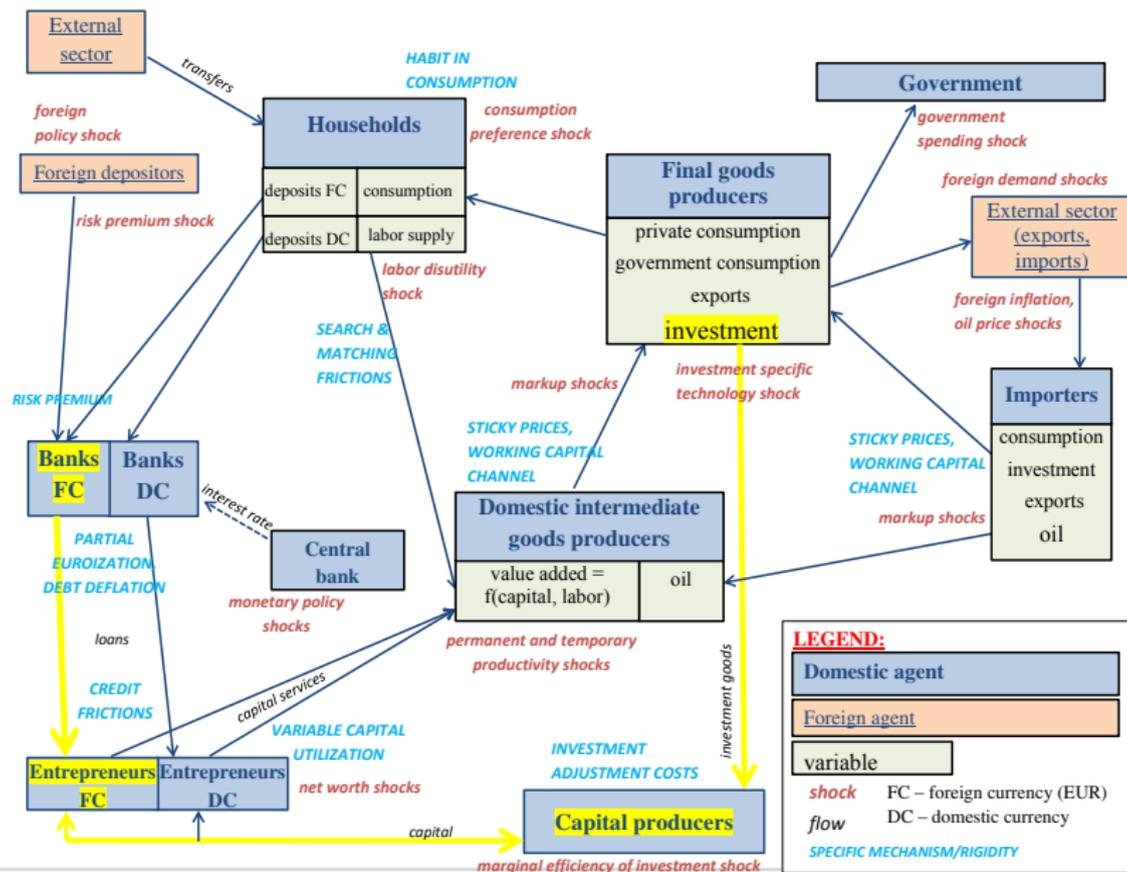
## Literature review - DSGE models with dollarization/currency mismatches

- ▶ Financial accelerator framework a la Bernanke et al. (1999) with full liability dollarization (in a SOE settings): **financial frictions in the presence of balance sheet effects magnify the real and financial volatility:**
  - ▶ Cespedes et al. (2004); Elekdag et al. (2005); Aysun and Honig (2011); Choi and Cook (2004); Aghion et al. (2004); Gertler et al. (2007);
- ▶ Other forms of partial dollarization:
  - ▶ Currency substitution (i.e. also real foreign currency balances yield utility) and price dollarization (i.e. some prices are set in foreign currency) - Castillo et al. (2006) ;
  - ▶ Financial (i.e. loans provided by households to firms in foreign currency) and real (i.e. some prices are set in foreign currency) - Ize and Parrado (2006);
  - ▶ Banks face some adjustment/regulatory costs - Djukic et al. (2017).

