DANMARKS
NATIONALBANK

Quest for ROMP

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Quest for Robust Optimal Macroprudential Policy

Starting from the end.....

Introduction

Optimal capital requirements

Optimal countercyclical capital buffers

Optimal interaction of instruments

The views expressed are our own and do not necessarily represent the official stance of Danmarks Nationalbank, Banco de Espana, ECB or the Eurosystem.

Some highlights

- Optimal level of bank capital for the Euro Area (EA) lie at 15.64% (2% higher than the average level for 2001-14 period).
- Compared to the 2000-14 level, optimal capital **increases somewhat** the total **level** of welfare (utility), but **reduces significantly** the **volatility** of the economy.
- 'Undershooting' is much more costly than 'overshooting'.
- Optimal EA Countercyclical Capital Buffer is the one that responds to **credit** and **house prices**, *with a heavier response to house prices*.
- Under an optimal combination of policies, gains in welfare are larger than the sum of its parts due to synergies.
- In this case, optimal CCyB changes to the one that responds to **credit** and **mortgage spreads**, *with a higher weight on the first argument.*

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Brief motivation from ongoing policy debates

- Since the financial crisis in 2008, a set of (macro)-prudential tools have been designed and implemented in the Euro Area. Yet, there is still thin evidence on their (joint) impacts and optimal interaction.
- At the same time, there are increasing concerns regarding the **costs** and **unintended consequencies** of macroprudential measures.
- There is also some concern that the **degree of complexity** of the current regulatory framework may be counteracting the original regulation objective and prevent a smooth functioning of the financial system.
- It comes back to the dichotomy of whether the current regulatory architecture is **overburdening** the financial system or **not sufficiently safegarding** the economy from future adverse events.

What we do here

- We respond to some of these questions by determining optimal macroprudential policies using holistic welfare criteria.
- The optimal policy approach has been adopted to the macroprudential context.
- The criteria (or objective functions) are consistent with the model structure and derived using the weighted utility of borrowers and savers.
- We use the criteria to extract the following policies:
  - Optimal level of capital requirement (CR)
  - Optimal countercyclical capital buffer rule (CCyB)
  - Optimal interaction between CR and CCyB
  - (Cross-country optima)
- Moreover, we incorporate a few imperfections common for policy-making in real-time.

Application - Clerc et al (2015)

- The 3D model has emerged as the Euro Area financial frictions model that allows policy experiments, counterfactual analysis and cross-country comparisons.
- The model introduces financial intermediation and three layers of default into a DSGE model.
- It provides a clear rationale for capital-based regulation arising from two types of distortions: **limited liability** by banks and bank **funding cost externalities** leading to excessive risk taking by banks.
- The model is fit to (Euro Area) individual country data, matching first and second moments of the main macro and financial variables
- Capital-based instruments are quantified and evaluated in terms of household welfare, GDP cost, credit losses, sectorial losses. We examine optimal policy in this paper.

Briefly on model structure

- The model consists of households, entrepeneurs, banks, bankers, and the macroprudential authority
- *Households* are of two types: *savers* and *borrowers*, they belong to dynasties of infinitely lived agents that differ in terms of the subjective discount factor. Wealth comes from owning housing and income from wages.
- *Entrepreneurs* live for two periods and own the capital used in the technology for consumption good production. Capital purchase is financed with entrepreneurial wealth and bank loans. Capital and housing production face adjustment costs
- *Banks* finance their loans by raising equity (from *bankers*) and deposits (from savers). Costly equity is only enough to satisfy the regulatory limit.

Briefly on model distortions

- Depositors are incentivized to save by allowing them to charge a time-varying deposit rate that includes a deposit risk premium.
- Deposits are formally insured by a deposit insurance agency funded with lump sum taxes paid by depositors.
- Both features incentivize the depositors to be 'in the game'.
- When banks default, depositors suffer some transaction costs despite the presence of deposit insurance.
- This feature is introduced in the model in order to provide a link between bank risk and banks' funding costs. It is important for our welfare analysis.

Key distortion

- The key distortion in the model is related to the fact that **banks' cost of funding is unrelated to banks' individual risk taking**. This happens for two main reasons:
  - Safety net-guarantees insulate banks from the effect of their risk taking on the cost of deposits;
  - The deposit premium is based on system-wide (rather than individual) bank failure risk. This *reduces the incentive* of any individual bank *to limit leverage and failure risk* because it will get no funding cost benefit when depositors are uninformed.

$$\tilde{R_t^D} = R_{t-1}^D + (1 - \gamma PD_t^b) \tag{1}$$

$$PD_t^b = \frac{d_{t-1}^H PD_t^H + d_{t-1}^F PD_t^F}{d_{t-1}^H + d_{t-1}^F} \tag{2}$$

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Curvature and method

- From the model, we know that **welfare of savers increases** with higher bank capital levels, meanwhile it **quickly drops for borrowers**.
- Moreover, in the long run, capital requirements affect bank funding costs in two off-setting ways. On one hand it **lowers the cost of deposit funding**, but at the same time, **increases the share of more expensive equity funding**.
- Further, on aggregate there are trade-offs between **maximizing output** (through supply of loans/AD) and **containing risks** (limit social costs related to defaults).
- Therefore, a comprehensive and consistent method is required to determine the 'optimal balance'.
- There is an established literature on optimal monetary policy design using a LQ approximation of the various utility functions in a model with financial frictions (De Fiore and Tristani (2009), Chadha et al (2013), Gerba (2016), Ferrero et al (2017)).
- We use their insights and adapt it to our particular problem.

Welfare function

- We make a second order approximation (SOE) of the joint utility, with both first-order and second-order terms in order to also capture volatility effects of capital requirements.
- *Reason*: CR is a non-cyclical instrument that affects the level of aggregate utility of agents in the steady state. Thus, apart from the standard **volatility** effects, bank capital levels impact the **level** of welfare (or consumption) in steady state.
- After derivations, our SOE welfare functions is:

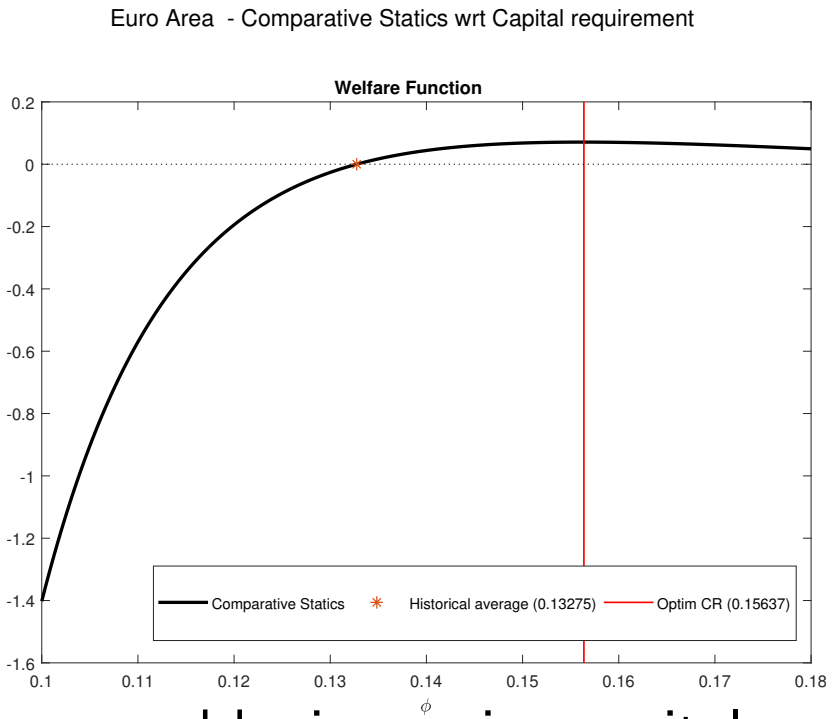
$$E_0 \sum_{i=0}^{\infty} \beta^{t+i} W_t,$$

$$W_t = \chi_{h^s}(\mu_{h^s} - \sigma_{h^s}^2) + \chi_{h^m}(\mu_{h^m} - \sigma_{h^m}^2) + \chi_w(\mu_w - \sigma_w^2) + \chi_k(\mu_k - \sigma_k^2)$$

where the normalized weights in SS of each term are:

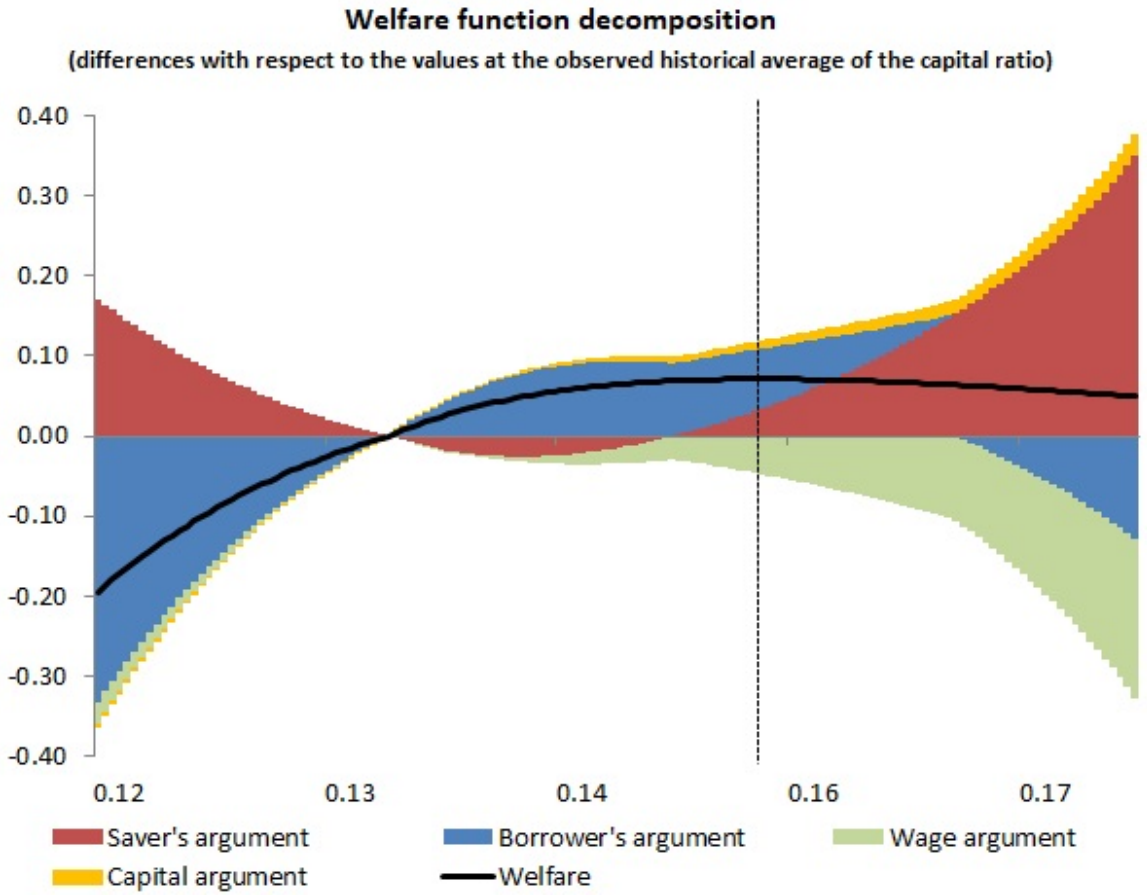
$$\chi_{h^s} = 0.99 \qquad \chi_{h^m} = 1 \qquad \chi_w = 0.47 \qquad \chi_k = -0.26$$

