NATIONAL BANK OF ROMANIA

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Quantitative toolkit for operationalizing the Countercyclical Capital Buffer in Romania

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

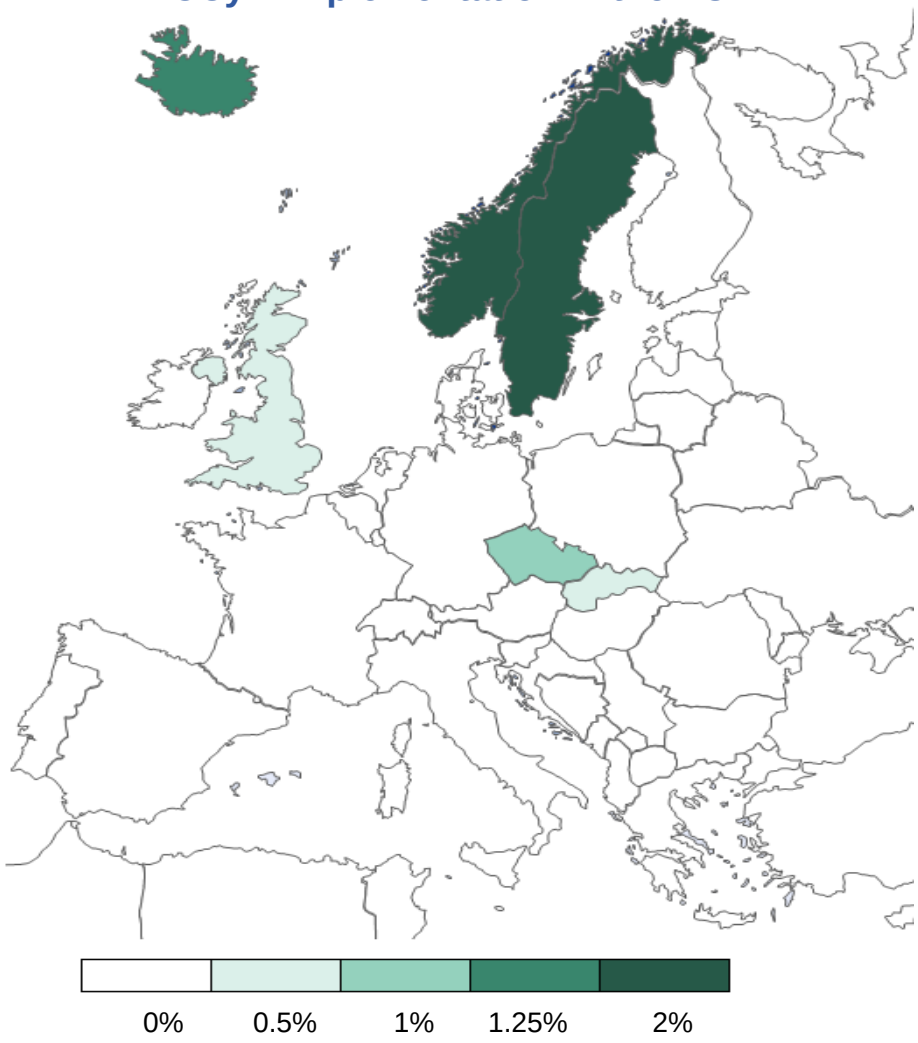
Presentation outline

- **Introduction: current EU experience with the CCyB**
- **The NBR's toolkit for the CCyB implementation**
  - Measuring financial cycle length
  - Predictability and forward guidance
  - Impact of capital buffers on the real economy
- **Conclusions and further work**

Current EU experience with the Countercyclical Capital Buffer

1. Current EU experience with the CCyB

CCyB implementation in the EU



Recovery in financial cycles ➔ mixed in the EU**,** divergence in trends:

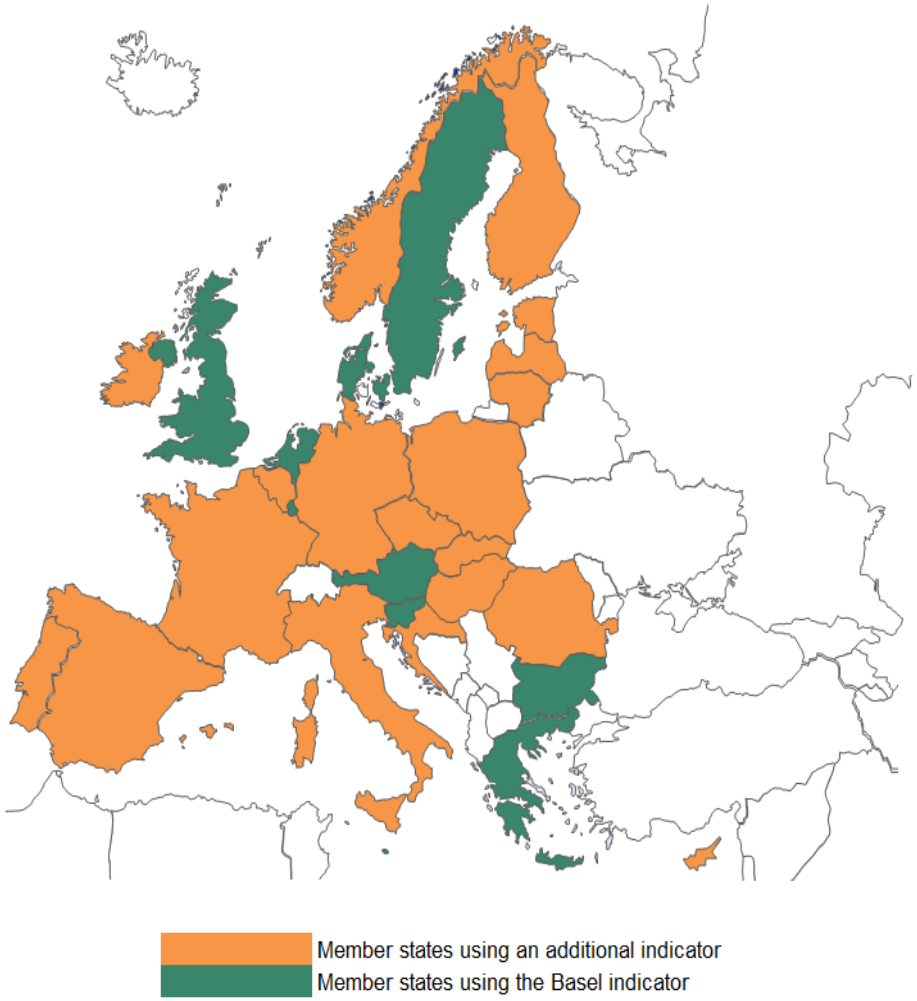
- Some Western EU members (DE,FR, UK, BE, ND) – **positive trend** or closing the gap
- Southern EU members (IT, ES, PT) – persistent **negative gap**

Country	CCyB	Application starting with
Czech Rep.	1	01 July 18
Sweden	2	19 March 18
Slovakia	1.25	01 August 18
Iceland	1.25	01 November 18
Norway	2	31 December 17
UK	0.5	21 June 2018