# R.E.M. 2.0 - Romania's Economic Model

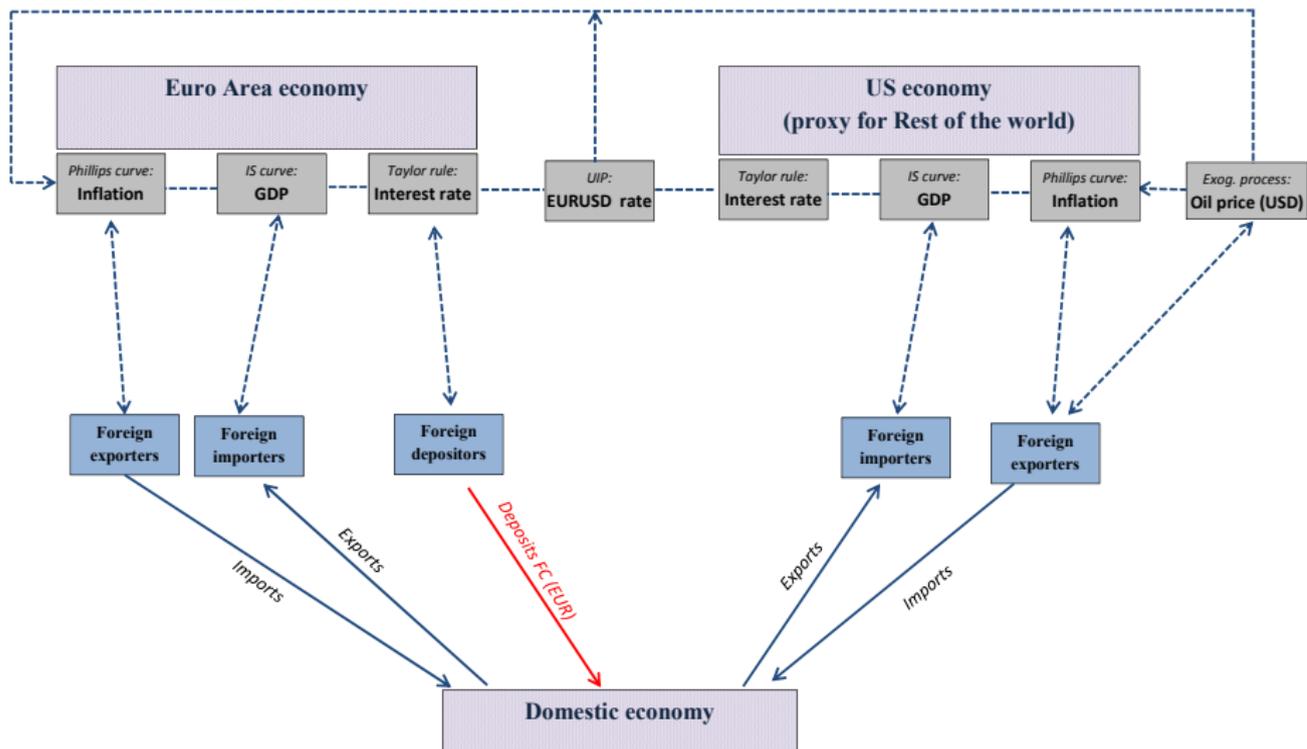
- ▶ **Christiano et al. (2011) - starting point:**
  - ▶ SOE New-Keynesian DSGE specific frictions
  - ▶ Financial accelerator (Bernanke et al., 1999)
  - ▶ Search and matching (Gertler et al., 2008)
- ▶ **Extensions - specific features of the Romanian economy:**
  - ▶ *Partial euroization - around 45% of new loans to non-financial corporations over the analyzed period;*
  - ▶ *Semi-structural, two open economies (Euro zone and US), model for the exogenous external block based on the currency invoice structure of Romania's external trade in goods and services;*
  - ▶ Oil as an input in the production of domestic intermediate goods;
  - ▶ Disaggregation of the CPI inflation rate;
  - ▶ National Accounts consistent measures for the real GDP and its deflator.