Welfare function - level effects



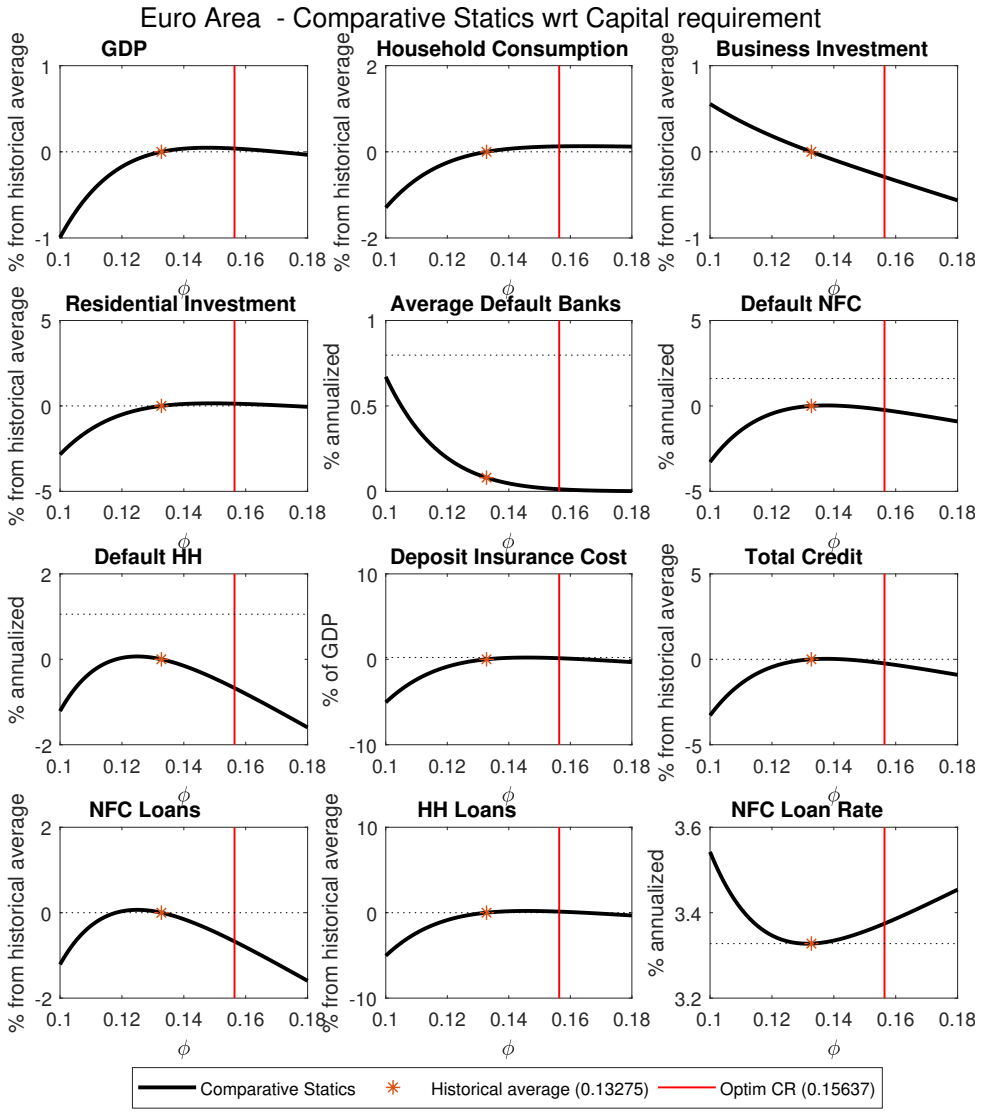
- Total welfare is improved by increasing capital requirements from the baseline steady-state levels.
- 'Undershooting' is costly.
- Asymmetric welfare function along the capital dimension.
- *Reason*: Defaults are socially very costly and generate important externalities: Remember: welfare of savers vs borrowers

Decomposition of the welfare function

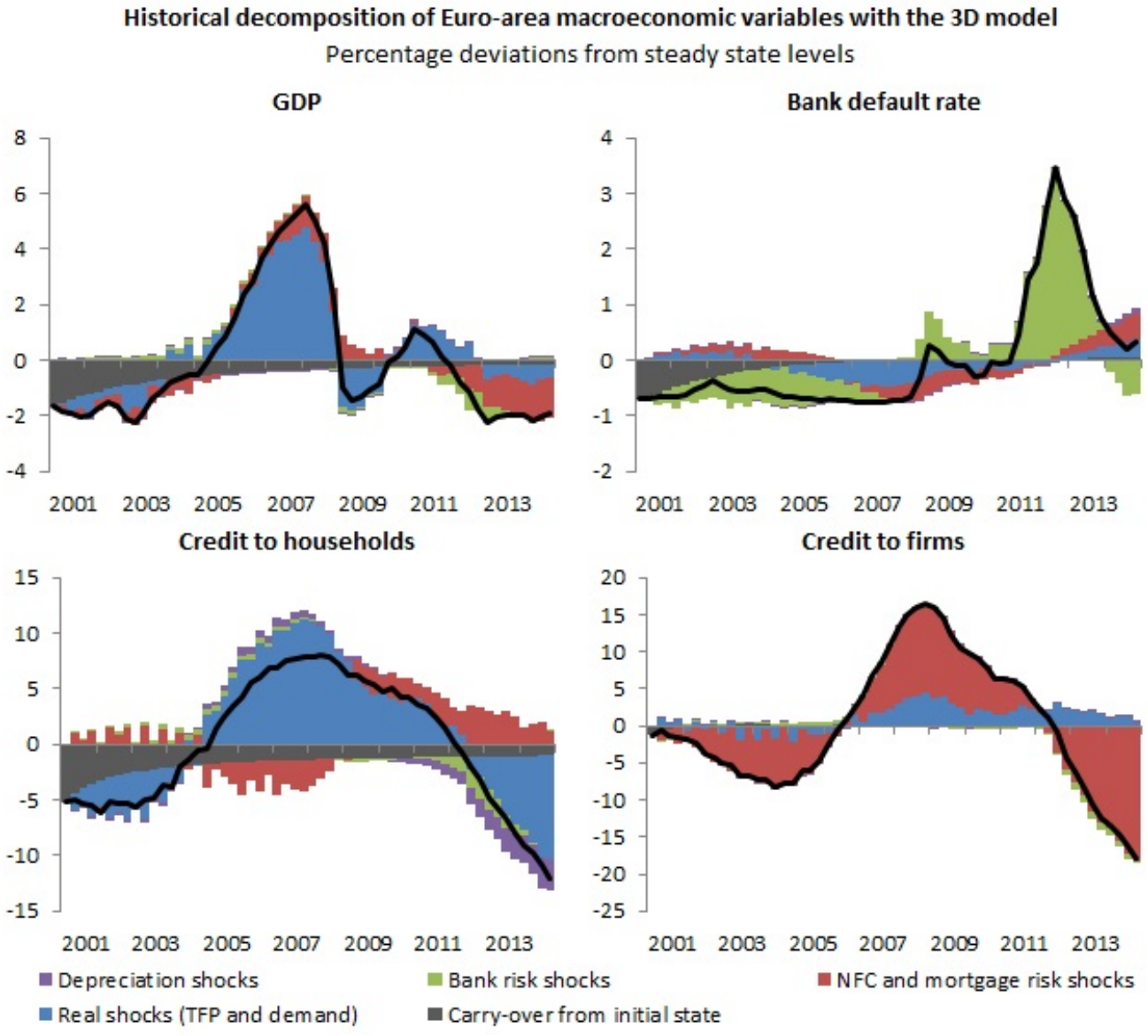


- Trade-off among borrowers, savers, wages and capital are non-linear and determine optimal capital requirements.
- Non-linear compromise between boosting economic activity and maintaining default risks very low is visible here.

