Capital requirements and macroeconomic stability in light of monetary tightening

Aurélien Espic[1], Lisa Kerdelhué[1], Julien Matheron[1,2]

[1]Banque de France

[2]Paris School of Economics

October 16, 2023 - 6^{th} MPPG research workshop

This presentation reflects the opinions of the authors and does not necessarily express the views of the Banque de France.

Introduction

Model

Parameters

Results

Conclusion

Appendix

Questions

- How does the current monetary tightening affect macro-financial variables?
    - Cost-push shocks and monetary surprises
    - Materialization of risks in case of solvency shocks
    - Fear of a hard landing
- Can capital requirements stabilize macro-financial conditions in case of monetary tightening?
- Focus on dynamic properties of the capital requirements target, rather than the countercyclical adjustment of capital requirements (see IWG/MPPG Agile ‘Policy’ Team conjunctural note)

Methodology

- A DSGE model with three layers of default and price rigidities
- Mix of calibration and Bayesian estimation on Euro Area data, 2003-2019
- Dynamic properties of the model at the optimal capital requirements in the long-run
- Computation of the **risky** steady state

Literature

- DSGE models with financial intermediaries: Clerc et al. (2015); Mendicino et al. (2018, 2020); Bratsiotis and Pathirage (2023)
- New-Keynesian models: Bernanke et al. (1999); Smets and Wouters (2003); Galí et al. (2011)
- Monetary and macroprudential policies: Revelo and Levieuge (2022); Boissay et al. (2023)

Results

- Optimal banks' capital requirements contribute to macroeconomic stability, especially if monetary tightening leads to solvency shocks: they guarantee a faster recovery, as they avoid disruption in financial intermediation.
- This comes at the expense of borrowers: optimal capital requirements lead to higher probability of default for non-financial entities in case of risk materialization.
- Expectations of a disruption in financial intermediation are sufficient to justify higher capital requirements, even though it does not materialize.

$\Longrightarrow$ Optimal capital requirements give more room to monetary policy

Introduction

Model

Parameters

Results

Conclusion

Appendix

General structure

- Patient households
  - Save through capital accumulation and banks' deposits
  - Pay for deposit insurance
  - Own all firms in the economy
  - Composed of three types: workers, entrepreneurs, bankers
- Impatient households
  - Borrow from banks and supply labour
  - Subject to idiosyncratic housing quality shocks
- Firms
  - Intermediary good producers with market power
  - Final good producers
  - Capital and housing producers subject to dynamic adjustment costs
  - Investment firms subject to idiosyncratic capital quality shocks
  - Housing and firm specialized banks subject to idiosyncratic portfolio quality shocks

Price rigidity

- Firm f sets its price $P_t(f)$ so as to maximize the value to its shareholders (the patient households), taking the demand function of the final good producers into account.
- Firm f faces nominal rigidities à la Calvo. In each period, firm f can reset its nominal price with probability $1 - \xi$.
- Otherwise, firm f rescales $P_t(f)$ according to $P_t(f) = (\Pi_*)^{1-\iota}(\Pi_{t-1})^{\iota} P_{t-1}(f)$, with Π_* the steady-state value of inflation.

Monetary policy

As in Mendicino et al. (2020), the central bank sets the gross nominal interest rate R_t according to the following monetary policy rule

$$\log\left(\frac{R_t}{R_*}\right) = \varrho_R \log\left(\frac{R_{t-1}}{R_*}\right) + (1-\varrho_R)\left[a_\Pi \log\left(\frac{\Pi_t}{\Pi_*}\right) + a_y \log\left(\frac{GDP_t}{GDP_{t-1}}\right)\right] + \zeta_{R,t}$$

Banks' net worth

For bank j, either firm-specialized (F) or mortgage-specialized (M), the ex post gross return on inside equity is the following:

$$Z_t^j = \frac{[1 - \Gamma_t^j(\bar{\omega}_t^j)]R_t^j}{\phi_{t-1}^j}.$$

Total bankers' real net worth evolves according to:

$$n_t^b = [\theta^b + \chi^b(1 - \theta^b)] \left(\frac{Z_t^M}{\Pi_t} e_{t-1}^M + \frac{Z_t^F}{\Pi_t} e_{t-1}^F \right)$$

Direct impact of inflationary pressures through Π_t, and indirect impacts through the threshold value for banks' default ($\bar{\omega}_t^j$) and the interest rate paid by borrowers (R_t^j). Capital requirements (ϕ_{t-1}^j) are crucial in this transmission channel.