# The environment



# The environment: external block

Similar to Pedersen and Ravn (2013), Juillard et al. (2008)

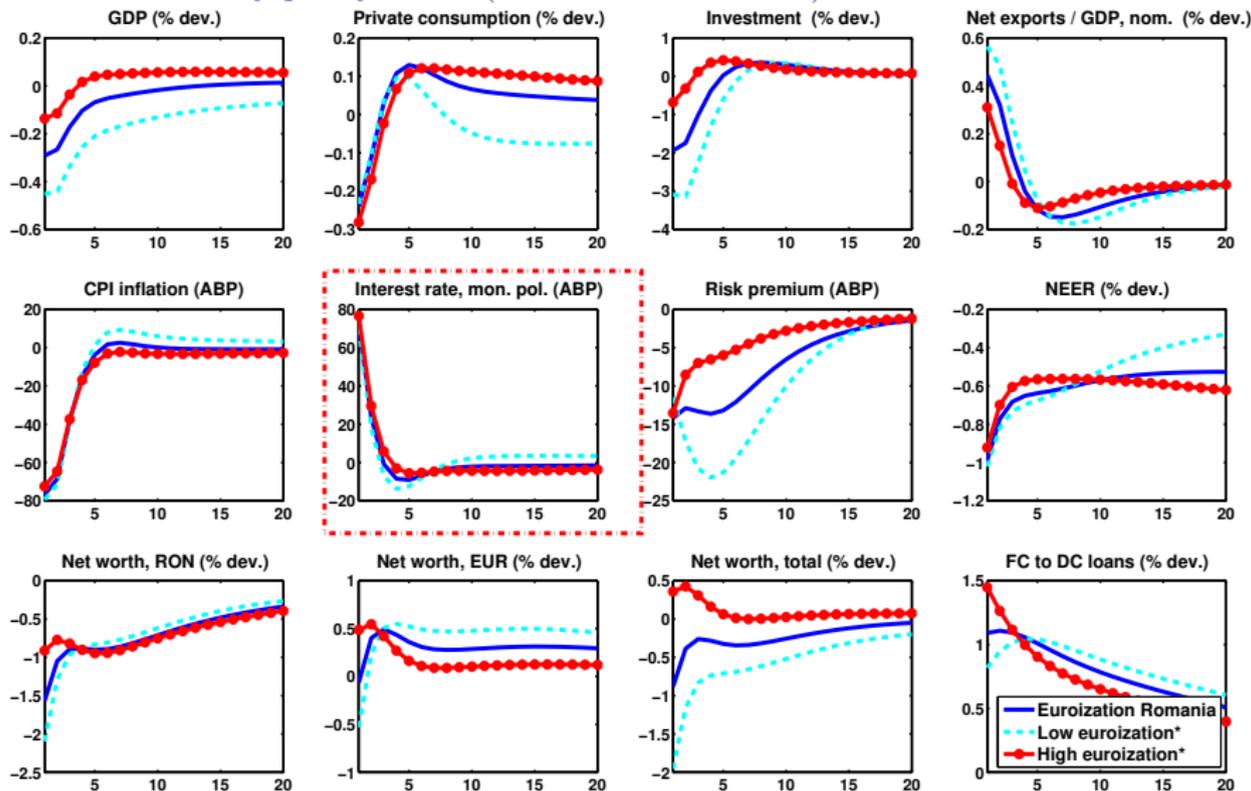


## Estimation

- ▶ **29 observable series (8 belonging to the external sector)**, most of them having excess trends/measurement errors;
- ▶ Initial sample: 2005Q3:2014Q3 (37 observations for each series);
- ▶ Different growth rates and high volatility;
- ▶ The semi-structural, exogenous, external sector model is estimated outside the core model using an extended sample;
- ▶ Calibration:
  - ▶ 7 parameters such that at the posterior steady-state 7 observable ratios to be matched exactly;
  - ▶ other parameters (mainly those that are not identified in the estimation process);
- ▶ Bayesian estimation:
  - ▶ posterior mode versus Metropolis-Hastings sampling from posterior distributions;
  - ▶ *endogenous priors*: enhanced consistency between data and model implied moments (i.e. standard deviation).

