National Bank of Ukraine

Macroeconomic Models for Monetary Policy at the NBU

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Odessa, September 2019

Інформаційні дні НБУ “Економічний експрес”

- І півріччя 2019 року – Житомир, Львів, Вінниця, Дніпро
- ІІ півріччя 2019 року – **Одеса**, Тернопіль, Чернівці, Харків, Херсон
- Формат заходів: лекції для вчителів / викладачів, інтерактивні заняття для школярів / студентів

Заходи Національного банку з фінансової грамотності

1. Інформаційні дні Національного банку “Економічний експрес”
2. Дні відкритих дверей у Національному банку
3. Світовий тиждень грошей (Global Money Week, березень)
4. Всеукраїнський тиждень заощаджень до Світового дня заощаджень (World Savings Day, жовтень)
5. Просвітницькі заходи на базі Музею грошей НБУ

Беріть участь у конкурсі!

Хештег програми –

#NBUexpress

Діліться своїми думками про заходи, ставте цей хештег – автори кращих рецензій отримають сувеніри від програми.

Contents

Disclaimer

- All the results and policy implications in this presentation do not necessarily represent the official views of the NBU

General Overview

Why we need macroeconomic models

- Advise on monetary policy
  - Consistency
  - Simulations and policy implications are discussed on Monetary Policy Committee
- Deliver non-partisan economic outlook and forecast
  - Framework for producing quarterly Inflation Report
- Enhance economic research
  - Discipline understanding of macroeconomic interrelations
  - Monetary policy transmission channel
  - Inspire research questions

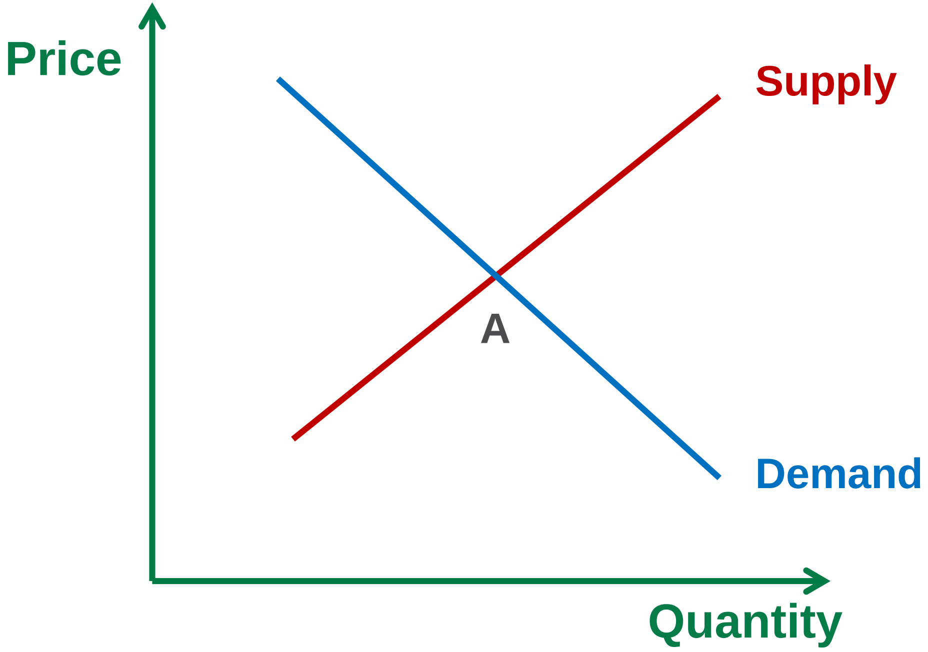
Changing environment for our modeling and forecasting team

- 2001-2013 **Silent mode**
  - Lack of interest in forecasts
  - No involvement into forecasting process by the Board
  - Requests for some analysis of individual events effects

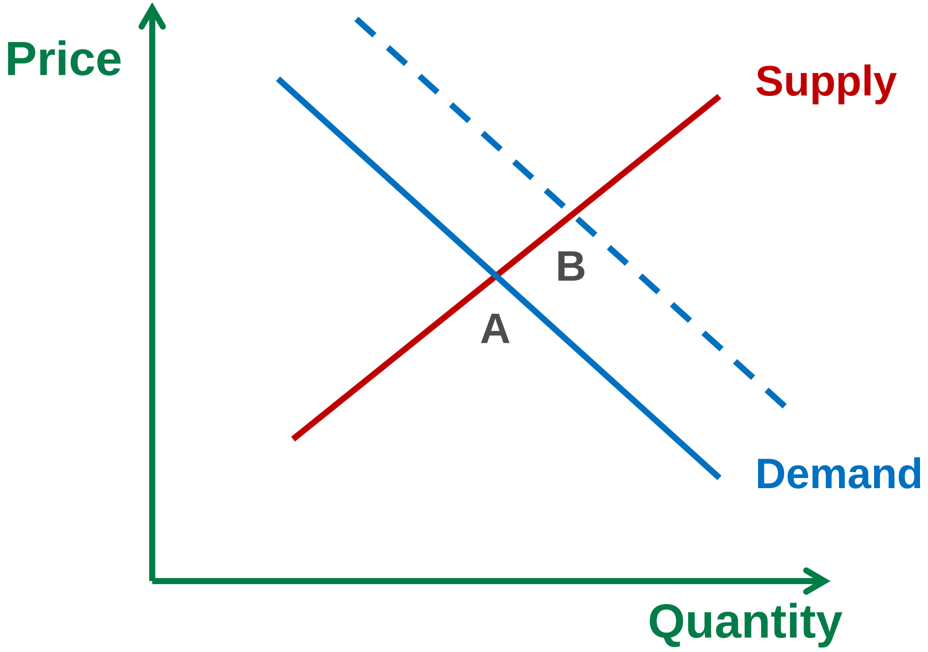
- 2014-Today **Active mode**
  - Major interest in forecasts and policy simulations
  - Focus on achieving targets
  - The Board is involved into forecasting; interest in details
  - Regular public communications of forecasts and policy decisions

Basic concepts

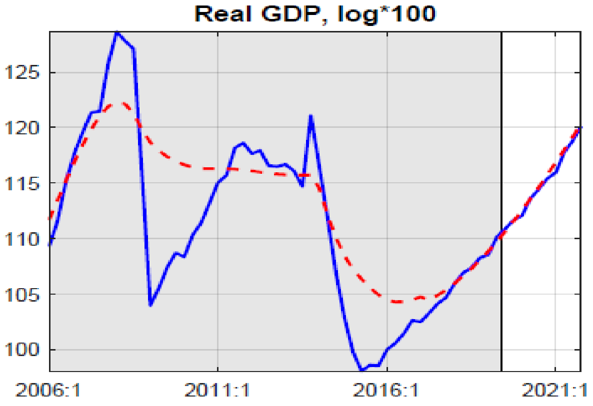
Supply vs Demand (1)

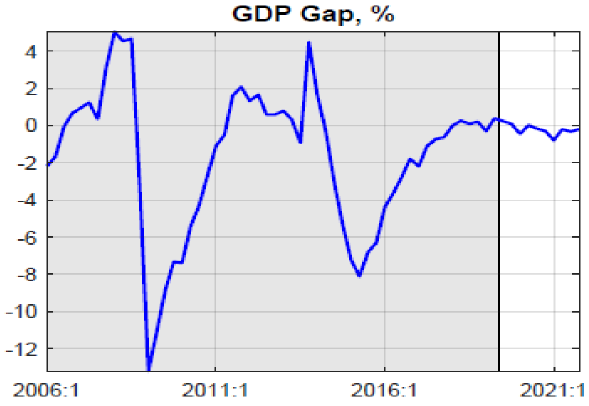


Supply vs Demand (2)



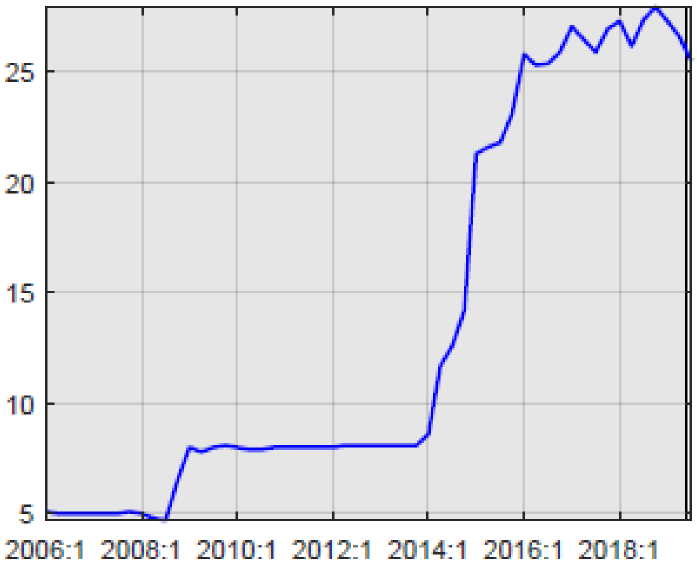
GDP vs Trend (Potential)