Short-run wealth effect

The laws of motion of net worth are crucial in BGG-type models, so it is important that wealth effects in the model are able to replicate business cycles (Galí et al., 2011). Therefore, instantaneous utility of household j writes as follows:

$$\log(c_t^j - \psi \bar{c}_{t-1}^j) + \upsilon^j \log(h_t^j) - \frac{\varphi^j}{1+\eta} e^{\zeta_{\ell,t}} \Theta_t^j (\ell_t^j)^{1+\eta}$$

Θ_t^j is an endogenous taste shifter, obeying

$$\Theta_t^j = \frac{J_t^j}{\bar{c}_t^j - \psi \bar{c}_{t-1}^j},$$

where

$$J_t^j = (J_{t-1}^j)^{1-\zeta_J} [(\bar{c}_t^j - \psi \bar{c}_{t-1}^j)]^{\zeta_J}.$$

This specification follows Galí et al. (2011) and mitigates the strong wealth effect on labor supply. Details

Introduction

Model

Parameters

Results

Conclusion

Appendix

Steady state calibration

Table : Preset and calibrated parameters

Preset parameters		
Description	Parameter	Value
Inverse Frisch elasticity	η	4
Patient disutility of labor	φ^p	1
Impatient disutility of labor	φ^i	1
Bank M bankruptcy cost	μ_M	0.3
Bank F bankruptcy cost	μ_F	0.3
Firm bankruptcy cost	μ_e	0.3
Household bankruptcy cost	μ_i	0.3
Share of insured deposits in bank debt	κ	0.54
Consumption smoothing	ψ	0.5
Productivity	A	1
Capital share in production	α	0.3
Depreciation rate of capital	δ_K	0.3
Survival rate of entrepreneurs	θ_e	0.975
Capital requirements for bank F	ϕ_F	0.10
Capital requirements for bank M	ϕ_M	0.05

Calibrated parameters		
Description	Parameter	Value
Impatient household discount rate	β_i	0.987
Patient household discount rate	β_p	0.995
Housing depreciation rate	δ_h	0.008
Patient housing scale factor	υ_p	0.131
Impatient housing scale factor	υ_i	1.414
Management cost	ξ_s	0.006
Survival rate of bankers	θ_B	0.873
Std. idiosyncratic shocks, bankers M	$\bar{\sigma}_M$	0.018
Std. idiosyncratic shocks, bankers F	$\bar{\sigma}_F$	0.039
Std. idiosyncratic shocks, entrepreneurs	$\bar{\sigma}_e$	0.365
Std. idiosyncratic shocks, HH	$\bar{\sigma}_i$	0.331
Banker's endowment	χ_b	0.82
Entrepreneur's endowment	χ_e	0.14

Estimation

Table : Estimated parameters

		Prior distribution			Posterior distribution	
		Dist.	Mean	Std.	Mean	Std.
Endogenous taste shifter	ζ_J	Beta	0.5	0.15	0.647	0.1252
Capital adjustment cost	ψ_K	Gamma	4.5	1	5.108	0.9176
Housing adjustment cost	ψ_H	Gamma	2.5	1	2.434	0.6707
Price rigidity	ξ	Beta	0.75	0.05	0.949	0.0063
Price indexation	ι	Beta	0.5	0.1	0.812	0.0504
MP reaction to inflation	a_Π	Normal	1.5	0.3	2.862	0.2052
MP reaction to GDP growth	a_y	Gamma	0.12	0.05	0.138	0.0463
Monetary policy smoothing	ϱ_R	Beta	0.85	0.1	0.737	0.0245

Introduction

Model

Parameters

Results

Conclusion

Appendix

Long-run optimum

- Calibrated capital requirements are lower than optimum
- The optimum is slightly higher than in the literature, partly because of the period chosen for calibration.
- Patient households benefit from higher banks' capital requirements as they pay for deposit insurance, while this is less clear for impatient households

Figure : Real variables

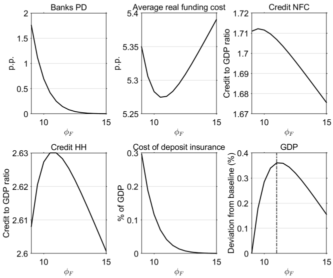
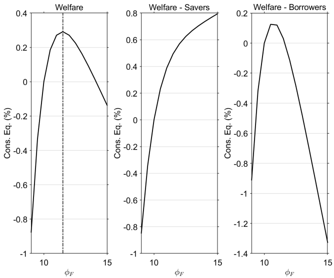