# The impact of domestic monetary policy

## Domestic monetary policy shock (1 standard deviation)

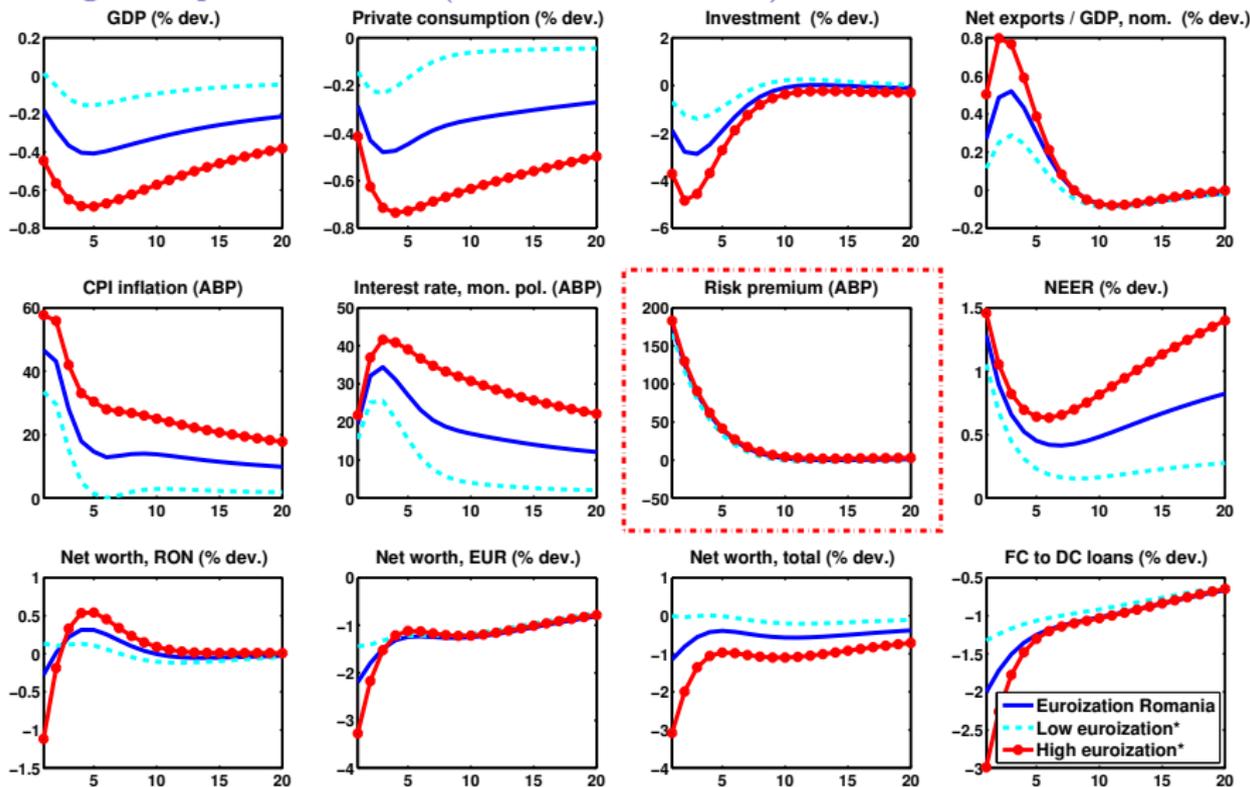


\* dev. – percentage deviation from steady state; lev. dev. – level deviation from steady state; ABP – annualized basis points;

\*By changing only the share of foreign currency financed entrepreneurs and keeping the rest of the parameter values from the baseline model estimated for Romania

# The impact of euroization

Sovereign risk premium shock (1 standard deviation)