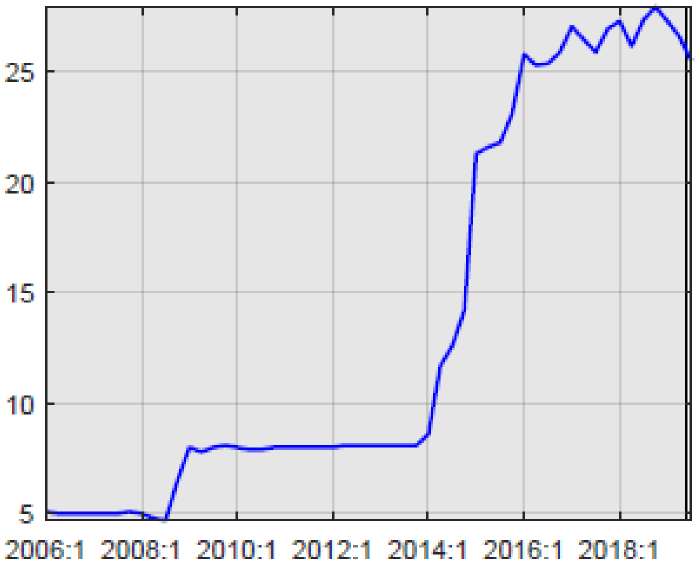


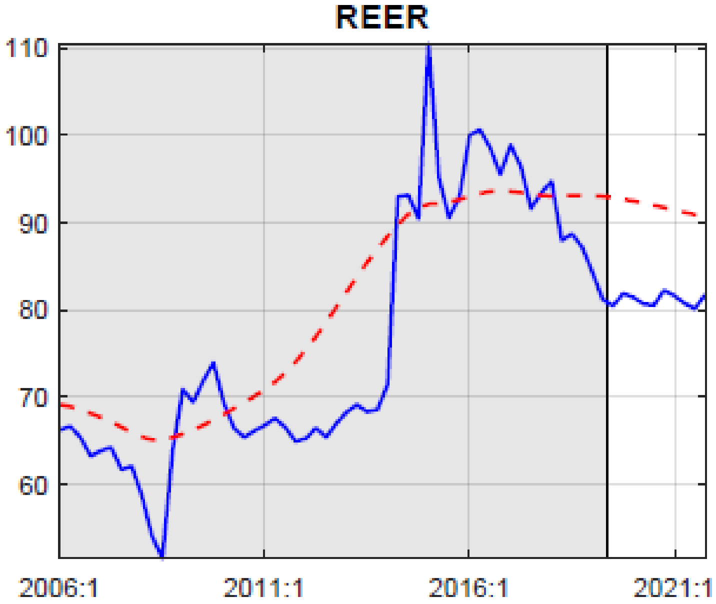
- **Potential GDP –** level of output that could be maintained for a prolonged period of time while retaining stable inflation
- **Positive Output Gap –** “overheated” economy, upward pressure on inflation
- **Negative Output Gap –** recession, deflationary pressure

The mystery indicator



Real Effective Exchange Rate (REER) vs Trend





- **Nominal exchange rate** measures the relation between the value of two currencies
- **REER** – the price of foreign goods relative to the price of domestic goods; indicates country competitiveness

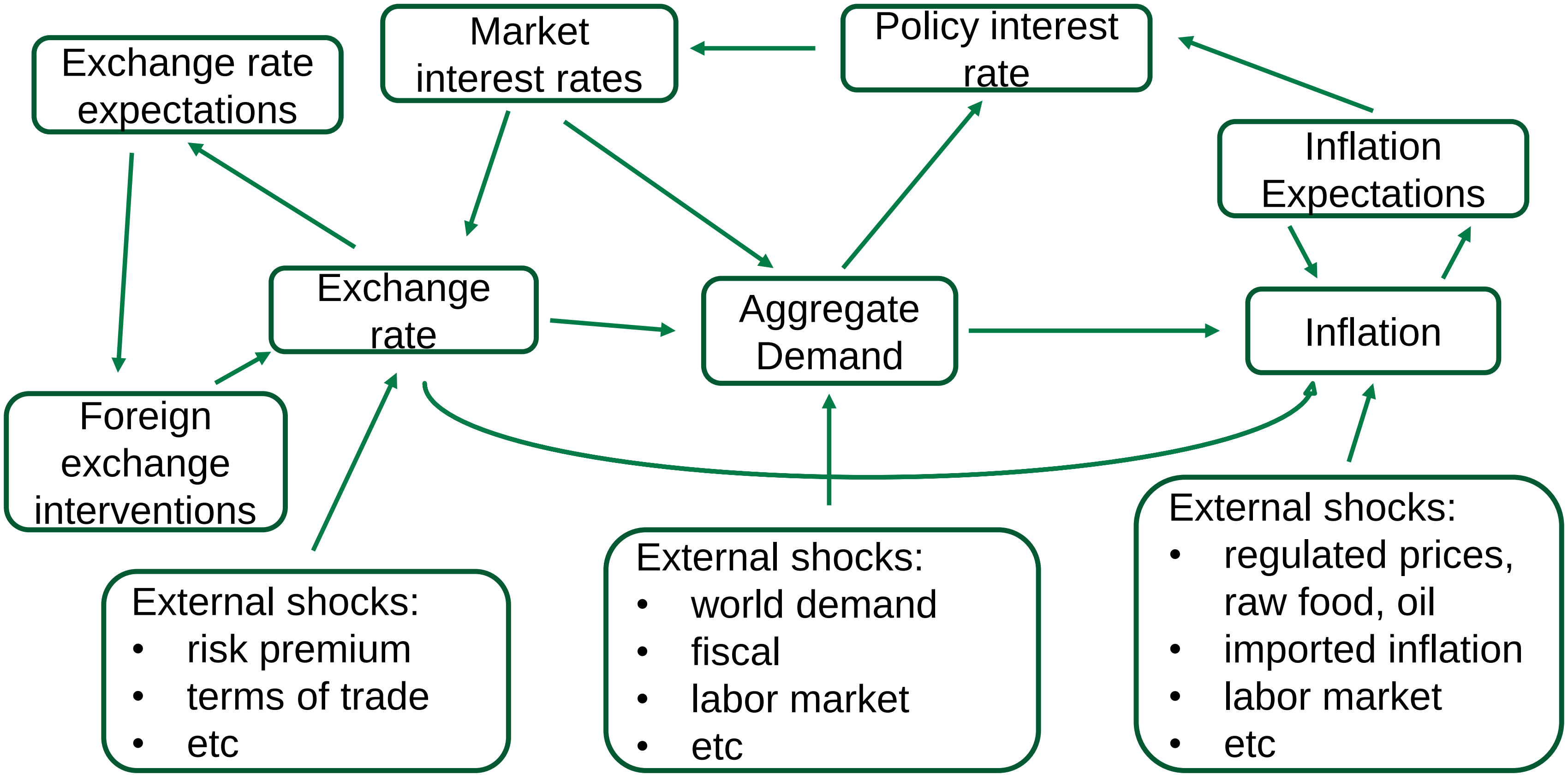
Main policy instrument (1)

Яким чином на Ваші очікування щодо інфляції на наступні 12 місяців впливає підвищення облікової ставки НБУ за інших рівних умов?

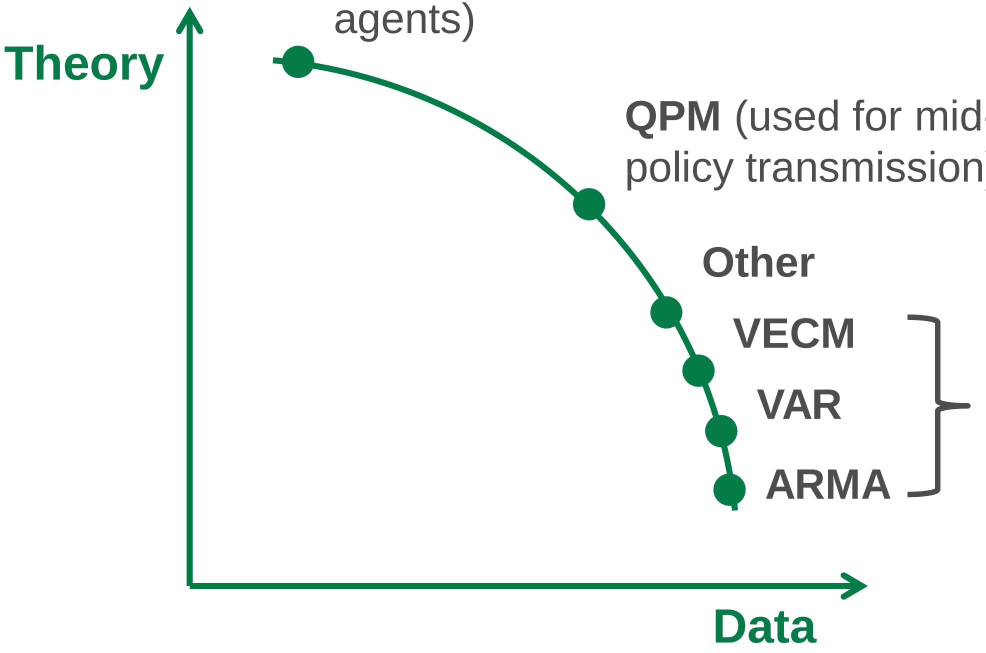
Main policy instrument (2)

Яким чином на Ваші очікування щодо інфляції на наступні 12 місяців впливає підвищення облікової ставки НБУ за інших рівних умов?