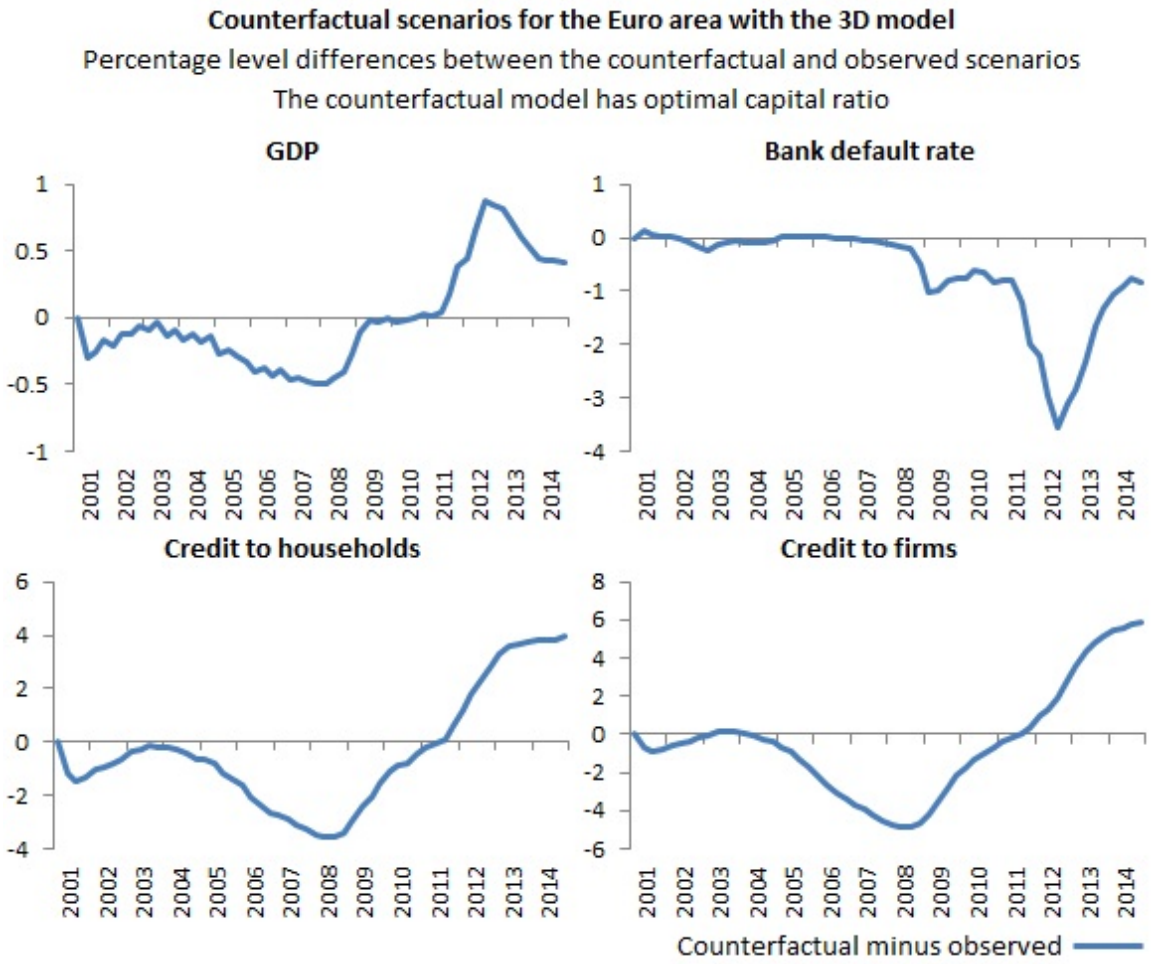
General equilibrium effects



Welfare function - volatility effects

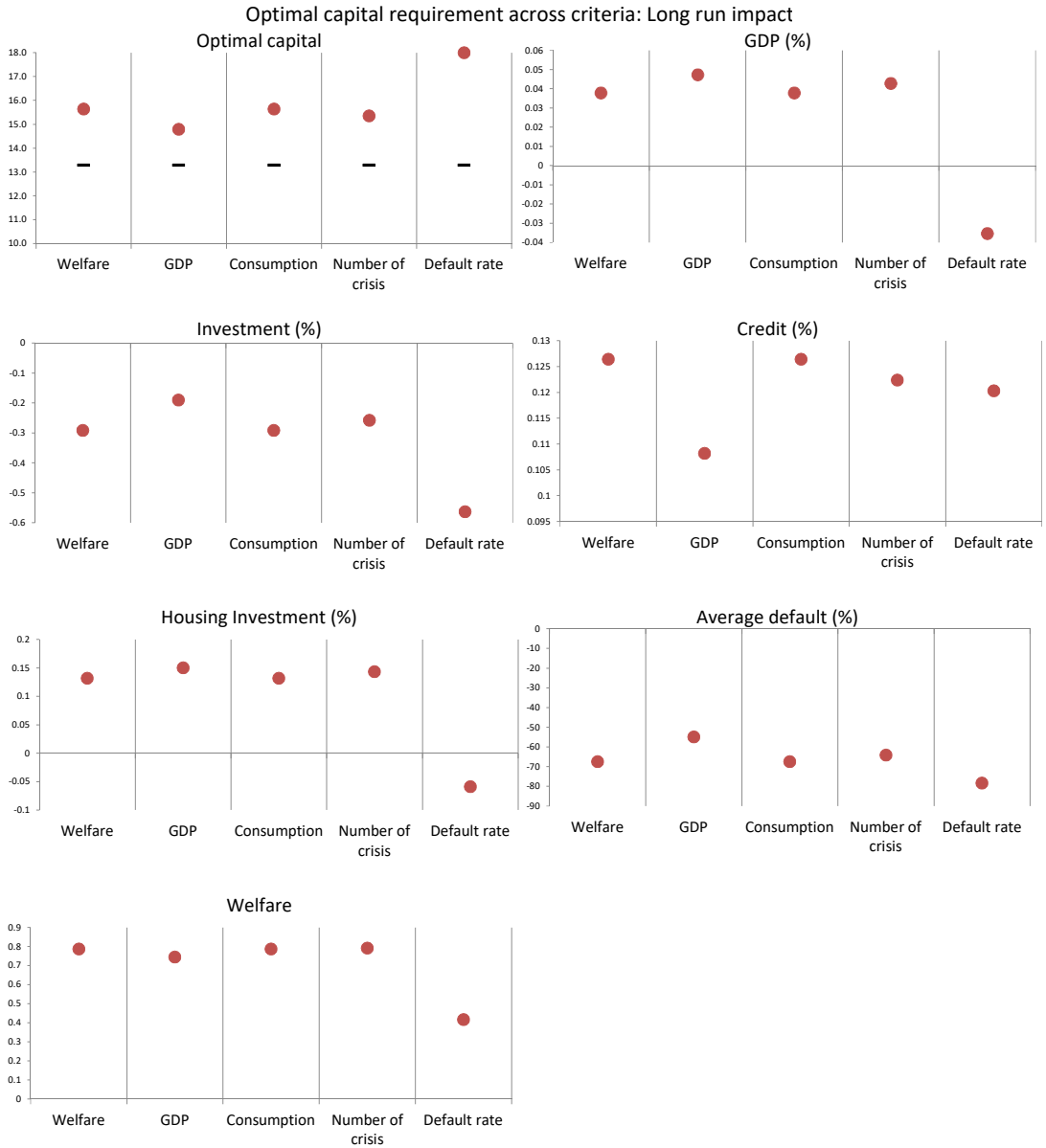


Counterfactual



- **Dual policy objective achieved**: Lower PD and smoother cycles
- Bank default rate is greatly reduced during crisis.

Comparison to other welfare criteria



Take home message

Key message from this section

The optimal capital level **increases somewhat** the total **level** of welfare (utility), but **reduces significantly** the **volatility** of the economy, even with a time-invariant rule.

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Why CCyB

- Optimal capital requirements make cycles smoother. But in principle, not time-varying and not focusing on short-term risks and costs.
- Causes of risks in the short-run are not *a priori* obvious. These need to be identified within a structural model and appopriate automatic rules designed to contain those risks.
- That is the role of the Countercyclical Capital Buffers (CCyB), which are added on top of the capital requirements (one could also accommodate for sector-specific CCyB, although not scope of the current paper).

Loss function

- Countercyclical Capital Buffers (CCyB) are time-varying, have a cyclical/shorter-run objective, and fluctuate based on certain thresholds (e.g. the Total credit-to-GDP gap).
