EUROPEAN CENTRAL BANK
EUROSYSTEM

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European Central Bank

Scenario Analysis and Risk Assessment

Discussion (M. Del Negro and A. Lehnert)

First annual Atlanta – New York Feds Joint Research Day on Quantitative Tools for Monitoring Macroeconomic and Financial Conditions

22 February 2019

The views expressed are my own and do not necessarily reflect the views of the ECB or the ESCB.

Outline

I. Scenario analysis and risk assessment at the ECB

- *Quantitative Risk Assessment: Narrative-based and judgemental*
- *Model-based scenario analysis*
- *Balance of risk indicators: Model and survey-based*
- *Quantile vector autoregressions*

II. Comments on “Building the NY Fed Staff Forecast Distribution” - Del Negro

- *Impressive use of modern empirical tools*

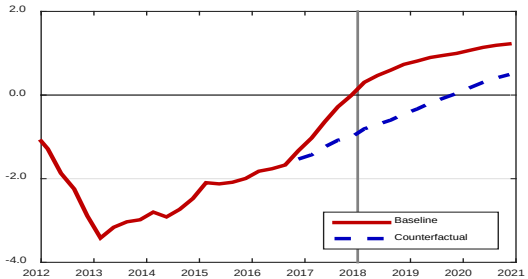
III. Comments on “Stress Testing and Financial Stability” - Lehnert

- *Challenges for **macroprudential** stress testing*

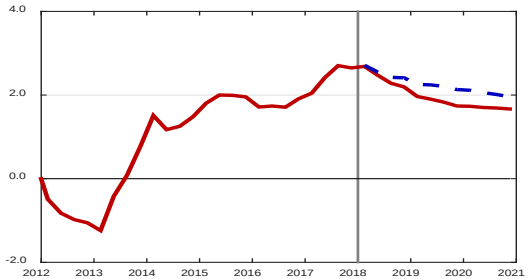
I.2. Scenario analysis: Misperception of the output gap (using NAWM)

- Effects of misperceiving the size of the output gap by -1 pp linked to upward revisions in the level of potential output

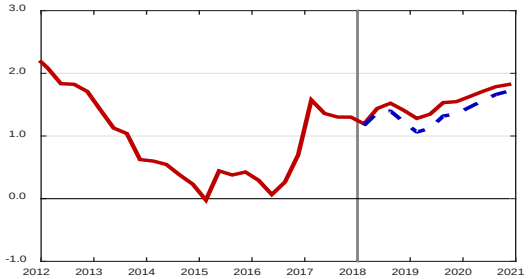
Output gap
(as a percentage of potential output)



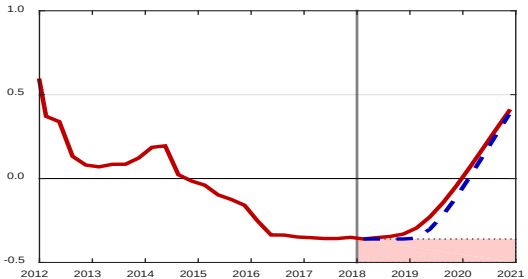
Real GDP growth
(annual rates, as a percentage)



Consumer price inflation
(annual rates, as a percentage)



Short-term nominal interest rate
(annualised rates, as a percentage)

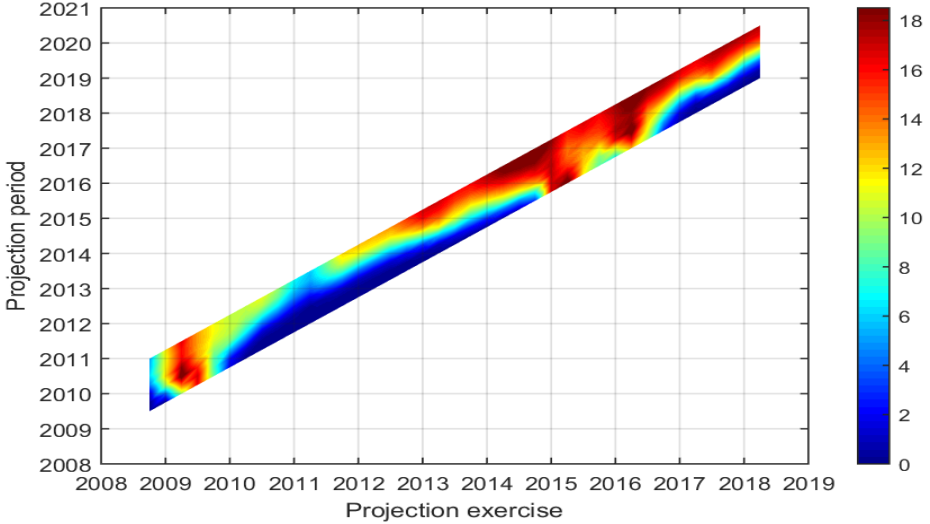


Note: Counterfactual simulation based on the NAWM. The vertical lines in the panels of the chart indicate the beginning of the March 2018 MPE horizon. At the start of the simulation, the historical output gap is initially 1.0 percentage point lower than the output gap in the baseline, reflecting upward revisions of potential output over the historical sample.