Transmission mechanism



Models in Forecasting and Policy Analysis System: Examples



DSGE (used for research; based on optimization problems of economic agents)

QPM (used for mid-term forecast and policy advice; models policy transmission)

Econometric models (used for short-term forecast; based on statistical relationships in data)

Forecasting and Policy Analysis System

Risk assessment
Risks to baseline, alternative scenarios

Forecasting and Policy recommendations

Econometric models
Now- and short-term forecasting

QPM
Coherent scenarios of main variables

Satellite models
Additional information

Judgments

Databases

Assumptions

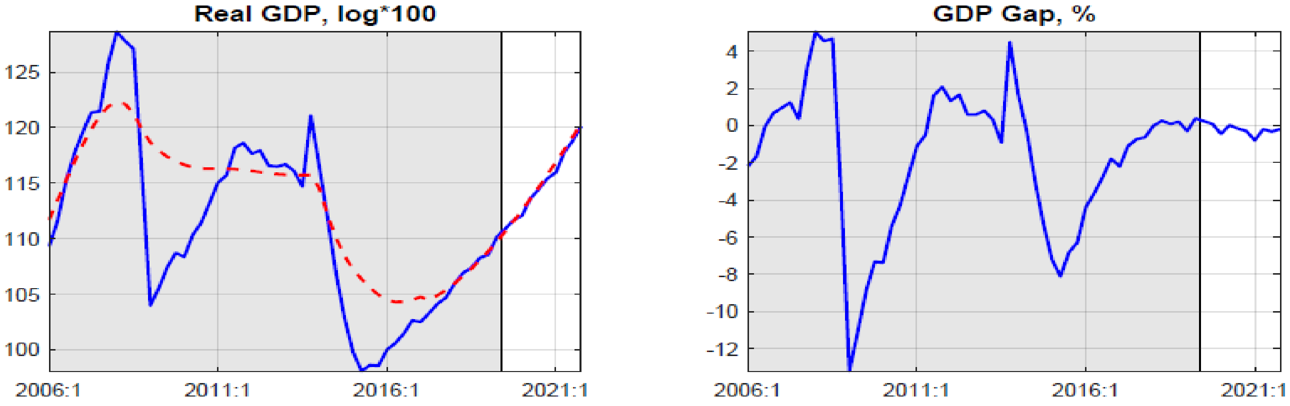
The Quarterly Projection Model

NBU's Quarterly Projection Model (QPM)

- Small open-economy New-Keynesian with specific extensions
- Model in "gaps"
  - measures trend variables and explains deviations
- Similar models are used by many other central banks
  - Coats et al. (2003), De Jager et al. (2015), Beneš et al. (2017)
- Describes monetary policy transmission mechanism
  - variables actively respond to shocks in the short run
  - shocks dissipate in the long run

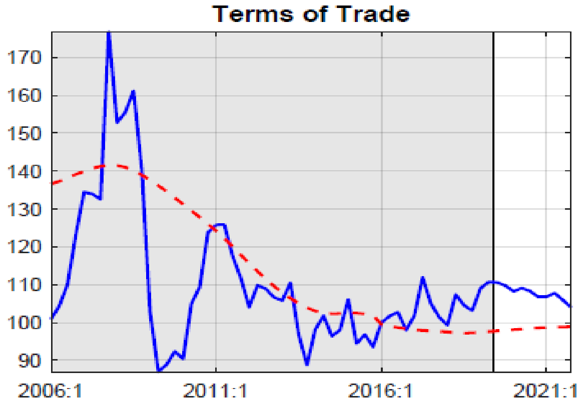
The Quarterly Projection Model: Filtration

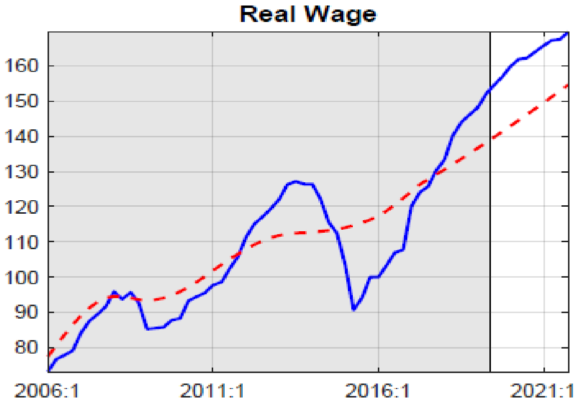
QPM Filtration (1) GDP vs Trend

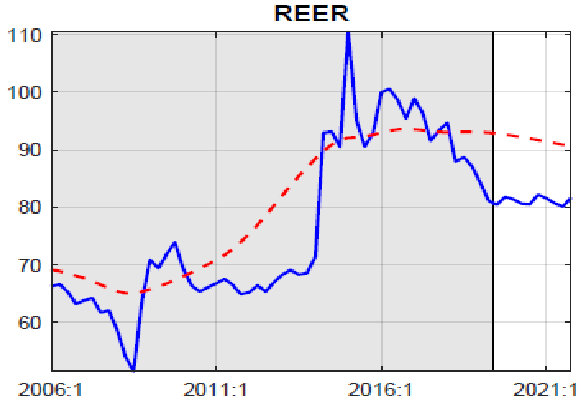


- **Potential GDP** – level of output that could be maintained for a prolonged period of time while retaining stable inflation
- **Positive Output Gap** – “overheated” economy, upward pressure on inflation
- **Negative Output Gap** – recession, deflationary pressure

QPM Filtration (2) Real Indicators vs Trends

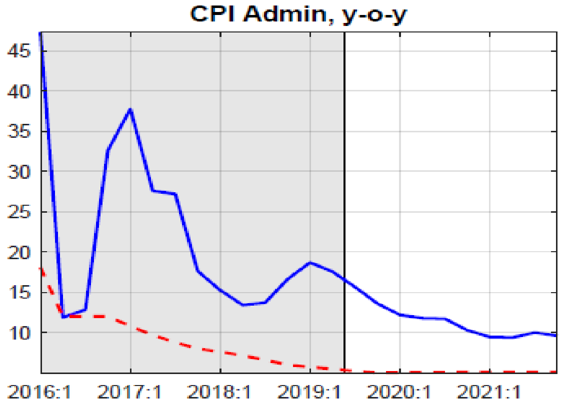


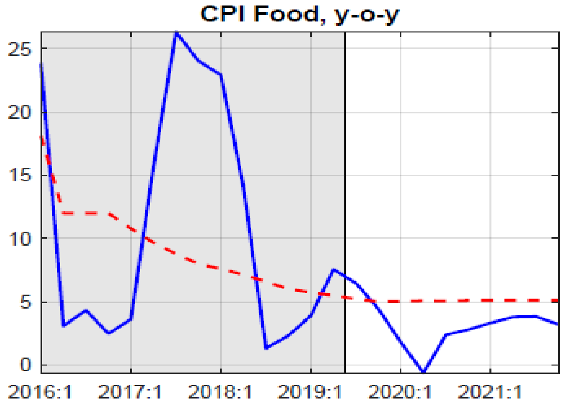


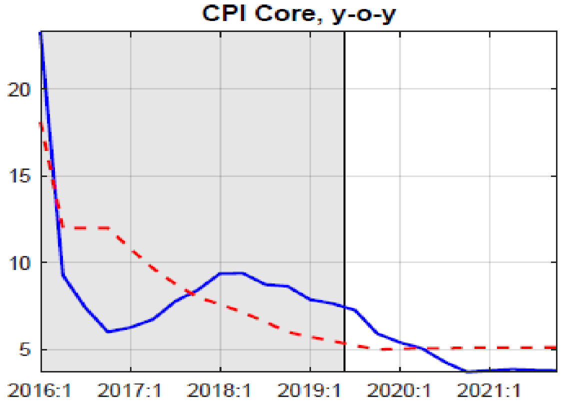


- Terms of Trade were unfavorable for Ukraine during the last 10 years
- Real Effective Exchange Rate (REER) trend reflects productivity growth and to a large extent is influenced by Terms of Trade
- Real Wage Gap influences inflation through both supply and demand channels

