

# Countercyclical Capital Regulation in a Small Open Economy DSGE Model\*

Matija Lozej <sup>1</sup>   Luca Onorante <sup>1</sup>   Ansgar Rannenberg <sup>1</sup>

<sup>1</sup>Central Bank of Ireland

---

\*The model used is a modified version of Clancy and Merola (2014)

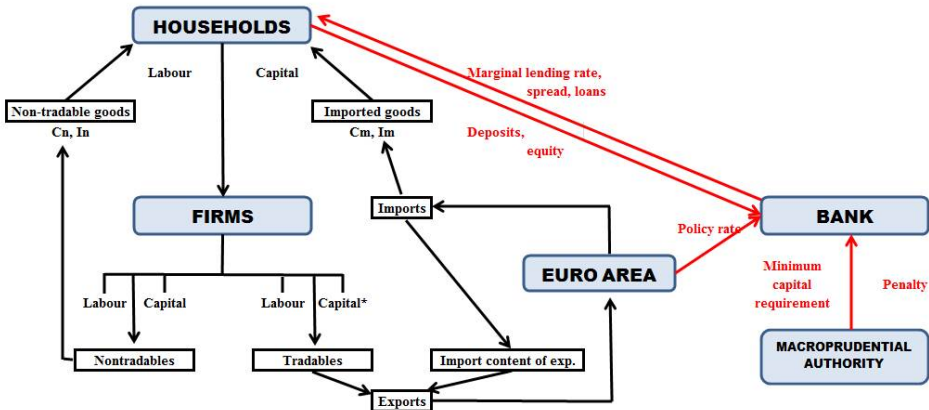
**THE VIEWS EXPRESSED HERE ARE THE VIEWS OF THE  
AUTHORS AND DO NOT NECESSARILY REFLECT THE VIEWS  
OF THE CENTRAL BANK OF IRELAND OR OF THE  
EUROSYSTEM.**

# Motivation

**Use the Central Bank of Ireland DSGE model (Clancy and Merola, 2014) to examine:**

- Performance of countercyclical capital rules proposed by ESRB for typical shocks affecting small open economies
- Examine some of alternative rules based on house prices
- Transition to higher capital requirements

## Graphical representation of the model



# Households

- Supply capital and labour, wages sticky.
- Derive utility from consumption, housing, leisure and saving deposits.
  - Deposits are also held for transaction purposes (consumption, investment, housing).
  - All deposits are paid riskless rate  $R_t$ .
- Borrow at loan rate,  $R_t^L$ , which is the relevant interest rate for consumption and investment decisions.
- Housing wealth is subject to uncertainty. Household defaults when the value of housing assets drops, which drives the probability of default.

# Banks

- Bank balance sheet:

$$L_t = D_t + B_t + E_t$$

- Cost of domestic and foreign deposits is the riskless **deposit rate**  $R_t$ .
- Cost of equity is related to the deviation of the bank capital ratio,  $E_t/L_t$ , from the regulatory capital requirement (regulatory penalty).
- Marginal lending rate**  $\tilde{R}_t$  is set by adding the compensation for the regulatory penalty to the deposit rate.
- Lending rate**  $R_t^L$  is set by adding a spread over the marginal lending rate to compensate the bank for the household default risk.
- Increasing capital requirement  $g_t$  increases the the marginal costs of lending and thus the (marginal) lending rate.

In short:  $R_t^L = R_t + \text{regulatory penalty} + \text{default rate}$

# Countercyclical capital rules vs. capital level rules

- **Countercyclical capital rules** do not affect the long-run equilibrium, but they do affect the response to shocks:
  - Indicator variable moves  $\Rightarrow$  capital requirement changes, affecting the (marginal) lending rate and hence the economy.
- **Level rules**, such as a permanent increase in capital requirement changes both the response to shocks and the long-run equilibrium:
  - Bank equity is higher  $\Rightarrow$  fluctuations in bank portfolio return have less effect on bank equity, which dampens fluctuations in the (marginal) lending rate and works stabilising.