Source: ESRB

1. Current EU experience with the CCyB

CCyB calibration in the EU



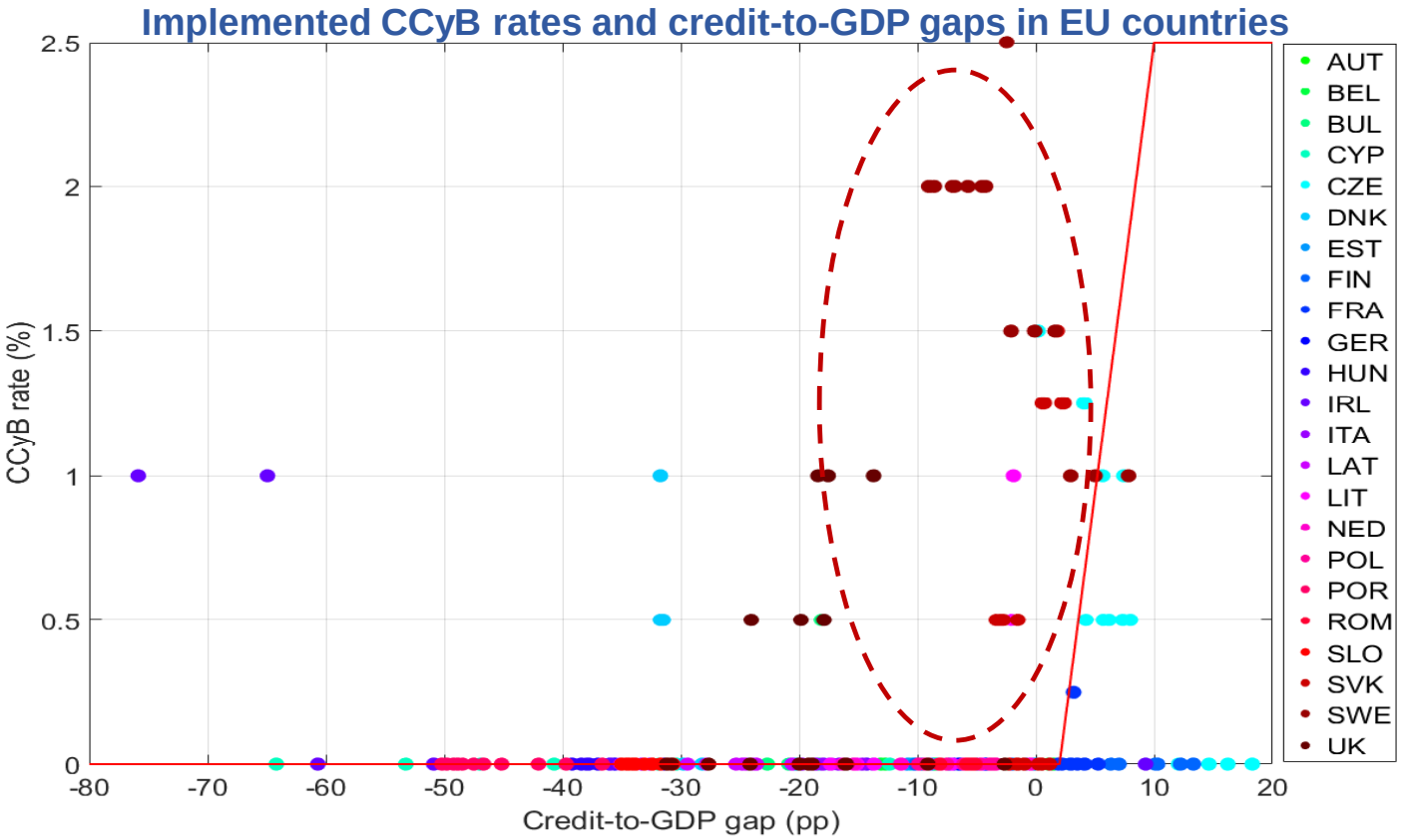
To **better reflect the specificities** of the national financial sector:

- Measure and calculate quarterly **additional credit-to-GDP gap** indicators (*ESRB Recommendation*)
- Use **composite indicators** for cyclical behavior (Cyclogram, FSI)
- Use stress-test results to calibrate the buffer rate

Most EU countries have opted for and rely on **additional indicators** besides the Basel methodology

1. Current EU experience with the CCyB

Heavy reliance on the **Guided Discretion** principle – many countries with positive CCyB rates and negative gap ↔ positive gap with 0% CCyB



Note: credit-to-GDP gap data extracted from the ECB database, using the standard harmonized framework at EU level

Source: ECB, ESRB

The NBR's toolkit for the CCyB implementation

2.1. Measuring financial cycle length

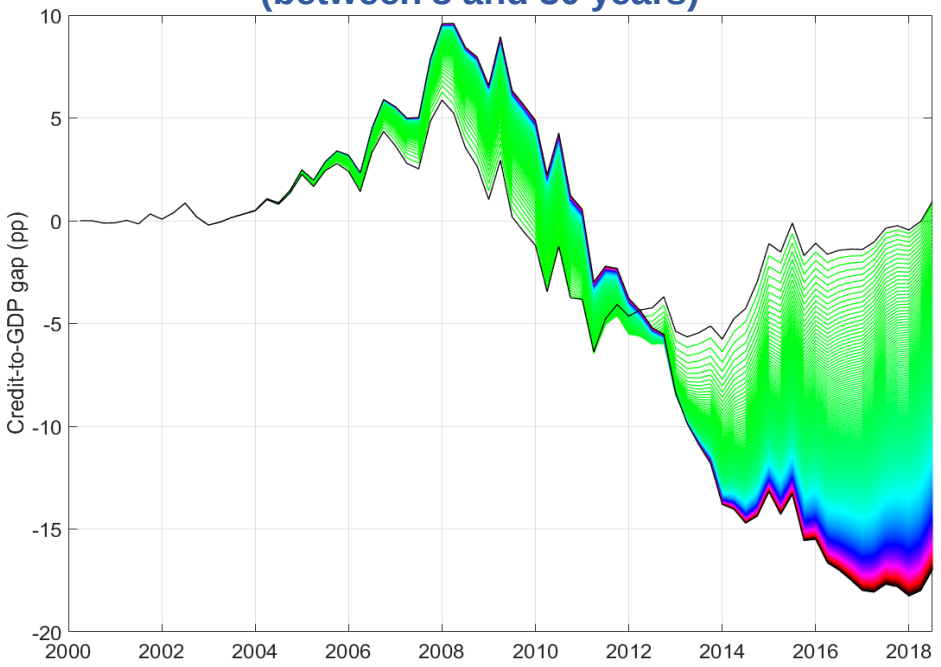
Question: How **long** is the financial cycle in the case of emerging economies with a financial sector in development? (such as the CEE region)

Main issues:

- Limited time series ↔ recent development of the financial sector + **low level** of financial intermediation
- Significant **structural changes** in the financial sector and the real economy

Difficult to assess the length of the financial cycle ➔ calibration process of the CCyB

Romania's credit-to-GDP gap, using a range of frequencies for the financial cycle (between 8 and 30 years)



Note: smoothing parameter ranges from purple (long cycle, λ=400.000) to green (short cycle, λ=1.600)

Source: ECB, ESRB, NBR

2.1. Measuring financial cycle length

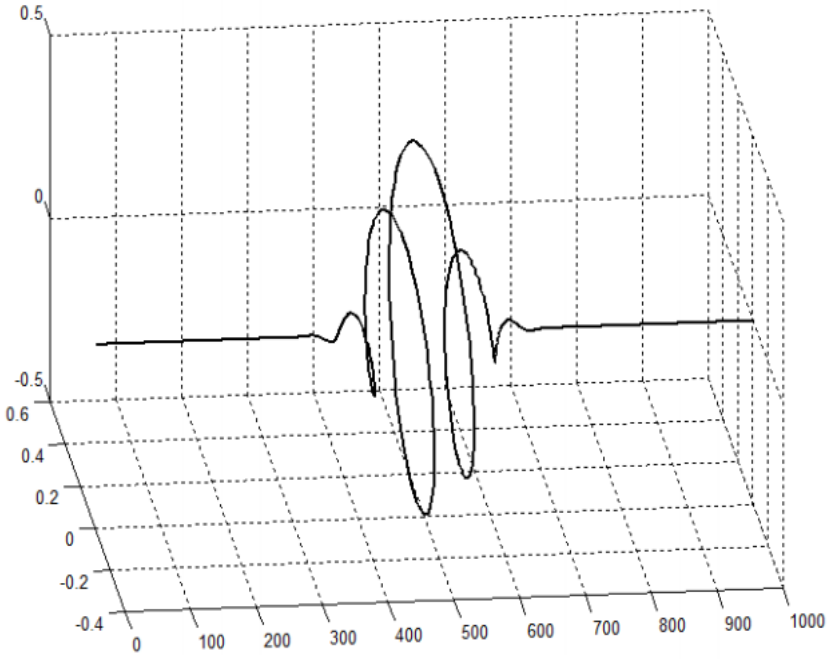
Wavelet analysis → extended form of **spectral analysis** allowing for time variation - decomposes a time series into a set of cycles with specific periods and estimates the contribution of these cycles to the variance of the series

