Agent-based models and financial stability

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12th April 2013

Complexity Models for Systemic Instabilities and Crises
Lorentz Centre

*The views expressed in this presentation are those of the presenter and not necessarily those of the Bank of England. Not for further distribution.
Outline

• What are the goals and policy levers of a macroprudential regime?

• What do policy institutions need to know to operationalise a macroprudential regime?
  – what models and tools are currently being used?

• Where might Agent Based Models fit in?
Macroeconomic policy
Extraordinary Times

UK

Index (2004=100)


15%

Source: Thomson Reuters

Simple linear trend used for pre-crisis trends
Only WWI was more costly
Extraordinary Times

Short-term policy rates

UK

US

Percentage Points

Source: GFD
Extraordinary Times

Bank of England balance sheet

Percent of GDP

1821 1861 1901 1941 1981
What is macroprudential policy?

- 2 components of systemic risk (Borio and Crockett, 2000)
  - Cyclical vs structural or time series vs cross section

- Cyclical risks = credit cycle
  - Upswing amplified by increasing leverage, maturity transformation, intra-financial system activity, and looser terms and conditions in markets
  - Factors go into reverse in downswing

- Structural risks
  - Systemically important financial institutions ("TBTF")
  - Opacity, complexity
Medium-term cycle in real credit and GDP in the UK

Source: Bank calculations.
Macroprudential policy in the UK

- Financial Policy Committee (FPC) set up to take a top-down macroprudential view
- Mandate to “protect and enhance the resilience of the UK financial system”
  - Subject to that, support growth and employment
- Includes members of the BoE’s executive, microprudential heads, and externals:
  - Non-voting HM Treasury representative
Financial Policy Committee’s powers

General Recommendations
• eg to HM Treasury over regulatory perimeter

Comply or Explain Recommendations
• Better suited for tackling structural, cross-sectional risks

Directions
• Binding instructions

• Directions carry greater statutory force – so which specific tools?
Which macroprudential tools?

• FPC will have immediate powers over
  – Countercyclical capital buffer (CCB)
  – Sectoral capital requirements (SCRs)

• Future candidates?
  – Leverage ratio (in 2018, subject to review in 2017)
  – Liquidity tool
  – Margining requirements
  – LTV / LTI restrictions

Policy Statement: The FPCs’ Powers to Supplement Capital Requirements (2013)
Countercyclical capital buffer (CCB)

- Part of Basel III
- Level playing field:
  - FPC sets CCB rate for UK lending
  - Other countries set national CCB rate for overseas lending
  - Mandatory reciprocity in EU up to 2.5% RWAs

(a) 'Additional buffers' refers to the capital conservation buffer, systemic risk buffers and any forward-looking guidance on capital levels by the microprudential regulators.
Sectoral capital requirements (SCRs)

• FPC sets temporary additional capital requirements on
  – Residential mortgages
  – Commercial property exposures
  – Exposures to other financial sector entities

• More targeted/flexible than CCB
  – Could target risky sub-sectors
    • High-LTV mortgages
    • Financial sector: institutions (eg exposures to SPVs) or instruments (eg repos)
  – Could apply to stock of existing loans or just new lending
What do we need to know to operationalise a macroprudential regime?
Policy process

Risk assessment process → FPC decisions → Coordination process → Implementation → Impact
Measuring systemic risk

• What is the current level of systemic risk? How has risk changed in the last quarter?
  – What summary statistic indicators should we look at?
  – Should we run more/less stringent stress tests?
  – What does a “severe but plausible” stress look like?