I.3. Colour-maps of NAWM-based deflation and excess inflation risks

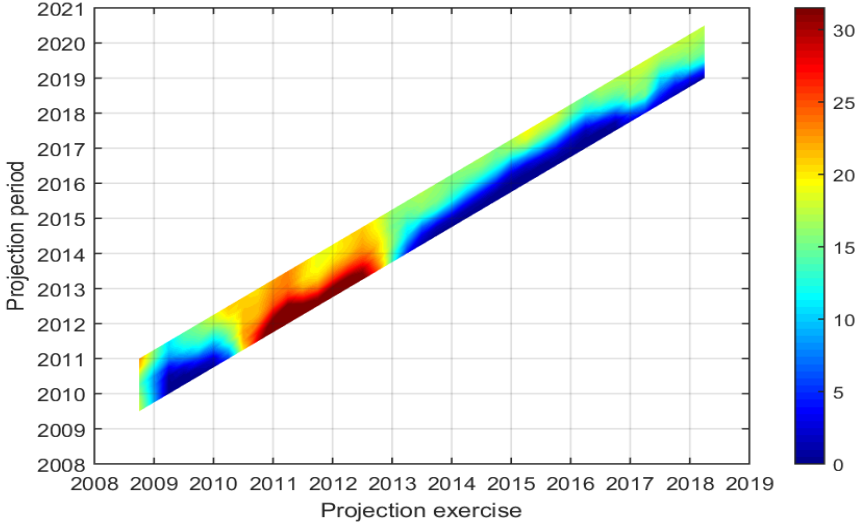
Deflation risk

(percent of times annual inflation below zero for at least 4 quarters)



Excess inflation risk

(percent of times annual inflation above 2% for at least 4 quarters)



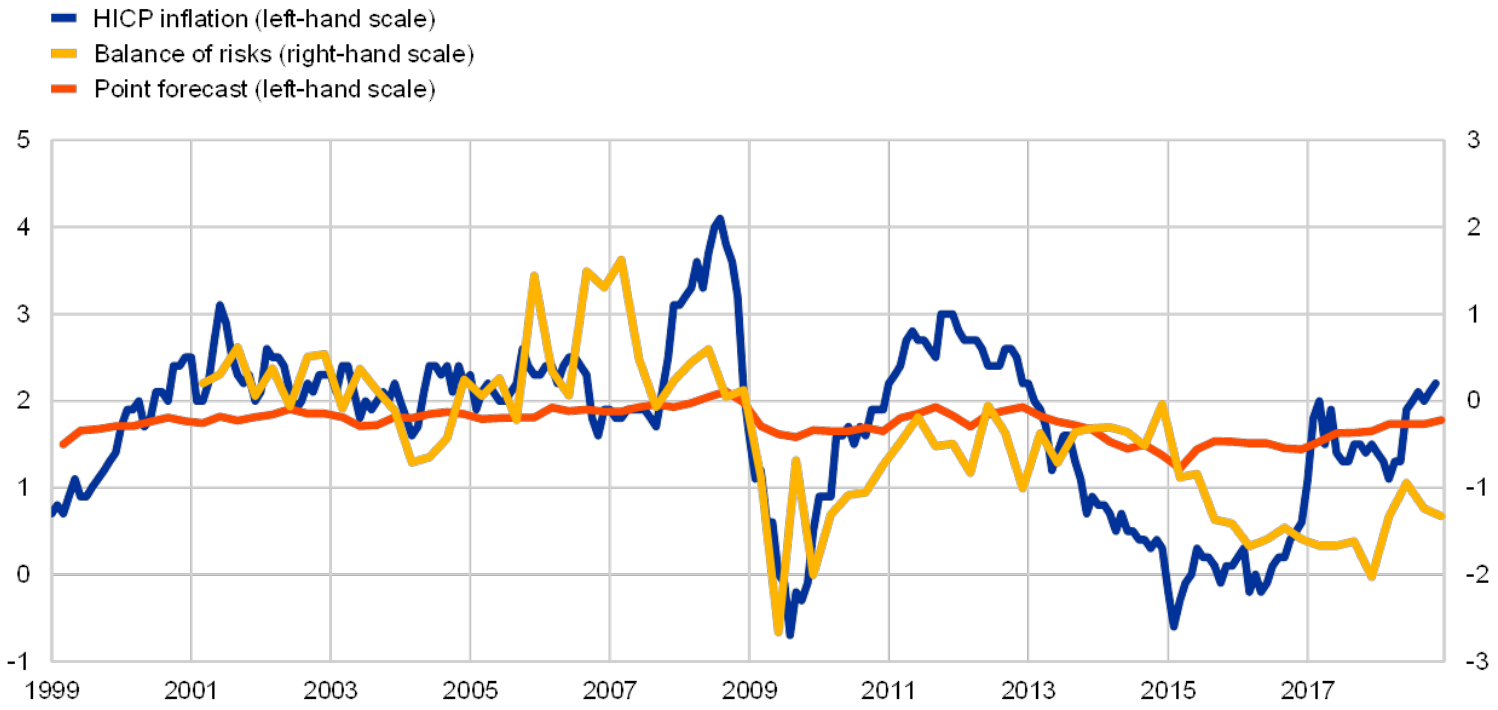
Sources: ECB projections database. NAWM. Coenen et al (2017)