Main advantages:

- Decomposes series on a **range** of frequencies → assess significant cyclical behavior
- Is able to deal with **non-stationary** data
- Provides intuitive tools for analysis ➔ **Wavelet Power Spectrum** = measures the relative **contribution to the variance** of the time series at each scale and at each point in time

⇨ is able to detect **cyclical behavior**

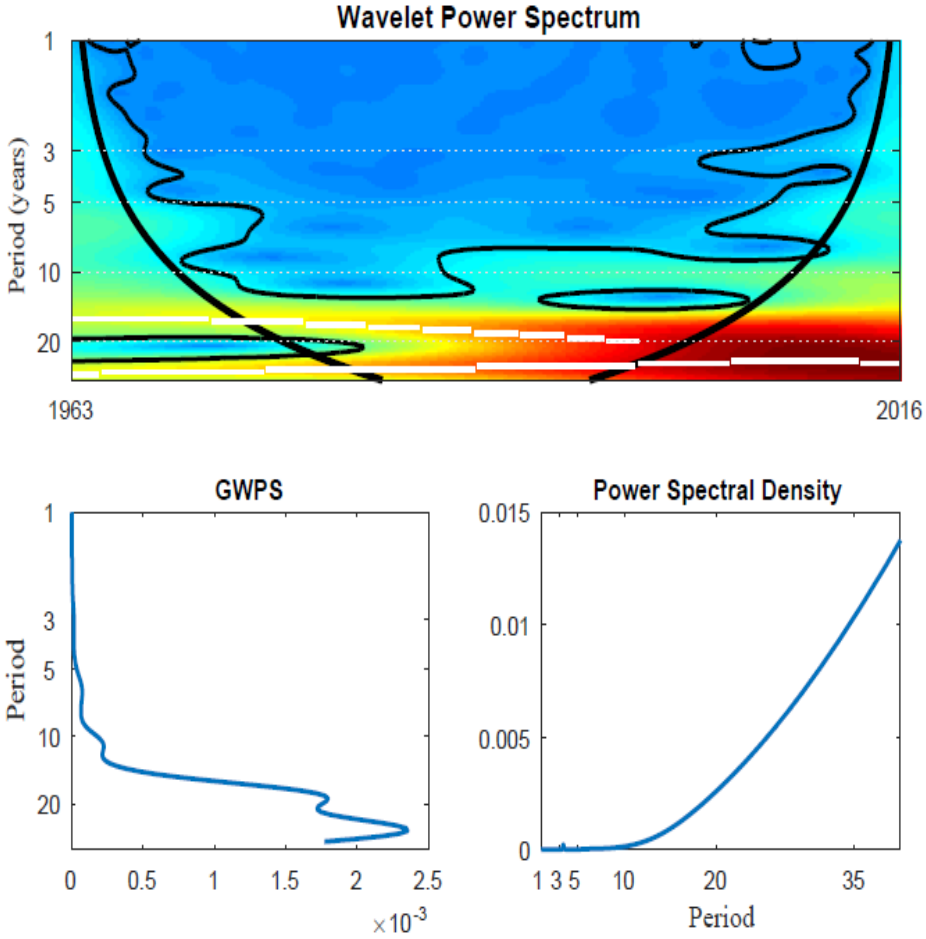
The Complex Morlet wavelet



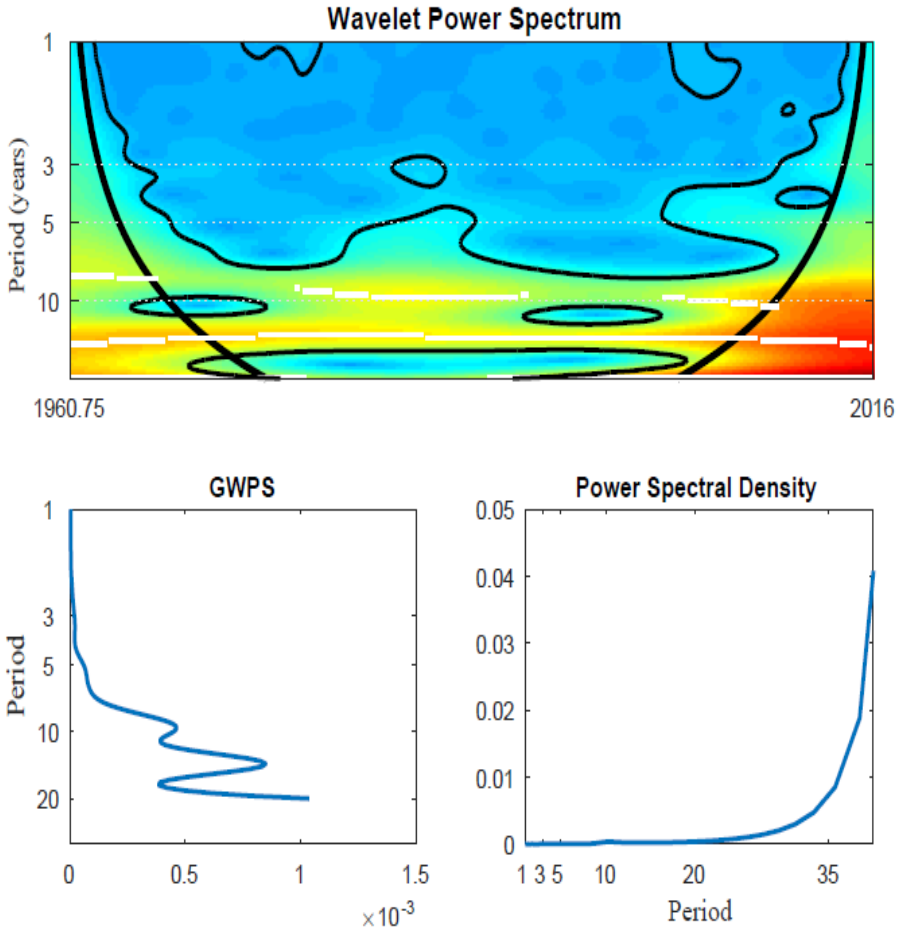
$$\psi_{\omega_0}(f) = Ke^{i\omega_0 t}e^{\frac{-t^2}{2}}$$