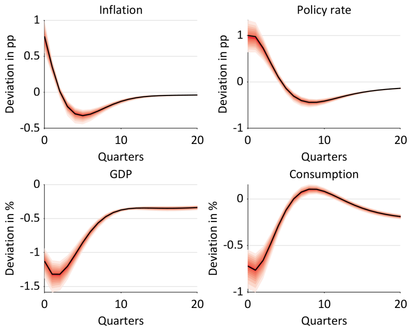
Figure : Welfare



Cost-push shock

- We estimate the effect of a cost-push shock, designed as a markup shock for intermediary good producers
- The Bayesian estimation enables to get uncertainty bands around a point estimate

Figure : Effects of a cost-push shock



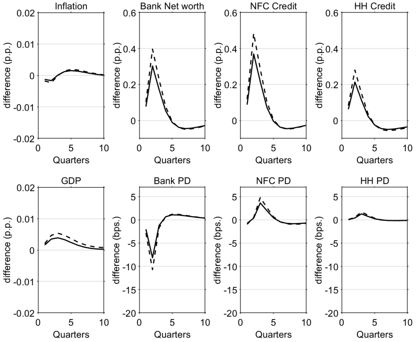
Solid black line: Mean impulse response function. Red bands: 95% confidence intervals, computed by drawing 2000 sets of parameters from the posterior distribution. Rates are yearly.

Financial variables

Cost-push shock, monetary surprise and capital requirements

- Bringing capital requirements closer to their optimal level slightly limits the macroeconomic effect of a cost-push shock
- This is true even when adding a monetary surprise, i.e. a deviation from the preset-rule

Figure : Cost-push shock, optimal vs. calibrated capital requirements



The black line corresponds to the resilience gain from a higher level of capital requirements before a cost push shock. The dotted line corresponds to the resilience gain from a cost push shock, together with an exogenous monetary shock.

Side effects of monetary policy

- Rising interest rates may lead to solvency shocks, for instance in case of interest rate risk mismanagement
- We simulate solvency shocks for banks, firms and impatient households, rising their respective probability of default by 100 bps
- The mitigating effect of optimal capital requirements is stronger for solvency shocks than for a standard cost-push shock

Figure : Solvency shocks

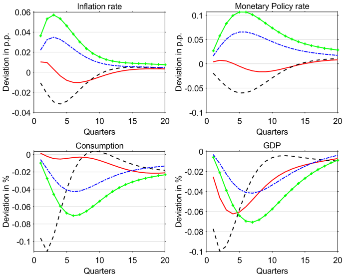
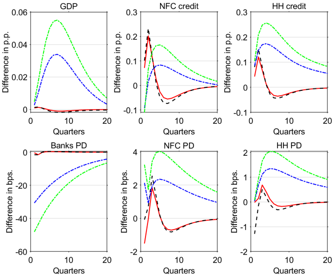


Figure : Optimal vs. Calibrated



Solid red line: firm shock. Dashed black line: household shock. Firm-specialized bank shock: dashed dotted blue line. Household-specialized bank shock: crossed-dashed green line.

Financial variables

Capital requirements in an uncertain environment

- The deterministic steady state assumes *(i)* no shock *(ii)* no anticipation of shock
- The risky steady state (Coeurdacier et al., 2011) does not assume the latter: we need second-order approximation to move beyond certainty-equivalence
- The optimal capital requirements are higher when agents anticipate some bank-level risk, which may justify an increase in capital requirements targets in the long-run

Figure : Real variables

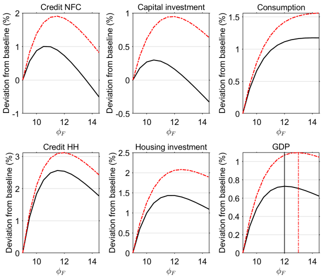
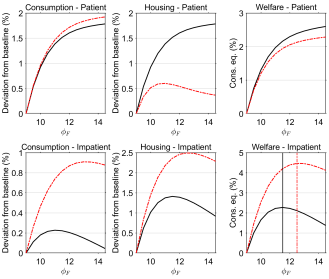


Figure : Welfare



Solid black line: deterministic steady state. Dashed-dotted red line: risky steady state.

Introduction

Model

Parameters

Results

Conclusion

Appendix

Conclusion

- We estimated a new-Keynesian model with a rich set of financial frictions on Euro Area data
- We find that a cost-push shock can significantly affect macro-financial conditions and that capital requirements are useful policy instruments to mitigate its impact
- Should monetary tightening lead to solvency shocks, these tools would be particularly useful, although they imply slightly tighter financial conditions for borrowing households and non-financial firms
- Fear of solvency shocks in itself is sufficient to justify higher capital requirements