- Roughly speaking, CCyB is the financial stability analogue of monetary policy rules.
- Hence, likewise inoptimal monetary policy, we proceed to make a second order approximation of the joint (weighted) utility of borrowers and savers. The scope of the policy is on short-run cyclical swings. We **minimize** this objective function as welfare decreases with higher volatility in the arguments.
- After derivations, our SOE loss functions is:

$$L_t = \chi_{h^s}\sigma_{h^s}^2 + \chi_{l^s}\sigma_{l^s}^2 + \chi_{h^m}\sigma_{h^m}^2 + \chi_{l^m}\sigma_{l^m}^2 + \chi_k\sigma_k^2$$

where the normalized weights in SS of each are:

$$\chi_{h^s} = 0.91 \quad \chi_{l^s} = 0.12 \quad \chi_{h^m} = 1 \quad \chi_{l^m} = 0.09 \quad \chi_k = 0.92$$

Candidate rules

We test four rules:

$$cr_t = \phi_{cr} cr_{fx} + \phi_a b_t + \phi_b q_t^H \tag{3}$$

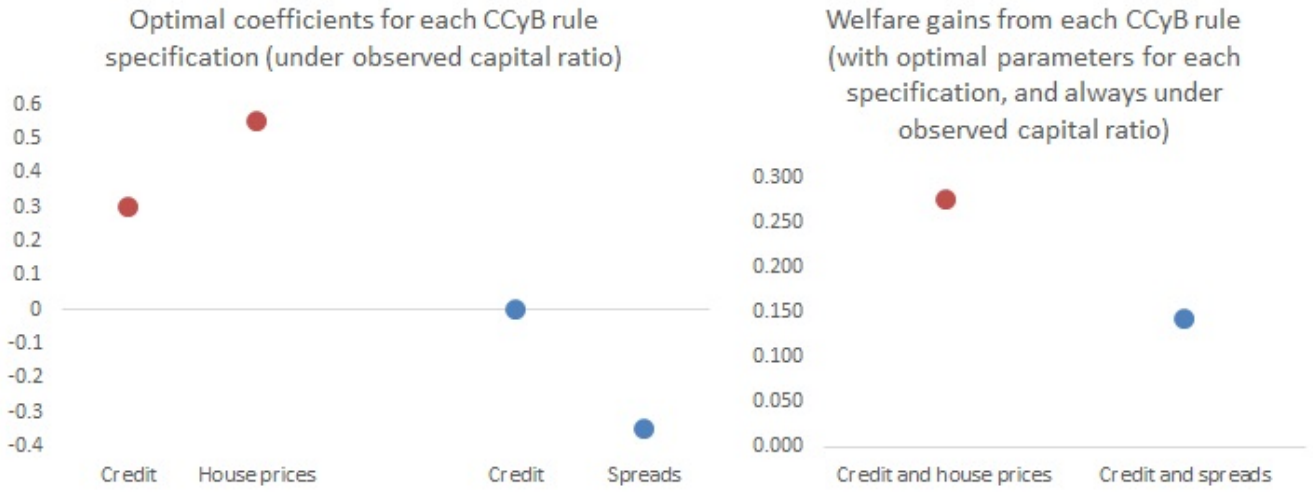
$$cr_t = \phi_{cr} cr_{fx} + \phi_a b_t + \phi_b R_t^H \tag{4}$$

$$cr_t = \phi_{cr} cr_{fx} + \phi_a b_t + \phi_b I_t^H \tag{5}$$

$$cr_t = \phi_{cr} cr_{fx} + \phi_a b_t^h + \phi_b b_t^f \tag{6}$$

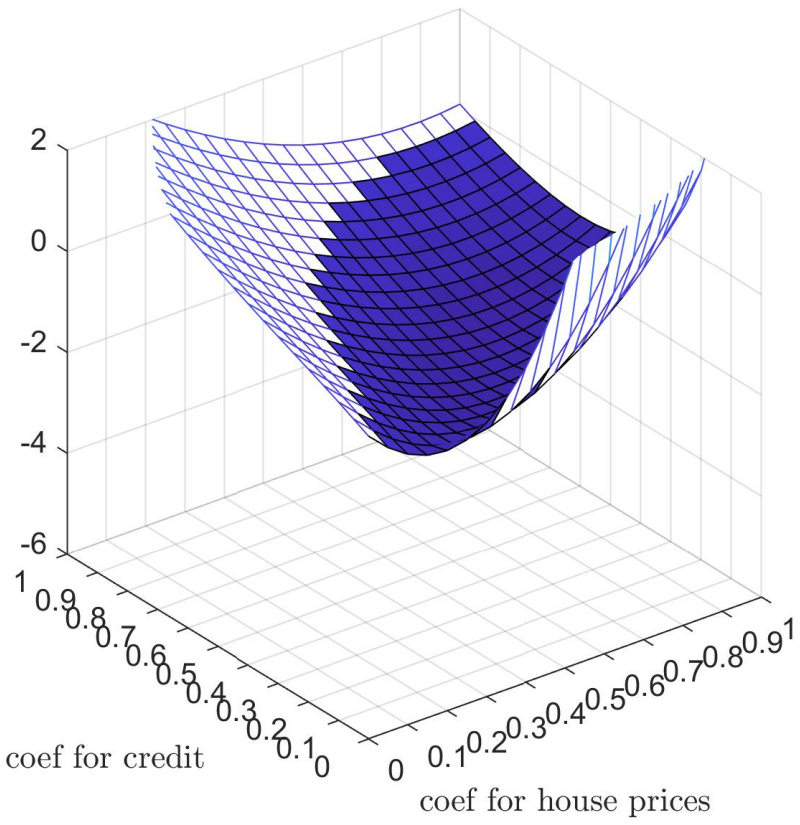
But we report here results from two best-performing rules.

