Financial (in)stability in Romania: The implications of Basel III

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The purpose

- Developing a framework that reveals the behavior of the Romanian banking system in transition to Basel III

- Conducting simulations to observe the coherence of the model reactions

- Estimating parameters using Bayesian techniques to reflect observed data

Basel III

- New capital requirement

Ratio/ RWA	Basel II	Transitional Arrangements						Basel III
	2012	2013	2014	2015	2016	2017	2018	2019
Total capital/ CCB	8.00%	8.00%	8.00%	8.00%	8.625%	9.25%	9.875%	10.50%

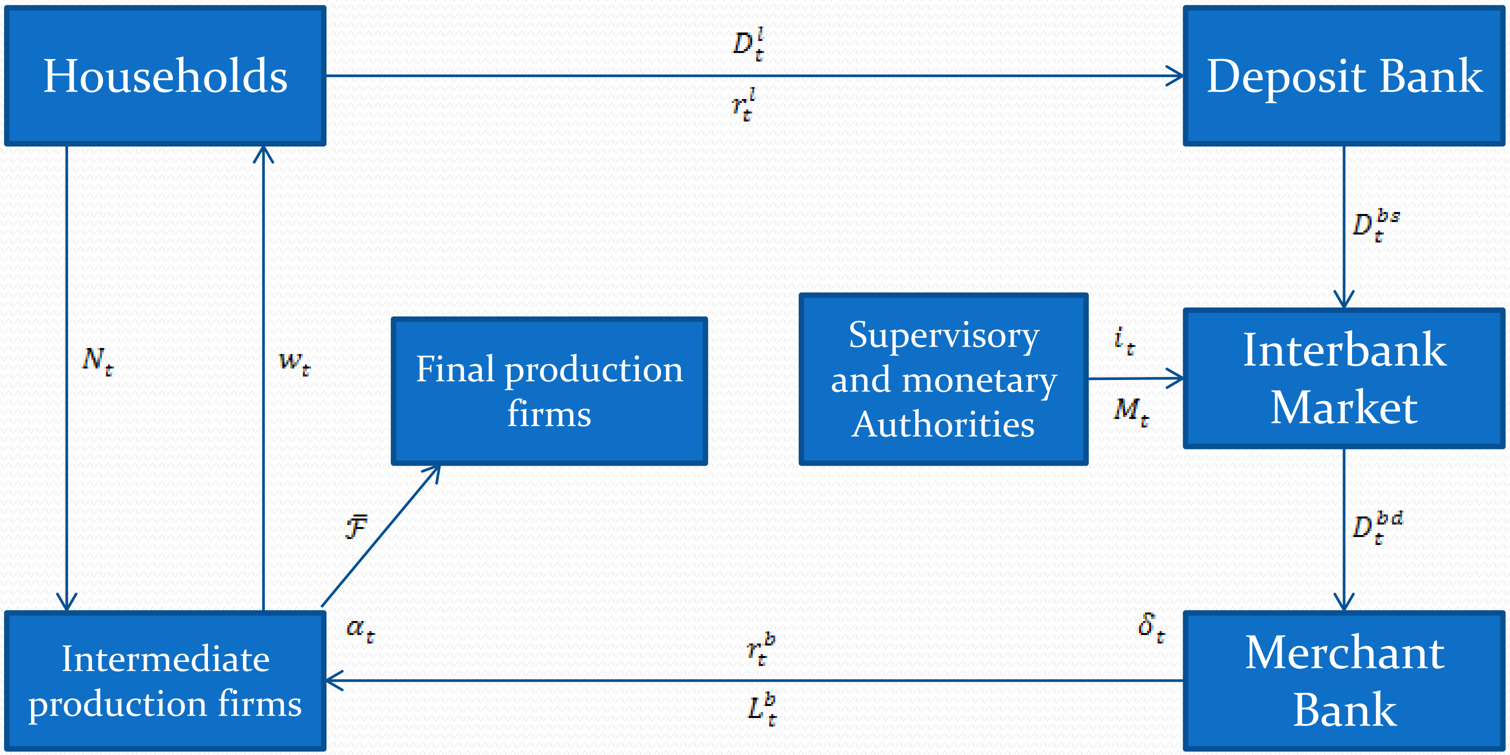
- New liquidity requirements involves a short-term and long-term :

  - Liquidity Coverage Ratio (LCR)
  - Net Stable Funding Ratio (NFSR)

Model features

- Starts from a classic RBC.
- Reflects both higher capital and liquidity requirements.
- New-Keynesian staggered prices model (a la Calvo).
- Endogenous and heterogeneous banking system (with interbank market).
- Endogenous repayment rates with balance sheet consequences.
- Credit and deposit insurance.