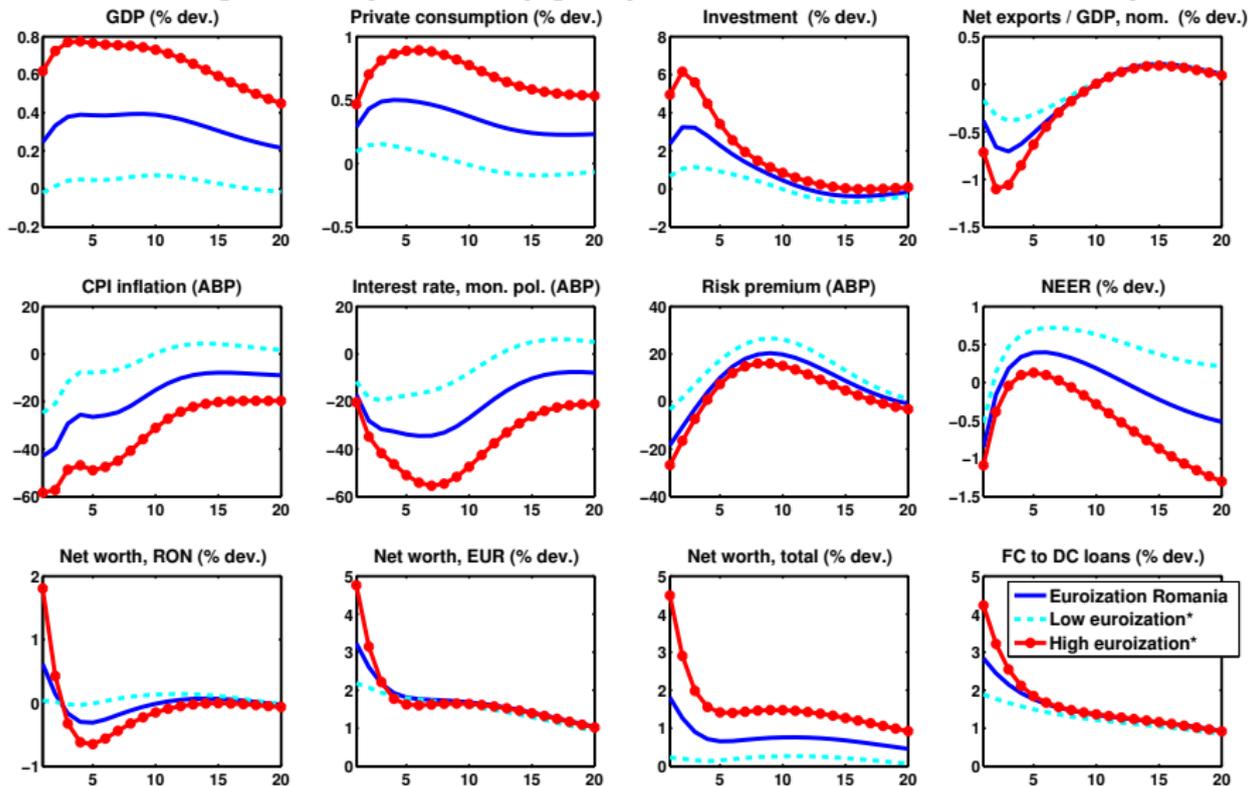


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# When ECB and FED move in opposite directions