Notes: The upper limit of each colour-map is computed as 4 times the standard deviation of the time series of the average probability for each projection exercise since the Dec. '08 BMPE in percent, while the lower limit is zero percent. The (average) steady-state probability of deflation over an initial 9-quarter horizon is 1.3%, while the corresponding probability of excess inflation is 29.3%..

I.3. Balance of risks from survey expectations

HICP inflation, two-year-ahead point forecasts and balance of risks

(left-hand scale: annual percentage changes; right-hand scale: balance of risks indicator)



Sources: SPF and ECB staff calculations.

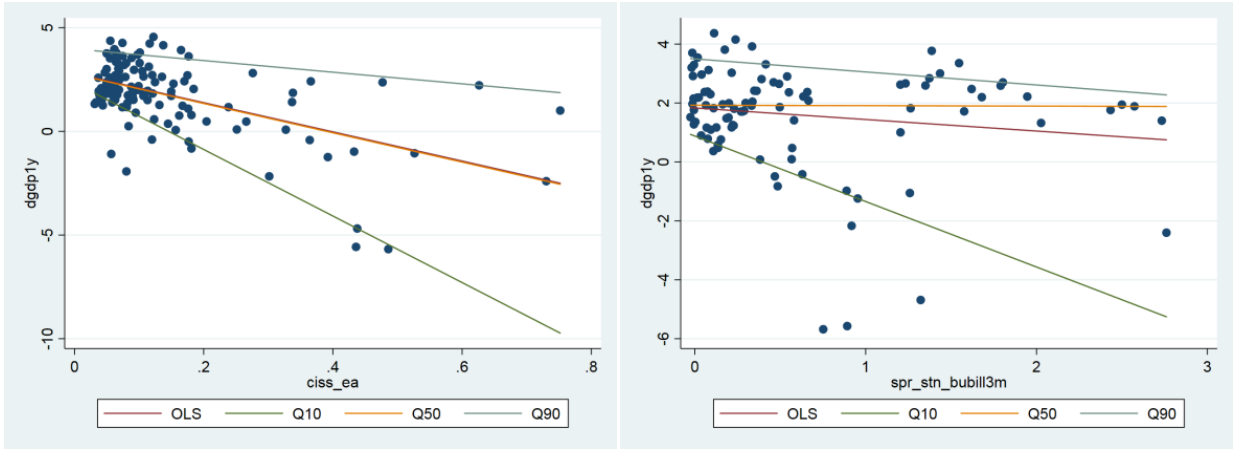
Note: Positive values of the balance of risks indicator denote that the balance of risks is tilted towards higher inflation outcomes, while negative values denote that the balance of risks is tilted towards lower outcomes.

I.4. Vulnerable growth: quantile regressions

- Adrian et al. (2018) vulnerable growth analysis applies also to the euro area (Figueres and Jarocinski)
- Certain financial stress measures are particularly informative about the lower quantiles of future output growth – also in the euro area.

