Financial (in)stability, supervision and liquidity injections: a dynamic general equilibrium approach

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Introduction

- Capital/credit market imperfections important to understand crisis (from the great depression to the subprime crisis)

- Financial instability may disrupt the economic system as a whole

- Public institutions to try to overcome these imperfections, *e.g.* supervisory authority with own fund requirements (to protect banks again defaults / solvability problems) or central bank with monetary policy (to avoid credit crunch / liquidity problems)

- Model to better understand shock transmissions through the imperfect credit market (interactions between "real world" and "financial world") and the role of public institutions to stabilise the economy ("real world" *vs.* "financial world", short-run *vs.* long-run)

- Standard Real Business Cycle model (DSGE model) with perfectly competitive markets
  but heterogenous banking sector with interbank market
  but endogenous default risk**s** (possibility of contagion)
  but supervisory authority (from Basel I to Basel II)
  but central bank (liquidity interventions)

Literature

- Kiyotaki and Moore (1997), Bernanke *et al.* (1999), Cooley *et al.* (2004), (...): frictions on the demand side (borrowing constraints, limited enforceability, agency costs, ...) and multiplier effects

- Meh and Moran (2004), Markovic (2006), (...): supply side (banks also subject to frictions in raising loanable funds) and supervision

- Goodhart *et al.* (2005,2006): interbank market, supervision and liquidity interventions but 2-state-2-period approach

Main results

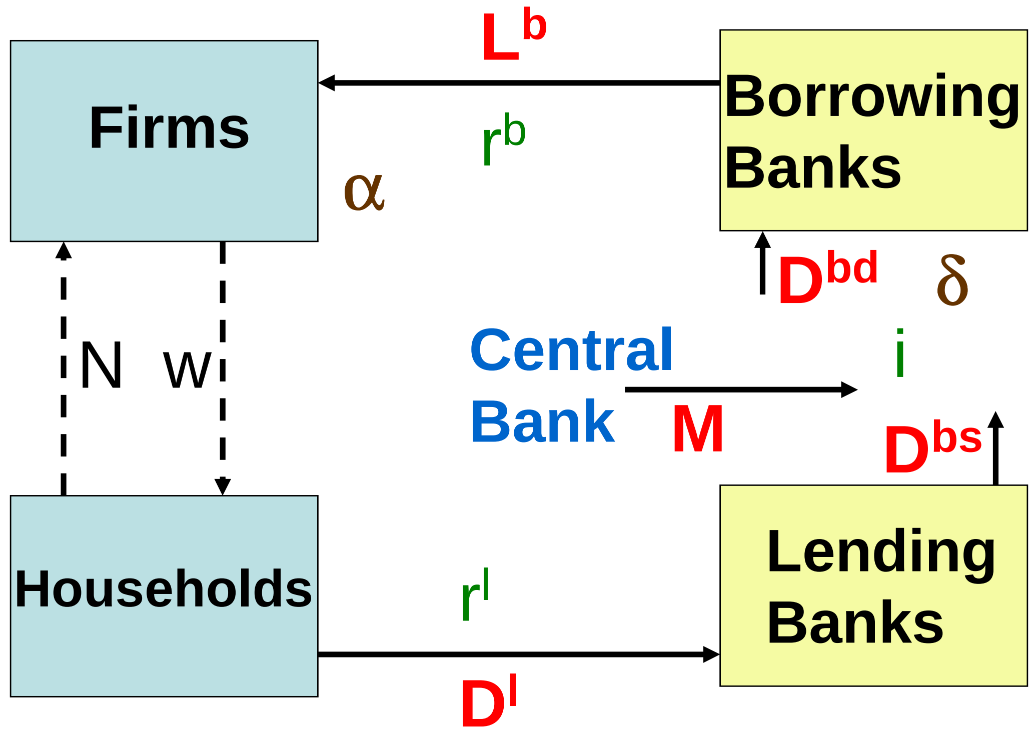
- Model calibrated and simulated: able to reproduce stylized facts on interest rates, defaults rates, risk premia

