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RESEARCH IN AND POLICY FOR FINANCIAL STABILITY – WHAT HAVE WE LEARNT?

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1 Introduction

This article seeks to provide a broad overview of lessons learnt in the field of financial stability over the past decade. During this period there have been numerous crises, coinciding with considerable research and developments in policy. A major impetus to these have been a growing realisation of the costs of crises, which can be as over 20% of GDP (Hoggarth and Sapporta 2001). Many central banks have obtained a mandate to pursue financial stability (Das et al 2004). A key policy development has been Macroprudential Surveillance, although as highlighted, there remain some unanswered questions as to its use in practice.

2 Developments in the Understanding of the Process of Financial Instability

(a) A generic approach

A primary issue, and background for the rest of our article, is a growing realisation of the generic nature of financial crises. In other words, they are not random events but share key common features. As highlighted in Table 1, there are both exogenous and endogenous aspects. The process often starts with a primary shock to the economy and financial system that is favourable to growth and investment. But this leads to a process of propagation, whereby there is a build-up of vulnerability in the economy and financial system leading to a crisis when a secondary (adverse) shock occurs. In turn, there is further propagation in a crisis period (systemic risk) that typically entails policy reactions if the crisis is sufficiently severe, and considerable adverse economic consequences (the “costs of instability”).

Phase of crisis	Nature	Example of features
Primary (favourable) shock	Diverse	Deregulation, monetary or fiscal easing, invention, change in market sentiment
Propagation - build-up of vulnerability	Common – main subject of macroprudential surveillance	New entry to financial markets, Debt accumulation, Asset price booms, Innovation in financial markets, Underpricing of risk, risk concentration and lower capital adequacy for banks, Unsustainable macro policy
Secondary (adverse) shock	Diverse	Monetary, fiscal or regulatory tightening, asymmetric trade shock
Propagation - crisis	Common	Failure of institution or market leading to failure of others via direct links or uncertainty in presence of asymmetric information – or generalised failure due to common shock
Policy action	Common – main subject of crisis resolution	Deposit insurance, lender of last resort, general monetary easing
Economic consequences	Common – scope depends on severity and policy action	Credit rationing and wider uncertainty leading to fall in GDP, notably investment

(b) Types of crisis

In the past decade, awareness has grown that while traditional banking crises remain a major manifestation of financial instability, especially in emerging market economies, there are alternative forms of crisis that may equally lead to systemic consequences. These are related to the ongoing securitisation of financial systems. One is extreme market price volatility after

a shift in expectations (see Davis 2002). Whereas violent price movements may in themselves not have systemic implications², these may emerge when such movements threaten institutions that have taken leveraged positions on the current levels of asset prices. Currency crises, a subset of these, may sharply affect banking systems, giving rise to “twin crises” (Kaminsky and Reinhart 1999) as in Asia in 1997 and Argentina in 2001.

There may instead be protracted³ collapses of debt or derivatives market liquidity and issuance (see Davis 1994). The risks are acute not only for those holding positions in the market but also for those relying on the market for debt finance or liquidity – which increasingly include banks. The Russia/LTCM crisis of 1998 and, particularly, the US Sub-Prime crisis of 2007-8 showed that these market-liquidity crises are recurrent features of modern financial systems. The Sub-Prime crisis has shown that interbank market liquidity can be highly vulnerable as well as that of securitised debt markets. Periodic collapse has been a feature of international interbank markets (Bernard and Bisignano 2000) but had hitherto been less common in domestic interbank markets.

(c) Lessons from traditional theory

The traditional theories of financial instability are set out in Davis (1995, 1999, 2002). Rather than repeating them here, we highlight some aspects shown to be of particular relevance in the past decade. The “financial fragility” view⁴ (Kindleberger (1978), Minsky (1977)); has been repeatedly vindicated by recurrence of credit and asset price booms, followed by crises, as in Asia 1997 and as widely threatened in the US Sub-Prime episode. The overall structure of the “generic crisis” set out in Table 1 links closely to this approach.