2.1. Measuring financial cycle length

Wavelet power spectrum for the UK



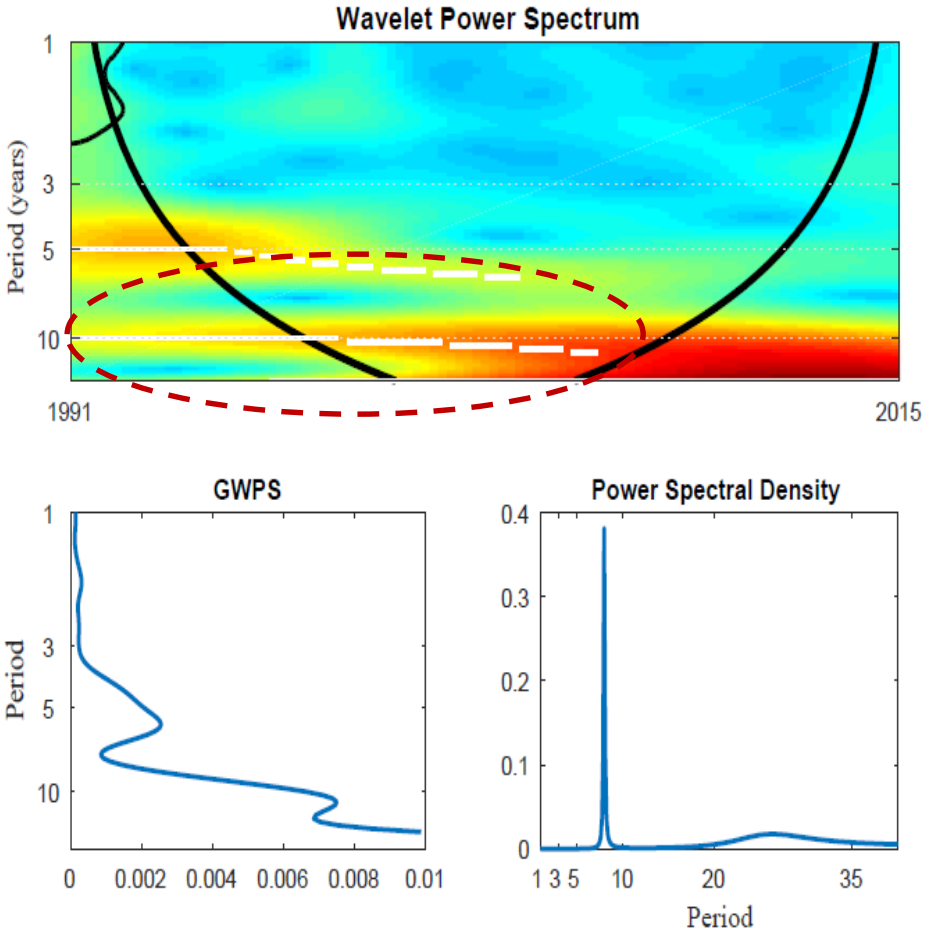
Wavelet power spectrum for Portugal



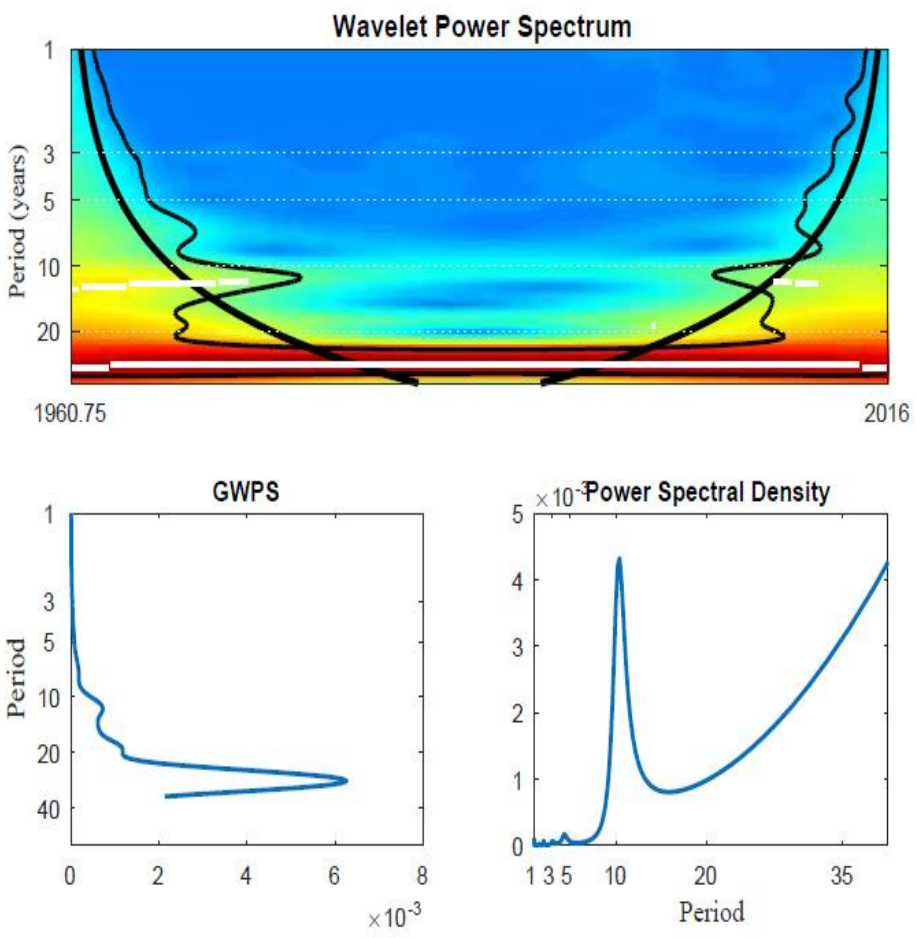
Source: own estimation

2.1. Measuring financial cycle length

Wavelet power spectrum for Romania



Wavelet power spectrum for Austria



Source: own estimation

2.2. Predictability and forward guidance

Additional indicators → **Dashboard** with signaling and alert thresholds (HH sector, NFC sector, Real estate market, Banking sector and Macroeconomic stance)

Forward guidance on CCyB calibration ➔ (i) measuring predictive power of each indicator and (iii) using a forecasting model for the Credit-to-GDP gap

I. Measuring predictability

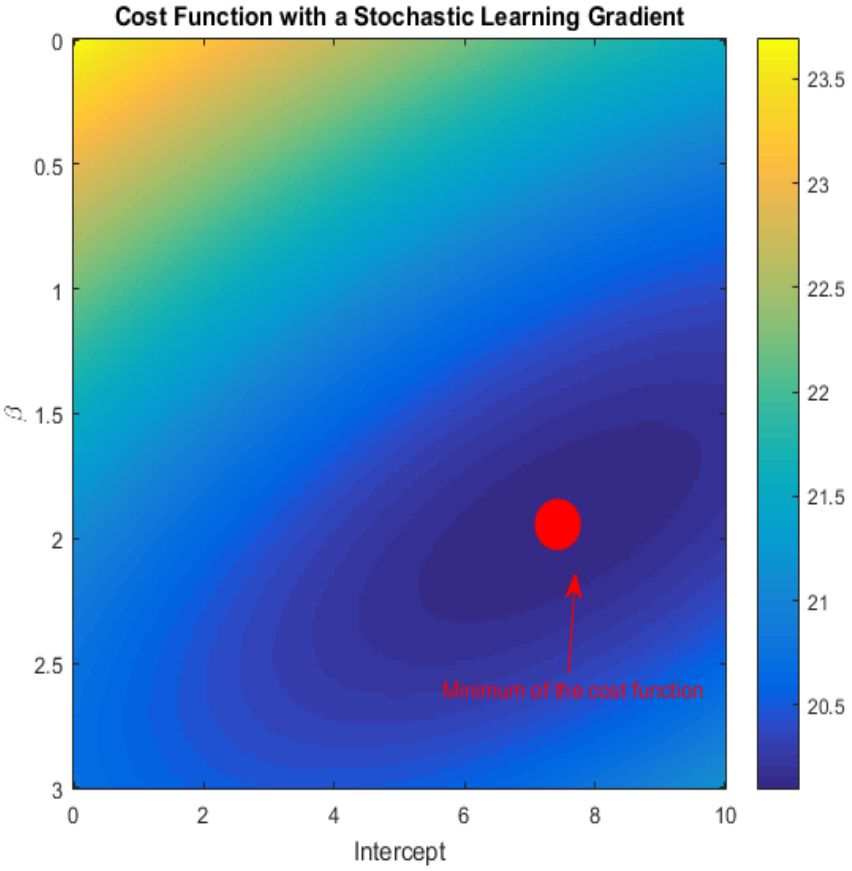
- Predictability relationships are important to see to which extent some variables contain important information for the future evolution of interest variables (important for EWS, forecasting etc.)