- Countercyclical risk premia generate financial accelerators

- Procyclicality of Basel II

- Liquidity injections stabilise the financial sector, short-run *vs.* long-run effects on the "real economy"

Model: flow sheet



Model: firms

- Choose N_t and L_t^b to maximise $E_t\left[\sum_{s=0}^{\infty} \tilde{\beta}_{t+s}\pi_{t+s}^{f}\right]$

- Unilateral decision to default: pay $\alpha_t L_{t-1}^b$ today

- Defaulters not excluded but pay tomorrow a stigma/search cost $\frac{\gamma}{2}\left((1-\alpha_t)L_{t-1}^b\right)^2$

- Gives a procyclical repayment rate and a countercyclical risk premium

Model: merchant banks

- Choose L_t^b and D_t^{bd} to maximise $E_t\left[\sum_{s=0}^{\infty} \tilde{\beta}_{t+s} \ln\left(\pi_{t+s}^b\right)\right]$

- Unilateral decision to default: similar to firms

- Derive utility from own funds buffer $F_t^b > k\left[\bar{\omega}_t L_t^b + \tilde{\omega} B_t^b\right]$

- A fraction of profits is devoted to own funds
  $F_t^b = (1-\xi_b)F_{t-1}^b + v_b \pi_t^b$
  and the remaining fraction is distributed to shareholders

Model: deposit banks and households

- Deposit banks maximise profits and derive utility from own funds buffer: similar to merchant banks

- No default on households' deposits

- Households choose D_t^l to maximise $E_t\left[\sum_{s=0}^{\infty} \beta^s \, \mathcal{U}(C_{t+s})\right]$ under a budget constraint

- Labour supply: wage *vs.* disutility

Model: institutions

- The supervisory authority fixes own funds minimum requirements $F_t^{b,min} = k\left[\bar{\omega}_t L_t^b + \tilde{\omega} B_t^b\right]$

- Basel I *vs.* basel II : $\bar{\omega}_t = \bar{\omega}\ E_t\left[\left(\frac{\alpha}{\alpha_{t+1}}\right)^{\eta}\right]$

- The central bank reacts (or not) to interbank interest rate fluctuations by liquidity interventions $M_t = \nu\ (i_t - \bar{i})$

- Interbank market equilibrium: $M_t = D_t^{bd} - D_t^{bs}$

Calibration

- Luxembourg real quarterly data (average 1995-2007)

- Try to match individual components of banks balance sheet (assets and liabilities), the three different interest rates (deposits, interbank, borrowing) and the bank default rates (Z-score)

- $\delta = 0.995 \longrightarrow \alpha = 0.98$

- Market book return: $\bar{\rho} = 0.02$

- Values for reserve minimum requirements: $k = 0.08$, $\bar{\bar{\omega}} = 0.20$, $\bar{\omega} = 0.70$, $\tilde{\omega} = 1.10$

- Extension: EA calibration (if available data)