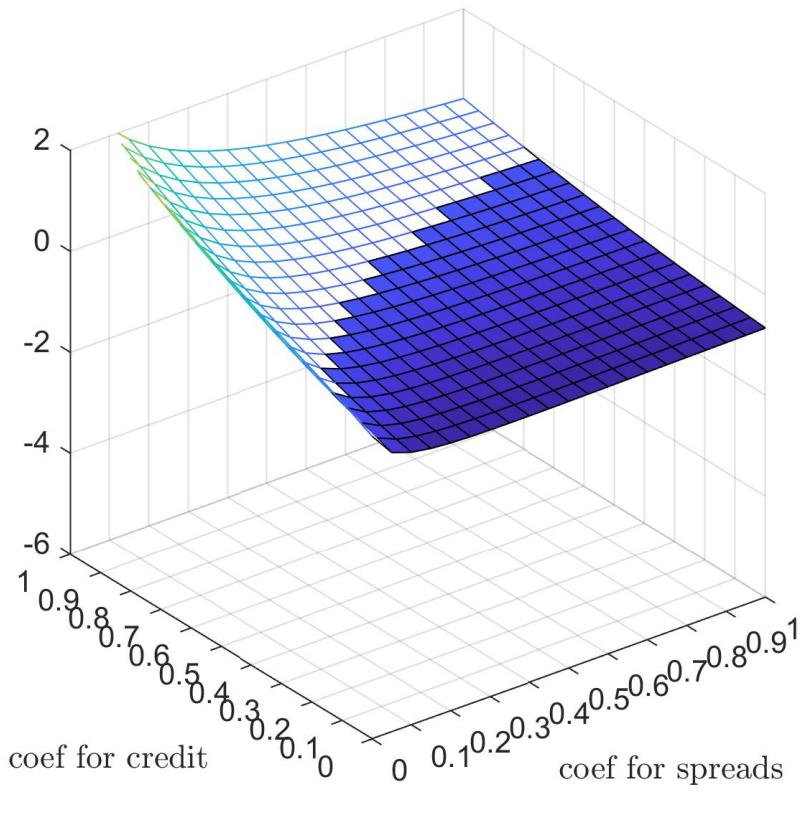
Optimal CCyB



- We report the arg-min. parameters (for each rule) and the minimum loss possible under those parameter values.
- A bad choice of parameters can deteriorate welfare. But how quickly? (*sensitivity analysis*)

Surface of the loss functions - sensitivity analysis





Take home message

Key message from this section

Optimal CCyB should tackle the (macro-financial) imbalances in the economy over the cycle. Those imbalances are economy/case-specific.

For Euro Area, the optimal rule is the one that responds to **credit** and **house prices**.

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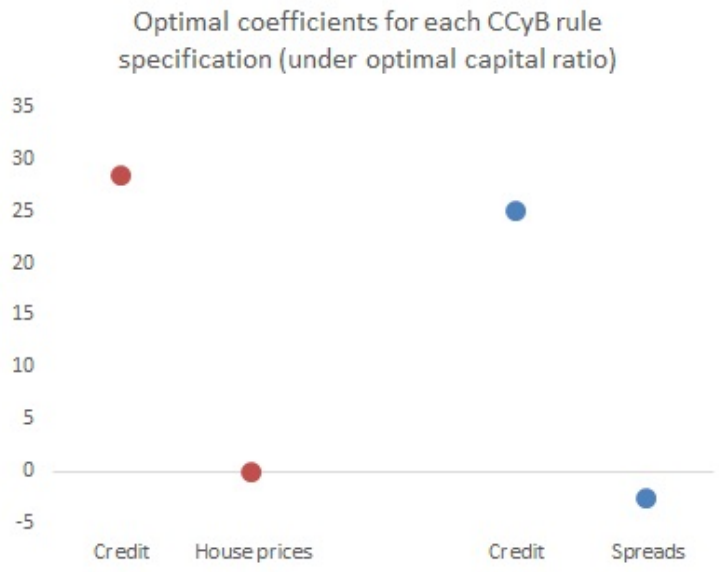
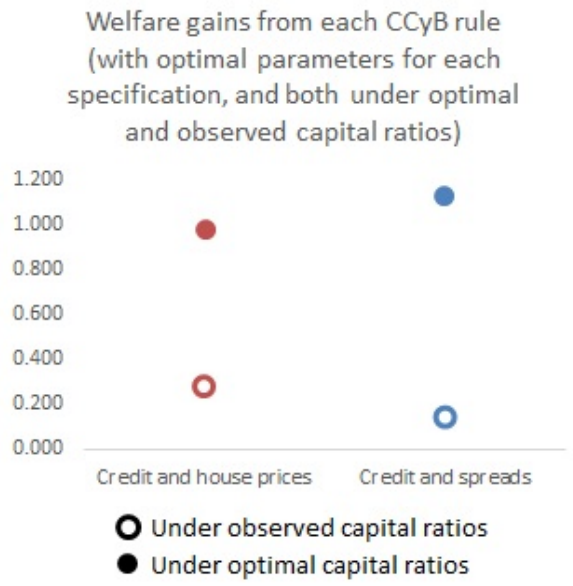
Joint optimal - questions

- Do (and by how much) our previous conclusions change if both instruments are at optimal levels?
- More specifically, and conditional on the *optimal* (not observed) level of capital requirements, what is the new optimal CCyB rule?
- Moreover, do the welfare gains from each rule look similar?
- Also, is the probability of 'missing' the optimal parameters in the optimal CCyB rule larger or smaller compared to before?
- Can we say anything about model stability wrt. instruments?