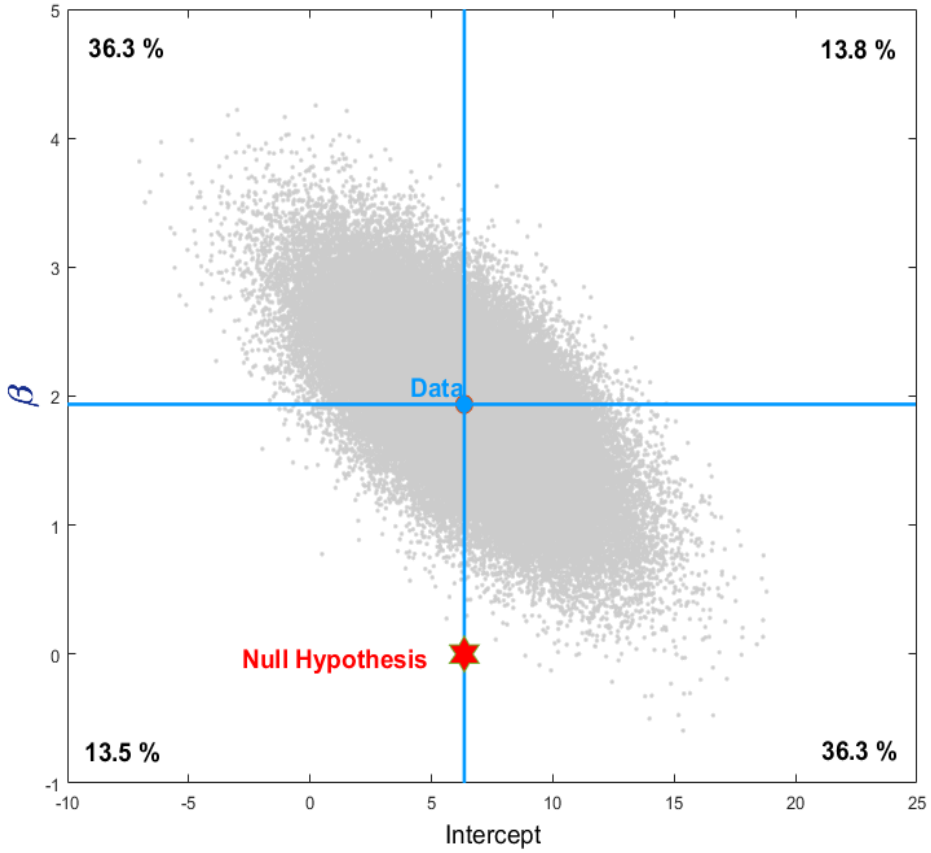
The methodology consists of:

- Running **bilateral regressions** with the additional indicators from the CCyB Dashboard to investigate the predictability relationship
- Testing the **likelihood** of the obtained estimates using a **stochastic learning gradient** and a **Monte-Carlo based experiment** for the joint distribution of regression parameters (LR test)

2.2. Predictability and forward guidance

Results for the stochastic gradient (*left*) and Joint Distribution (MC simulation) (*right*) for testing the relationship between indebtedness and economic growth





Source: own estimation

2.2. Predictability and forward guidance

II. Forecasting the Credit-to-GDP gap

Model = medium scale BVAR model, Minnesota prior with hyperparameter optimization using grid search (Giannone et al. 2012)

Variables included

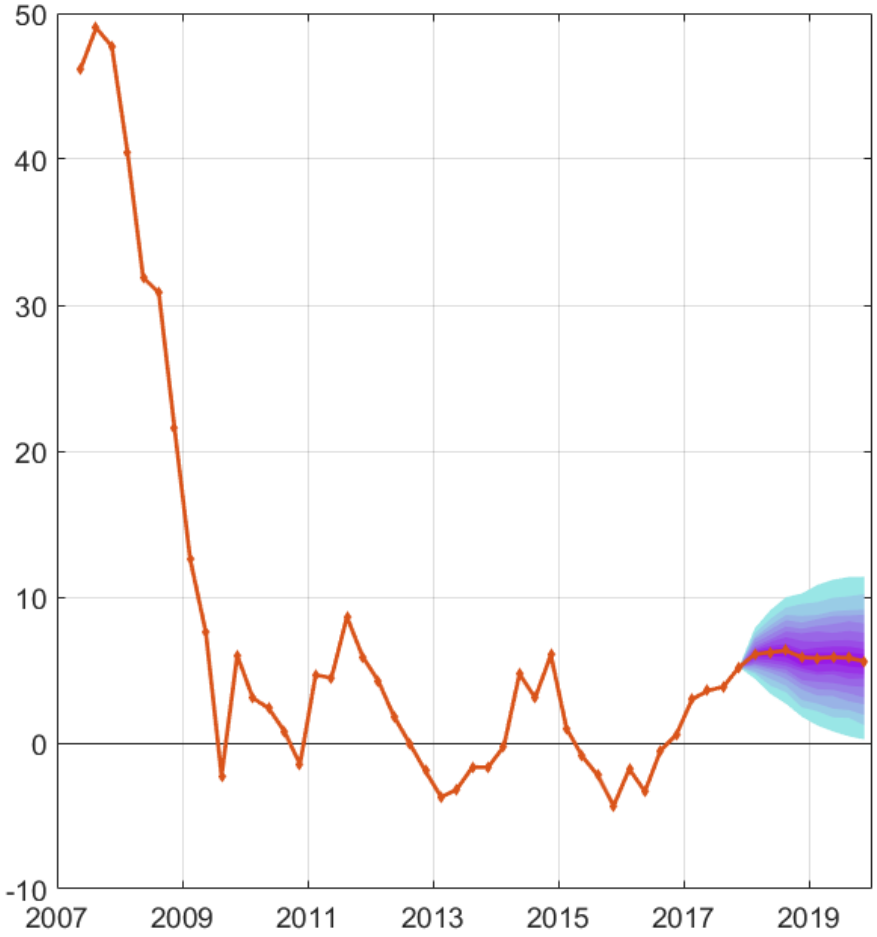
- **Credit growth rates –** sectorial basis (NFC, HH on Consumer and Mortgage)
- **Real estate market prices**
- **Real GDP growth**
- **Short Term Interest Rate – ROBOR 3M**
- **HH and NFC spreads**

Other variables were tested (unemployment, industrial sector indices) but were omitted due to **low predictive power**

Goal ➔ forecast total credit growth and use GDP projections to compute the **Credit-to-GDP gap on a 2-year horizon**