Simulations: cyclical properties

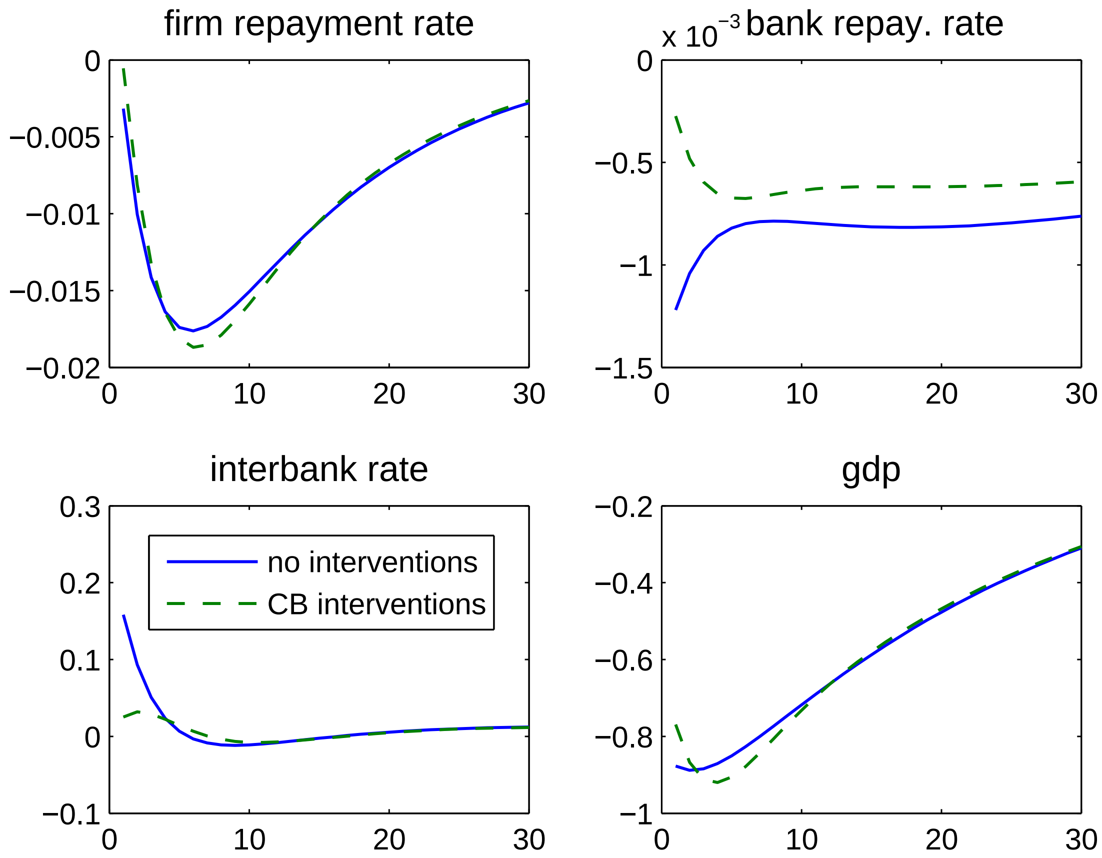
- How is the model able to match real historical data?
- AR(1) productivity shock (RBC approach), Basel I and $\nu = 10$ to get realistic interbank rate volatility
- ! 2 financial accelerators at work
- ! ν important for volatility of all interest rates
- ! importance of investment adjustment cost for correlations

	relative standard deviation		correlation with output		first-order autocorrelation	
	data	model	data	model	data	model
r_t^b	0.05	0.09	-0.58	-0.54	0.90	0.87
i_t	0.05	0.08	-0.43	-0.34	0.91	0.88
r_t^l	0.05	0.08	-0.49	-0.33	0.92	0.88
rp_t	0.01	0.02	-0.42	-0.98	0.76	0.94
α_t	NaN	0.01	NaN	0.87	NaN	0.96
δ_t	0.01	0.01	0.38	0.83	0.75	0.97
N_t	0.74	0.46	0.99	0.93	0.99	0.92
gdp_t	1.00	1.00	1.00	1.00	0.99	0.92

