Eurosystem model development needs – themes and priorities

SUERF Online Workshop

“Macroeconomic models for monetary policy: State of play and way forward”

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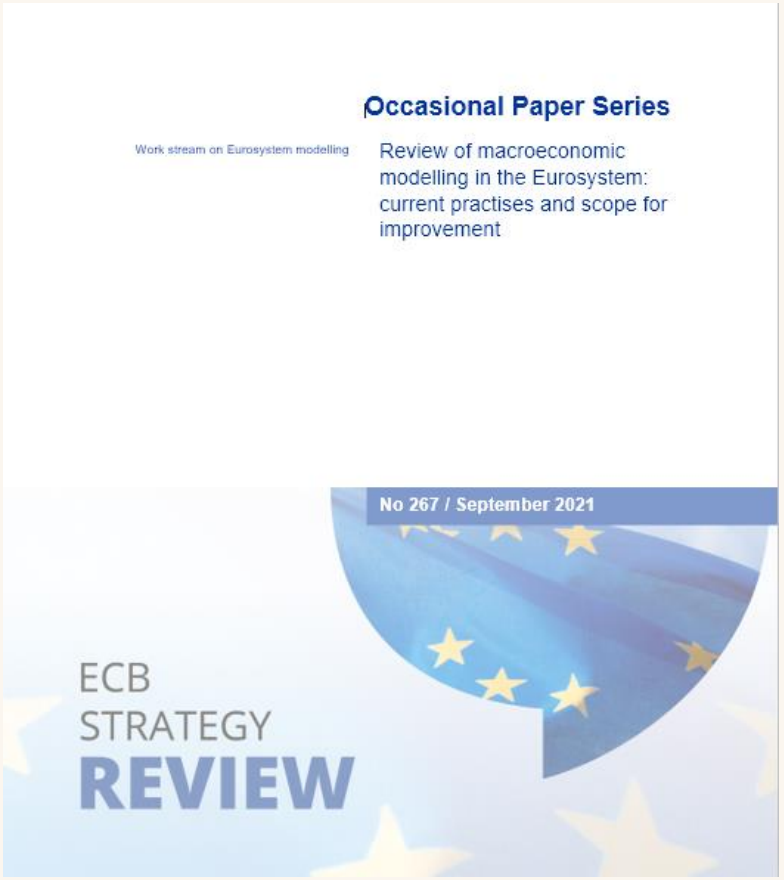
Introduction

- Presentation is based on Section 4 of the ECB Occasional Paper No. 267 "*the Review of macroeconomic modelling in the Eurosystem: current practises and scope for improvement*"

- Section 4: Assessment of analytical gaps and associated development needs of ESCB macroeconomic models



Eurosystem macroeconomic modelling is based on suite of modelling strategy

- Projections: typically large semi-structural models
- Scenario/policy analysis: structural (DSGE) models
- Satellite models: short-term forecasting

	Projections	Monetary policy simulations	Other policy use
Geographic coverage	Country-specific Euro area (ECB)	Country-specific Euro area Global	Country-specific Euro area Global
Structural (DSGE)	Macroeconomic models regularly used to build the (B)MPE baseline	Macroeconomic models regularly used to assess the ECB monetary stance and effects	Macroeconomic models regularly used for other policy purposes (e.g. fiscal or global scenarios)
Semi-structural			
Time-series			

These models are routinely used as analytical frameworks for building baseline projections and for supporting the preparation of monetary policy decisions.