2.2. Predictability and forward guidance

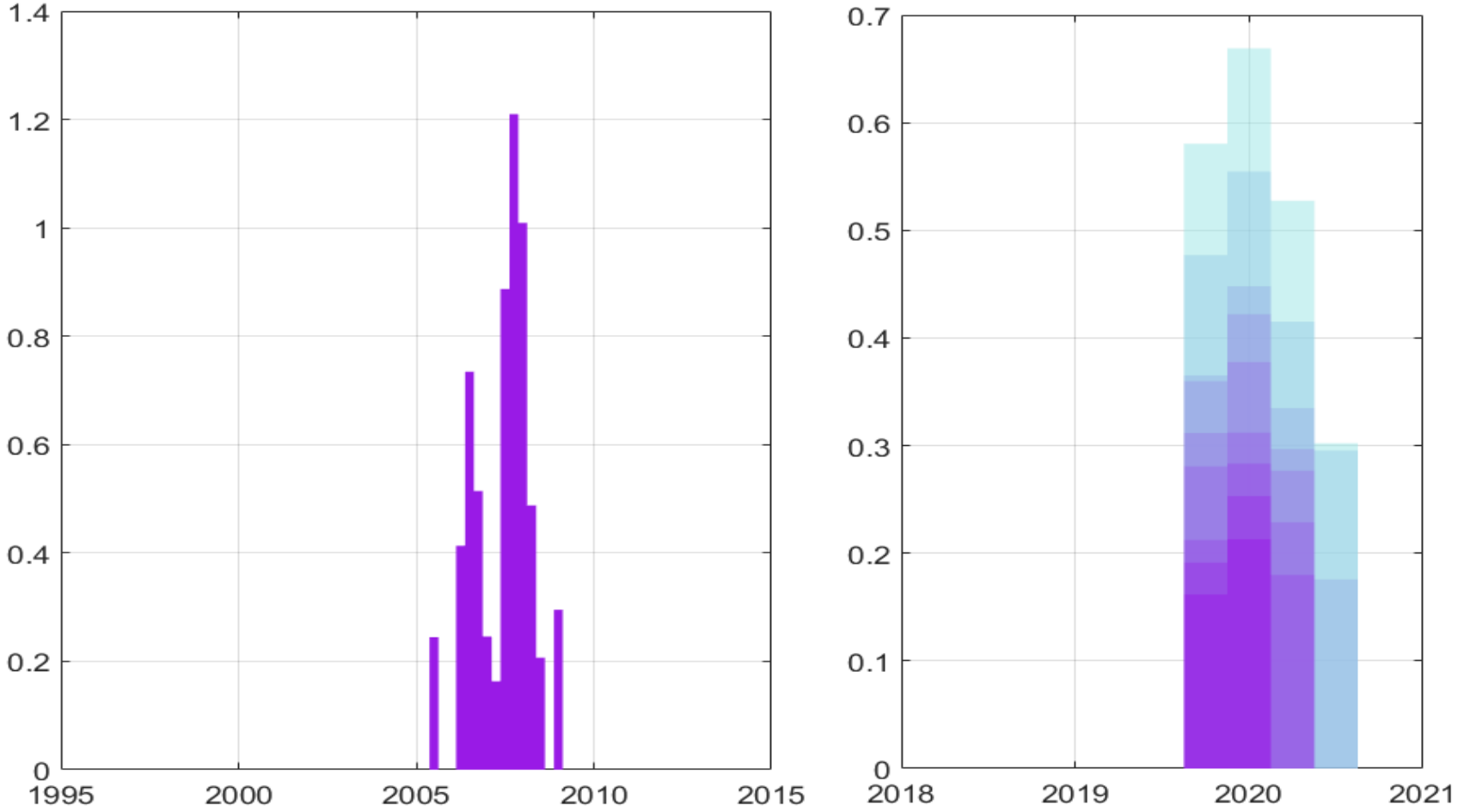
Density forecast results for total credit growth (*left*) and Credit-to-GDP Gap (*right*)



Source: own estimation

2.2. Predictability and forward guidance

CCyB historical rate (*left*) and projections (*right*) on a 2-year horizon



Source: own estimation

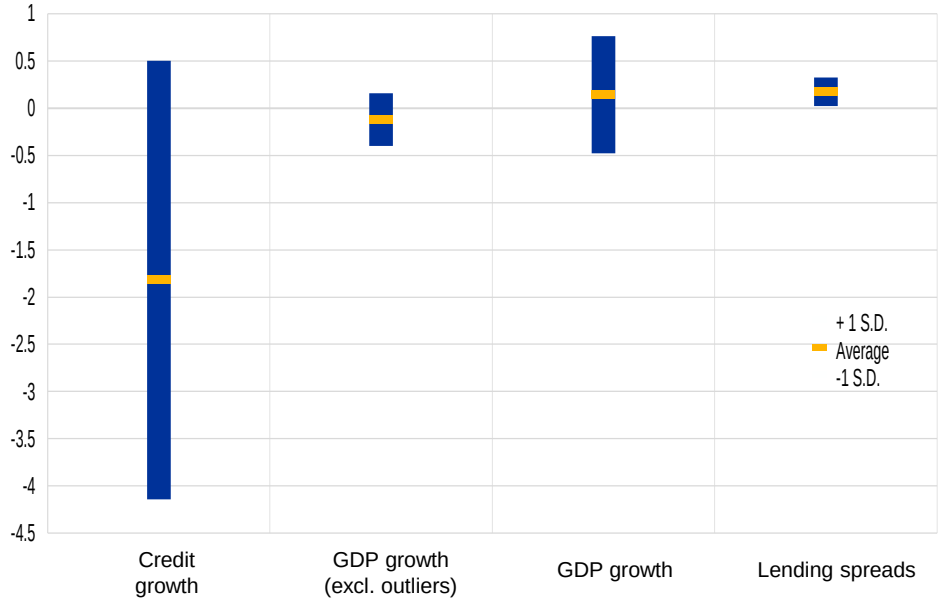
2.3. Impact of capital buffers on the real economy

Empirical studies → impact of capital buffers varies with the choice of model, underlying assumptions, time frame and horizon considered:

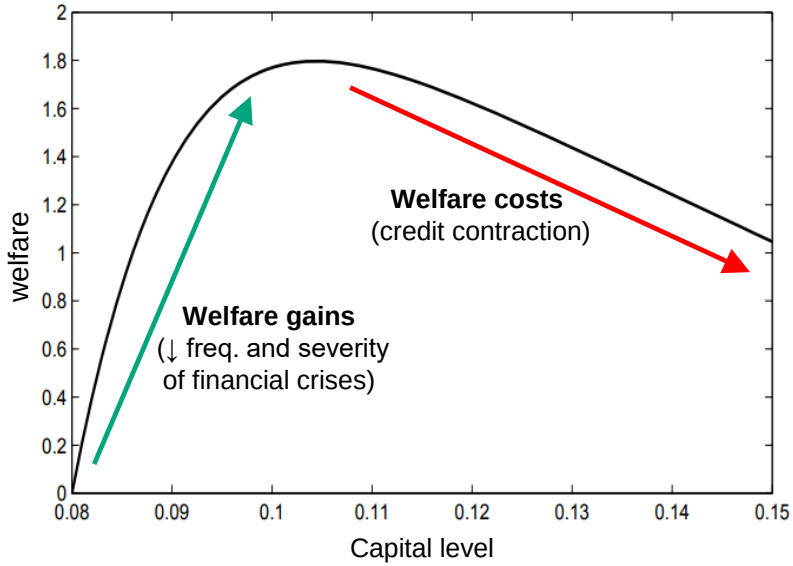
➔ **Short-term effects** = **Negative** – **credit contraction** with negative effects on economic growth

➔ **Long-term effects** = **Positive** – limit the **frequency** and **severity** of financial crises