# Capital level rules

Capital **level rules** are different capital requirements, e.g.:

① **Constant capital requirement:**

$$g_t = gmin$$

② **Higher constant capital requirement**

$$g_t = gmin + 10p.p.$$



# Countercyclical capital rules

**Countercyclical** capital rules are rules that react to developments in some reference variable, e.g., the credit gap:

$$gap_t = \left( \frac{L_t}{Y_t + Y_{t-1} + Y_{t-2} + Y_{t-3}} - \frac{L}{4 * Y} \right)$$

## 1 ESRB rule:

$$g_t = 8\% + \begin{cases} 0 & \text{if } gap_t \leq 2\% \\ 0.3125 * gap_t & \text{if } 2\% < gap_t \leq 8\% \\ 2.5\% & \text{if } gap_t > 8\% \end{cases}$$

## 2 Moving-average rule:

$$g_t = 8\% + 0.3125 * \frac{(gap_t + gap_{t-1} + gap_{t-2})}{3}$$

# House price rule

ESRB Recommendations: “Designated authorities should assess the information contained in the credit-to-GDP gap and any other relevant variables...”

## Definition of the house price gap:

$$price\ gap_t = \frac{P_{H,t} - \overline{P_H}}{\overline{P_H}}$$

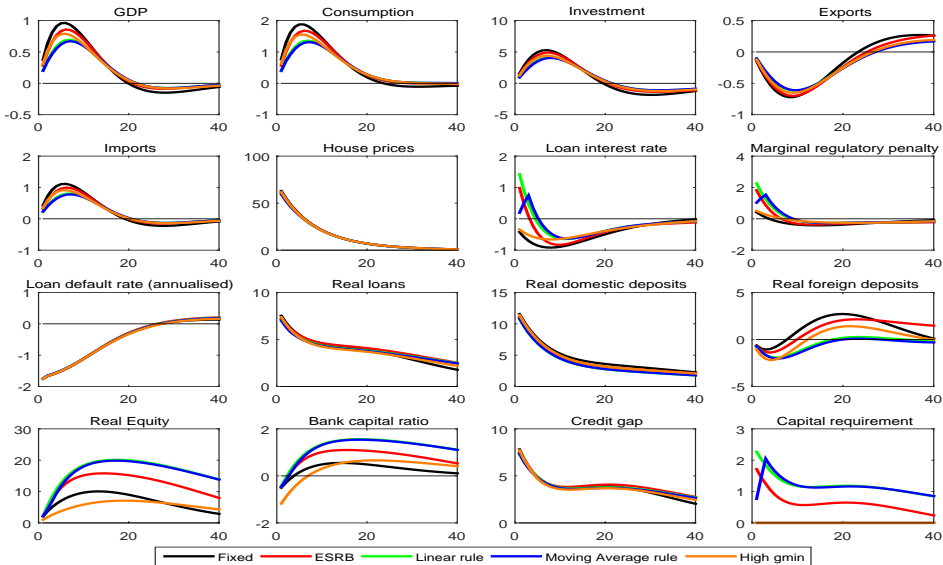
## Alternative house-price-based rule:

$$g_t = 8\% + \begin{cases} -2\% & \text{if } price\ gap_t \leq -2\% \\ 0.35 * price\ gap_t & \text{if } -2\% < price\ gap_t \leq 2\% \\ 2\% & \text{if } price\ gap_t > 2\%. \end{cases}$$

# Overview of simulations

- 1 ESRB-style credit gap-based rules
  - An increase in housing demand at home
  - A boom and bust scenario in the housing market
  - Reduction in bank portfolio returns
  - Reduction in foreign interest rate
  - Reduction in export competitiveness
- 2 Alternative house price-based rules
  - An increase in housing demand at home
  - A boom and bust scenario in the housing market
  - Reduction in export competitiveness
- 3 Transition to higher capital requirements