Flows between agents



Households

- The representative j ♏ [0,1] household maximize its program facing a budget constraint by choosing consumption and labor supplied:

$$\max_{N_t, C_t} \sum_{s=0}^{\infty} \beta^s E_t \left[\mathcal{U}(C_{t+s}(j)) + \bar{m} \ln(1 - N_{t+s}(j)) - \frac{\chi}{2} \left(\frac{D^l_{t+s}(j)}{1 + r^l_t} - \frac{D^l(j)}{1 + r^l} \right)^2 \right]$$

under constraint

$$p_t C_t(j) + p_t \frac{D^l_t(j)}{1 + r^l_t} = w_t(j) N_t(j) + p_{t-1} D^l_{t-1}(j) + \pi^f_t + (1 - v_b)\pi^b_t + (1 - v_l)\pi^l_t$$

Intermediate production firms

- Intermediate production firm $j \in [0,1]$ is maximizing its individual profit and face a penalty cost for delayed repayment. It raises capital trough credit:

$$\max_{N_t(j), L_t^b(j), \alpha_t(j)} \sum_{s=0}^{\infty} E_t\left[\beta^s \left\{\pi_{t+s}^f(j) - d_f \left(1 - \alpha_{t+s}(j)\right)\right\}\right]$$

under constraints

$$K_t(j) = (1 - \tau)K_{t-1}(j) + \frac{L_t^b(j)}{1 + r_t^b}$$

$$\pi_t^f(j) = \epsilon_t p_t^w \mathcal{F}(K_t(j), N_t(j)) - w_t(j)N_t(j) - \alpha_t(j)p_t L_{t-1}^b(j) - \frac{\gamma}{2}\left(\left(1 - \alpha_{t-1}(j)\right)p_{t-1}L_{t-2}^b(j)\right)^2$$

Final production firms and market demand aggregation

- Final production firm $j \in [0,1]$ is maximizing profit and sets the selling price (through a Calvo type mechanism):

$$\max_{\mathcal{F}_t(j), p_t(j)} \sum_{s=0}^{\infty} E_t\left[\beta^s \xi_p^s \{p_t^* X_{tl} \mathcal{F}_t(j) - p_t^w \overline{\mathcal{F}_t}(j)\}\right]$$

under constraints

$$X_{tl} = \begin{cases} \pi_t \cdot \pi_{t+1} \cdot \pi_{t+2} \cdot \dots \cdot \pi_{t+l-1} & for\ l \geq 1 \\ 1 & for\ l = 1 \end{cases}$$

$$\mathcal{F}_t(j) = \left(\frac{p_t(j)}{p_t}\right)^{-\varepsilon^p} \mathcal{F}_t$$

$$p_t = \left[(1-\xi_p)(p_t^*)^{1-\varepsilon^p} + \xi_p(\pi_{t-1}p_{t-1})^{1-\varepsilon^p}\right]^{\frac{1}{1-\varepsilon^p}}$$

- Market demand aggregation

$$\min_{\mathcal{F}_t(j)} \int_0^1 p_t(j)\mathcal{F}_t(j)\, dj$$

under constraint

$$\mathcal{F}_t = \left(\int_0^1 \mathcal{F}_t(j)^{\frac{\varepsilon^p - 1}{\varepsilon^p}} dj\right)^{\frac{\varepsilon^p}{\varepsilon^p - 1}}$$

Financial system

- The representative merchant bank maximization program

$$\max_{\delta_t, D_t^{bd}, L_t^b, B_t^b, F_t^b} \sum_{s=0}^{\infty} E_t\left[\beta^s \left\{\ln\left(\pi_{t+s}^b\right) - d_\delta \left(1 - \delta_{t+s}\right) + d_{F^b}\left(F_t^b - k[\overline{w}_t L_t^b + \widetilde{w} B_t^b]\right)\right\}\right]$$

under constraints

$$F_t^b = (1 - \xi_b) F_{t-1}^b + \frac{p_{t-1}}{p_t} v_b \pi_{t-1}^b$$

$$\pi_t^b = \alpha_t L_{t-1}^b + \frac{D_t^{bd}}{1 + i_t} - \delta_t D_{t-1}^{bd} - \frac{L_t^b}{1 + r_t^b} - \frac{\varpi^b}{2}\left((1 - \delta_{t-1}) D_{t-2}^{bd}\right)^2 + \zeta_b (1 - \alpha_{t-1}) p_{t-1} L_{t-2}^b + (1 + \rho_t) B_{t-1}^b - B_t^b$$

- The representative deposit bank maximization program

$$\max_{D_t^{bs}, D_t^l, B_t^l, F_t^l} \sum_{s=0}^{\infty} E_t\left[\beta^s \left\{\ln\left(\pi_{t+s}^l\right) + d_{F^l}\left(F_t^l - k[\overline{\overline{w}} D_t^{bs} + \widetilde{w} B_t^l]\right)\right\}\right]$$

under constraints

$$F_t^l = (1 - \xi_l) F_{t-1}^l + \frac{p_{t-1}}{p_t} v_l \pi_{t-1}^l$$

$$\pi_t^l = \delta_t D_{t-1}^{bs} + \frac{D_t^l}{1 + r_t^l} - D_{t-1}^l - \frac{D_t^{bs}}{1 + i_t} + \zeta_l (1 - \delta_{t-1}) D_{t-2}^{bs} + (1 + \rho_t) B_{t-1}^l - B_t^l$$