Simultaneous expansionary monetary policy in Euro area and contractionary in US



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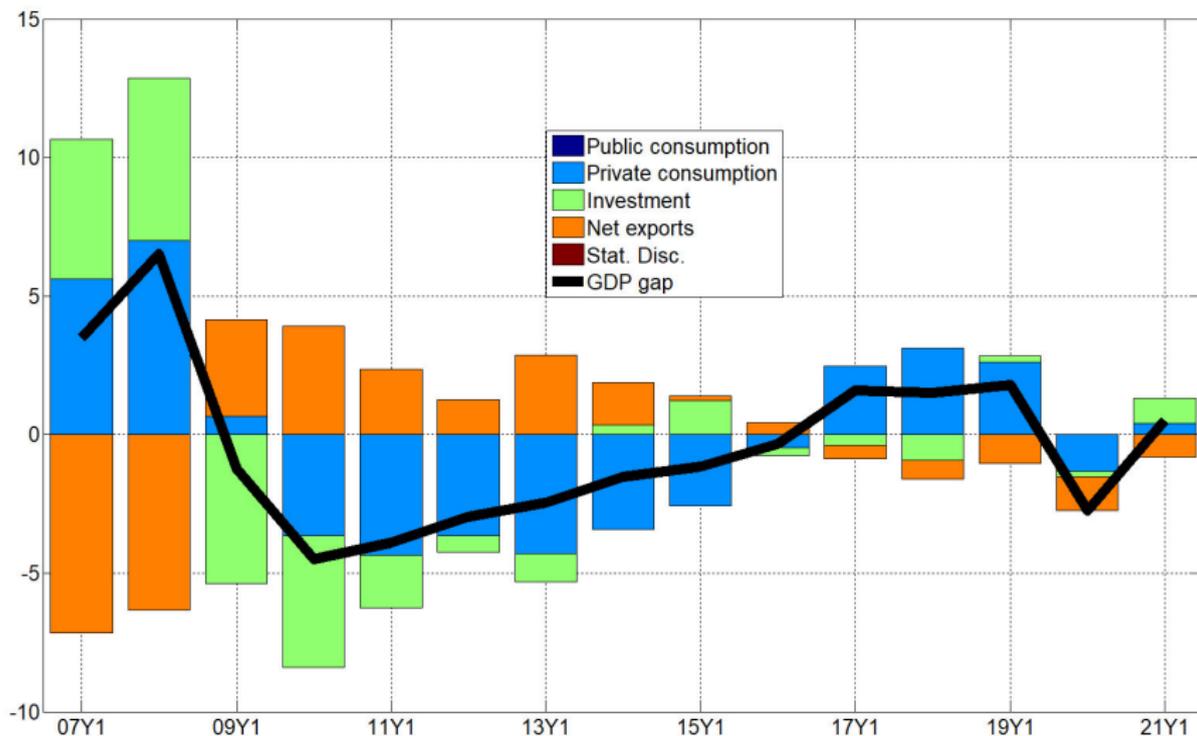
## Day-by-day usage

- ▶ Regular use as complementary tool for quarterly macroeconomic projections:
  - ▶ cross-checking results from main quarterly projection model (semi-structural); itemenriching forecast story with structural interpretation;
- ▶ codes transferred from DYNARE to IRIS - more flexibility;
- ▶ can be run by one person from the beginning to end;
- ▶ usually re-estimated annually, in the summer;
- ▶ detailed sectorial and technical reports; two-page summary distributed in the department;
- ▶ alternative and counterfactual scenarios;
- ▶ foreign variables, non-core CPI inflation measures, NTFs - similar with those on quarterly projection model;
- ▶ two-three pages box in the MPC forecasting report.