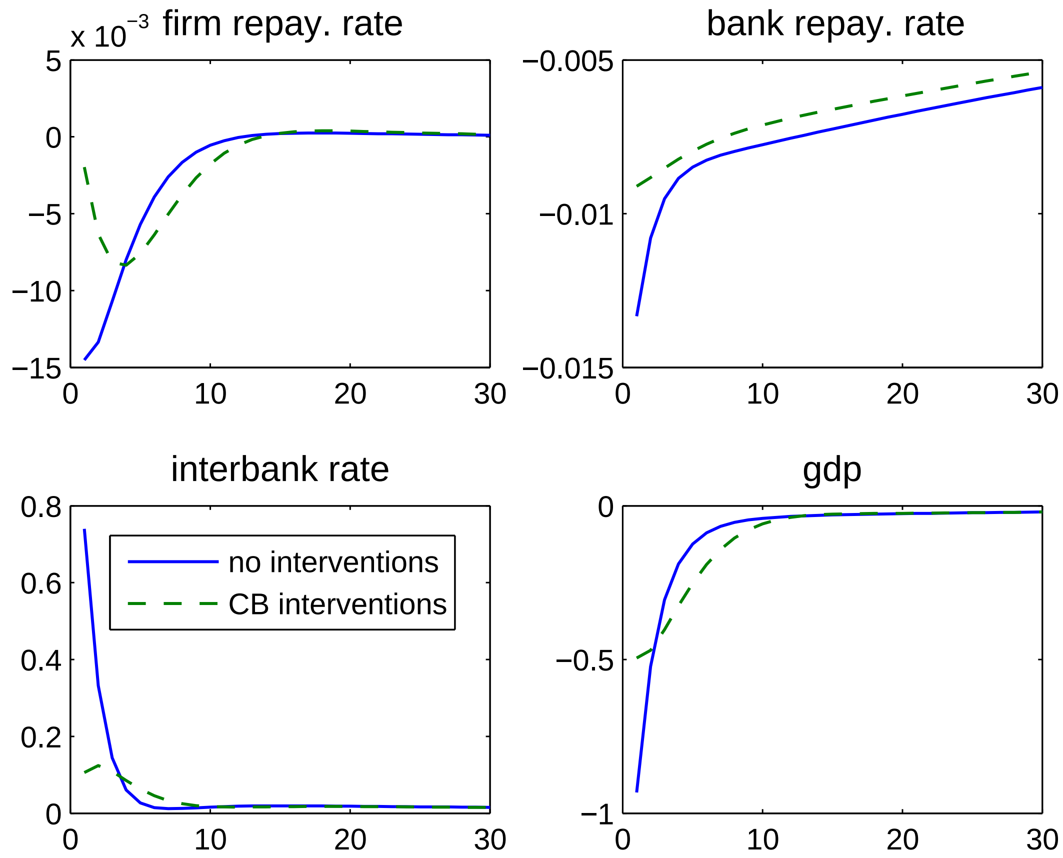
Procyclical effects of Basel II

- Positive shock and increase in $\alpha \implies \bar{\omega}_{II} < \bar{\omega}_I$
- From FOC's we have $\frac{1}{1+r_I^b} - \frac{1}{1+r_{II}^b} = c\ (\bar{\omega}_{II} - \bar{\omega}_I)$
- It implies $r_{II}^b < r_I^b$: lower risk premium under Basel II and multiplier effect
- Confirmed with our GE simulations, but with weak quantitative effects
- Same conclusions if Basel II linked to $\bar{\bar{\omega}}\left(E_t\left[\delta_{t+1}\right]\right)$