Supervisory Authority and Central Bank

- Supervisory Authority sets the capital adequacy ratio and the liquidity requirement and also the weights for risky assets:

$$k_t = \delta_k k_{t-1} + (1 - \delta_k)k^* + req_k$$

$$B_t^{gov} = \delta_B B_{t-1}^{gov} + (1 - \delta_B)B^{gov*} + B_t^{gov} req_l$$

$$\bar{\bar{w}}_t = \bar{\bar{w}} E_t \left[\left(\frac{\delta_t}{\delta_{t+1}} \right)^{\eta} \right] \qquad \bar{w}_t = \bar{w} E_t \left[\left(\frac{\alpha_t}{\alpha_{t+1}} \right)^{\eta} \right]$$

- Central Bank controls the interbank rate through a Taylor type rule and conducts liquidity interventions

$$i_t = \phi_i i_{t-1} + (1 - \phi_i)(\bar{\imath} + \Delta p_t + \phi_p(\Delta p_t))$$

$$M_t = v(i_t - \bar{\imath})$$

$$M_t = D_t^{bd} - D_t^{bs}$$

Implied model ratios and steady state

Implied ratios

$\frac{\mathcal{F}}{K} = 0.1$

$\frac{C}{\mathcal{F}} = 0.81$

$\frac{tpc^f}{\mathcal{F}} = 0.003$

$\frac{B^b}{L^b} = 0.5$

$\frac{D^l}{L^b} = 1.16$

$\frac{D^{bd}}{L^b} = 0.64$

$\frac{F}{B} = 1.2$

$D^{bd} = D^{bs}$

$B^b = B^l$

Steady state