Summary of estimated impact from empirical studies



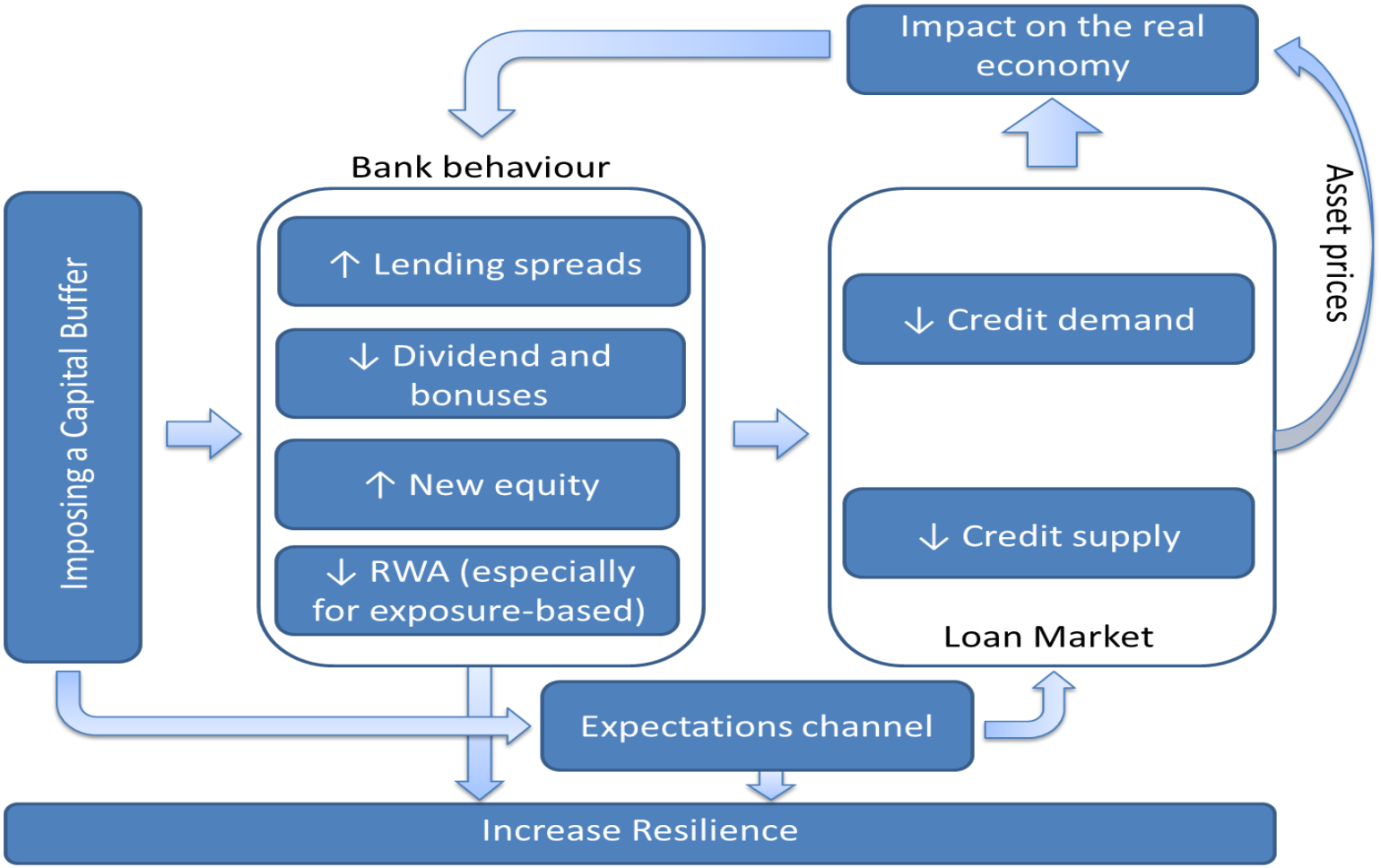
Impact of capital requirements on welfare



Source: Clerc et al. (2015) - 3D DSGE Model

2.3. Impact of capital buffers on the real economy

Transmission mechanism of higher capital buffers



Source: adaptation from ESRB

2.3. Impact of capital buffers on the real economy

Methodology = Bayesian SVAR with sign restrictions for Romania – *ECB Working Paper No. 2077/ June 2017* on "Estimating the impact of shocks to bank capital in the euro area".

Variables included – quarterly basis from **2007Q1 to 2018Q2**

- GDP growth – annual growth rate
- HICP inflation – annual rate
- Short-term Interest Rate (ROBOR 3M)
- NFC/Mortgage loans – annual growth rate
- CET1 capital ratio
- NFC/Mortgage loan spreads – difference between total cost and ROBOR 3M

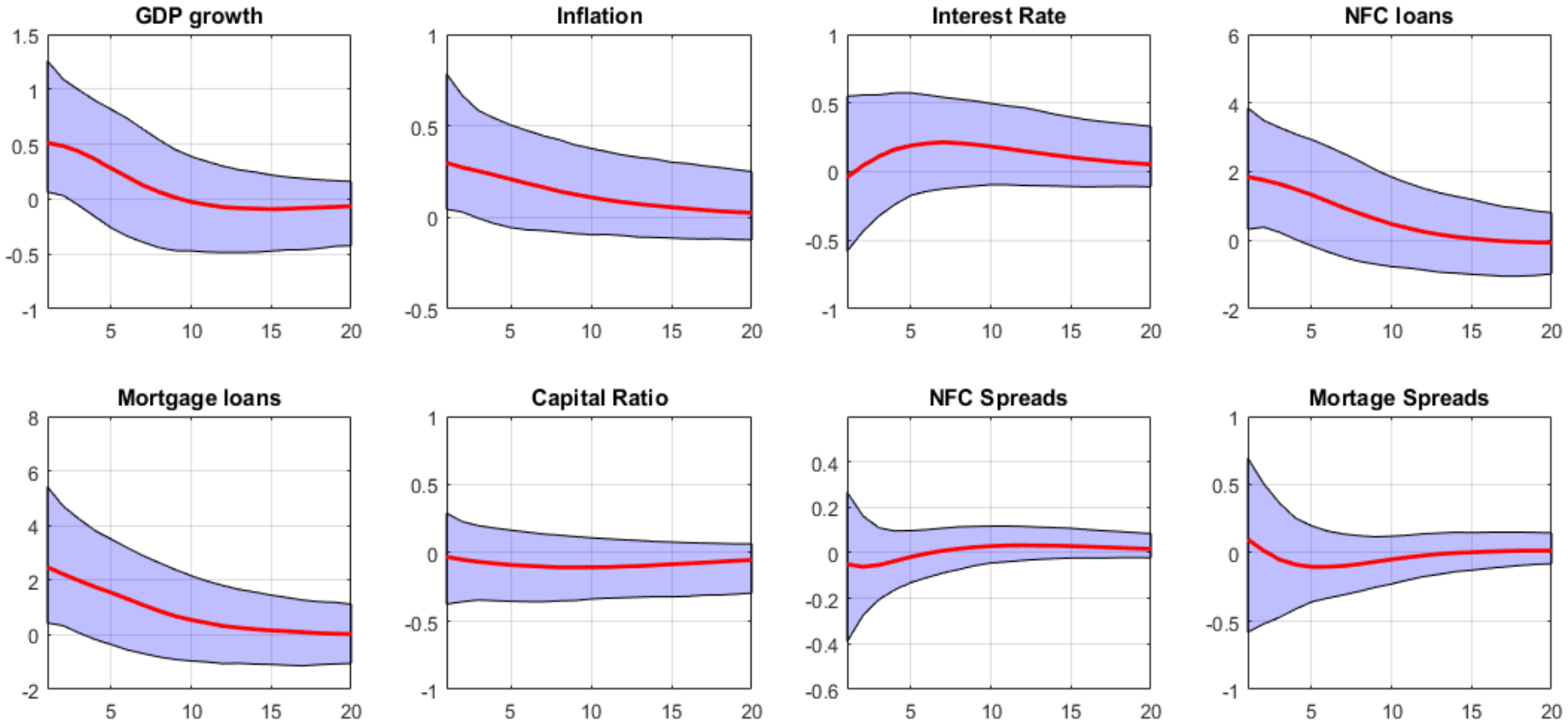
Model specification – dummy observation prior (Banbura et al. 2010), 3 lags

Shock identification scheme

	Real GDP	Inflation	ST Interest Rate	NFC loans	Mortgage loans	NFC Spreads	Mortgage Spreads	Capital Ratio
Demand Shock	+	+		+	–			
Bank Capital Shock	–	–		–	–	+	+	+