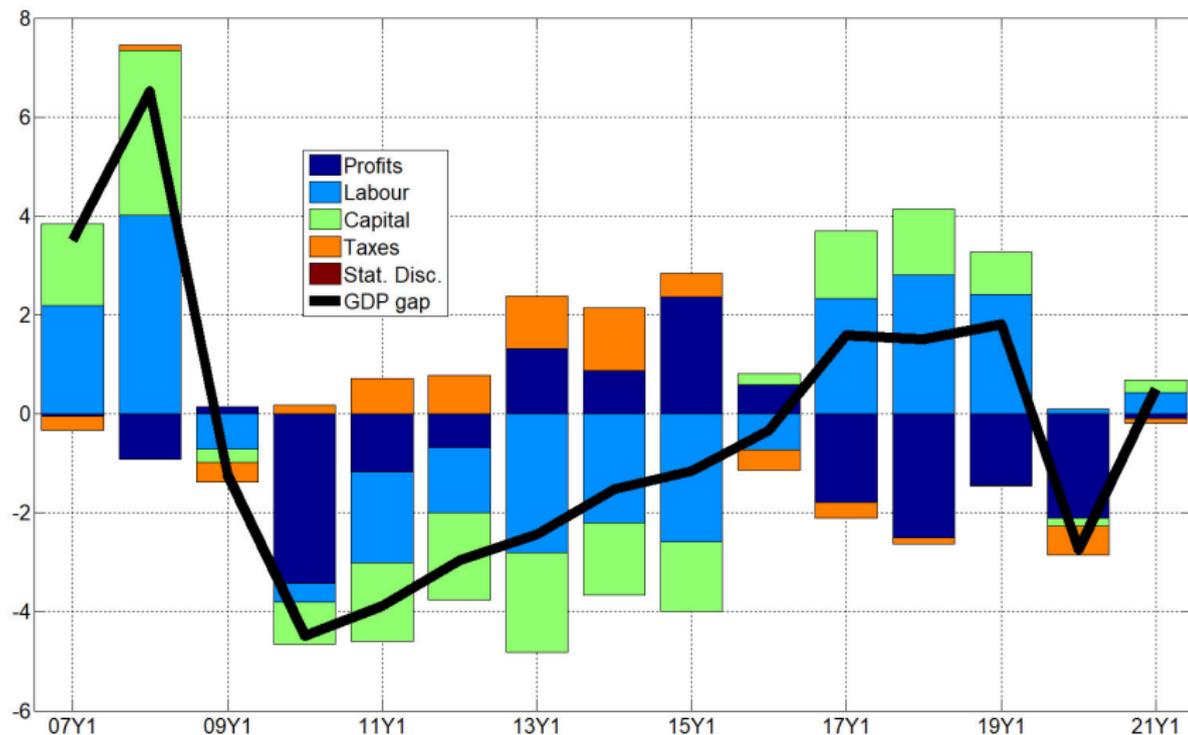
## Day-by-day usage

- ▶ changed in order to accommodate different ad-hoc issues (i.e. change in VAT, impact of agriculture);
- ▶ given also the set of observables, the output from the labour market is rather limited relative to its detailed derivation;
- ▶ doing good in terms of inflation forecasting relative to QPM, less in terms of GDP growth - low persistence to match the historical volatile data - relative fast convergence towards SS growth rate;
- ▶ limited (indirect) impact of oil price changes given modelling choice - should allow also for a direct impact by changing the production functions of final goods.

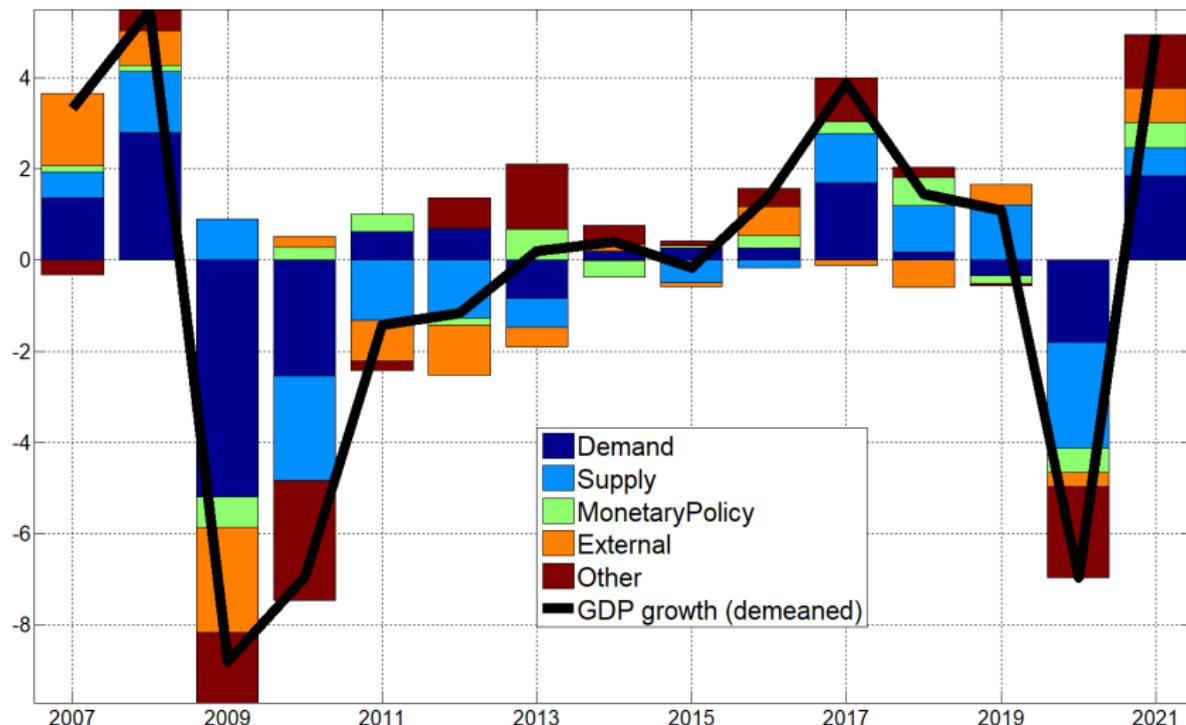
# Output gap - alternative decompositions