# An increase in housing demand at home



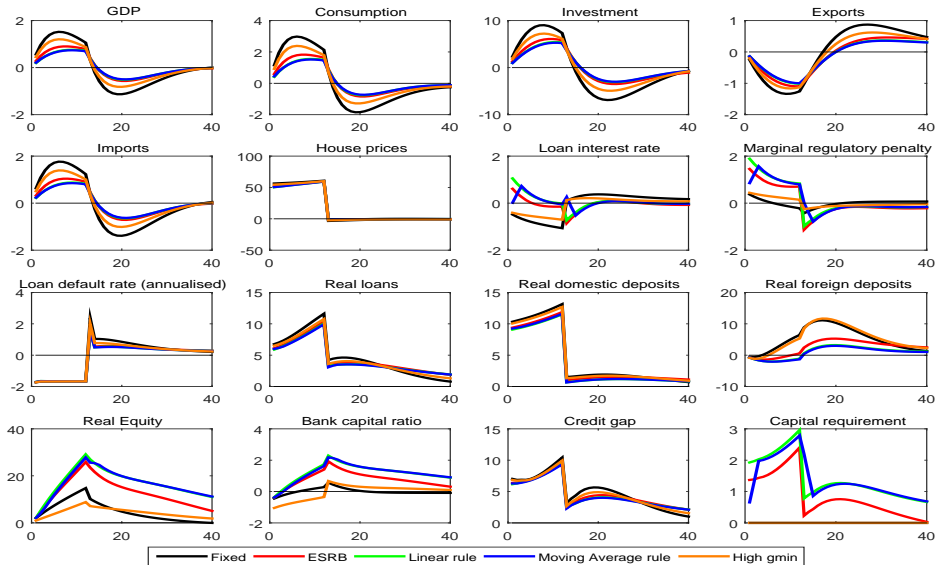
## Positive housing demand shock

- Increases housing wealth, lowers default rate (and NPLs) and thus lowers lending rates. Domestic demand ( $C_t, I_t$ ) increases, trade balance worsens.
- Loans increase because a.) *Household expenditure* > *income*, funded by foreign borrowing b.) Households want to hold more transaction (saving) deposits due to higher consumption/housing wealth (lower lending rate). Need to borrow money back.
- With the ESRB rule: Credit gap increases by more than 2%, hence capital requirement increases, leading to an increase in the (marginal) lending rate, resulting in a lower increase in domestic demand. MA rule responds earlier, thus larger attenuation.
- Higher  $g_{min}$ : Lower bank leverage means that decline in NPL has a smaller positive effect on bank equity.

# Stylised boom and bust in the housing market

- Assume that everyone expects that there will be an increase in the demand for housing in period 13 (in three years' time), hence immediate increase in house prices.
- When period 13 arrives, demand for housing **does not increase**.
- Disappointed expectations cause recession because
  - Past investment was excessive.
  - Housing wealth back to normal, but loans still high - persistent increase in default rate and thus lending rate, depressing consumption and investment.
- Capital rules can mitigate recession
  - Countercyclical capital buffers can reduce fluctuations.
  - High level of capital requirement makes the system more resilient.

# Stylised boom and bust in the housing market

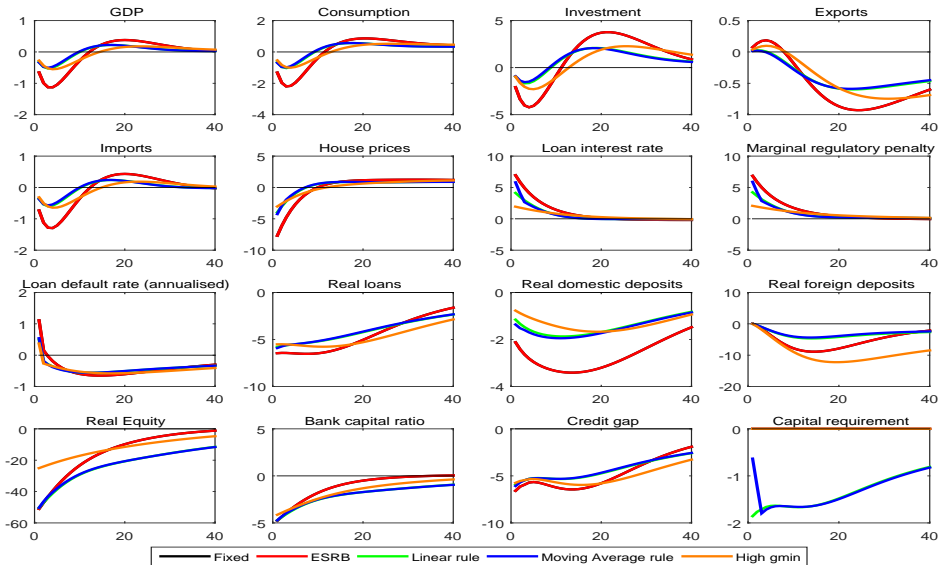


# Reduction in bank portfolio return

- Mimic the losses arising from asset price fluctuations.
- A one-off shock of 5 p.p. to bank portfolio return.
- The shock implies a decline in bank equity by about 50%.
- Lower capital increases marginal regulatory penalty and hence the lending rate, reducing domestic demand.
- Credit gap declines, ESRB rule does not kick in, but MA rule and linear rule do.



