THE PROCYCLICAL EFFECTS OF BANK CAPITAL REGULATION

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Overview

1. Procyclicality as a macroprudential challenge
2. Procyclicality induced by bank capital regulation
3. A model-based assessment
4. Dampening the procyclicality of Basel II in practice
1. Procyclicality as a macroprudential challenge

- Important lesson extracted from the current financial crisis:
  Need to adopt a more macroprudential approach

- Traditional microprudential approach:
  - Macro and system-wide phenomena taken as given
  - Focus on the risk of failure of each individual financial intermediary (bank)

- Macropurulent approach = better understanding + regulatory/policy treatment of...
  - Build-up of systemic risk (common exposures, propagation channels)
  - Various channels of interaction between the financial health of banks and the macroeconomy
Sources of procyclicality in banking

**Fundamental sources**

1. Impact of cycle on investment opportunities and credit demand
2. Impact of cycle on risk profile of candidate borrowers

**General amplifiers**

1. Impact of cycle on bank profits (+ equity issuance difficulties)
2. Procyclical rules and standards of practice
   (a) Fair value accounting + rules based on accounting figures
   (b) Margins calls / haircuts
   (c) Ratings-based and VaR-based risk management
   (d) Compensation practices (?)
3. Capital requirements, especially if risk-based
4. Misperception of risk (disaster myopia, cognitive dissonance) (?)  
5. Asset price bubbles (exogenous?)  
6. Monetary policy (?)

- Crisis-specific amplifiers
  1. Panic and contagion in deposit and interbank markets  
  2. Maturity mismatches  
  3. Fire sales (→ liquidity-in-the-market pricing)  
  4. Strategic behavior of large players (?)

[ Main effects of the amplifiers:  
  – Capital-driven credit crunches  
  – Procyclical risk-taking (by preference or by capacity)  
  – Liquidity spirals (funding liquidity ⇝ market liquidity) ]
2. Procyclicality induced by bank capital regulation

- Now top in agenda for financial regulation reform, possibly because:
  - Genuine importance
  - Close connection to central microprudential regulatory tool

- Potential instance of micro/macro inconsistency:
  Good design from perspective of individual (or cross-section of) banks may have undesirable aggregate, time-series properties

- Main argument:
  - Regulation imposes minimum capital to (risky-weighted) assets ratio $\gamma$
  - Capital $K$ feeds from retained profits & equity issuance
  - New equity is hard to raise (costly, time-consuming process, esp. in bad times)
• For fixed $K$, capital requirements impose an upper limit on risk-weighted assets (say, loans $L$):

$$K \geq \gamma L \iff L \leq \frac{K}{\gamma}$$

  – Basel I: $\gamma \approx 8\%$
  – Basel II: $\gamma$ is determined by a complex VaR-based formula, which is increasing in the estimated probabilities of default (PDs) and losses-given-default (LGDs) of each exposure

• In recessions:
  – Loan defaults & other losses may turn profits into losses
  – Equity issues are even more expensive than usual
  – Estimated PDs and LGDs increase
    • Basel I: Recessions $\Rightarrow \downarrow K \Rightarrow$ Effect on $K/\gamma$
    • Basel II: Recessions $\Rightarrow \downarrow K \& \uparrow \gamma \Rightarrow$ Stronger effect on $K/\gamma$
Ratings drift and GDP growth: US and euro area (1)

Note: ratings drift is equal to upgrades minus downgrades divided by the number of rated issuers (source: Moody’s). GDP growth is the annualized quarterly percentage change in GDP (source: Thomson Financial).