QPM Filtration (3) Inflation Components vs Target



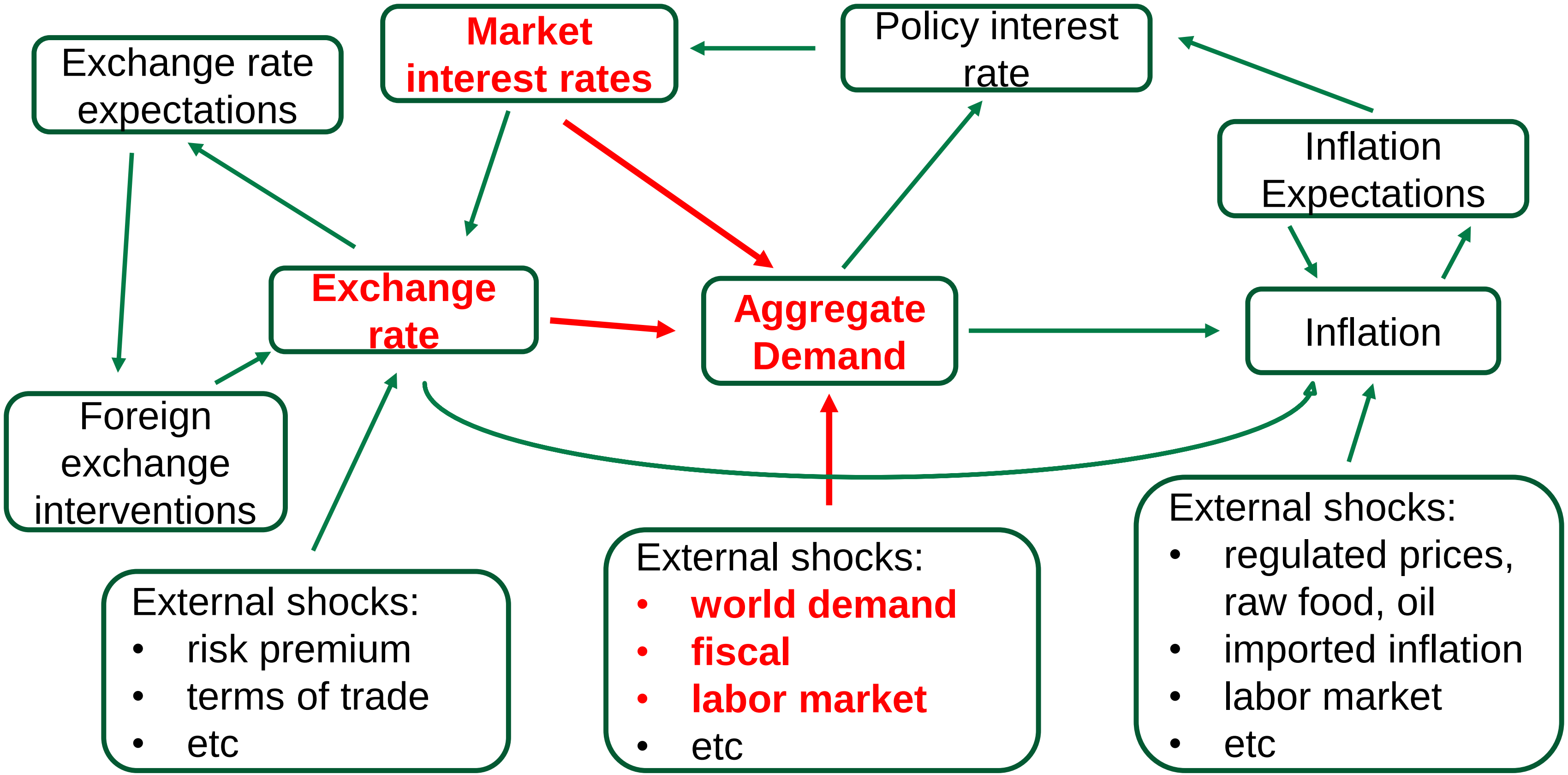




- Monetary policy has little influence on Administratively regulated and Raw food prices
- Inflation Targeting was officially adopted in 2016

The Quarterly Projection Model: Main Equations

Aggregate demand



QPM's main equations (1)

- Output gap (IS curve)

$$\hat{y}_t = \alpha_1 \hat{y}_{t-1} + \beta_1 \hat{z}_{t-1} - \gamma_1 \widehat{lr}_{t-1} + \delta_1 \widehat{w}_t + \theta_1 \hat{y}_t^W + \mu_1 \widehat{tot}_t + \rho_1 f_t - \sigma_1 \widehat{prem}_t + \varepsilon_{1,t}$$

$\hat{z}_t$ – real exchange rate gap (up is depreciation)

$\widehat{lr}_t$ – real credit rate gap

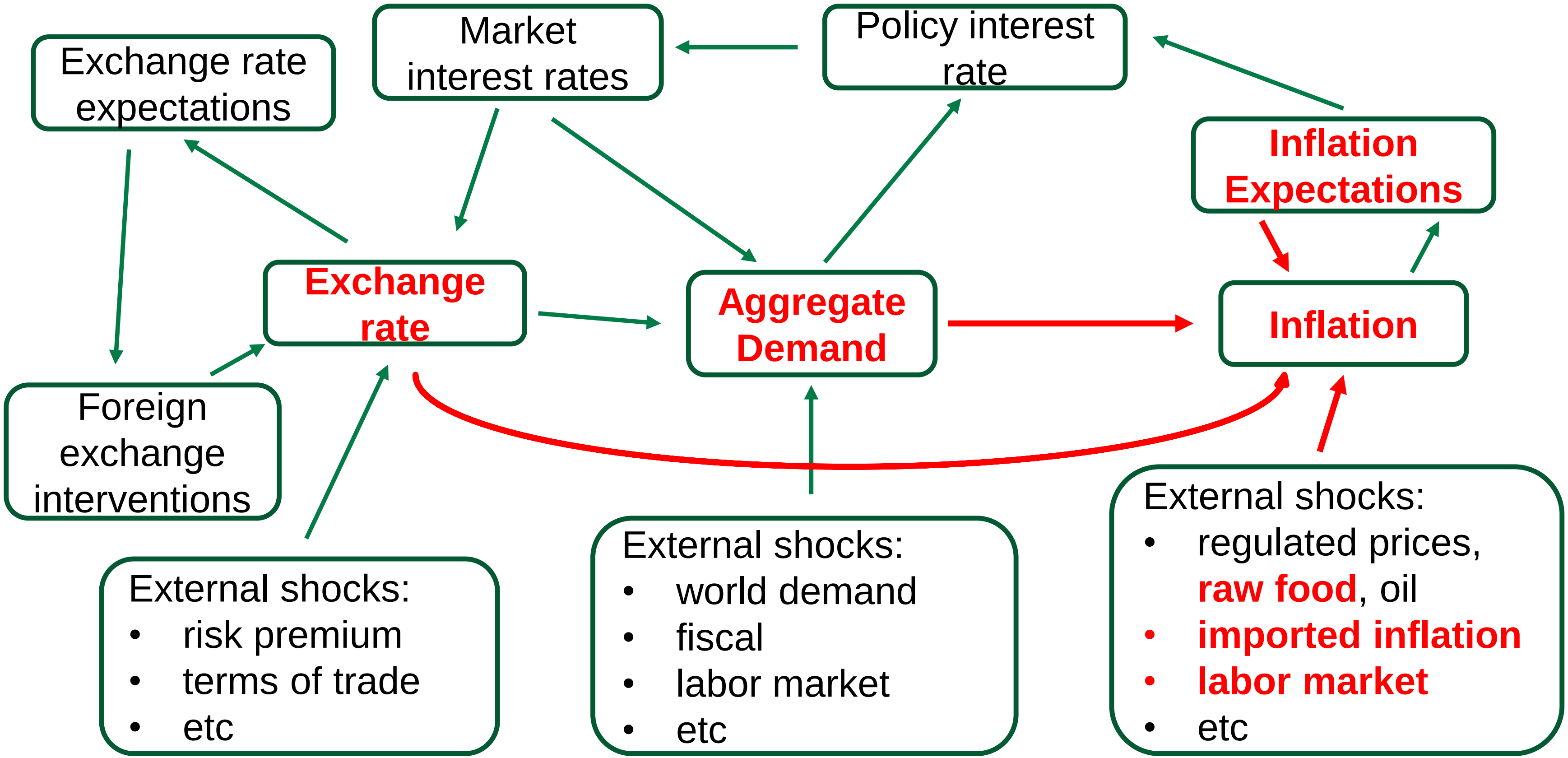
$\widehat{w}_t$ – real wage gap

$\hat{y}_t^W$ – main trade-partners GDP gap

$\widehat{tot}_t$ – terms of trade gap

f_t – fiscal impulse

Inflation (we discuss core inflation)



QPM's main equations (2)

- Core inflation (expectation-augmented Phillips curve)

$$\pi_t^{core} = \alpha_2 \pi_{t-1}^{core} + \beta_2 \pi_{t+1} + \gamma_2(\pi_{t-1}^W + \Delta s_{t-1} - \Delta \bar{z}_{t-1}) + \delta_2 \hat{y}_t + \theta_2 \hat{z}_{t-1}$$
$$+\vartheta_2 \widehat{w}_t + \mu_2(\pi_t^{food} - \pi_t^T) + \varepsilon_{2,t}$$