$r^b = 11.68\%$

$C = 0.725$

$r^l = 5{,}8\%$

$N = 0.20$

$i = 6.56\%$

$\pi^f = 0.0314$

$L^b = 0.2754$

$D^{bd} = 0.0561$

$D^l = 0.3209$

$F^b = 0.0902$

$D^{bs} = 0.0561$

$B^b = 0.1377$

$F^l = 0.0252$

$\pi^b = 0.0106$

$B^l = 0.1377$

$B^{gov} = 0.0688$

$\pi^l = 0.0033$

$\alpha = 94.863\%$

$\delta = 99.786$

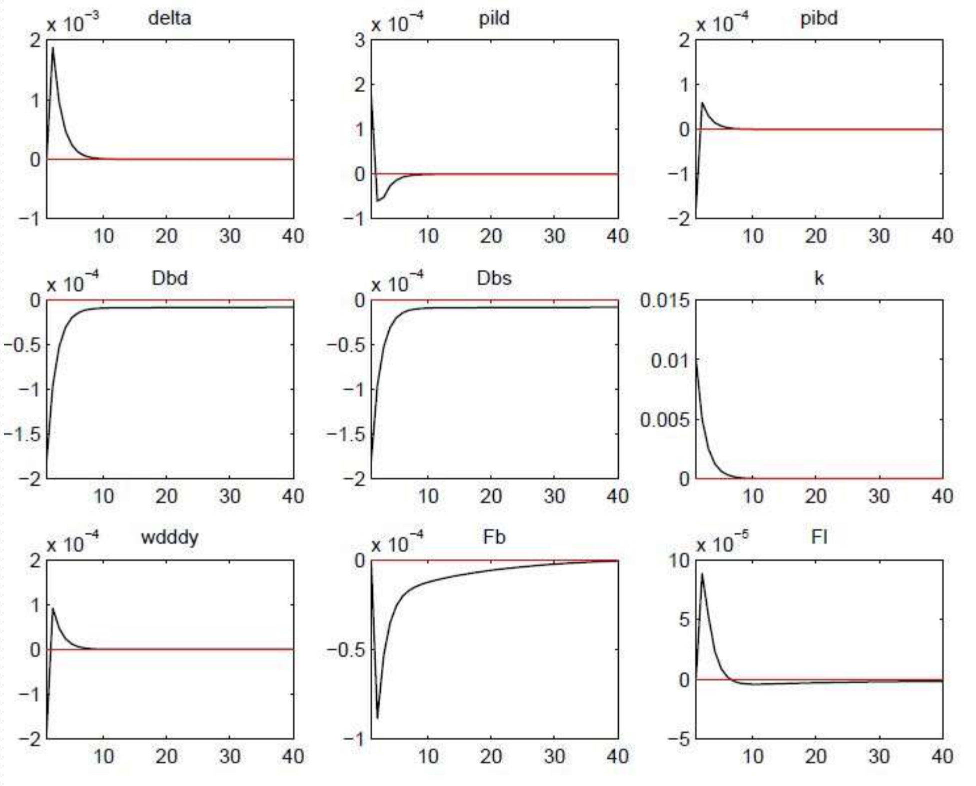
Calibrated parameters

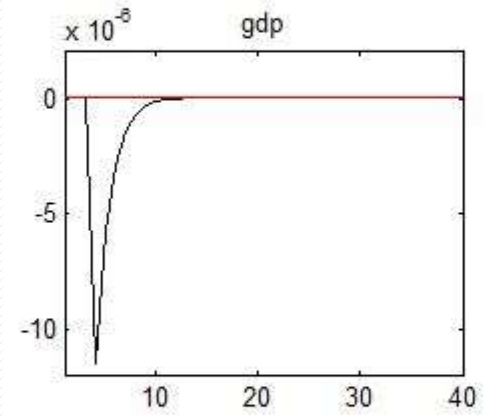
$\mu = 1/3$	$\tau = 0.03$	$\chi = 0.5$	$\zeta_b = 80\%$	$\zeta_l = 80\%$
$\rho = 20\%$	$v_b = v_l = 50\%$	$\beta = 0.986$	$\xi_b = 6\%$	$\xi_l = 6.5\%$
$k = 8\%$	$\overline{w} = 0.8$	$\overline{\overline{w}} = 10\%$	$\widetilde{w} = 120\%$	$\overline{m} = 3.28$
$\xi_p = 0.75$	$\delta_k = 0.5$	$\delta_B = 0.6$	$\phi_i = 0.8$	$\phi_p = 1.2$
$\bar{r} = 6.4\%$	$s_{gov} = 0.5$	$\rho^p = 0.5$	$v = 5$	$Markup_p = 1.05$

$\overline{m} = 3.2853$	$\gamma = 79.7963$		$w^b = 502.9814$
$d_{F^b} = 9.5996$	$d_{F^l} = 12.2114$	$d_f = 0.0454$	$d_\delta = 3.6418$

Simulations (1)

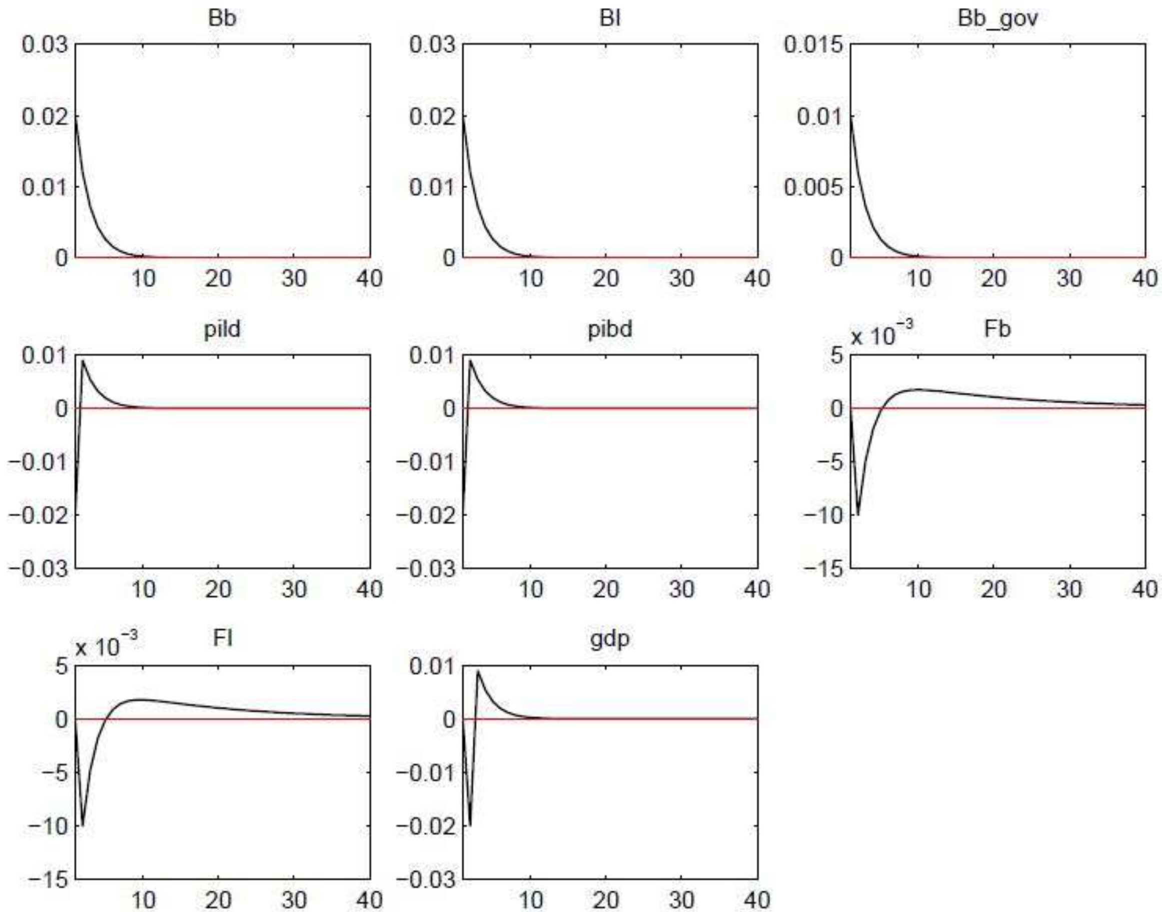
- Capital requirement shock (1 p.p.)