[From: Panetta et al. (2009) “Financial Sector Pro-cyclicality:…”]
SPAIN: PIT CAPITAL REQUIREMENTS AND GDP GROWTH

[From: Repullo et al. (2009), “Mitigating the Pro-cyclicality of Basel II”]
• If banks cannot quickly raise sufficient new capital...
  – Fall in lending capacity may produce persistent credit crunch
  – Negative impact on economy may cause a feedback loop (via bank profits, PDs, and LGDs)

• In expansions, symmetric effects would allow banks’ to expand their lending capacity, but final effects unlikely to be symmetric:
  – Banks can pay dividends or keep surplus capital
  – Equilibrium lending likely to be demand driven
  – Feedback effects are likely to be more limited

• Preventing capital-driven credit crunches may require...
  – Cyclical adjustment of capital requirements
  – Arranging for contingent capital injections in bad times
• Level & form of possible reforms are objects of intense debate:
  
  – **Macro-prudentialists**
    * Consider this an issue of great relevance
    * Would prefer to see...
      · adjustments based on rules
      · rules based on aggregate/bank indicators of credit cycle
    * Some defend going beyond the pure correction of regulation-induced effects
  
  – **Micro-prudentialists**
    * Play down the importance of the procyclical effects
    * Consider it a necessary evil
    * Would prefer adjustments based on...
      · supervisory discretion (Pillar 2)
      · use of (supervisory-validated?) through-the-cycle inputs
- **Sceptics**
  
  * Banks typically hold capital in excess of required minima
  * Binding requirements are “economic capital requirements”
  * Cyclical adjustments of regulation cannot do much

- Repullo and Suarez (2009) challenge the view that regulation-induced procyclical effects are not important
  
  - Banks keep *capital buffers* of realistic size in response to uncertainty on future profits, capital requirements, and difficulties to raise new capital
  - Banks wish to avoid losing profitable lending opportunities when their capital is too scarce
  - Effects on credit supply are sizeable; effects on bank solvency not
    (Call for caution on micro-prudentialists advice!)
3. Model-based assessment

- For capital requirements to have a significant impact on aggregate credit two conditions must be met:
  - Some **banks** must find it difficult to issue equity when needed
  - Some **borrowers** must find it difficult to switch from a constrained bank to other financing sources

  [Blum and Hellwig (1995), Kashyap and Stein (2004)]

- Our **relationship banking** model captures these conditions in a way that produces a tractable OLG structure:
  - Borrowers need loans for **two consecutive periods** and become dependent on initial lenders
  - Banks with **ongoing relationships** cannot issue equity (→ they only access the equity market every other date)
• Other features of the model:
  
  – Perfect competition in market for first period loans
  
  – Business cycle = 2-state Markov chain for loans’ PDs
    * Low default state $l$
    * High default state $h$
  
  – Loan losses are as in the model underlying the IRB approach
    * State of the economy determines expected default rate (PD)
    * Single risk factor determines realized default rate
  
  – ...

Density of the default rate $x_t$

Here: two extreme PD values, 10% & 20%
In baseline calibration: 1.1% & 3.3%

Reminder:
IRB approach of Basel II adopts target confidence level $\alpha = 99.9\%$
(capital so as to absorb losses in 99.9% quantile of this distribution)
• Other features of the model:

  – Perfect competition in market for first period loans

  – Business cycle = 2-state Markov chain for loans’ PDs
    * Low default state $l$
    * High default state $h$

  – Loan losses are as in the model underlying the IRB approach
    * State of the economy determines *expected* default rate (PD)
    * *Single risk factor* determines *realized* default rate

  – Focus on **supply side**, ignoring demand-side&feedback effects
    * Expected credit rationing
    * Implications for bank solvency
Strategy for the analysis

• Dynamic optimization reduced to sequence of 2-period problems
  – Banks optimize on their first-period capital holdings $k_s$ (Maximizing net present value of shareholders’ expected payoffs)
  – First-period loan rates $r_s$ found in perfectly competitive fashion (Zero net present value condition)

• Banks’ optimal capital buffers depend on simple trade-off:
  Cost of excess capital vs. Capacity to satisfy future loan demand

• Effects of capital requirements are analytically ambiguous
  – Precaution effect: ↑future $\gamma_s$ ⇒ ↑buffers
  – Profitability effect: ↑future $\gamma_s$ ⇒ ↓profitability of future lending