π_t – headline inflation

π_t^W – main-trade partners inflation

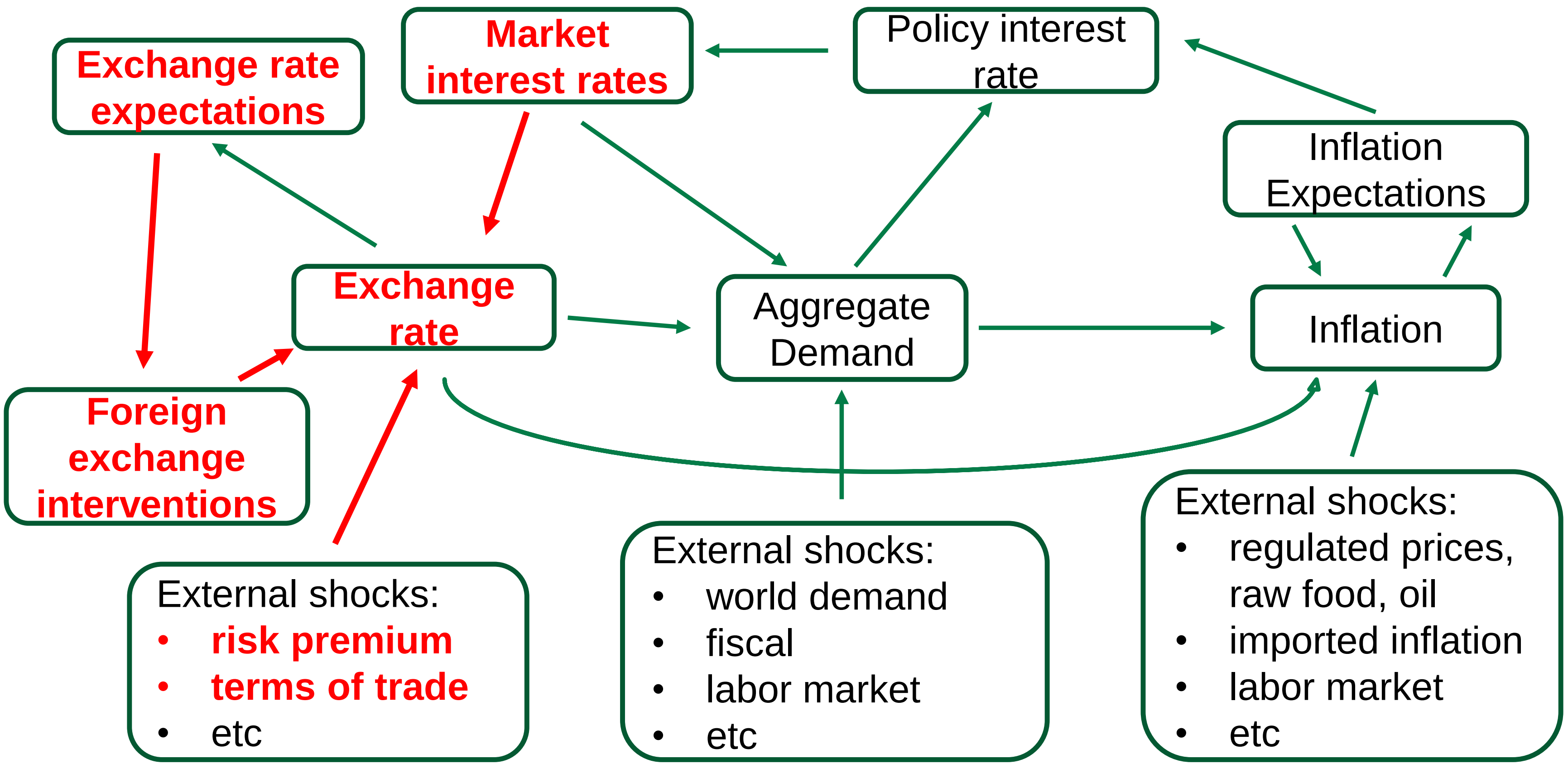
s_t – nominal exchange rate (up is depreciation)

$\bar{z}_t$ – real exchange rate trend (up is depreciation)

π_t^{food} – raw food inflation

π_t^T – inflation target

Exchange rate



QPM's main equations (3)

- Nominal exchange rate against USD (uncovered interest rate parity with smoothing interventions and terms of trade)

$$s_t = s_{t+1} + interv_t + \frac{i_t^W - i_t + prem_t}{4} - \gamma_3 \widehat{tot}_t + \varepsilon_{3,t}$$

$$interv_t = \beta_3\Big((\Delta s_t^T - \Delta s_{t+1}) + (\Delta s_t^T - \Delta s_t)\Big)$$

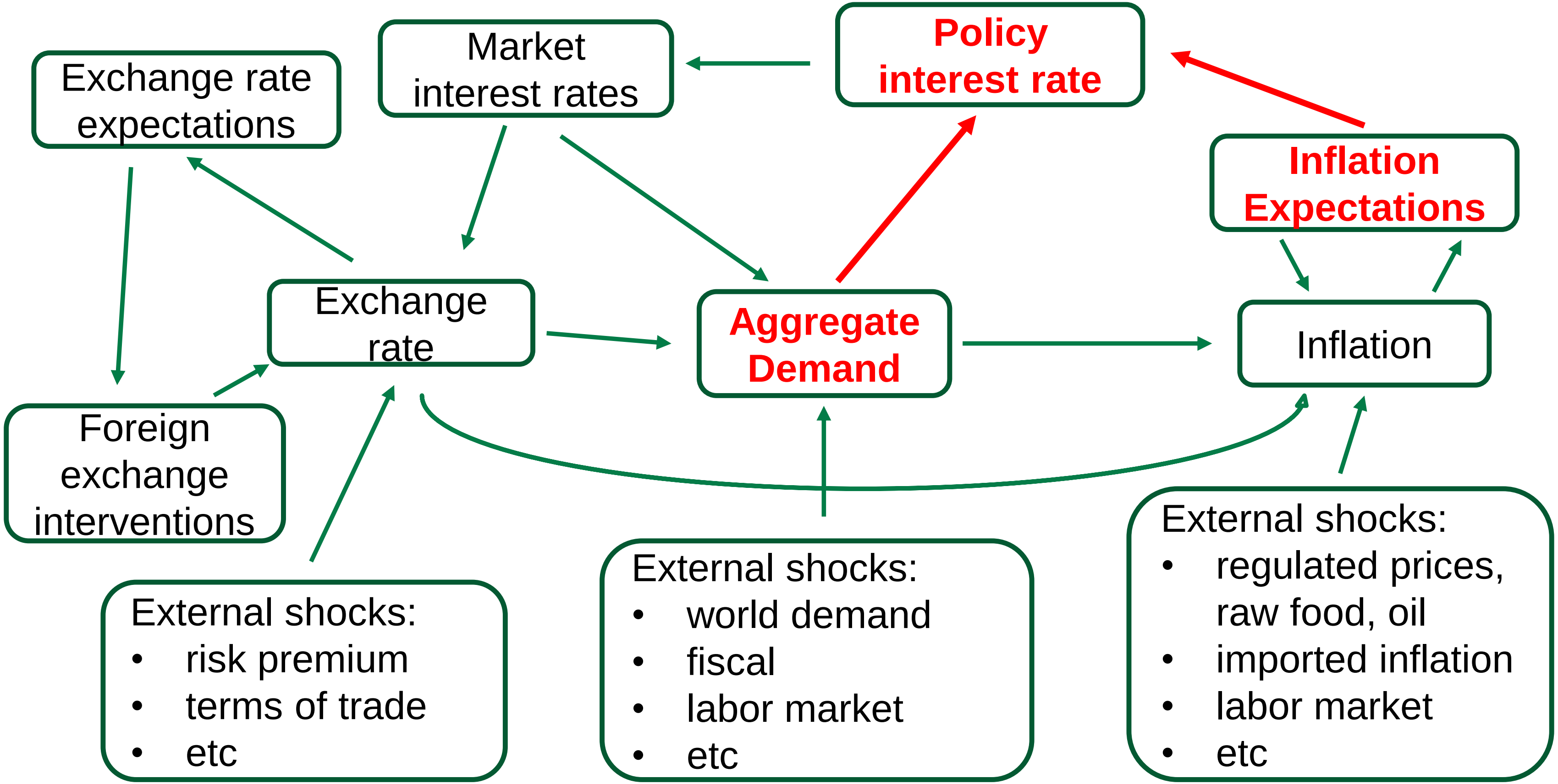
$interv_t$ – foreign exchange interventions (in terms of impact)

i_t^W – world interest rate

$prem_t$ – sovereign risk premium

s_t^T – “targeted” exchange rate

Policy interest rate



QPM's main equations (4)

- Policy short term interest rate (Taylor-type monetary policy rule)

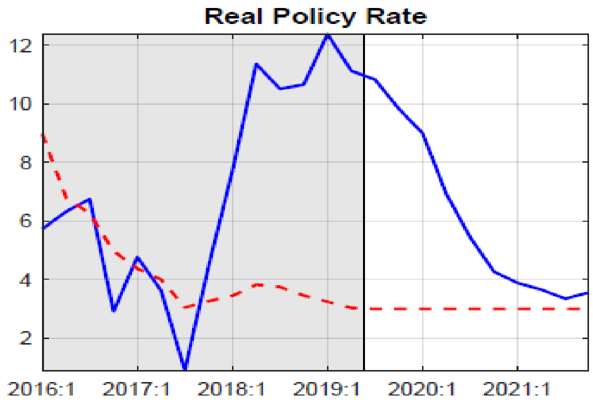
$$i_t^P = \alpha_4 i_{t-1}^P + (1-\alpha_4)\left(\bar{r}_t + \pi 4_{t+1}^{exp} + \beta_4\left(\pi 4_{t+1}^{exp} - \pi_{t+1}^T\right) + \gamma_4 \hat{y}_t\right) + \varepsilon_{4,t}$$

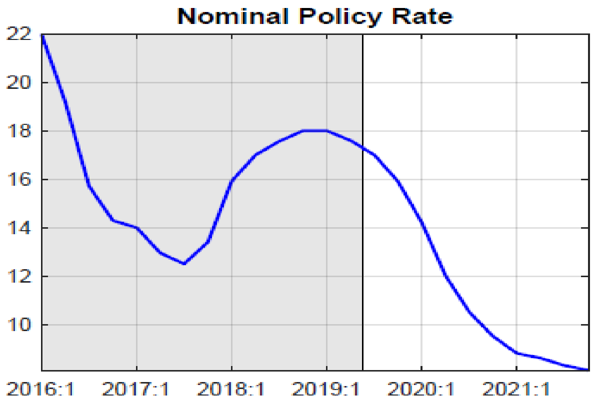
$\bar{r}_t$ – real neutral rate

$\pi 4_{t+1}^{exp}$ – expected annual inflation

Why bother?