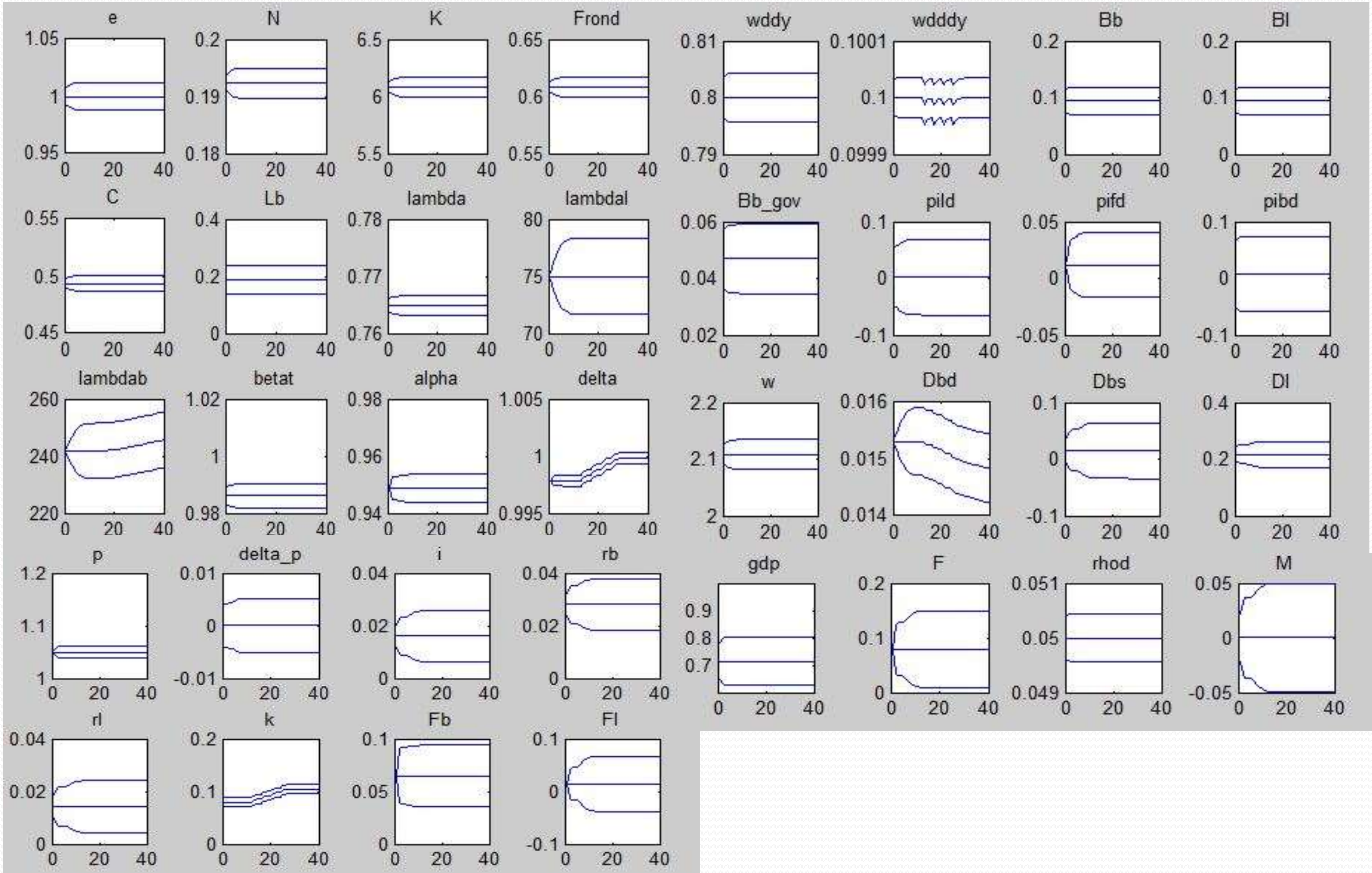


Simulations (2)

- Liquidity requirement shock (25% increase)