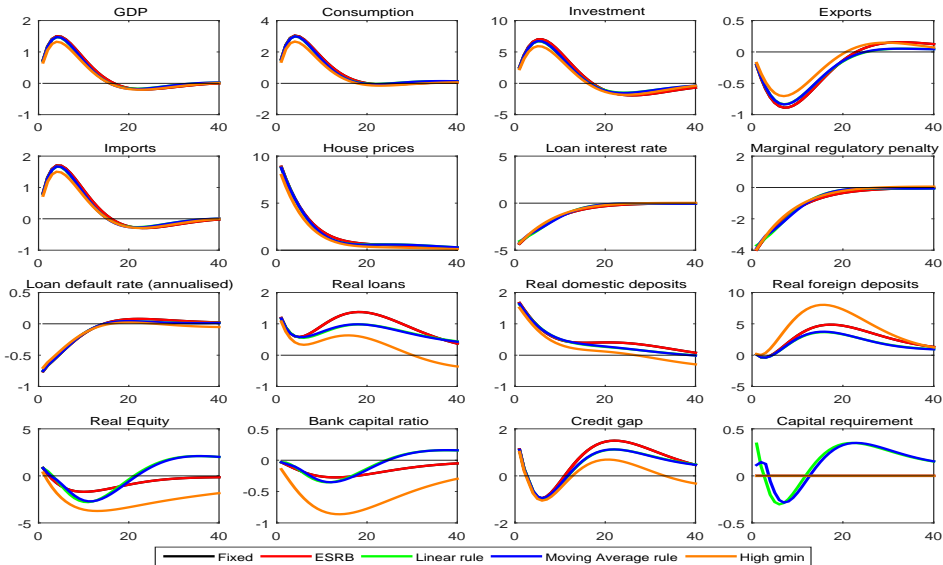
## Decline in bank portfolio return



## Reduction in foreign deposit interest rate by 4 pp

- Irish bank deposits become more attractive, e.g. due to perception of lower risk.
- Deposit rate declines, which banks pass on to borrowers.
- Higher domestic demand and imports due to lower loan rate, lower exports due to declining competitiveness. Worsening of the current account funded by foreign borrowing, channeled to households via higher lending.
- Loans increase less relative to GDP than for housing demand shock due to relatively small house price increase and thus lower demand for transaction funds.
- Credit gap first decreases (GDP increases more than loans) and breaches the 2% threshold only in quarter 10. Hence with ESRB rule small and short lived increase in minimum capital requirement and thus little effect on borrowing costs.

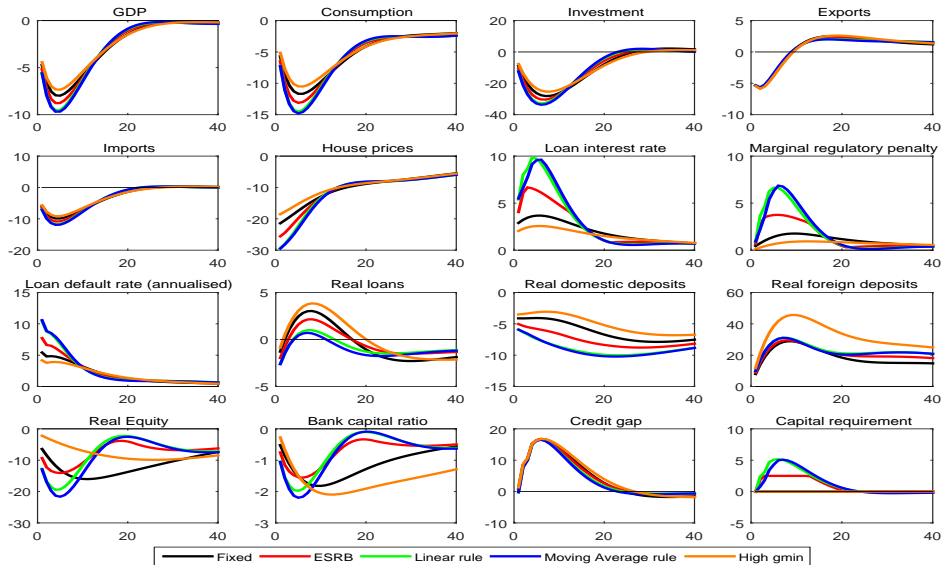
# Reduction in interest rate on foreign deposits by 4 pp