CISS
(Composite Index of Systemic Stress)

TED spread
(Euribor – BuBill, 3m)

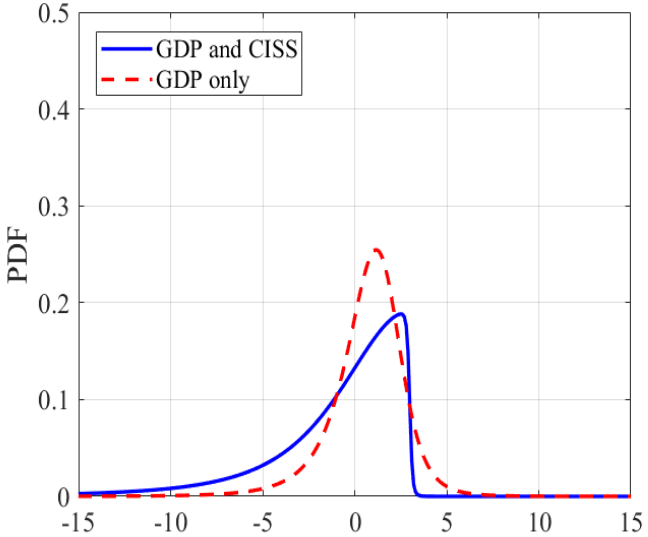


Source: ECB staff calculation (Figueres and Jarociński)
Notes: Univariate quantile regressions of one-year-ahead real GDP growth on CISS (left panel) and TED spread (right panel).

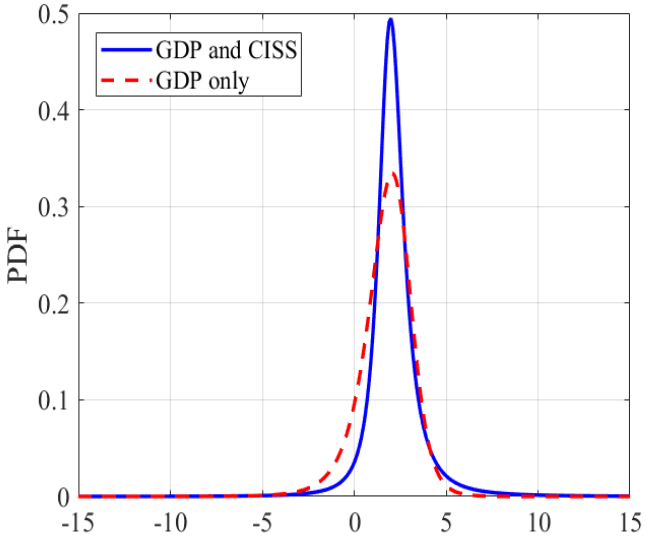
I.4. Non-gaussian predictive distributions fitted to quantile regressions

- In particular, the Composite Index of Systemic Stress (CISS, Hollo et al. 2010, ECB) implies a fat lower tail in 2012.

Growth in 2012
conditional on 2011Q4, in %



Growth in 2019
conditional on 2018Q4, in %



Source: ECB staff calculation (Figueres and Jarociński)
Notes: Estimated one-year-ahead conditional distribution of real GDP growth based on bivariate quantiles regressions with the following conditioning variables: current real GDP growth and CISS (blue solid line); and current real GDP growth only (red dashed line).

Chavleishvili and Manganelli (2019)

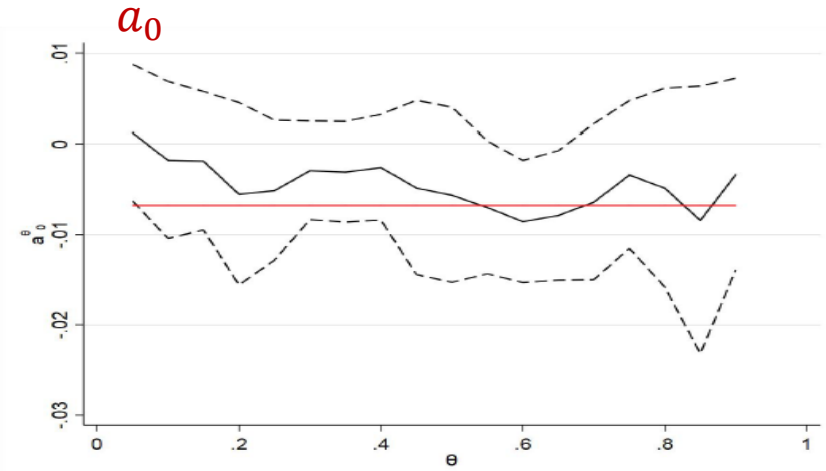
Quantile VAR:

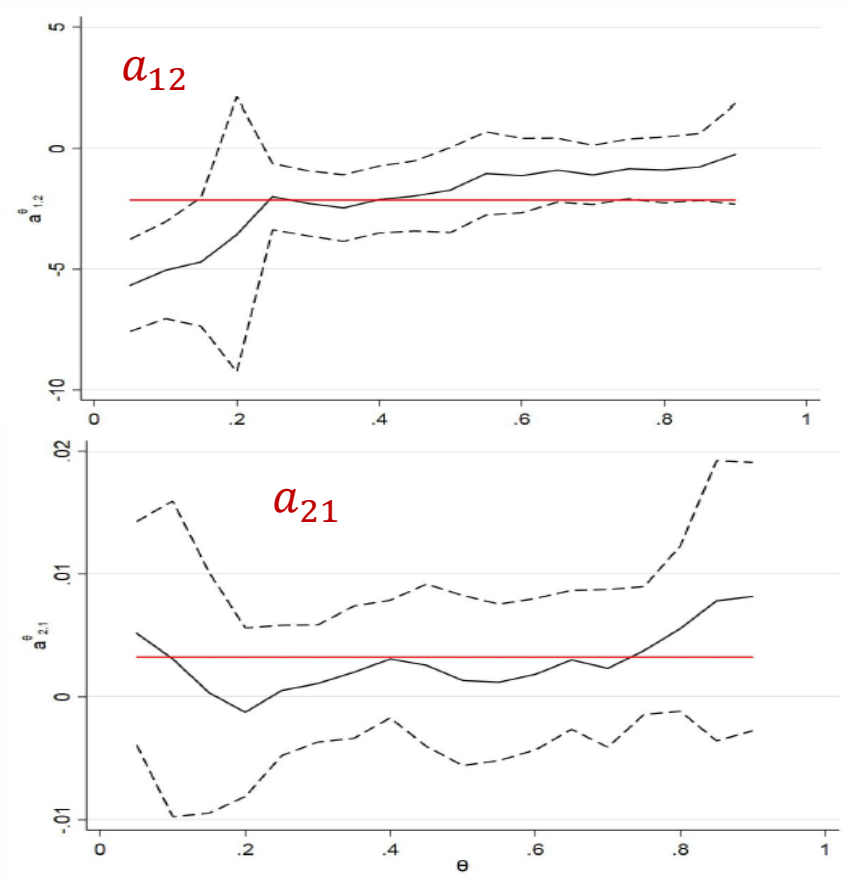
$$Y_{1,t+1} = \omega_1 + a_{11}Y_{1,t} + a_{12}Y_{2,t} + \varepsilon_{1,t+1}$$
$$Y_{2,t+1} = \omega_2 + a_0 Y_{1,t+1} + a_{21}Y_{1,t} + a_{22}Y_{2,t} + \varepsilon_{2,t+1}$$

Testing the presence of real-financial linkages:

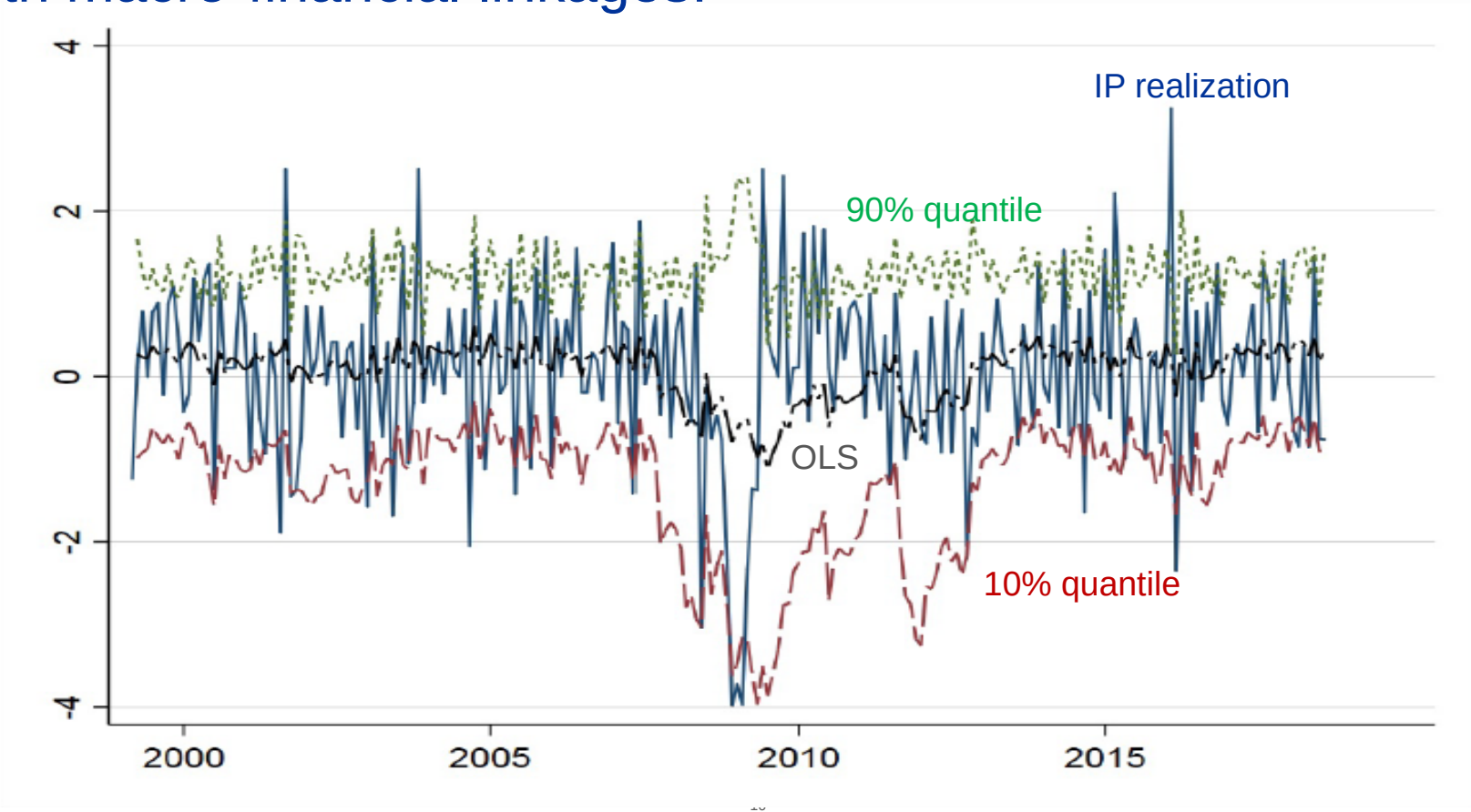
$$H_0: a_{12} = a_0 = a_{21} = 0$$

Forecasting and stress testing with quantile vector autoregression