Secondly, the relevance of the “uncertainty” approach⁵ has been shown by repeated problems with institutions’ exposures to financial innovations, whose properties are not yet tested over a full cycle and are thus subject to uncertainty. The current exposures to Asset Backed Securities (ABS) entailing credit risk transfer is a case in point. Equally, the “disaster myopia” theory⁶ is illustrated by the apparent short memories of instability once a period of calm has been observed. Disaster myopia highlights incentives leading to underpricing of risk and these may in turn reflect expectations of safety net provision and risk taking incentives under capital adequacy regulations, both of which have been seen in the Sub-Prime crisis.

(d) Recent theoretical research findings

² They may, however, lead to resource misallocation and an increased cost of capital, with deflationary macroeconomic implications.

³ It is not denied that all sharp asset price changes will tend to affect market liquidity to a greater or lesser degree

⁴ This suggests that financial crises follow a credit cycle with an initial positive shock (displacement) provoking rising debt, mispricing of risk by lenders and an asset bubble, which is punctured by a negative shock, leading to a banking crisis.

⁵ As opposed to risk (in the sense of Knight 1921) is seen as a key feature of financial instability, in that unlike the cycle, one cannot apply probability analysis to rare and uncertain events such as financial crises and policy regime shifts and hence price risk of them correctly. Innovations are by definition subject to such uncertainty as probabilities are not yet known over the full cycle.

⁶ This suggests that competitive, incentive-based and psychological mechanisms in the presence of uncertainty lead financial institutions and regulators to underestimate the risk of financial instability, accepting concentrated risks at low capital ratios.

Allen (2005)⁷ models links between asset price bubbles and financial fragility. Central to bubble creation are principal-agent conflicts since bank managers' upside-risk payoffs increase in risk whereas limited financial liability ensures restricted downside-risk losses⁸. With intermediation, investors place borrowed funds⁹ into risky assets such as commercial property and transfer default risk onto lenders. This motivates borrowers to bid-up asset prices above their fundamental¹⁰ values creating a bubble. Moreover, bubbles are propagated by investors' expectations of higher future credit availability and credit volatility, since this allows higher asset returns via risk transfer.

Theoretical and empirical models of contagion are extensively reviewed by De Bandt and Hartmann (2002). Freixas and Parigi (1998) and Freixas et al. (2000) focus on direct bank linkages and suggest borrowing arrangements between banks cause a domino effect if one bank is unable to meet its obligations, sometimes due to depositors withdrawing funds from a single bank in fear of deposit withdrawals from others¹¹. Resulting externalities which explain "rational herding" are modelled by Chen (1999).

Empirical work has shown contagion to be a valid concept. Autocorrelations between bank failures indicates concentrations of failures i.e. contagion (De Bandt and Hartmann, 2002). Abnormal bank stock price behaviour alongside "bad news" of banks' performance (tested by event studies) also shows contagion as does depositors' behaviour in response to bad news. Calomiris and Mason (2000) identified abnormally high withdrawals during the Great Depression. Jayanti and Whyte (1996) find significant increases in UK and Canadian banks' Certificate of Deposit rates after the Continental Illinois failure (1984), indicating international contagion.

Aspachs et al (2007) suggest two components should define financial fragility: reduced bank profitability and increased default probability, the advantage being that it can be applied at a firm or aggregate level (Goodhart et al, 2006). The combination is used because neither component alone implies fragility; lower profitability could arise through recession and excessive risk taking could raise defaults without instability. Heterogeneous agents with a distribution of risk appetites are used to link fragility with welfare changes; Aspachs et al (2007) show an exogenous banking system shock increases aggregate defaults, decreases profits and reduces agents' welfare. These theoretical predictions are calibrated against UK data.

Shin (2008) suggests that by holding assets which are claims against other borrowers and by holding claims against each other, financial institutions generate complex webs of risk exposures; relative asset and liability values, credit availability and asset prices become interdependent. Resulting externalities mean shocks to financial systems are amplified, causing spillovers onto many balance sheets¹². The author models a system of interlocking balance sheets to solve for asset prices which depend on the creditworthiness of other institutions in the system. He shows this fixed point problem has a well defined solution; each

⁷ The underlying model which also incorporates contagion via overlapping claims in inter-bank markets, is detailed in Allen and Gale (2000).

⁸ At worst the manager loses her job and possibly reputation. Allen (2005) suggests that if default is not penalised and if reputation risk is low, the manager improves her expected return by gambling depositors' funds.

⁹ Repayable at the borrowing rate.

¹⁰ A fundamental asset prices is simply its payoff discounted by the investor's opportunity cost of her own funds.