⇒ Numerical evaluation is required
## Parameterization*

Baseline parameter values (*medium volatility scenario*)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$a$</td>
<td>0.04</td>
</tr>
<tr>
<td>$\lambda$</td>
<td>0.45</td>
</tr>
<tr>
<td>$\delta$</td>
<td>0.04</td>
</tr>
<tr>
<td>$q_l$</td>
<td>0.20</td>
</tr>
<tr>
<td>$q_h$</td>
<td>0.64</td>
</tr>
<tr>
<td>$p_h$</td>
<td>3.3%</td>
</tr>
<tr>
<td>$p_l$</td>
<td>1.1%</td>
</tr>
</tbody>
</table>

Comments:

- Realistic values, but not intended to provide a calibration
- Transition probabilities reflect observed default cycles (high/low PD states last 2.8y/5y on average)
- PDs imply an average capital charge of 8% under Basel II:

\[
\gamma_l = 6.6\% < \gamma_h = 10.5\%
\]
Numerical results (i)

Loan rates and capital buffers (%)

<table>
<thead>
<tr>
<th>Rates</th>
<th>Capital</th>
<th>Buffers</th>
</tr>
</thead>
<tbody>
<tr>
<td>$r_l$</td>
<td>$r_h$</td>
<td>$k_l$</td>
</tr>
<tr>
<td>Basel I</td>
<td>1.2</td>
<td>2.7</td>
</tr>
<tr>
<td>Basel II</td>
<td>1.2</td>
<td>2.8</td>
</tr>
<tr>
<td>Laissez-faire</td>
<td>0.6</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Comments:

– Small loan rate effects

– Sizeable buffers: noncyclical under Basel I; higher in expansions under Basel II
Numerical results (ii)

Expected credit rationing in state $s'$ (%)

Conditional on $s \rightarrow s'$

<table>
<thead>
<tr>
<th></th>
<th>$l \rightarrow l$</th>
<th>$l \rightarrow h$</th>
<th>$h \rightarrow h$</th>
<th>$h \rightarrow l$</th>
<th>Uncond.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basel I</td>
<td>1.4</td>
<td>1.4</td>
<td>2.7</td>
<td>2.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Basel II</td>
<td>0.3</td>
<td><strong>10.7</strong></td>
<td><strong>4.5</strong></td>
<td>0.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Laissez-faire</td>
<td>2.1</td>
<td>2.1</td>
<td>5.2</td>
<td>5.2</td>
<td>3.2</td>
</tr>
</tbody>
</table>

Comments:

– Basel II is clearly procyclical:
  * increases rationing in $s' = h$, especially after $s = l$
  * decreases rationing in $s' = l$, especially after $s = h$
– Unconditionally, Basel II increases expected credit rationing
Economic Activity
(realized value of investment projects)
Numerical results (iii)

Probabilities of bank failure (%):

<table>
<thead>
<tr>
<th></th>
<th>1st period banks</th>
<th>2nd period banks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$s = l$</td>
<td>$s = h$</td>
</tr>
<tr>
<td>Basel I</td>
<td>0.022</td>
<td>0.115</td>
</tr>
<tr>
<td>Basel II</td>
<td>0.014</td>
<td>0.054</td>
</tr>
<tr>
<td>Laissez-faire</td>
<td>2.080</td>
<td>5.210</td>
</tr>
</tbody>
</table>

Comments:

– Basel II makes banks safer

– Pr(bank failure) is well below the nominal target of 0.1%
Specific policy evaluation

• There is room for introducing cyclical adjustments in the requirements w/o compromising long-term solvency targets

• Consider state-contingent confidence levels \( \{\alpha_{ss}\} \)
  
  – Policy 1: Mean-preserving spread with \( \alpha_{lh} = \alpha_{hh} = 99.8\% \)
  
  – Policy 2: Mean-preserving spread with \( \alpha_{lh} = 99.8\% \)