Forecast



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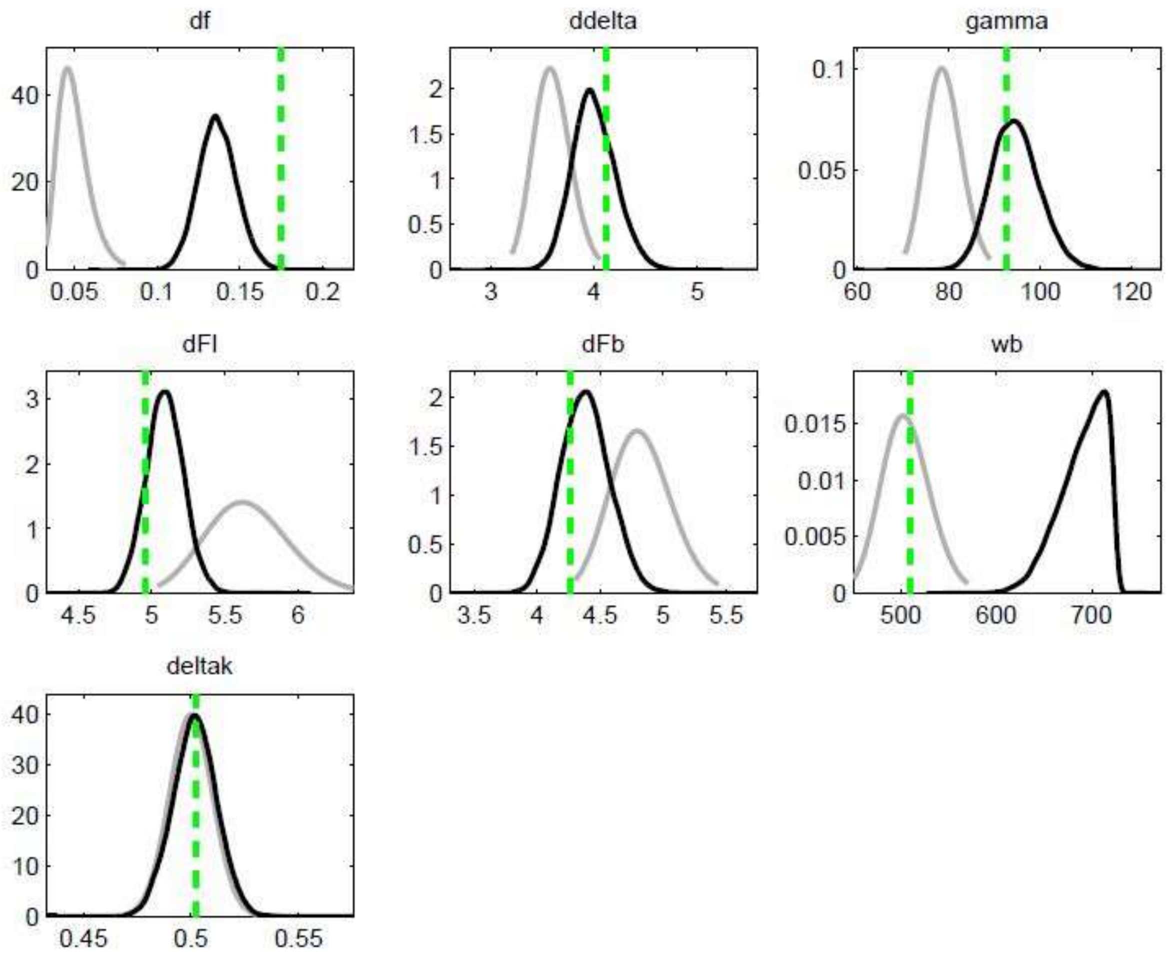
Estimated parameters (1)

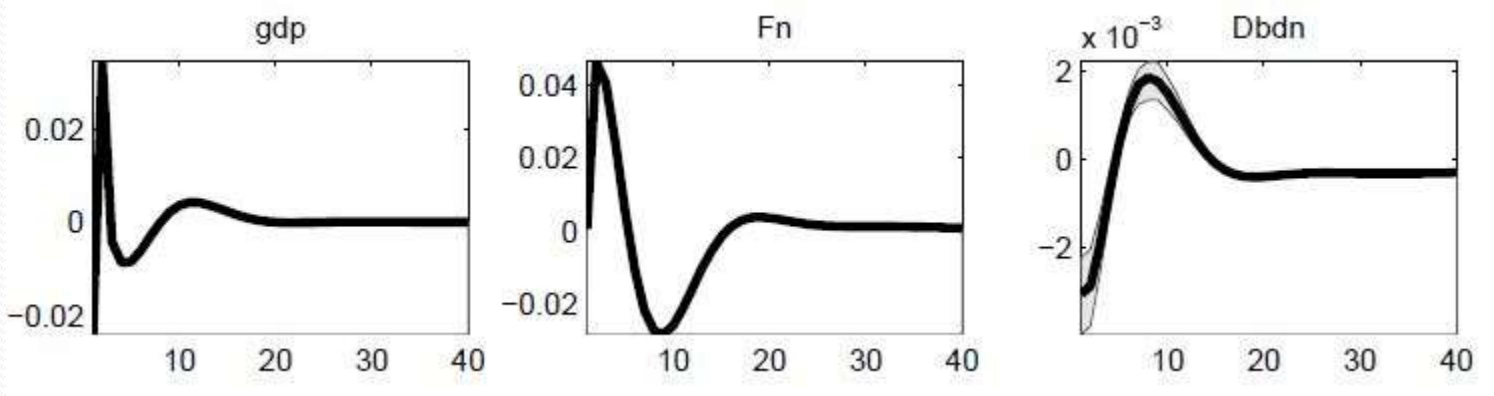
Parameter	Prior mean	Posterior mean	Confidence interval (90%)		Prior distribution	Prior st. dev.
d_f	0.050	0.1363	0.1180	0.1559	Inverse Gamma	0.01
d_δ	3.600	3.9996	3.6508	4.3292	Inverse Gamma	0.05
γ	79	94.4546	86.0744	103.2842	Inverse Gamma	0.1
d_{F^b}	4.830	4.3827	4.0758	4.7015	Inverse Gamma	0.05
d_{F^l}	5.660	5.0892	4.8734	5.2860	Inverse Gamma	0.05
w^b	506	689.8866	655.4378	723.4556	Inverse Gamma	0.05
δ_k	0.500	0.5016	0.4847	0.5183	Beta	0.05