¹¹ This is motivated by the "first come, first served" process of depositor reimbursement.

¹² Presence of externalities means shocks are amplified symmetrically; a positive shock generates positive externalities and bank balance sheets benefit from asset price booms.

claim can be uniquely priced in terms of parameters describing the underlying financial system (current prices of underlying assets, debt levels and structure, and the profile of balance sheet inter-linkages).

Recent research has also focused on regulators' incentives. Kocherlakota and Shim (2006) suggest the regulator's response to instability is conditioned on the ex-ante probability of asset price collapse; if this is high, remedial action is optimal, otherwise the regulator shows forbearance towards instability. Principal-agent and political motives explain why regulators show forbearance (instead of "prompt corrective action") towards instability¹³. Degennaro and Thompson (1996) suggest regulators who act as utility-maximising agents, view forbearance as an attractive gambling strategy where taxpayers bear the costs for losing the gamble as has occurred already to some extent in the sub-prime context.

3 The Development of Macroprudential Oversight

(a) Definition

Owing to costs of crisis, there is an immense premium on timely warnings regarding systemic risks as an input to policy decisions as well as to strategies and market behaviour of financial institutions. Accordingly, in the last decade 'macroprudential surveillance' – defined as monitoring of conjunctural and structural trends in financial markets so as to give warning of the approach of financial instability – has become a core activity for many central banks.

(b) Methods of surveillance

Typically, central banks institute regular "Financial Stability Reviews" to assess the outlook for financial stability. Already by end-2005, 50 central banks had done so (Cihak 2006), often prompted by IMF/World Bank Financial Sector Assessment Programmes (FSAPs).

Data needs (Davis 1999) include macroeconomic and financial data for assessing conjunctural conditions, non-financial sector debt, leverage and asset prices for considering vulnerability of borrowers, and in the light of these, bank balance sheets and income and expenditure for considering robustness of banks. Risk measures derived from financial prices complement leverage and income indicators. Stress tests and forecasts of indicators and derived stability indicators such as defaults and bankruptcies, including risks to the central projection are needed to tell a full story.

Key lesson learnt in surveillance practice for these data include the importance of economy in the number of variables to tell a coherent story; and derivation of data needs from theory and experience. Furthermore, there is a need to use qualitative aspects – surveillance cannot be purely numerical and unlike inflation is not easily summarised in a single index. Changes in regulation and competition, and innovation are among key qualitative inputs. Equally, there is a need to develop benchmarks and norms for the economy and financial system to assess deviations, while remaining aware that these can change (e.g. during financial liberalisation). Cross border as well as domestic influences need to be taken into account, not least given the internationalisation of banking. Also new players such as hedge funds need to be incorporated when they become relevant.

¹³ Kane (1992) defines forbearance towards low banking capital as a situation where "Deposit-institution regulators engage in capital forbearance when they lower standards for minimum net worth at de-capitalised institutions", (p359). Prompt Corrective Action necessitates immediate termination of critically undercapitalised banks via asset liquidation (Kocherlakota and Shim, 2006).

There is a need for observation of overall patterns in the light of past occurrences of financial instability, both at home and abroad, developments in theory and the generic view set out in Table 1. Viewed in the light of that table, data can show either shocks (e.g. triggering boom or crisis) or propagation mechanisms (showing a boom is underway). But since shocks are random, the vulnerabilities are the main focus. Then there is a need for a judgmental approach in drawing conclusions, using again a conceptual framework derived from theory such as that of Table 1 (how vulnerable is the system – what shocks could take place?) Fell and Schinasi (2005) suggest the use of an implicit corridor of financial stability, akin to an exchange rate target, with judgements made as to whether the system is inside the corridor, approaching the edge, just outside or systematically outside, which will imply different policy recommendations.

As an example of a procedure, the ECB undertake a 7-point vulnerabilities exercise, first identifying vulnerabilities and imbalances, then translating them into potential risk scenarios, identifying triggers (shocks) for the scenarios, assessing the likelihood of scenarios arising, estimating the costs for the financial system, assessing robustness to such shocks and then ranking the risk. They note the need to include endogenous sources of risk (within institutions, markets and infrastructure) as well as exogenous risks from the macroeconomy. Fell and Schinasi (2005) give a check list of criteria for sound analysis including: Is the process systematic? Are the risks identified plausible? Are the risks identified systemically relevant? Can linkages and transmission (or contagion) channels be identified? Have risks and linkages been cross-checked? Has the identification of risks been time consistent?