Liquidity injections: short- vs. long-run



Market book shock



Summary: optimal monetary policy

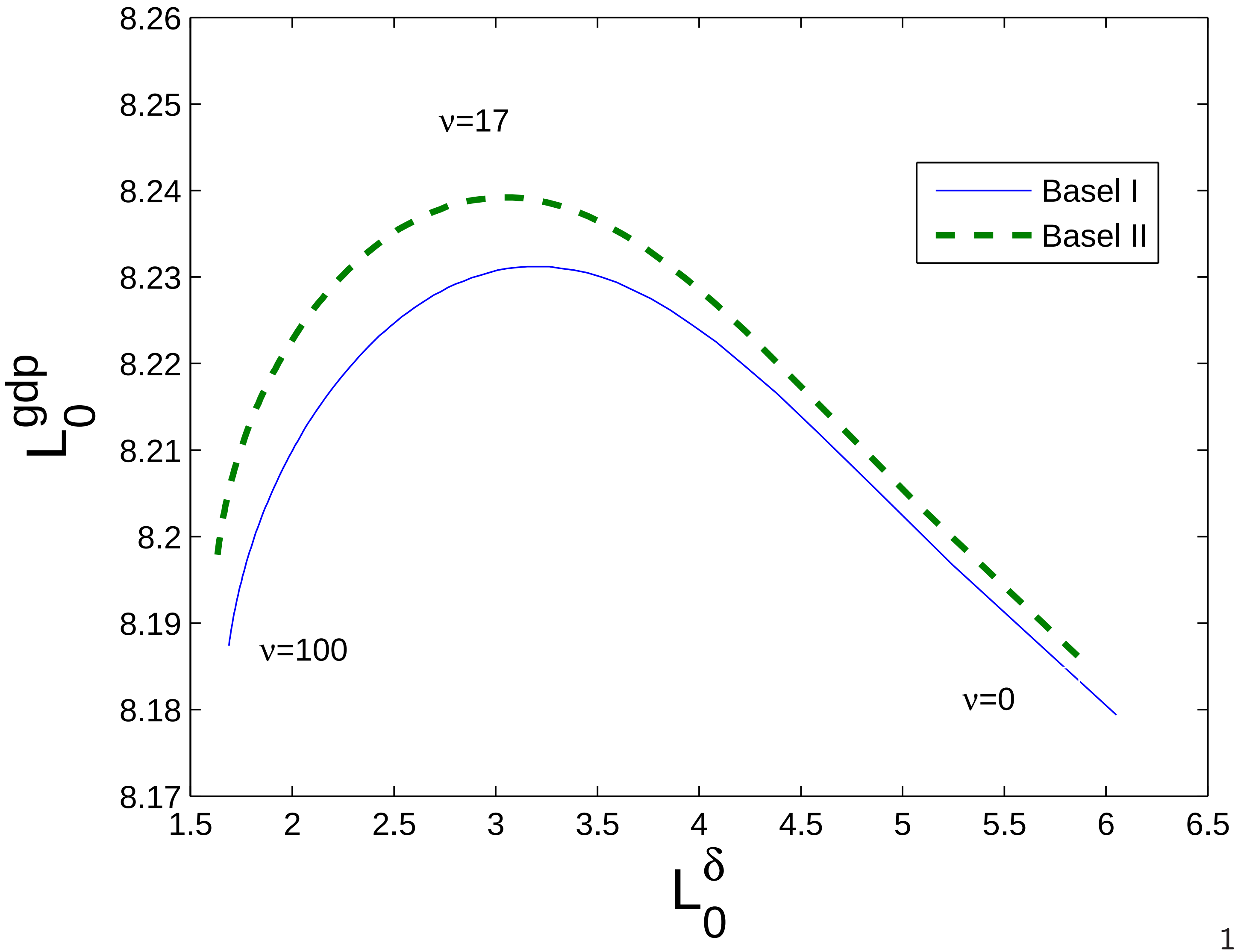
- Liquidity rule $M_t = \nu\,(i_t - \bar{i})$ with $\nu \in [0, 100]$

- Two possible objectives for the central bank : stabilising the financial sector or stabilising the “real economy”

- Loss function in 1st case : $\mathcal{L}_0^{\delta} = E_0\left[\sum_{t=0}^{\infty} \beta^t (\hat{\delta}_t)^2\right]$

- Loss function in 2nd case : $\mathcal{L}_0^{gdp} = E_0\left[\sum_{t=0}^{\infty} \beta^t (g\hat{d}p_t)^2\right]$

- Basel I *vs.* Basel II regulations



8.26
8.25
8.24
8.23
8.22
8.21
8.2
8.19
8.18
8.17
1.5
2
2.5
3
3.5
4
4.5
5
5.5
6
6.5
ν=17
ν=100
ν=0
Basel I
Basel II
L_0^{gdp}
L_0^{δ}

Conclusion

- RBC approach: model, calibration, simulations

- Endo defaults $\Rightarrow$ countercyclical risk premia $\Rightarrow$ fa's
  Basel II $\Rightarrow$ countercyclical risk premia $\Rightarrow$ fa's

- Liquidity interventions stabilise the financial sector but intertemporal trade-off for GDP (although weak)

- Extensions: calibration, shocks, nominal dimension