2.3. Impact of capital buffers on the real economy

Structural Impulse Response Functions for a Demand Shock

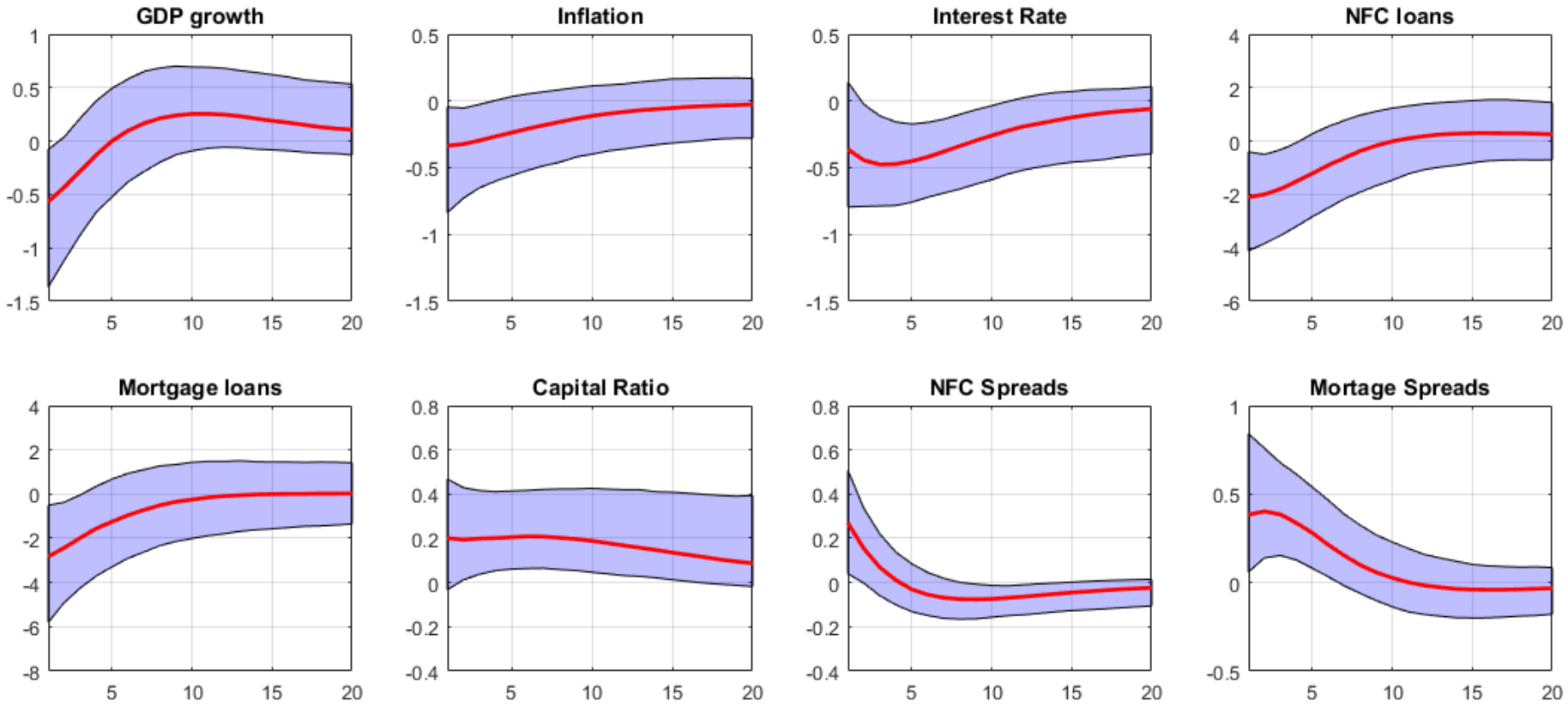


Source: own estimation

➔ **Cross-check** – results are in line with economic theory and similar to the Euro Area results from the ECB Working Paper

2.3. Impact of capital buffers on the real economy

Structural Impulse Response Functions for a Bank Capital Shock

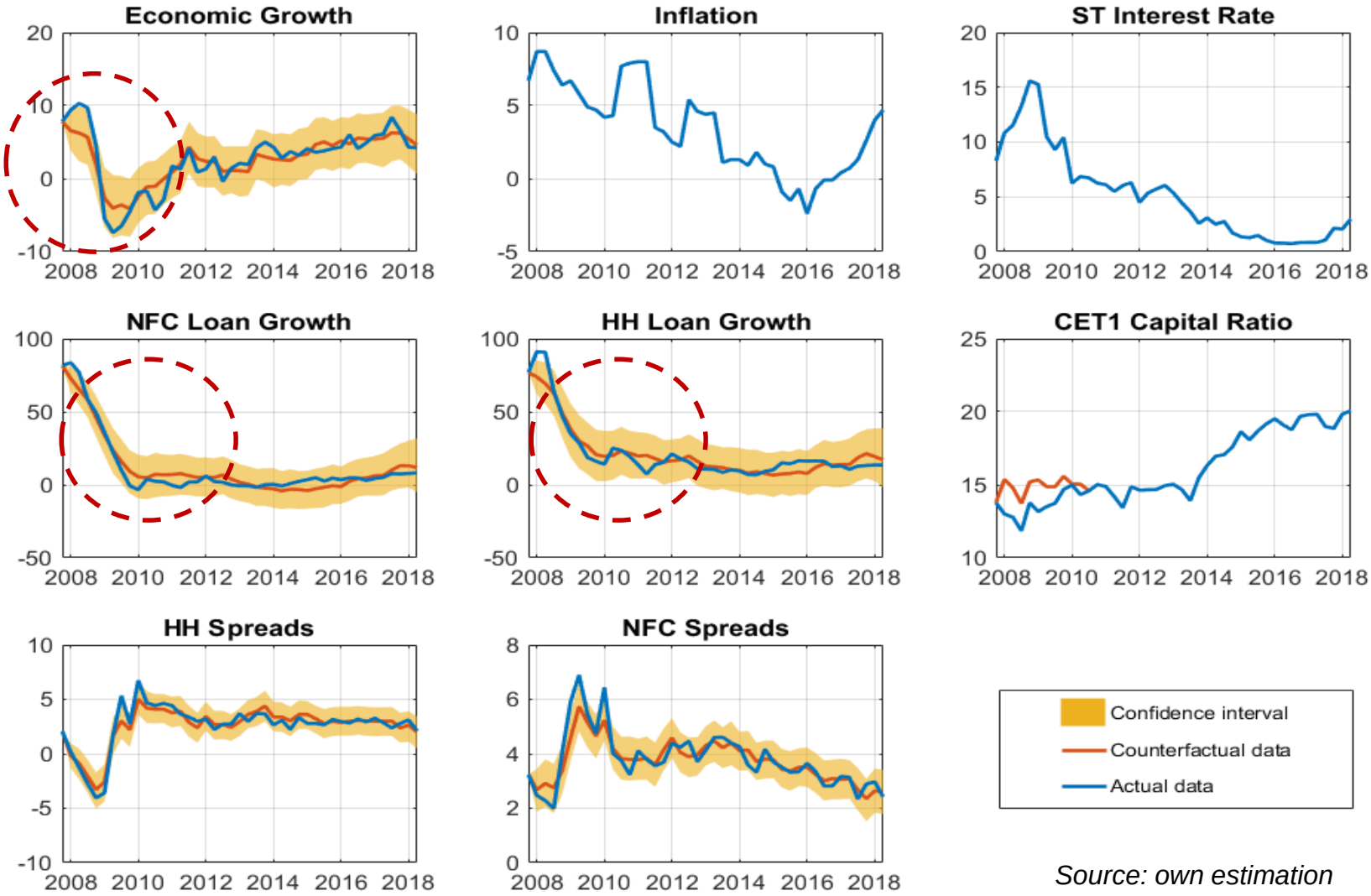


Source: own estimation

➔ **Impact** on lending and credit growth – higher than Eurozone results (limited data availability) ↔ **highly dependent** on capital reserves (can dampen the impact significantly)

2.3. Impact of capital buffers on the real economy

Counterfactual exercise: introduction of the CCyB in 2008



Source: own estimation

3. Conclusions and further work

The NBR's toolkit for CCyB implementation contains quantitative tools for:

– Measuring financial cycle length

– Predictability and forward guidance on the CCyB rate (forecast model)

– Evaluating the macroeconomic impact of raising capital buffers

Key points:

- **Financial cycle is significantly shorter in CEE region** ➔ monitor the credit to GDP gap using additional specifications (smaller smoothing parameter)
- **Baseline forecasts for credit growth show stable dynamics** ➔ potential to introduce a CCyB in the next to years, with a low rate (median of 0.2 pp), when using the Credit-to-GDP gap on with a short financial cycle definition
- **Impact of raising capital buffers is in line with empirical literature** ➔ short-term negative impact on economic growth (relatively higher than other European and international studies) and similar negative impact on NFC and Mortgage loan growth
- **Counterfactual exercise — introducing the CCyB before the crisis** ➔ dampened volatility of **NFC & HH loan growth + the business cycle** → potentially successful in reaching its objective of **limiting procyclicality**

Thank you for your attention!