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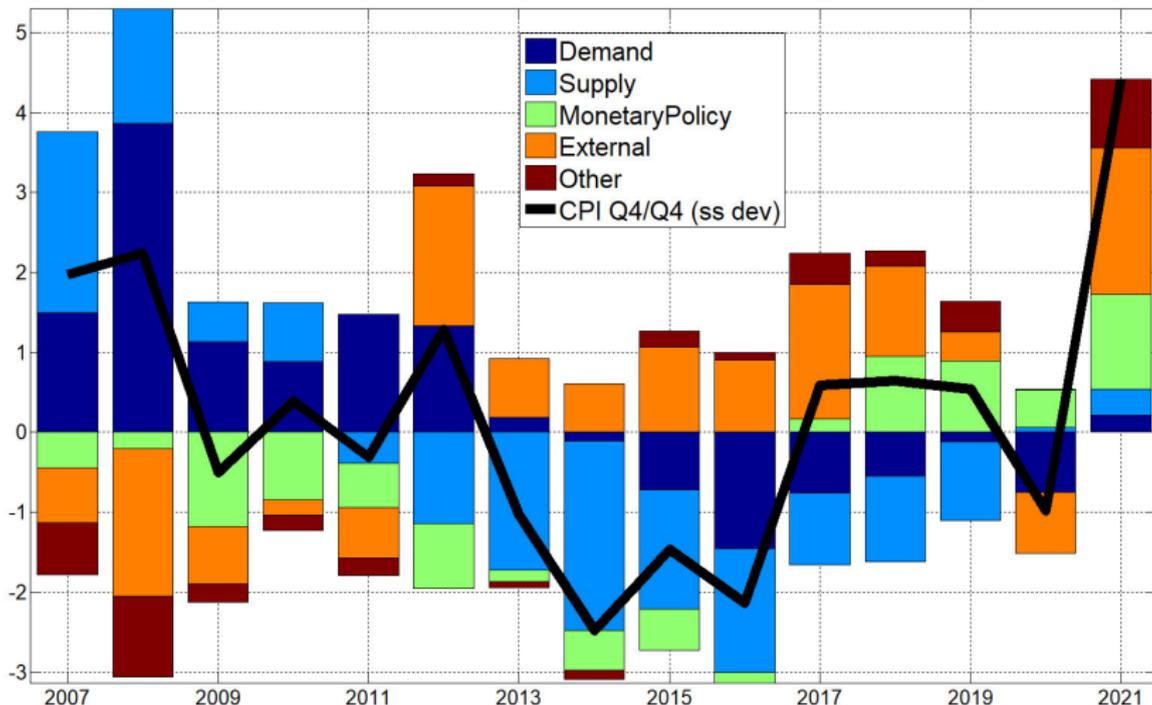


# Shock decompositions - useful for story telling



The category "Monetary policy" comprises domestic interest rate shocks. The category "External" captures shocks from the external sector - interest rate, prices and demand for the euro zone and USA, EURUSD and oil price-, mark-up shocks to export and import prices, and sovereign risk-premium shocks. The category "Demand" includes shocks to consumer preferences, net-worth and government spending, while "Supply" includes transitory and permanent technology shocks, labor disutility, marginal efficiency of investment, domestic and administered prices mark-up shocks. The category "Other" includes mostly measurement errors.

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## Conclusions

- ▶ Introducing partial euroization is important in explaining business cycle dynamics and volatility for Romania, with financial sector shocks playing an important role;
- ▶ A depreciation of the currency generates contractionary balance sheet effects that are increasing with the amount of foreign currency denominated loans to unhedged borrowers and dominating the positive effect on net exports. As a result GDP drops;
- ▶ Divergent monetary policies in advanced economies may have net positive effects in terms of output, depending on the degree of euroization for CEE economies;
- ▶ The relevance of the euroization channel and resulting the less efficient domestic monetary policy highlights the need for properly designed/targeted macroprudential policies.