<table>
<thead>
<tr>
<th>Expected credit rationing in state ( s' ) (%)</th>
<th>( l \to l )</th>
<th>( l \to h )</th>
<th>( h \to h )</th>
<th>( h \to l )</th>
<th>Uncond.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basel II</td>
<td>0.3</td>
<td>10.7</td>
<td>4.5</td>
<td>0.6</td>
<td>2.6</td>
</tr>
<tr>
<td>Policy 1</td>
<td>0.8</td>
<td>3.7</td>
<td>3.6</td>
<td>1.6</td>
<td>1.9</td>
</tr>
<tr>
<td>Policy 2</td>
<td>0.5</td>
<td>4.4</td>
<td>4.4</td>
<td>0.6</td>
<td>1.9</td>
</tr>
</tbody>
</table>

[Note: \( \Pr(\text{bank failure}) \leq 0.08\% \) in all sequences]
The findings in perspective

• Under Basel II capital requirements,
  – Banks indeed choose to hold capital buffers
  – Buffers are not sufficient to fully neutralize the implications of a downturn

⇒ Sizeable fall in supply of credit to bank-dependent borrowers

• Advantages of cyclically-varying feature of Basel II (preserving banks’ solvency over the business cycle) are disproportionately small relative to potential credit crunch effects

• But risk-sensitivity has good cross-sectional properties
  – Alternative is not to return to Basel I
  – Alternative is to correct the procyclical effects of Basel II
4. Dampening the procyclicality of Basel II in practice

• Issues under discussion
  – Inputs vs outputs
  – Rules-based vs discretionary
  – Contingent on what?
  – How ambitious?

• I will refer to these points by offering my constructive criticism to what looks like the trend followed by the Basel Committee at the moment
  – Problems with the through-the-cycle approach
  – An alternative rules-based adjustment factor approach
• Definitely, correct the procyclicality of capital requirements

• Dominant trend
  – Full implementation of *through-the-cycle* input estimates
  – Some version of the Spanish pre-provisioning system [or other mechanisms that encourage the formation of “usable” buffers]

• Without objecting to the second part, I think that:

  *Relying on through-the-cycle estimates is a mistake:*

  1. Makes internal models harder to verify
  2. Expands the scope of supervisory discretion
  3. Kills the statistical interpretation of *required capital*
  4. Not clear that available data can deliver reliable through-the-cycle estimates
• My advice:

Adjustment factor based on simple macro aggregate (GDP, credit?)

– Richer alternatives may have virtues
– But also many pitfalls in terms of simplicity, predictability, flexibility and manipulability
  * more complicate
  * more uncontrollably heterogeneous across jurisdictions
  * harder to re-assess or predict in real time
  * harder to recalibrate
  * more open to discussions with the industry
  * more vulnerable to “specification errors”
  * more vulnerable to “regulatory capture”
– Go for a smooth factor based on lags of e.g. GDP growth [Moving average of quarterly growth rates]

* Tailored to specificities of credit categories & jurisdictions.
* For cross-border loans, use composite index based on borrowers’ location
* With elasticities to GDP growth calibrated according to:
  1. Link between $\triangle$GDP & relevant inputs
  2. Link between $\triangle$GDP & credit growth
  3. Targeted “countercyclicality”
Default rates and GDP growth: US and euro area

![Graph showing default rates and GDP growth](image)

Note: The default rate is the 12-month moving average of corporate bonds in default weighted by their nominal amount; data for the euro area refer to all non-US corporate bonds (source: Moody’s). GDP growth is the annualized quarterly percentage change in GDP (source: Thomson Financial). The shaded areas for the United States are the NBER recession quarters (source [www.nber.org](http://www.nber.org)) and for the euro area are the quarters when the euro area GDP is below its exponential trend.

[From: Panetta et al. (2009) “Financial Sector Pro-cyclicality:…”]
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[From: Repullo et al. (2009), “Mitigating the Pro-cyclicality of Basel II”]
At this stage,

- Start with the modest target of neutralizing regulation-induced procyclicality
- More ambitiously, one could try to also compensate for cyclicality of bank profits, and availability/cost of equity financing
- Leave further adjustments to the discretion of macroprudential authorities

→ Automatic stabilizer + Explicit, transparent tool for discretionary fine-tuning

 Added advantage:

It will signal that there is an explicit tool that
- operates as an automatic stabilizer and
- can be fine-tuned by the new macroprudential authorities