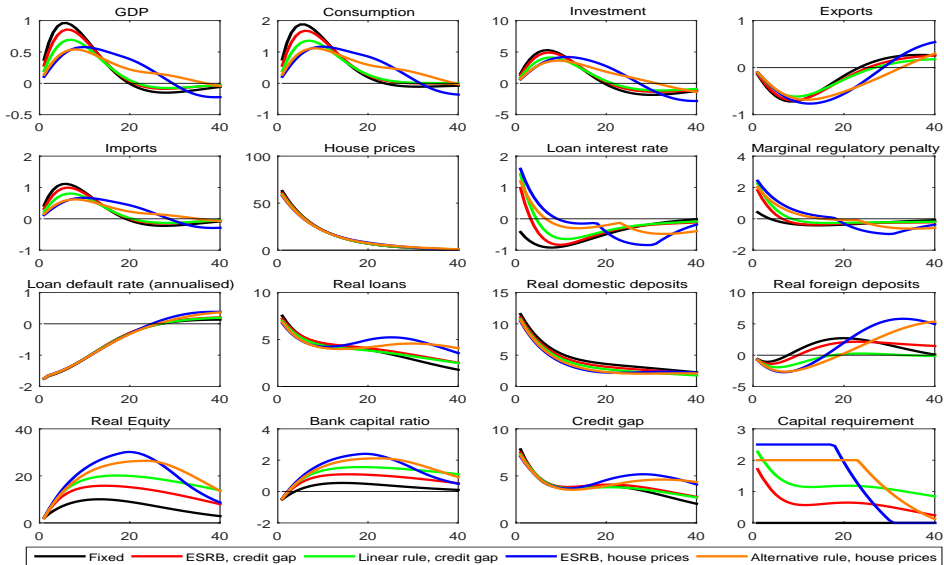
## Temporary decline in export competitiveness (terms of trade) shock: -10%

- Lower demand for exports causes decline in GDP.
- Worsening of current account, therefore more foreign borrowing, channeled to households via higher loans. Lower  $E_t/L_t$  and higher default rate causes increase in loan rate.
- Lower consumption and investment.
- Credit gap increases, hence with ESRB or MA rule response to shock amplified: Capital requirement and loan rate higher, domestic demand and GDP considerably lower.
- Credit gap not always a good target, as borrowing may help to smooth the effects of shocks adversely affecting exports.

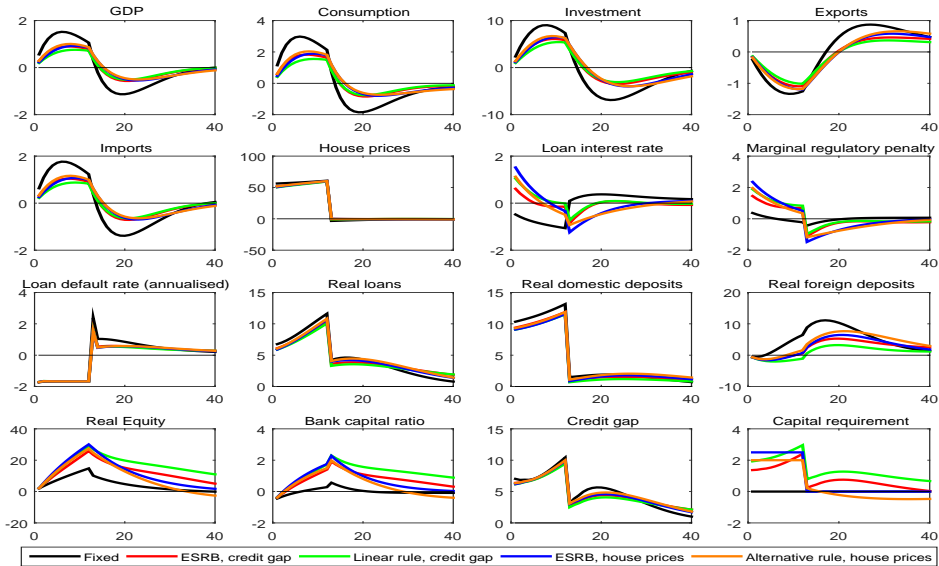
# Temporary decline in export competitiveness