Gaps in analytical frameworks – key topics

- Long term trends
- Monetary policy transmission (MPT)
- Interactions with financial and fiscal policies
- Climate change
- Large shocks and uncertainty: lessons from COVID-19 pandemic
- Global factors and international spillovers

More specific topics

- Long term trends: Measurement issues, drivers of long-term growth, natural rate of interest
- MPT: Expectation formation, non-standard measures, non-linearities, heterogeneity,
- Interactions: financial frictions, banking, macropru, mon-fiscal interaction, fiscal multipliers
- Climate change: Climate, policies, Transition risks, difference modelling approaches, implications for monetary policy
- Large shocks: Empirical approaches to deal with large shocks, Covid-19 experiences,
- Global factors: international spillovers, role of global factors in the euro area growth and inflation

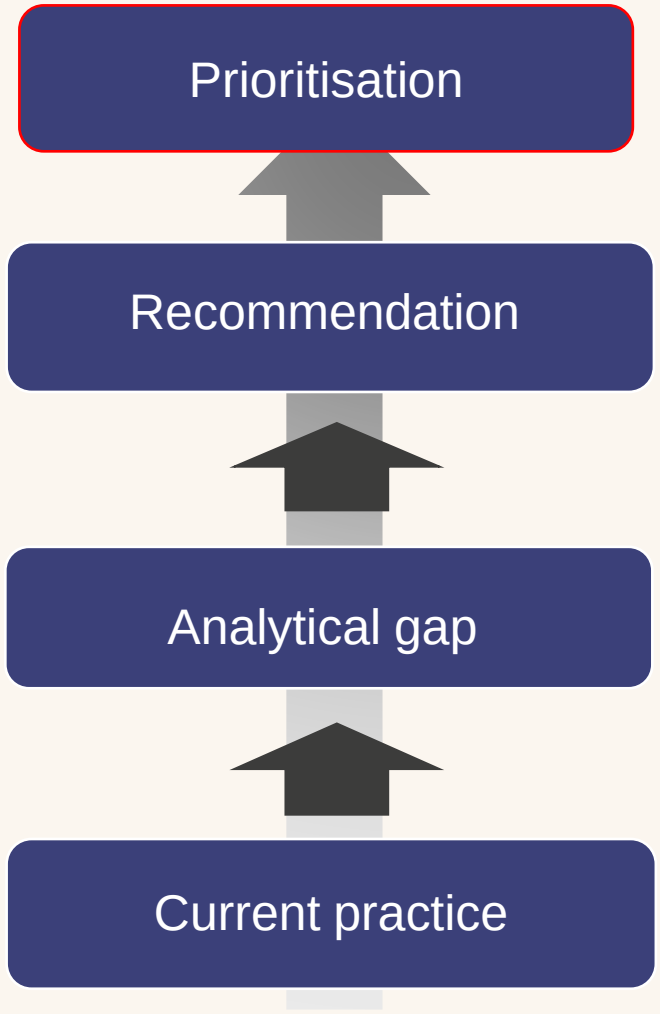
Gaps in analytical frameworks – Priorities

- After identifying these key topics, we provide a list of priorities, actions and literature benchmarks with respect to
  - *adapting current semi-structural and structural models and,*
  - *development of new models*

Model development needs: assessment roadmap

Analytical gaps

- Long-term trends
- Monetary policy transmission
  - ✓expectations
  - ✓NSM
  - ✓Non-linearities
  - ✓Heterogeneity
- Interactions with Fiscal and Financial policies
- Climate change
- Large shocks and uncertainty



- ✓ Assessment differentiated across projection models and other models
- ✓ Distance to the academic frontier internalizes the technical feasibility constraints
- ✓ Recommendation are suggestions for model development with varying time horizon, flagging the most relevant academic reference and institutional example if available
- ✓ Prioritisation scoring:

(distance-to-frontier) * (policy-impact)

(feasibility-constraints) * (resource-cost)

Indicative first and second ranked priorities

Semi-structural models

Analytical gaps	Action	Benchmark
Long-term trends	✓ Include a relevant role for long-term trends, at least as exogenous variables, notably related to i) growth determinants ii) the natural rate	Academic: Primiceri (2005), Laubach and Williams (2003)
Monetary Policy Transmission	✓ Include either model-consistent expectations, VAR-based expectations or a mix of both types of expectations ✓ Account for the relevant transmission channels of Non-standard measures, notably via expectations or the financial sector	Best practices among the Eurosystem FORE taskforce; Eurosystem research
Interactions with Fiscal and Financial policies	✓ Account for the relevant granularity of (new) fiscal instruments (e.g. related to Covid-19 and climate change) ✓ Adapt for a realistic design of financial intermediation	Best practices among the Eurosystem
Climate change	✓ Introduce relevant climate change-related specific transmission channels at business cycle frequency: sectoral dimension (with specific energy sectors), transition policy instruments	NIESR

