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 sub-prime 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 risks (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 $E_t \left[ \sum_{s=0}^{\infty} \tilde{\beta}_{t+s} \pi^{f}_{t+s} \right]$

• 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 $F_t^b > k \left[ \bar{\omega}_t L_t^b + \bar{\omega} B_t^b \right]$

- A fraction of profits is devoted to own funds
  \[ F_t^b = (1 - \zeta_b) F_{t-1}^b + v_b \pi_t^b \]
  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 $E_t \left[ \sum_{s=0}^{\infty} \beta^s U(C_{t+s}) \right]$ under a budget constraint

- Labour supply: wage vs. disutility
Model: institutions

• The supervisory authority fixes own funds minimum requirements $F_{t}^{b,min} = k \left[ \tilde{\omega}_{t} L_{t}^{b} + \tilde{\omega} B_{t}^{b} \right]$

• Basel I vs. Basel II: $\tilde{\omega}_{t} = \bar{\omega} E_{t} \left[ \left( \frac{\alpha}{\alpha_{t+1}} \right)^{\eta} \right]$

• The central bank reacts (or not) to interbank interest rate fluctuations by liquidity interventions $M_{t} = \nu \left( i_{t} - \bar{i} \right)$

• 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)

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

- Market book return: $\bar{\rho} = 0.02$
• Values for reserve minimum requirements: $k = 0.08$, $\ddot{\omega} = 0.20$, $\ddot{\omega} = 0.70$, $\ddot{\omega} = 1.10$

• 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

• ! $\nu$ important for volatility of all interest rates

• ! importance of investment adjustment cost for correlations
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Procyclical effects of Basel II

• Positive shock and increase in $\alpha \implies \bar{\omega}_{II} < \bar{\omega}_{I}$

• From FOC’s we have $\frac{1}{1+r_{I}^b} - \frac{1}{1+r_{II}^b} = c \left( \bar{\omega}_{II} - \bar{\omega}_{I} \right)$

• 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 $\bar{\omega} (E_t [\delta_{t+1}])$
Liquidity injections: short- vs. long-run

- Firm repayment rate
- Bank repayment rate
- Interbank rate
- GDP

Graphs showing the impact of liquidity injections on firm repayment rate, bank repayment rate, interbank rate, and GDP, with and without interventions.
Market book shock

- Firm repay. rate
- Bank repay. rate
- Interbank rate
- GDP

- No interventions
- CB interventions
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: $\mathcal{L}_0^\delta = E_0 \left[ \sum_{t=0}^{\infty} \beta^t (\delta_t)^2 \right]$

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

- Basel I vs. Basel II regulations
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