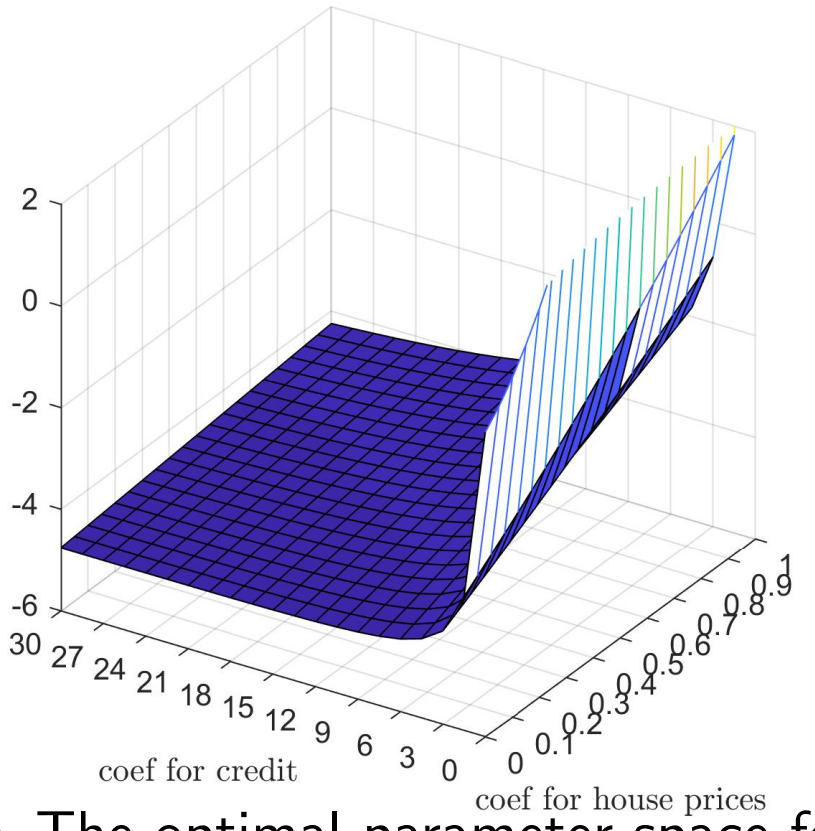
Optimal CCyB when optimal CR is in place

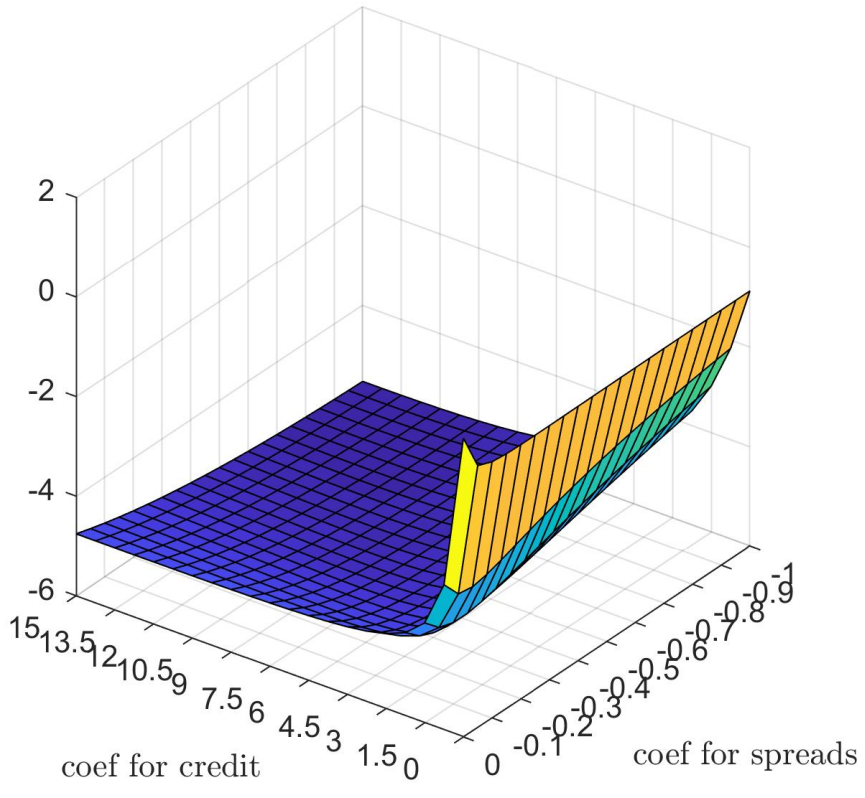




- Our previous conclusions change dramatically.
- Overall much larger gains from the combination of optimal policies.
- The welfare gains from joint optimal are *greater* than the sum of the individual gains.
- The optimal CCyB rule changes to one responding to **credit** and **credit spreads** when capital requirements are at optimal.