Structural models

Indicative first and second ranked priorities

Analytical gaps	Recommendation	Benchmark
Long-term trends	✓ Include a relevant role for exogenous long-term trends and account for their time-variation: i) potential growth drivers, ii) the natural rate	Academic: Canova (2014) Eurosystem research
Monetary policy transmission	✓ Allow for simulation modalities and/or estimation under learning mechanisms or imperfect common knowledge assumptions	WGEM Expert Group on expectation formation; Eurosystem research
	✓ Focus on the complementarities across instruments and side effects across different NSMs, and empirical validation of their transmission channels	FORE taskforce; Eurosystem research
MTM and non-linearities	✓ Use advanced computational methods to account for non-linearities	Academic: Guerrieri and Iacoviello (2015), Linde et al. (2016)

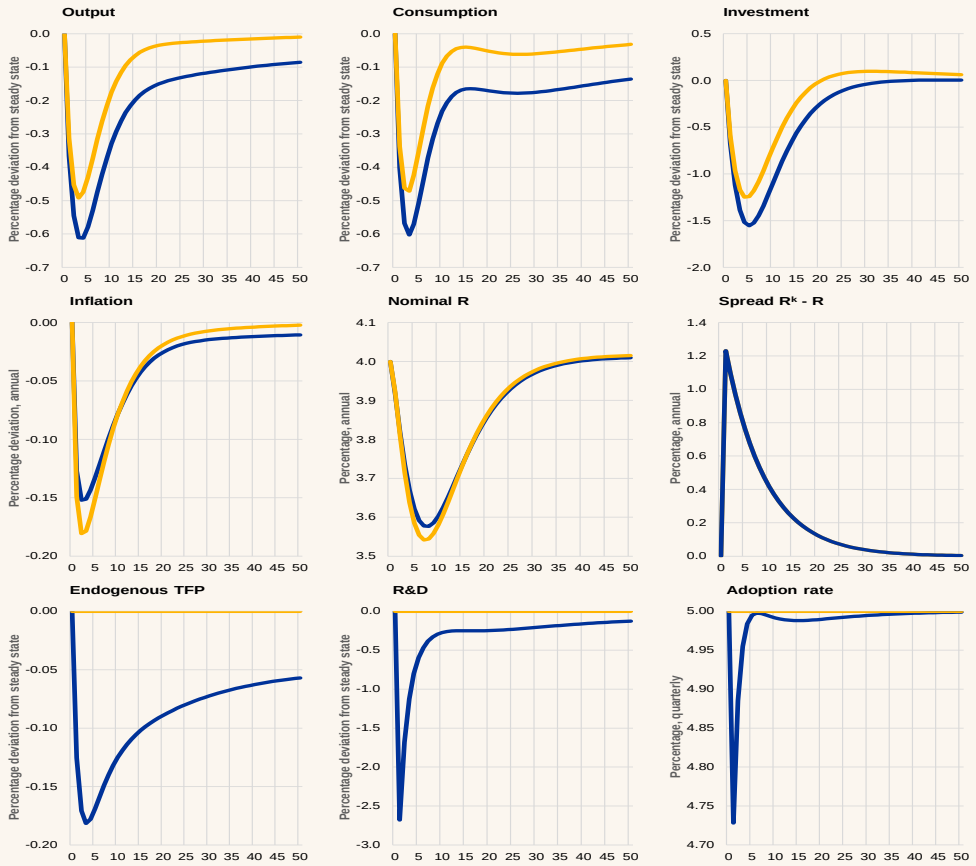
Indicative first and second ranked priorities