Introduction

Model

Parameters

Results

Conclusion

Appendix

Endogenous taste shifter

In a symmetric equilibrium, the marginal rate of substitution between consumption and labor is the following:

$$-\frac{\mathcal{U}_n}{\mathcal{U}_c} = \varphi^p e^{\zeta_{\ell,t}} \Theta_t^p (c_t^p - \psi \bar{c}_{t-1}^p)(\ell_t^p)^\eta$$
$$= \varphi^p e^{\zeta_{\ell,t}} J_t^p (\ell_t^p)^\eta$$

where

$$J_t^p = (J_{t-1}^p)^{1-\zeta_J} [(\bar{c}_t^p - \psi \bar{c}_{t-1}^p)]^{\zeta_J}$$

Without endogenous taste shifter:

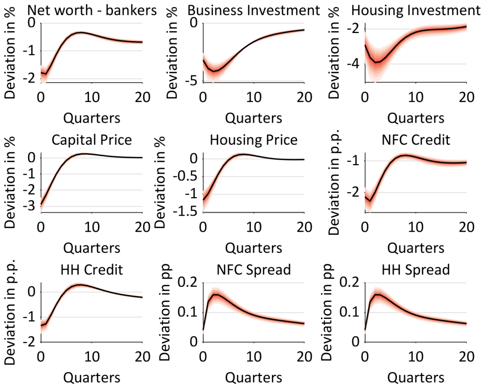
$$-\frac{\mathcal{U}_n}{\mathcal{U}_c} = \varphi^p e^{\zeta_{\ell,t}} (c_t^p - \psi \bar{c}_{t-1}^p)(\ell_t^p)^\eta$$

A lower ζ_J means a lower short-run wealth effect than baseline.

Cost-push shock - Financial variables

Back

Figure : Cost-push shock

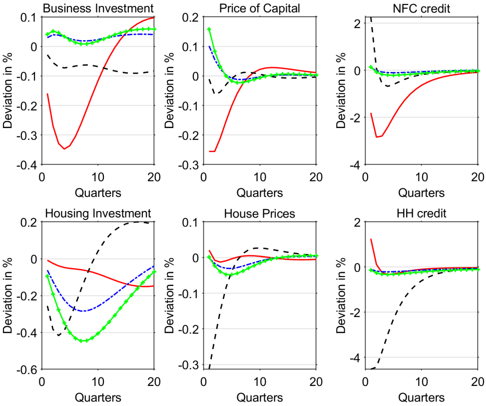


Solid black line: Mean impulse response function. Red bands: 95% confidence intervals, computed by drawing 2000 sets of parameters from the posterior distribution. Rates are yearly.

Solvency shocks - Financial variables

Back

Figure : Solvency shocks shock



Solid red line: firm shock. Dashed black line: household shock. Firm-specialized bank shock: dashed dotted blue line. Household-specialized bank shock: crossed-dashed green line.

Bernanke, B. S., M. Gertler, and S. Gilchrist (1999): "The financial accelerator in a quantitative business cycle framework," in *Handbook of Macroeconomics*, ed. by J. B. Taylor and M. Woodford, Elsevier, vol. 1 of *Handbook of Macroeconomics*, chap. 21, 1341–1393.

Boissay, F., C. Borio, C. Leonte, and I. Shim (2023): "Prudential policy and financial dominance: exploring the link," .

Bratsiotis, G. J. and K. D. Pathirage (2023): "Monetary and Macroprudential Policy and Welfare in an Estimated Four-Agent New Keynesian Model," *Journal of Money, Credit and Banking*.

Clerc, L., A. Derviz, C. Mendicino, S. Moyen, K. Nikolov, L. Stracca, J. Suarez, and A. P. Vardoulakis (2015): "Capital Regulation in a Macroeconomic Model with Three Layers of Default," *International Journal of Central Banking*, 11, 9–63.

Coeurdacier, N., H. Rey, and P. Winant (2011): "The risky steady state," *American Economic Review*, 101, 398–401.

Galí, J., F. Smets, and R. Wouters (2011): "Unemployment in an Estimated New Keynesian Model," in *NBER Macroeconomics*

Annual, National Bureau of Economic Research, vol. 26, 329–360.

Mendicino, C., K. Nikolov, J. Suarez, and D. Supera (2018): "Optimal Dynamic Capital Requirements," *Journal of Money, Credit and Banking*, 50, 1271–1297.

——— (2020): "Bank capital in the short and in the long run," *Journal of Monetary Economics*, 115, 64–79.

Revelo, J. D. G. and G. Levieuge (2022): "When could macroprudential and monetary policies be in conflict?" *Journal of Banking & Finance*, 139, 106484.

Smets, F. and R. Wouters (2003): "An estimated dynamic stochastic general equilibrium model of the euro area," *Journal of the European economic association*, 1, 1123–1175.