Estimated parameters (2)

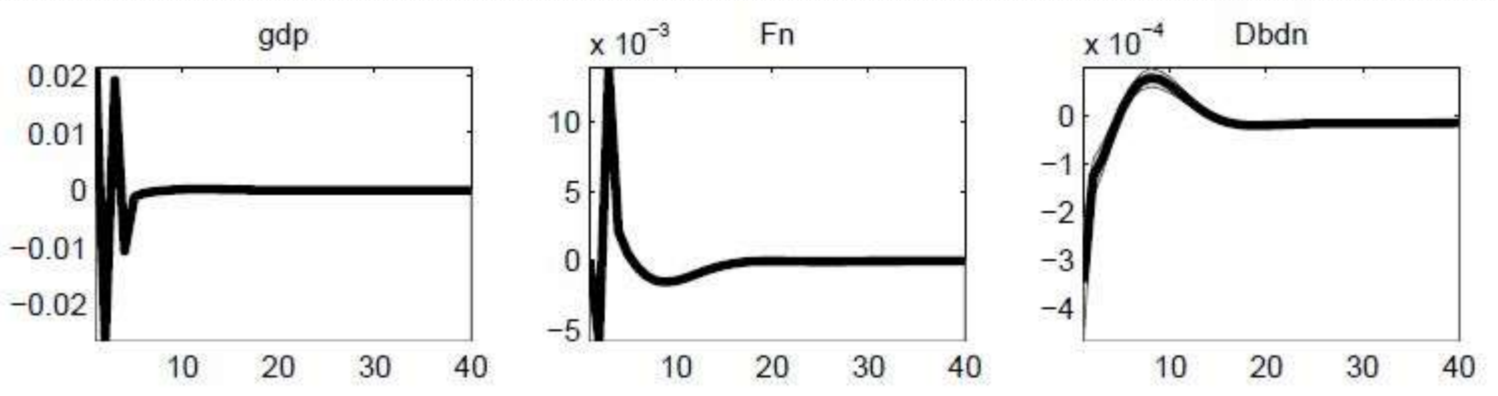


Impulse response functions (1)