Development of new models

Analytical gaps	Actions	Benchmark
Monetary policy Transmission	✓ Focus on households and labour market heterogeneity and empirical validation of models, such as HANK.	Academic: Kaplan et al. (2018), Auclert et al. (2020); Eurosystem research
Monetary policy transmission	✓ New macro-financial models focusing on NSM cost-benefits, related non-linearities in MTM and interactions with MaPru ✓ Explore other non-linearities (i.e. Labour market, price-setting)	Academic: Adrian et al (2020,2021); Eurosystem research
Climate change	✓ Develop Satellite DSGE models: emphasize the specification of the energy sector, the microfoundations of the relevant externalities, the nature of disturbances, the global dimension, and the role of mitigation policies	Findings of the Climate change workstream

Some examples

Long term issues, endogenous TFP

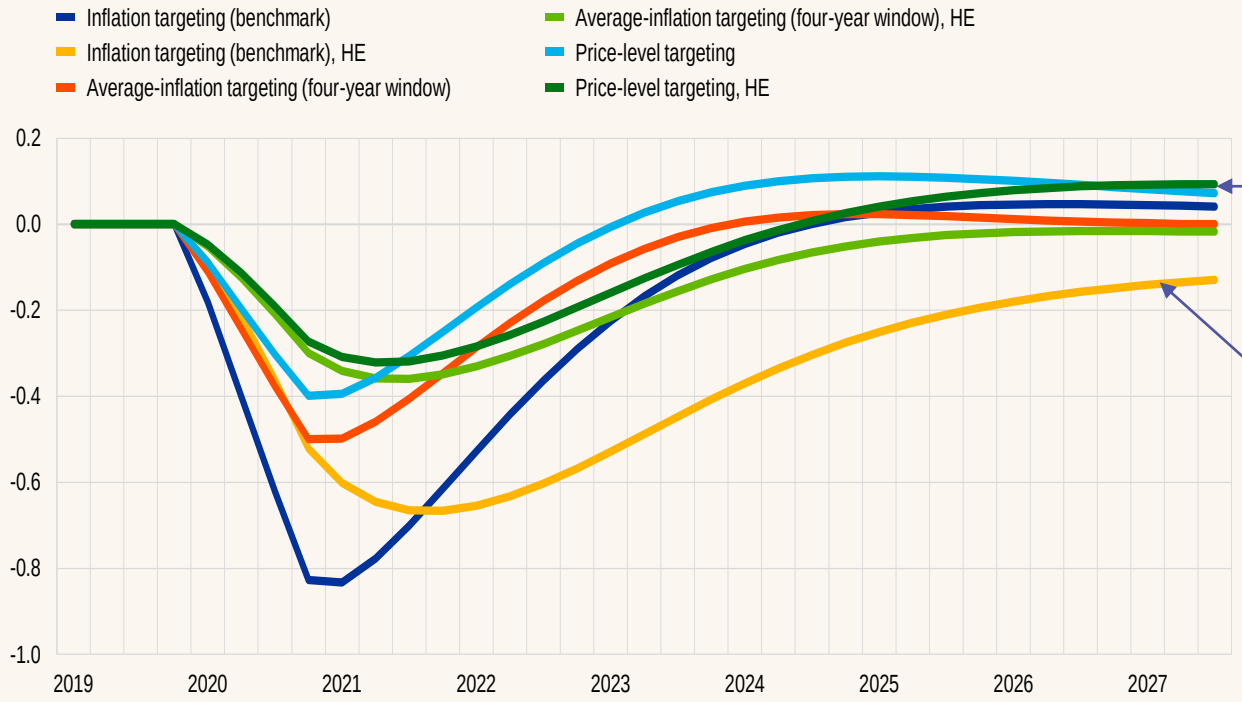


Source: Elfsbacka Schmöller and Spitzer, 2021.
Note: Impulse response to a one standard deviation liquidity demand shock.