QPM Filtration (4) **Policy Rates vs Neutral**

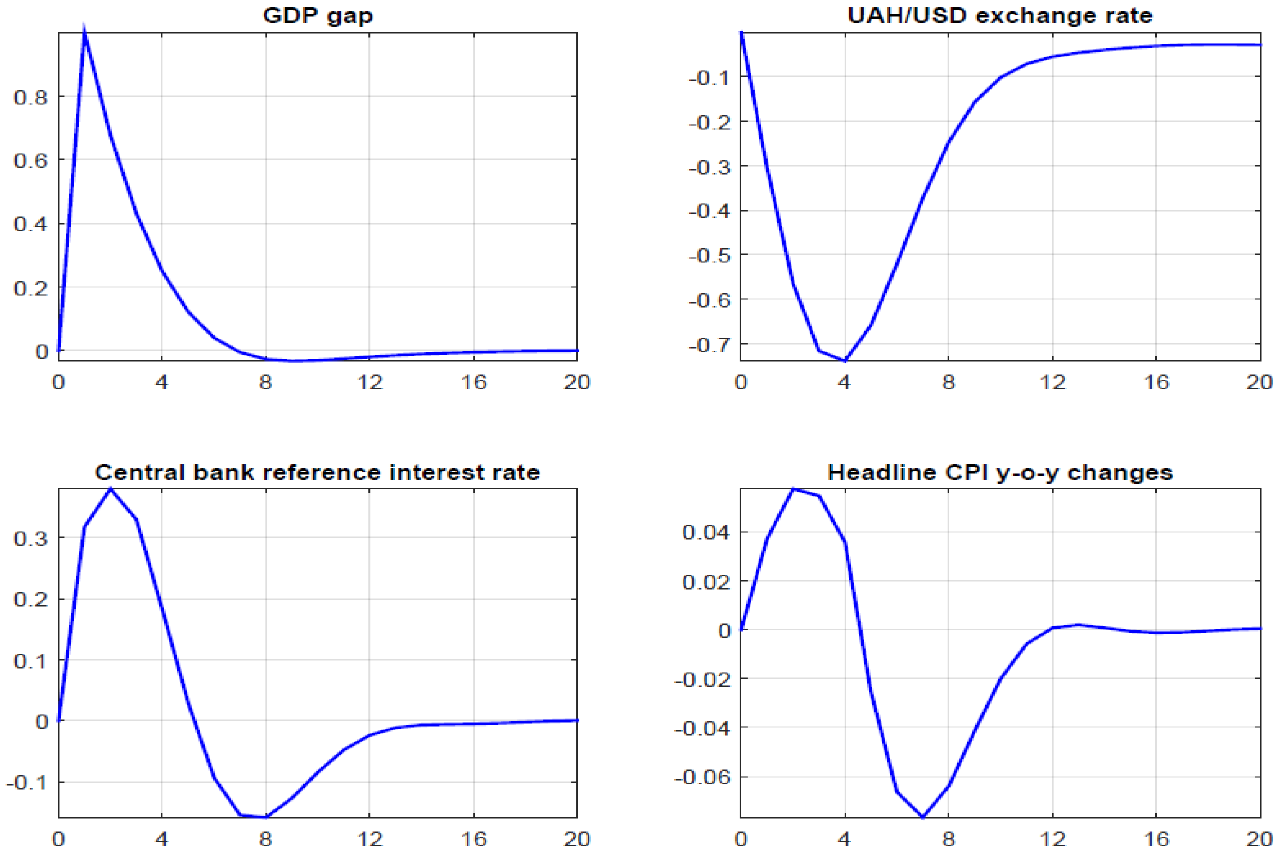




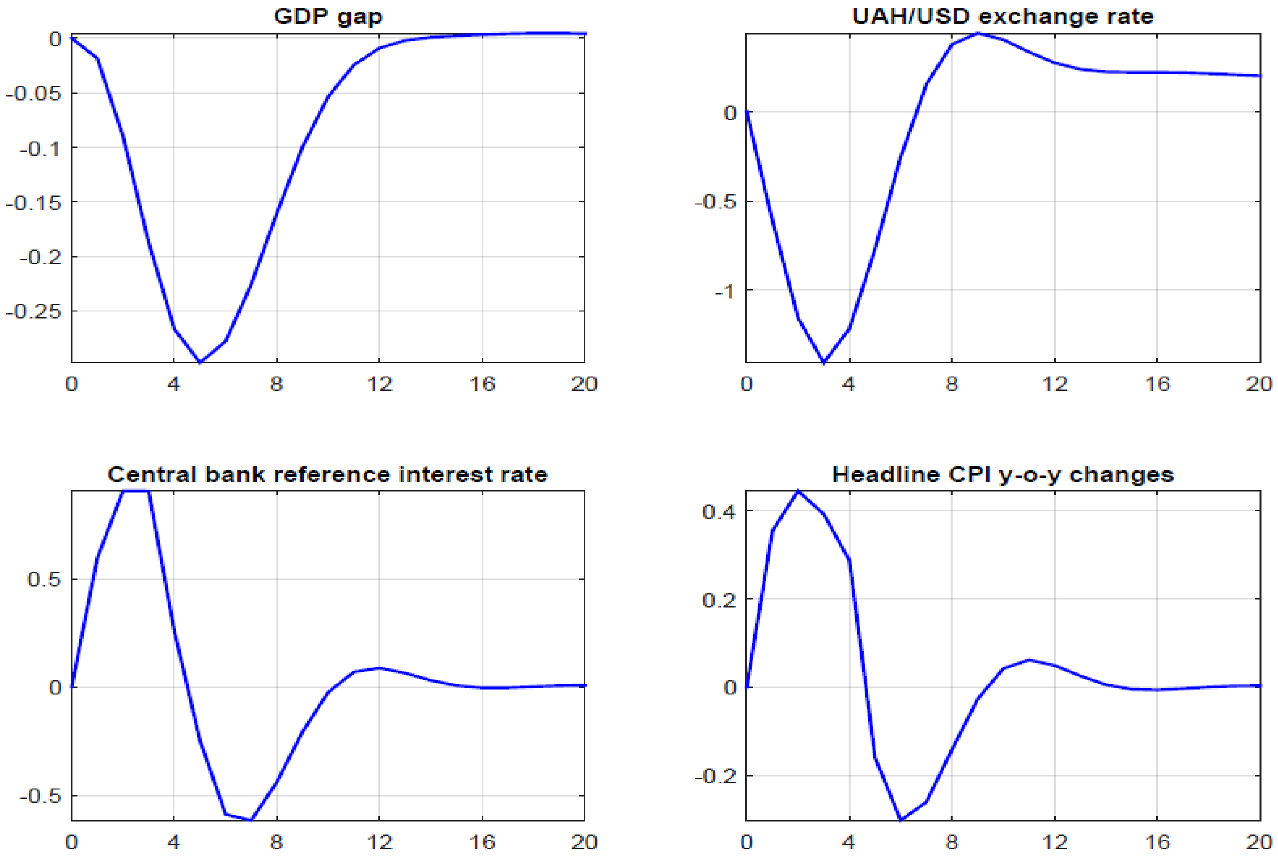
- Real interest rate is adjusted by model consistent inflation expectations
- Neutral rate allows judging about monetary policy stance
- Real policy rate above neutral is needed to ensure disinflation