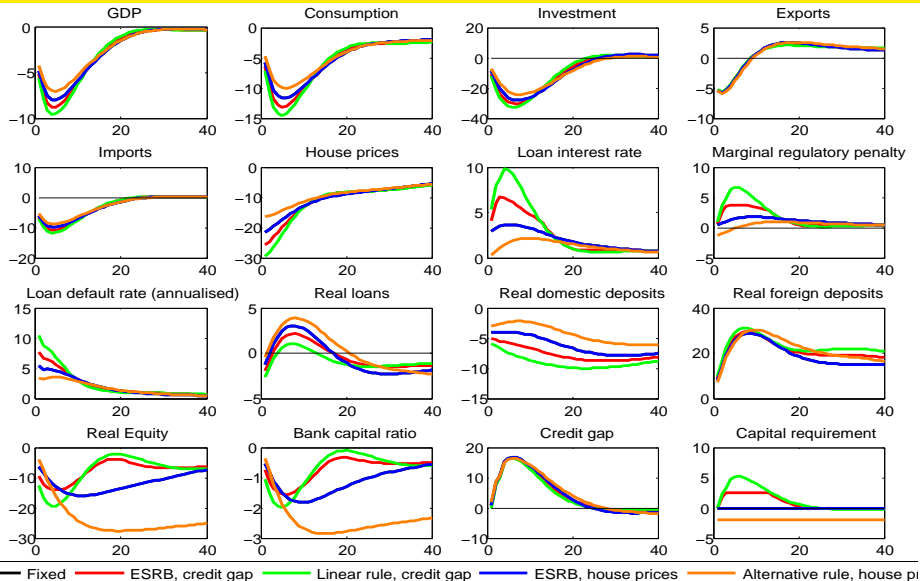
# House-price rule: An increase in housing demand at home



# House-price rule: Boom and bust in the housing market



## House-price rule: Decline in competitiveness





# Policy implications

- Countercyclical capital regulation is a powerful instrument...
- ... but may be counterproductive in response to some shocks, such as a temporary decline in competitiveness.
- Higher minimum capital requirements (lower bank leverage) attenuate cycles, but less than macroprudential rules (and are costly).
- If house prices move procyclically in response to the shocks considered, countercyclical capital rules linked to the house price gap may perform better than rules linked to the credit gap.
- To guide expectations, perhaps steering macroprudential policy by something like "Financial stability forecast," if feasible, could perform better than rules.

# Questions/comments

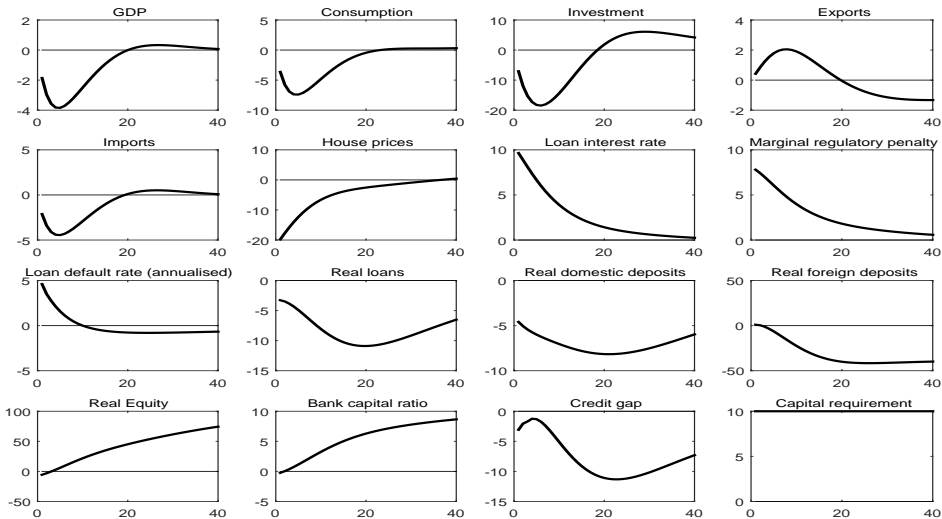
Thank you.

# Backup slides

## Transition to higher capital requirement

- Higher minimum capital requirement stabilizes the economy, but transition associated with costs.
- Assume a one-time permanent increase in minimum capital ratio from 8% to 18%.
- Increases the marginal cost of lending and thus the loan rate. Lower domestic demand and output lower imports, higher exports and current account surplus. Foreign deposits decline.
- As banks accumulate more equity due to a higher loan rate, marginal cost of lending and loan rate decline, domestic demand recovers. GDP essentially unchanged (slightly higher).
- Foreign deposits permanently lower, Bank equity permanently higher. Domestic deposits only temporarily lower as they are related to domestic variables. Domestic loans also unchanged in the long run.
- Caveat: Model does not capture any effect of lower leverage/ higher equity holdings by households on the cost of equity and thus loans.

# 10 PP increase in minimum capital requirements



# Boom-bust scenario from negative housing demand shock