- What if TFP is not only driven by technology shocks, but is also subject to endogenous fluctuations in the spirit of endogenous growth theory?
  - *A substantially higher degree of business cycle persistence, with a more pronounced and long-lasting effects of demand shocks to key economic variables relative to the exogenous TFP setting*
  - *There is a spillover from weak aggregate demand to technology growth, which is absent in standard macroeconomic frameworks*
- These hysteresis effects are substantially amplified (but not shown here) if monetary policy at ZLB

Monetary policy transmission, strategies and expectations

Impact of an adverse demand shock on HICP inflation under different monetary policy strategies



Source: ECB calculations based on NAWM.
Notes: The chart shows the marginal impact on annual inflation of a negative demand shock around the December 2019 BMPE extended baseline (MTRS). The model is simulated under rational and hybrid expectations, and takes into account an ELB set to -0.5%

- What if agents do not have fully forward looking expectations (RE) and monetary policy strategies differ?

- *Make-up strategies such as average inflation targeting or price level targeting can effectively mitigate the negative impact due to the expected reversal in future inflation.*

- *Partly backward looking expectations prolong the impact of negative demand shock on inflation under all monetary policy strategies*

Thank you!

Additional slides

Semi-structural models

Indicative first and second ranked priorities

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Monetary Policy Transmission	✓ Include either model-consistent expectations, VAR-based expectations or a mix of both types of expectations	Best practices among the Eurosystem
MTM and NSM	✓ Account for the relevant transmission channels of NSMs, notably via expectations or the financial sector	FORE taskforce; Eurosystem research
MTM and non-linearities	✓ Non-linear specifications of selected issues (e.g. price setting, financial block, ELB)	Best practices among the Eurosystem
Interactions with Fiscal and Financial policies	✓ Account for the relevant granularity of (new) fiscal instruments (e.g. related to Covid-19 and climate change) ✓ Adapt for a realistic design of financial intermediation	Best practices among the Eurosystem
Climate change	✓ Introduce relevant climate change-related specific transmission channels at business cycle frequency: sectoral dimension (with specific energy sectors), transition policy instruments	NIESR
Large shocks and uncertainty	✓ Robustify the estimation strategy in the presence of large shocks and consolidate the use of alternative short-term forecasting tools	Academic: Lenza and Primiceri (2020)

Indicative first and second ranked priorities

Development of new models

Analytical gaps	Recommendation	Benchmark
Long-term trends	✓ Consider endogenizing economic drivers of trends in the medium sized DSGE models	Academic: Anzoategui et al. (2019), or Queralto (2020); Eurosystem research
MTM and Heterogeneity	✓ Focus on households and labour market heterogeneity and empirical validation of models, such as HANK.	Academic: Kaplan et al. (2018), Auclert et al. (2020); Eurosystem research
MTM of NSM and Non-linearities	✓ New macro-financial models focusing on NSM cost-benefits, related non-linearities in MTM and interactions with MaPru ✓ Explore other non-linearities (i.e. Labour market, price-setting)	Academic: Adrian et al (2020,2021); Eurosystem research
Interactions with Fiscal and Financial policies	✓ Integrate in large-scale DSGE models all relevant policy frameworks and assess their areas of interactions	Analogous to IMF Integrated Policy Framework agenda
Climate change	✓ Develop Satellite DSGE models: emphasize the specification of the energy sector, the microfoundations of the relevant externalities, the nature of disturbances, the global dimension, and the role of mitigation policies	Findings of the Climate change workstream

Structural models

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MTM and non-linearities	✓ Use advanced computational methods to account for non-linearities	Academic: Guerrieri and Iacoviello (2015), Linde et al. (2016)
Large shocks and uncertainty	✓ Review the estimation strategies accounting for the “pandemic” historical sample	
Global factors and international spillovers	✓ Account for and quantify the relative importance of common shocks and spill-overs, through trade and financial channels	Eurosystem research