The Quarterly Projection Model: Impulse Response Functions

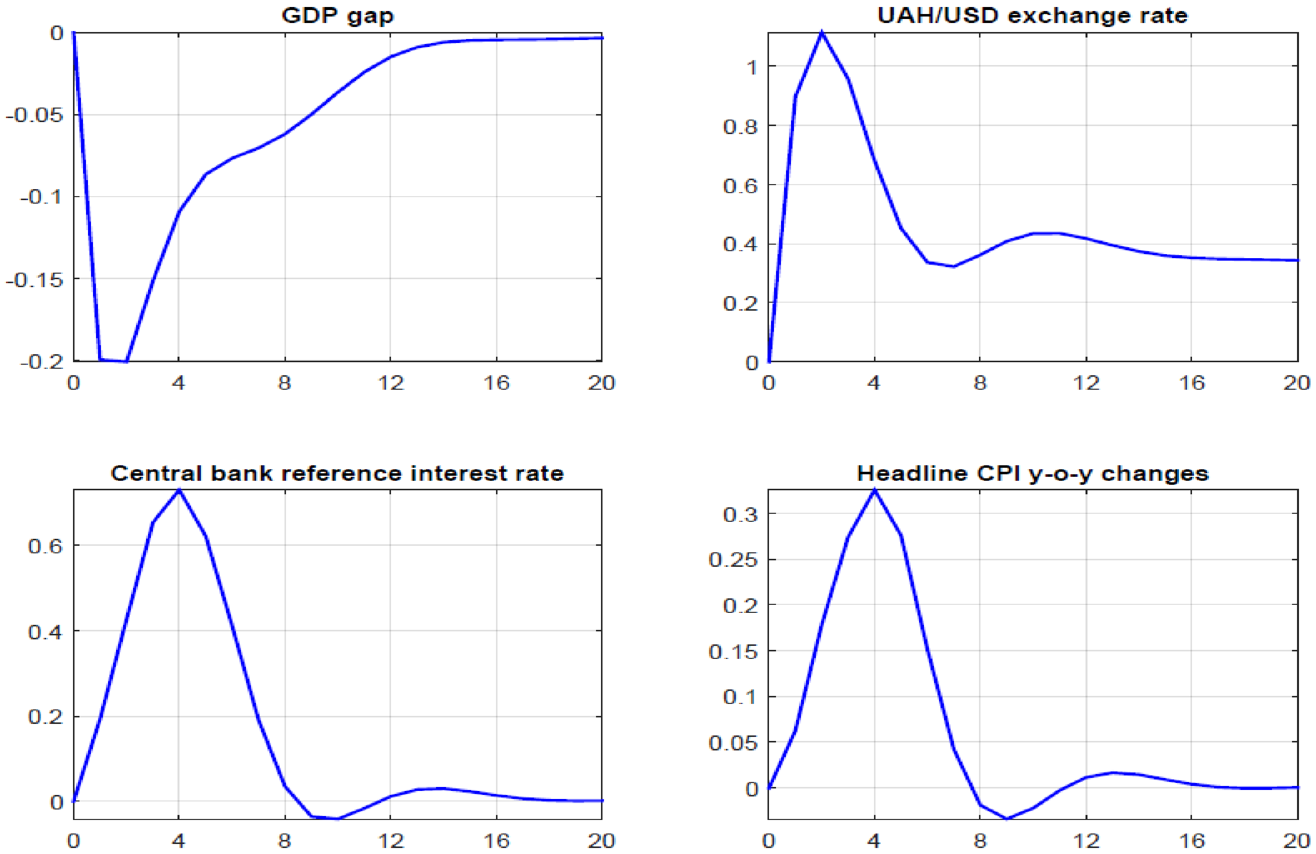
Impulse Response Functions (1) Positive Demand Shock