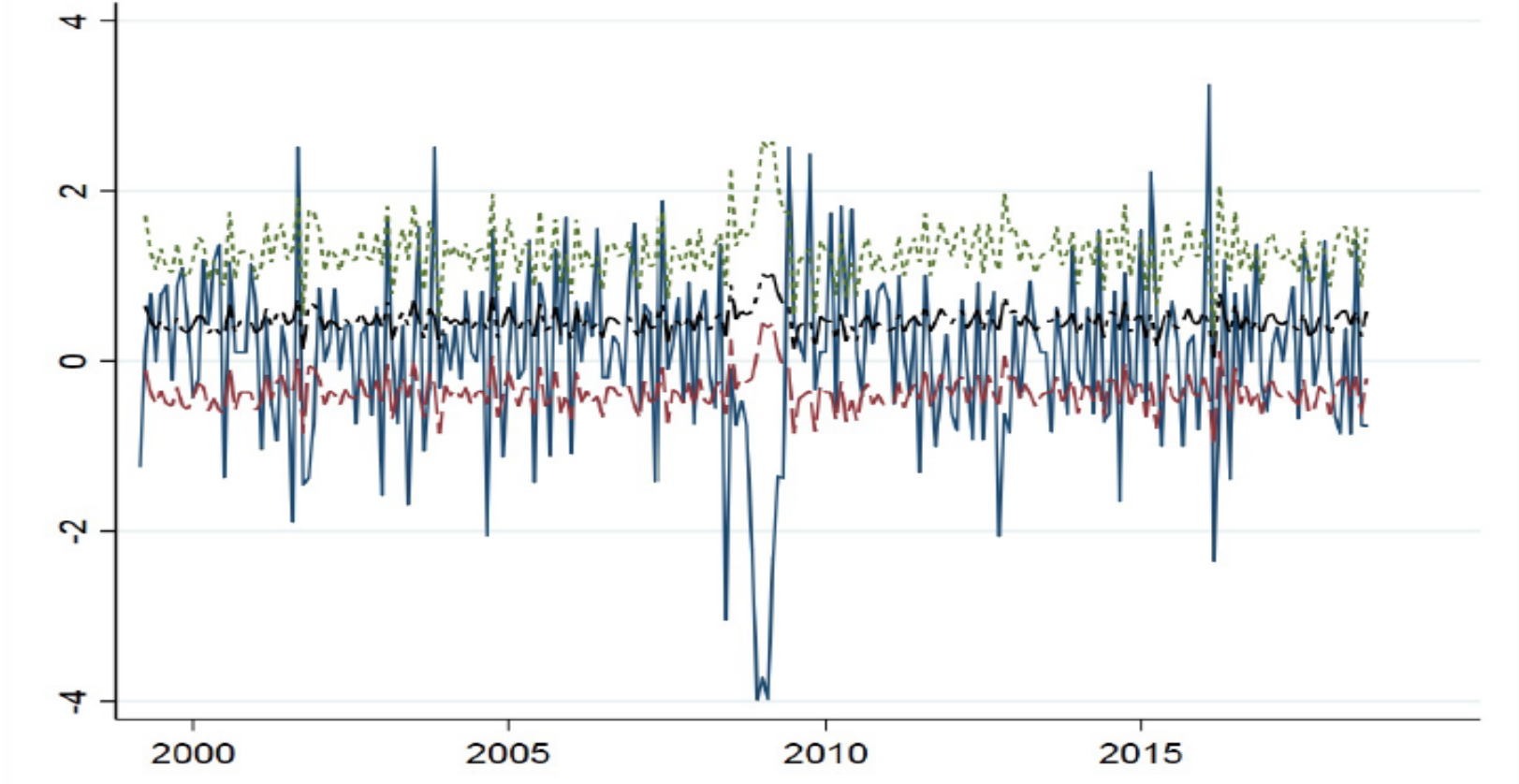




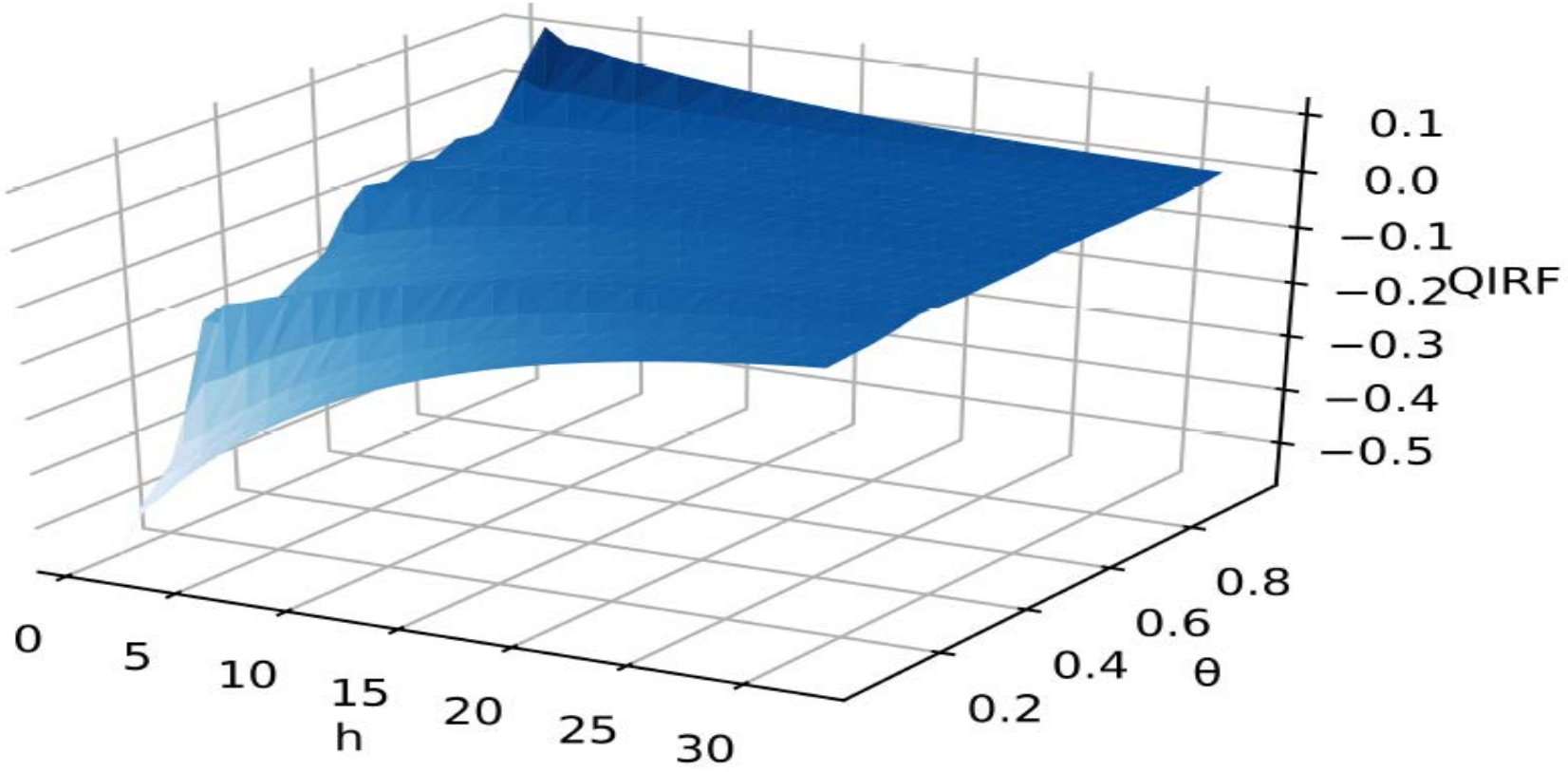
With macro-financial linkages:



Without macro-financial linkages:



Shock to CISS



Very impressive and smart combination of state-of-the-art empirical models

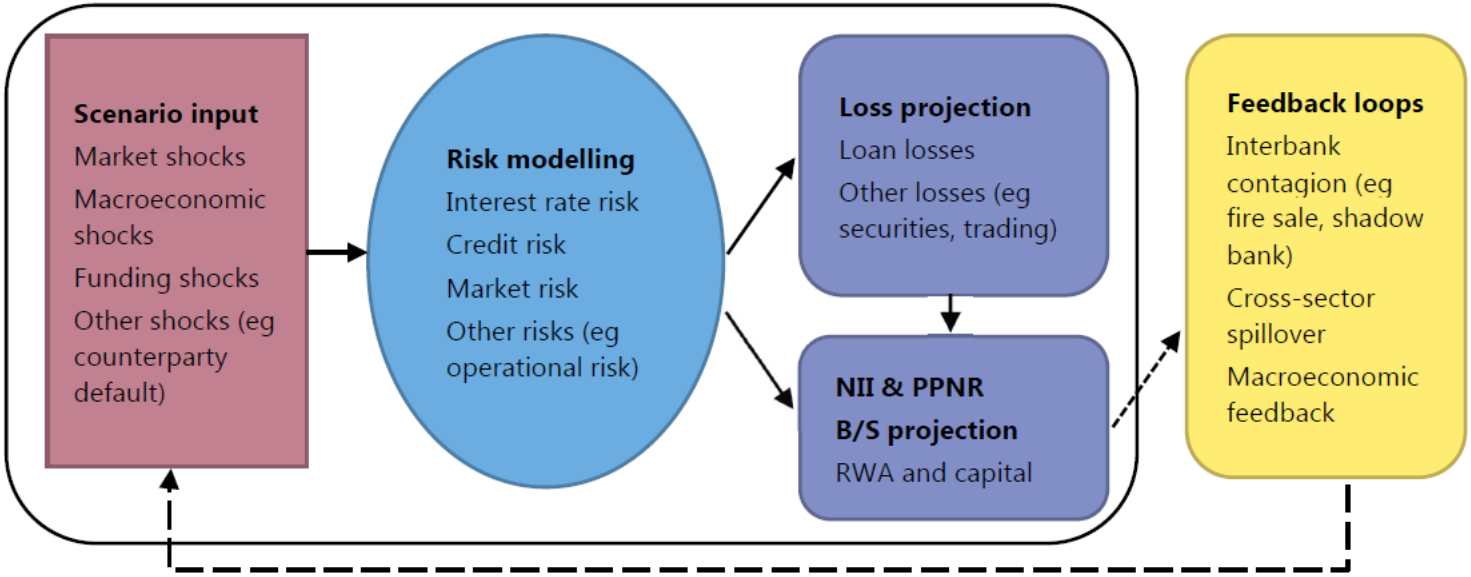
Consistency across BVAR and DSGE tools?

- *Empirical BVAR approaches help put numbers behind a narrative risk event (e.g a rise in corporate spreads)*
- *Empirical DSGE models help to tease out a structural interpretation and the associated policy implications*
- *Check consistency between judgemental and model-based narrative?*

How to combine multiple forecast distributions?

- *Optimal combination of density forecasts: Geweke and Amisano (2011), McAllin, West et al. (2017).*
- *Exponential tilting (e.g. Altavilla et al. 2017): Central tendency from one model, tails from another model.*

Figure 1: Major modelling steps in a solvency stress test



NII = net interest income; PPNR = pre-provision net revenue; B/S = balance sheet; RWA = risk-weighted asset.

Source: FSI staff.

Source: Baudino, Goetschmann, Henry, Tanigushi and Zhu (2018), “Stress-testing banks: A comparative analysis”, FSI Insights 12:

Financial stability stress testing methodologies are still in their infancy

- *Macroeconomic and market scenario is often the start and the end point (baseline and adverse scenario)*
- *Little stochastics or acknowledgement of model uncertainty*
- *Simple assumed behaviour of banks (e.g. static versus dynamic approach)*
- *Often focus on solvency (capital requirements); much less on liquidity and the solvency/liquidity interaction which turned out to be key in the GFC*
- *Real-financial interactions are often not considered (no second round)*
- *Focus on banking sector, much less on financial intermediation is rising*

Still too much focus on a micro versus macro prudential approach
Policy response is not included
Need a lot of research to integrate the micro and macro perspective
Is challenging because need to integrate micro heterogeneity and non-linearities