• Where are the major structural fault-lines in the financial system?
  – Which institutions/markets/infrastructures are most systemic?
Macroprudential indicators

Chart A  UK credit gap and credit growth

Credit growth (per cent on a year earlier)
Credit-to-GDP gap (percentage points)

Sources: Bank of England, ONS and Bank calculations.
## Macroprudential indicators

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<th>Core indicator set for the countercyclical capital buffer(1)</th>
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<td>Bank balance sheet stretch(4)</td>
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<tr>
<td>1 Core Tier 1 capital ratio(5)</td>
<td>6.6%</td>
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<tr>
<td>2 Leverage ratio(6)</td>
<td></td>
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<tr>
<td>Simple</td>
<td>4.7%</td>
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<td>Basel III</td>
<td>n.a.</td>
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<td>Bank debt measures</td>
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<td>CDS premia(11)</td>
<td>12 bps</td>
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<td>Subordinated spreads(12)</td>
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<td>Bank equity measures</td>
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<td>Price to book ratio(13)</td>
<td>2.14</td>
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<td>Market-based leverage ratio(14)</td>
<td>9.6%</td>
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<td>Non-bank balance sheet stretch</td>
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<td>9 Credit-to-GDP(15)</td>
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<tr>
<td>Ratio</td>
<td>131.8%</td>
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<td>Gap</td>
<td>4.2%</td>
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<td>10 Private non-financial sector credit growth(16)</td>
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<td></td>
<td>10.8%</td>
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<td>Conditions and terms in markets</td>
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<td>14 Long-term real interest rate(20)</td>
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<td>3.09%</td>
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<td>15 VIX(21)</td>
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<td></td>
<td>19.1</td>
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<td>16 Global spreads(22)</td>
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<td>Corporate bond spreads(23)</td>
<td>115 bps</td>
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<td>Collateralised and securitised debt spreads(24)</td>
<td>50 bps</td>
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<td>17 Spreads on new UK lending</td>
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<td>Mortgage lending(25)</td>
<td>81 bps</td>
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<tr>
<td>Corporate lending(26)</td>
<td>103 bps</td>
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</tbody>
</table>
**Stress testing - RAMSI**

Source: Aikman et al (2009)  
Source: Burrows, Learmonth and McKeown (2012)
Understanding the impact of policy

• What transmission mechanism would we expect a change in capital requirements to have?
  – On financial stability
  – On growth
  – On different segments of society

• Which tools are best suited to tackling a particular problem?

• How should we think about the interaction across tools?
Transmission map

Nelson and Gabor (2013): DSGE framework

Simulating a credit boom under different capital requirements rules

- By leaning against the wind, countercyclical capital requirements can moderate credit cycles

Solid line: no intervention
Dashed line: fixed capital requirement
Dotted line: countercyclical capital requirement responding to credit imbalance
Bridges et al (2013): Estimating the sectoral impact of capital requirements

Impact of a 100 basis point increase in Pillar 2 requirements

- Micro-econometric estimates of the impact of micro-prudential standards on credit volumes
Gai et al (2011): Haircuts and liquidity

Haircut vs frequency of liquidity hoarding in a geometric network

Source: Gai, Haldane and Kapadia (2011)
Gai et al (2011): Haircuts and liquidity

Haircut vs frequency of liquidity hoarding in a geometric network

- Raising liquidity requirements as haircuts fall reduces contagion risk

Source: Gai, Haldane and Kapadia (2011)
Where might ABMs fit in?
How do ABMs fit in?

• We’re in exploring mode

• ABMs seem to offer major advantages
  – allow a more flexible characterisation of expectations and instability
  – Allow modelling of detailed features of credit markets

• Caution too:
  – ABMs seem overparameterised;
  – question marks too over their story-telling power
Some concrete suggestions

• How different might recent macro history have been had we had a countercyclical macroprudential regime in place?

• Which policy lever would have been most potent in pricking the housing bubble? LTVs, LTIs, amortisation periods, capital requirements, interest rates etc

• How does banking market structure affect transmission mechanism of policy?

• Can one construct a simple model of procyclicality based on adaptive expectations? Or on strategic complementarities such as “keeping up with the Goldmans”?  

Some concrete suggestions (cont)

• What impact might the shift towards collateralised lending have for financial stability? For growth?

• Under what conditions might the insurance sector be a shock absorber?

• What are the financial stability implications of Vickers? Liikanen? Volcker?

• What are the implications of simple vs complex regulatory rules? Eg leverage vs risk-based capital requirements?