Impulse Response Functions (2) Negative Supply Shock

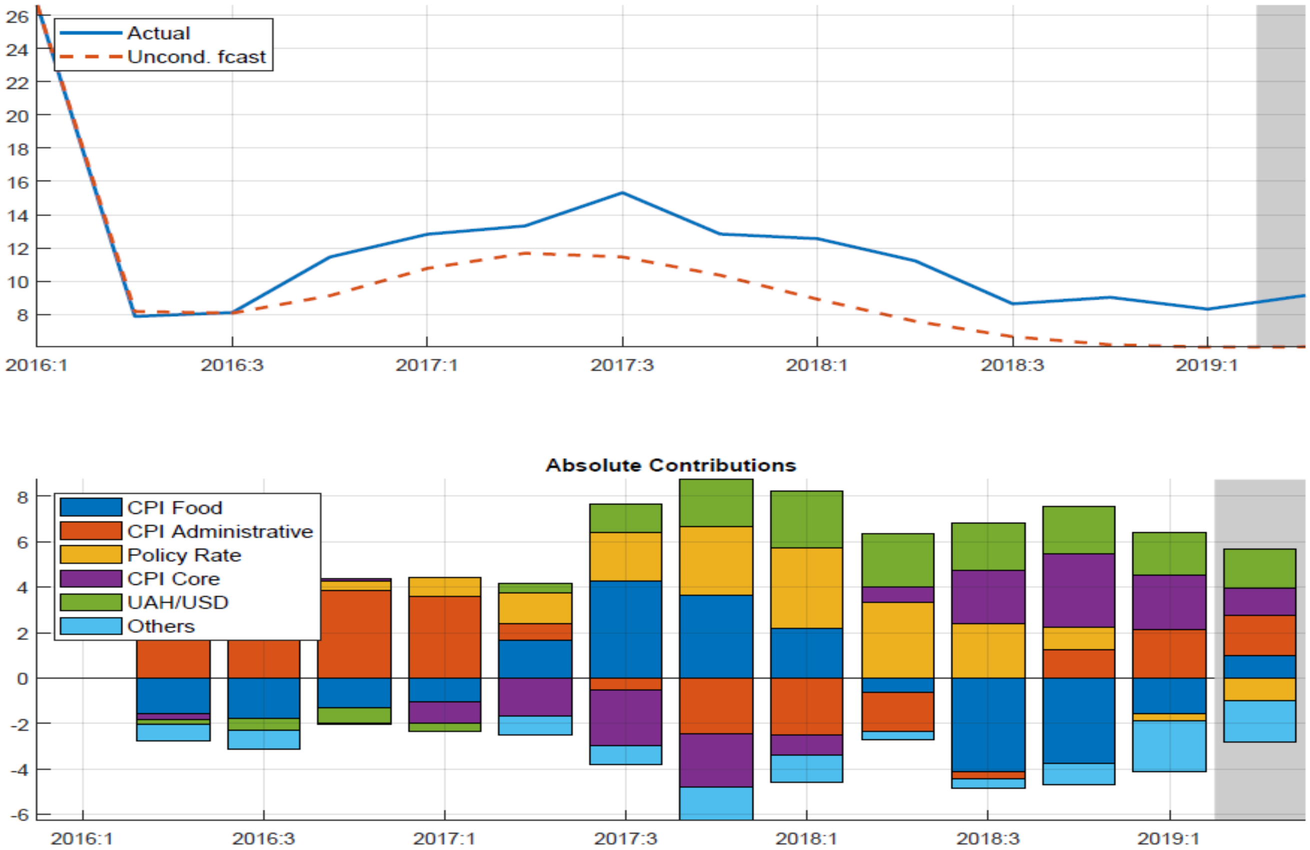


Impulse Response Functions (3) Negative Risk Premium Shock

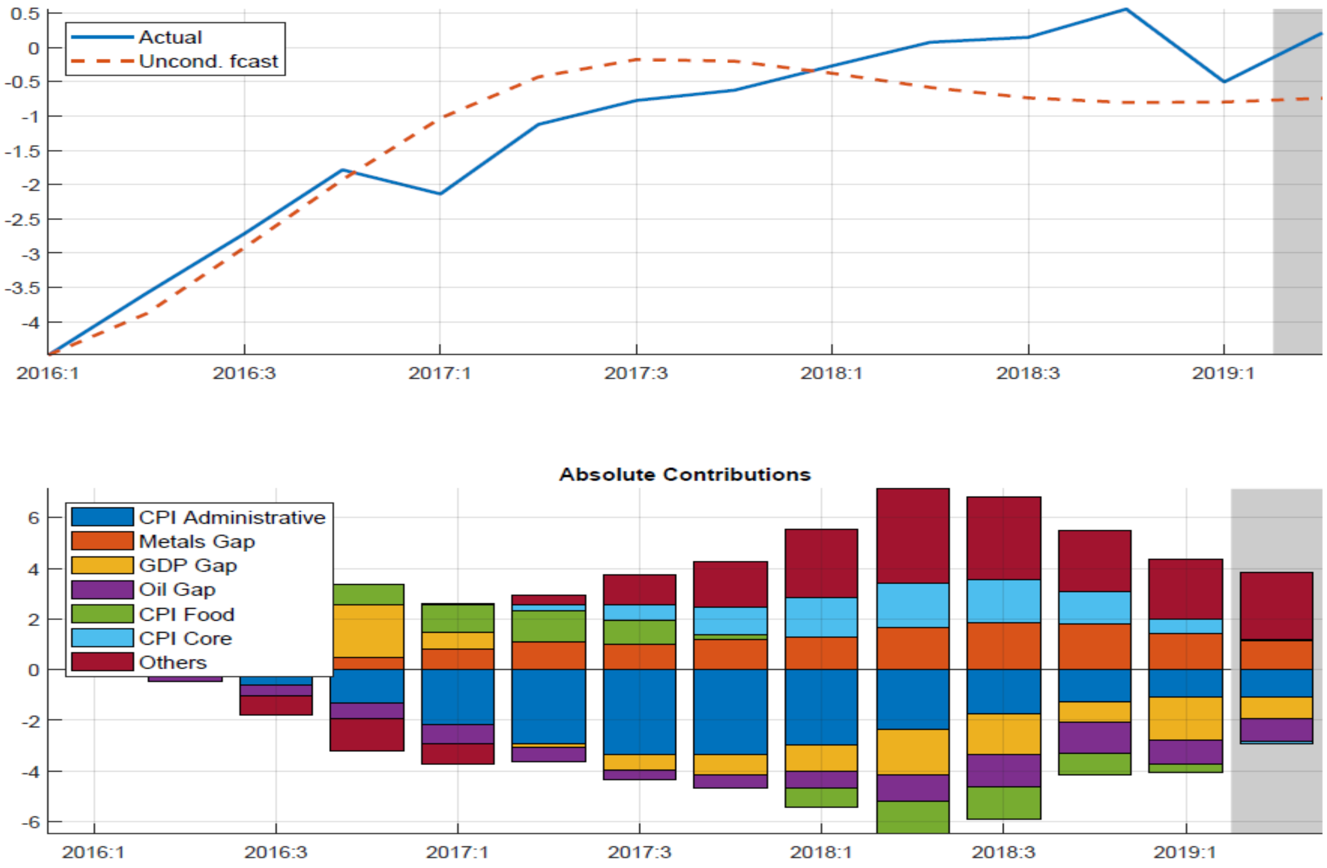


The Quarterly Projection Model: Shock Decompositions

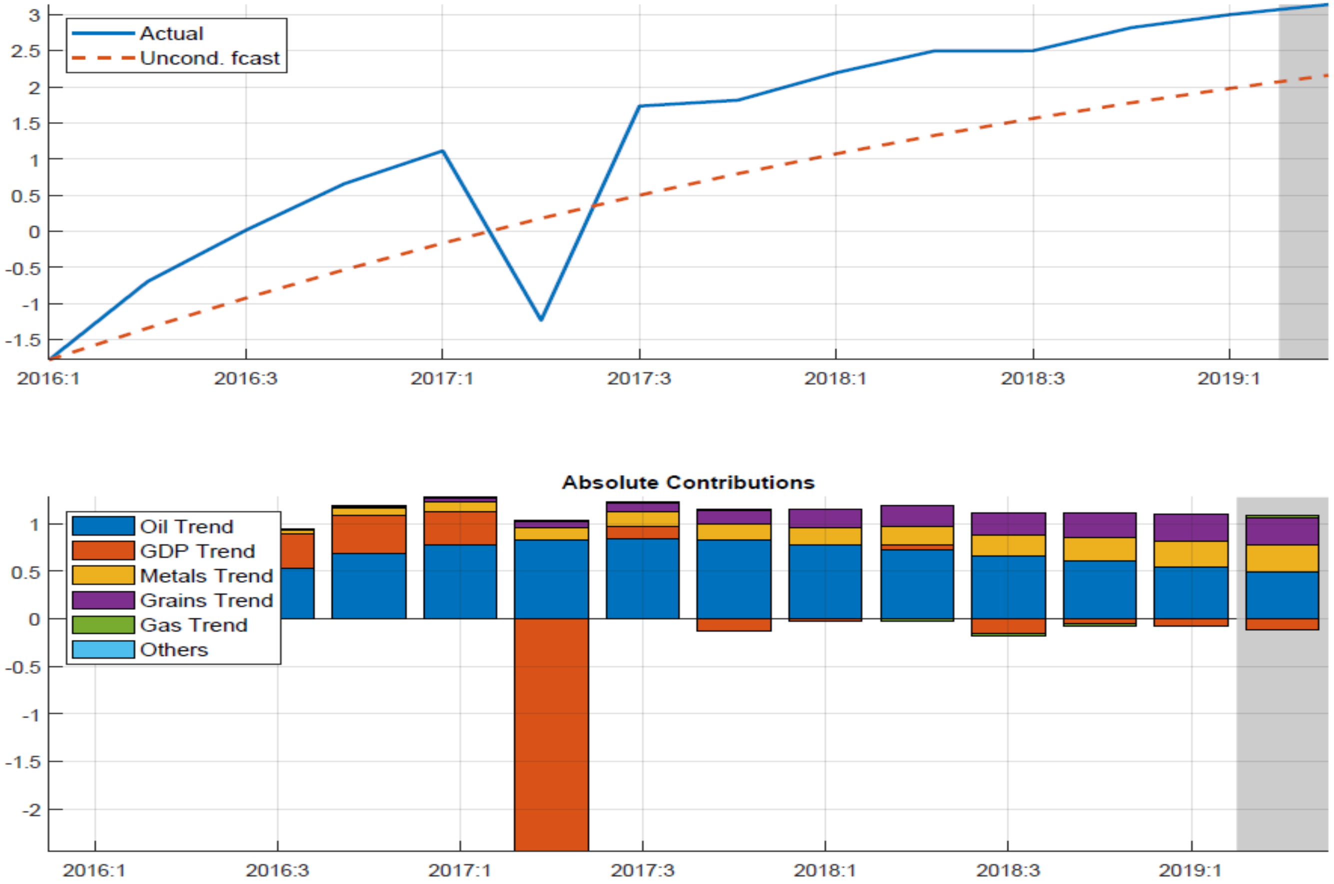
Shock Decompositions (1) Headline Inflation, % y-o-y



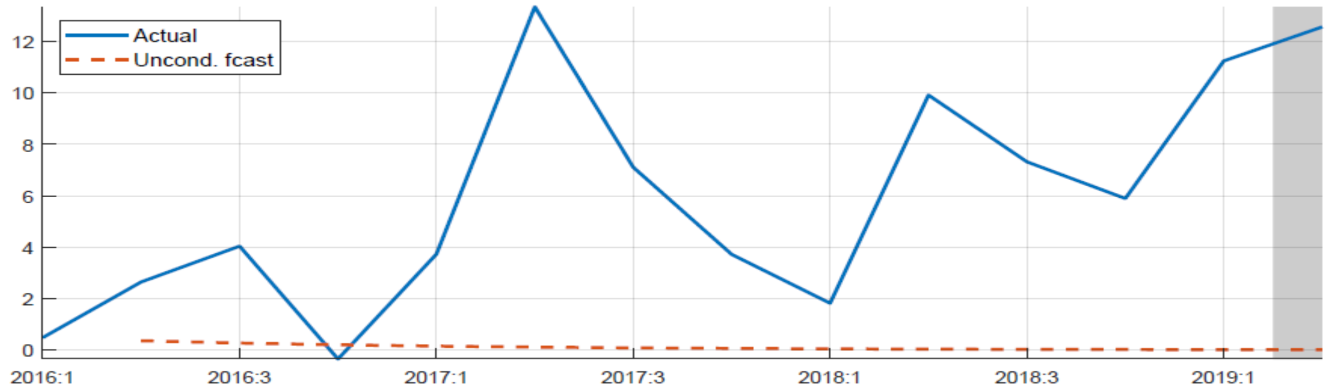
Shock Decompositions (2) GDP Gap, %

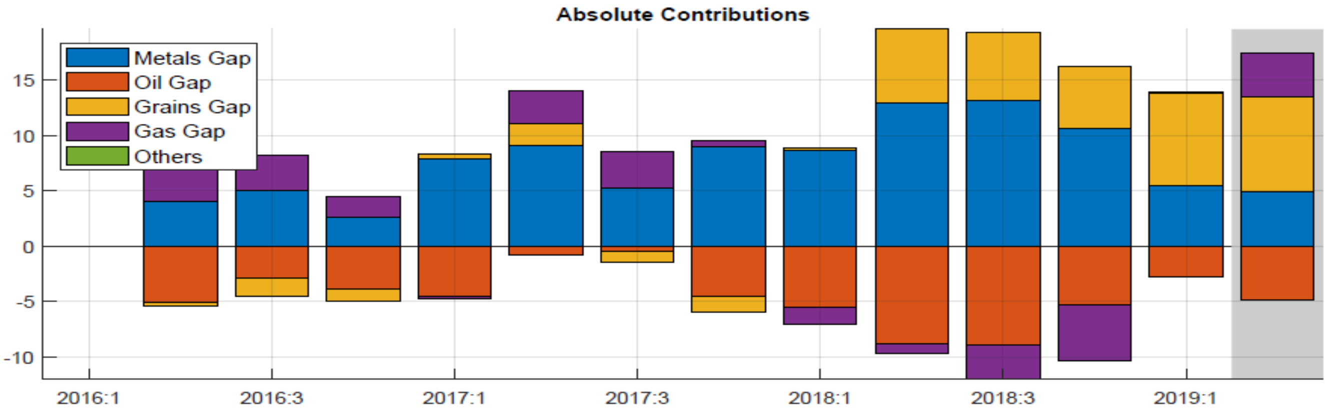


Shock Decompositions (3) GDP Trend growth, % q-o-q ann.



Shock Decompositions (4) Terms of Trade Gap, %





Concluding Part

Improving modeling and forecasting toolkit

- Conferences and seminars
- Research
- Requests from the top management
- Cooperation with other central banks
- Cooperation with the IMF

Conclusions

- Macroeconomic models are used for monetary policy advise, forecasting and economic research
- The NBU Board is interested in forecasts and policy simulations
- Models are based on both statistical relationships in data and economic theory
- The core model describes monetary policy transmission mechanism
- The NBU cooperates with external experts and does research with a view to enhance its modeling toolkit

References and further reading

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Національний банк України

Економічний експрес

Інформаційні дні Національного банку України в регіонах

Беріть участь у конкурсі!

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Діліться своїми думками про заходи, ставте цей хештег – автори кращих рецензій отримають сувеніри від програми.

National Bank of Ukraine

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