Price shock

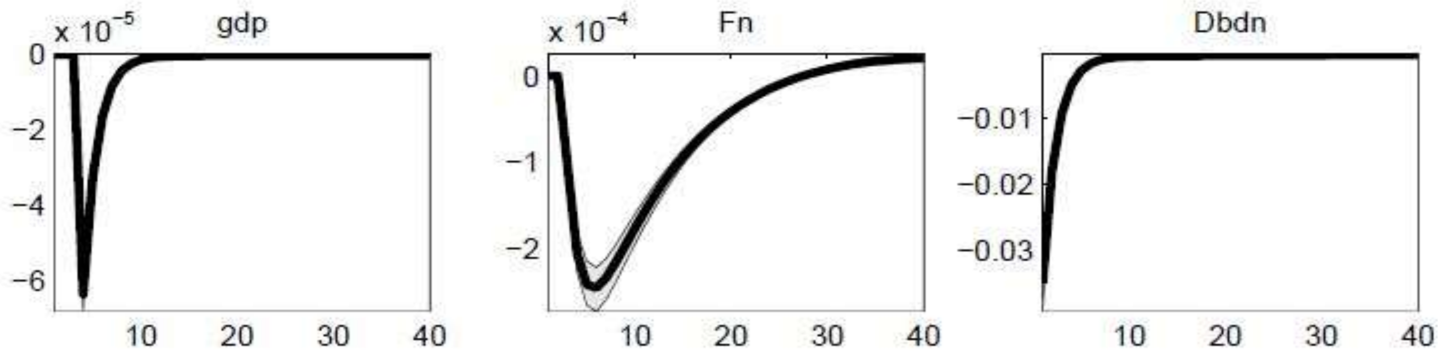


Production price shock

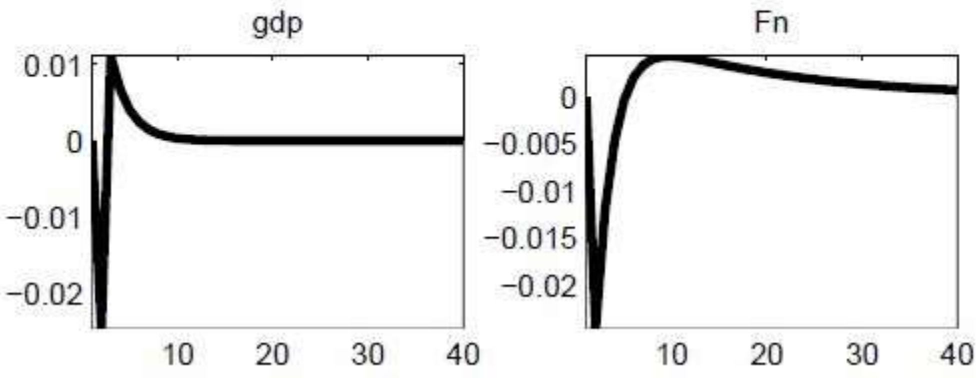


Impulse response functions (2)

Capital requirement shock

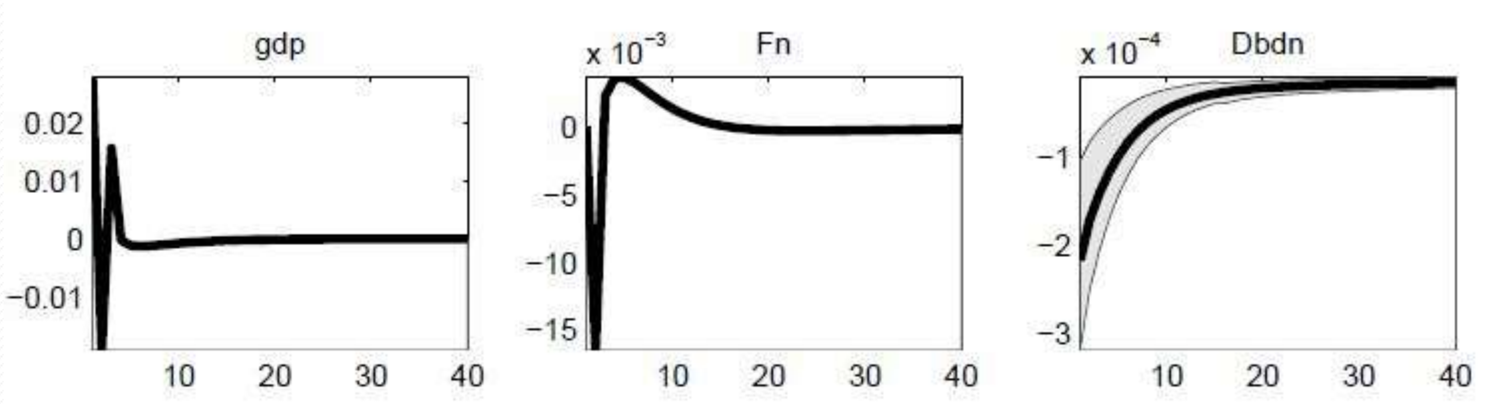


Liquidity requirement shock

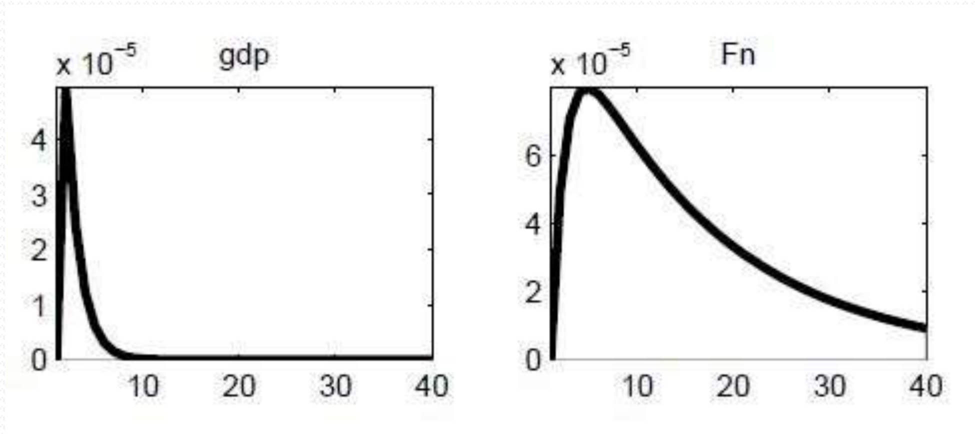


Impulse response functions (3)

Total productivity factor shock



Book value shock



Conclusions and further directions for study

- New requirements will have a small negative impact on the output (as in MAG literature).
- The interbank flows are affected when the capital and liquidity requirements are changing.
- Data limitations.
- The DSGE framework can be further more developed (e.g. open economy, non-bank financial sector).

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Thank you!