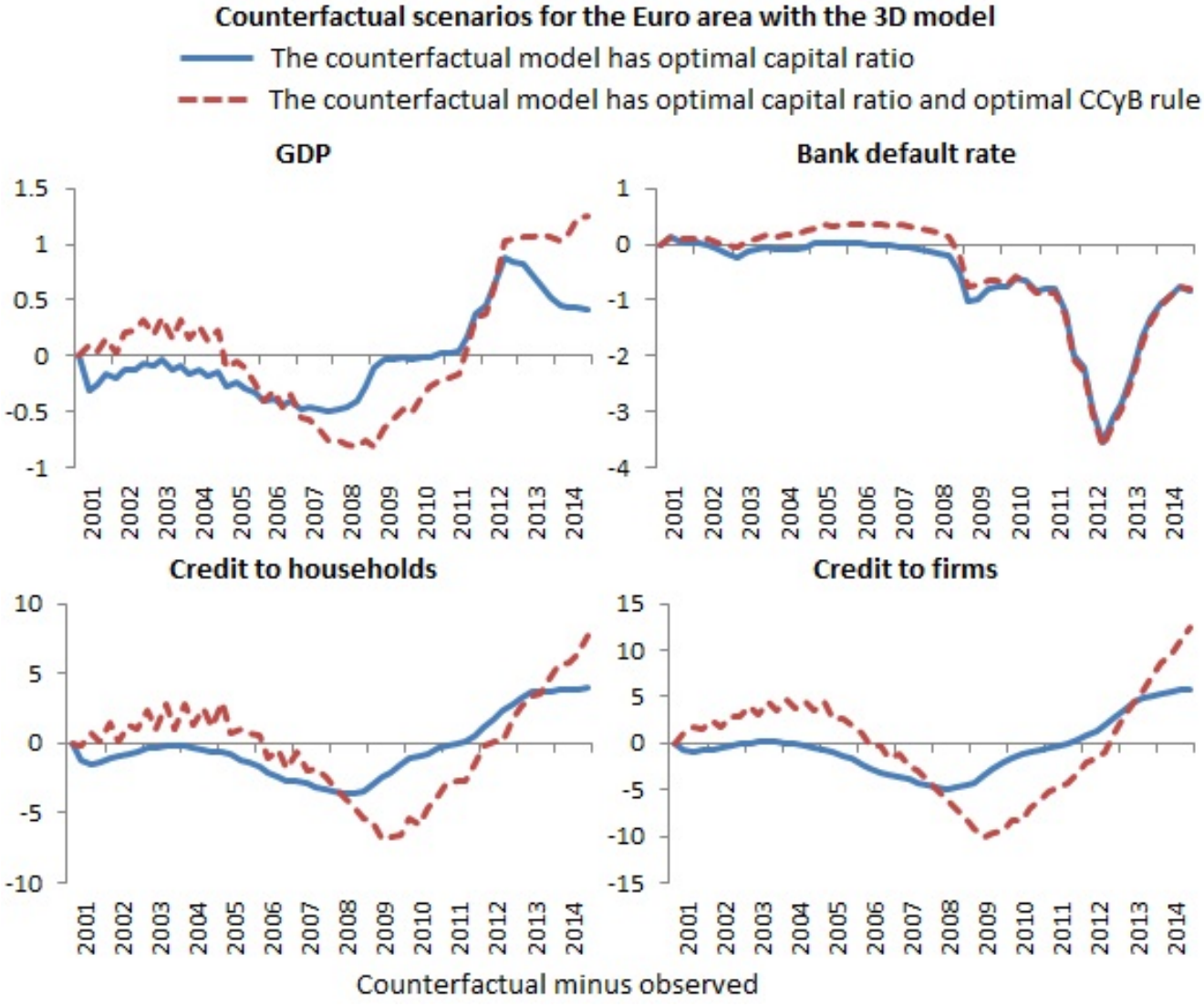
Optimal CCyB when optimal CR is in place



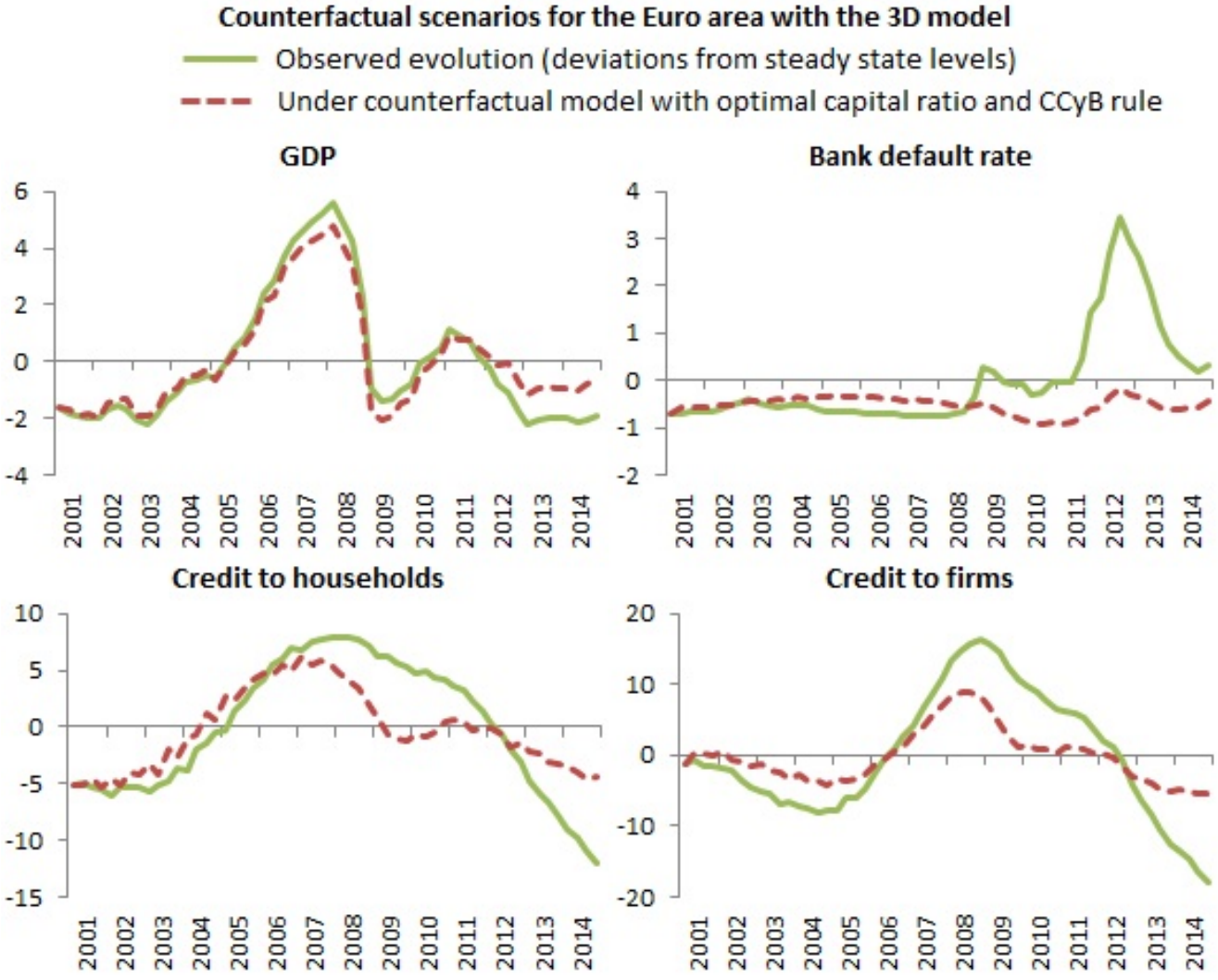


- The optimal parameter space for both CCyB rules is much wider.
- The probability of 'missing' is therefore much narrower.
- Our results point to greater model stability when both instruments are jointly considered.

Counterfactual - volatility effects



What if Eurosystem had done it differently.....



Take home message

Key message from this section

Optimal rule depends on the level of capital.
Optimal EA CCyB is one that responds to **credit** and **credit spreads**.

The combination of instrument generates synergies.
The welfare gains from the interaction is greater than the sum of the parts.

Trade-offs are smoothened when both both instruments are at optimal.

The end

THANK YOU!