(c) Tools for macroprudential analysis

“Distance to Default” (DtD)¹⁴ measures credit risk by expressing a firm’s net worth as a proportion of asset price volatility¹⁵; the higher this ratio, the lower the likelihood of default. Any asset with a liquid secondary market¹⁶ can be used because assuming market efficiency, prices should incorporate markets’ forward looking expectations of firm default (Chan-Lau, 2006). However, when applied to banking distress, DtD ignores the risk of regulators intervening well before default. Hence Chan-Lau and Sy (2007) suggest banking DtD measures should reflect regulatory capital requirements, in line with the Basel Committee.

For a given confidence interval and time span, Value at Risk (VAR), a market risk measure, indicates the maximum expected portfolio loss under normal market conditions (Benninga and Weiner, 1998). Basle sets a 99% confidence interval and a 10 day horizon, based on at least 12 months historic data¹⁷ (Jackson and Perraudin, 1998). Banks must hold at least three times this VAR amount in capital. Criticisms arise because means, variances and correlations of asset returns are based on assumed probability distributions. Also, quantifying actual portfolio positions requires detailed knowledge of all asset risks by banks.

Stress tests quantify portfolio movements for unlikely but feasible events (see BIS, 2000 and 2001 for more detail). Scenario tests simultaneously vary several risks in one direction, emulating historic events or hypothetical scenarios. Sensitivity tests shock individual risks symmetrically¹⁸. Limitations arise because probabilities of shocks materialising are not computed. Also, risk parameters are at times subjectively chosen by managers and impose high computational costs on institutions.

¹⁴ For a practical guide on DtD, see Crosbie and Bohn (2002).

¹⁵ Standard deviation of the annual percentage change in asset value.

¹⁶ Credit default swaps, corporate or sovereign bonds.

¹⁷ Hence this market risk measure is backward looking.

¹⁸ E.g. parallel yield curve shifts.

Bubble¹⁹ detection searches for bubble premiums, excess volatility and cointegration between dividends and prices (Brooks and Katsaris, 2003). In older models, bubble components exploded over time whereas recent, more realistic models allow prices to return to fundamentals via crashes (Raymond Feingold, 2001). This makes detection by cointegration harder due to bias and kurtosis (Evans, 1991), hence correction for these will improve bubble detection (Raymond Feingold, 2001).

Early Warning Systems (EWS) generate out-of-sample probabilities of crisis using historic data. Demirguc-Kunt and Detragiache (1997) developed a parametric EWS for banking crises using a multinomial logit model with macroeconomic, financial and structural variables as inputs. Logistic models are appropriate for explaining binary banking crisis observations in panel data. Davis and Karim (2008) improved prediction by introducing more countries, crises²⁰ and dynamics in the macro variables; over 90% of in-sample crises were correctly identified.

Kaminsky and Reinhart (1999) developed a non-parametric signal extraction EWS which tracks individual time series for abnormal behaviour that has previously been associated with crises. If a variable subsequently behaves abnormally, a crisis probability can be computed. Davis and Karim (2008) improve signal extraction for banking crisis prediction by creating composites of indicators weighted by their signalling quality.

Difficulties in identifying systemic crises compromise the EWS dependent variable. Also, predictive accuracy varies according to the cut-off threshold subjectively chosen by the policymaker. Nevertheless, logistic and signal extraction techniques provide a computationally easy way to predict banking crises using global and country-specific data respectively and are thus useful tools to complement macroprudential surveillance.

4 Policy issues

The initial two policy objectives of macroprudential surveillance are early identification of potential vulnerabilities; and through their public reporting, to encourage financial institutions to do stress testing. The more difficult policy decision is what to do if there are macroprudential warnings, given the third objective is to promote preventative and remedial policies to prevent financial instability. Surveillance should also help to resolve instabilities when preventative and remedial measures fail, but this is not the desirable scenario.

Moral suasion and intensified supervision are obvious preventative measures but may not be sufficient. Experience suggests there is a need for variation in prudential parameters (e.g. against portfolio concentration in real estate). Goodhart (2005) suggests to relate the capital requirement on bank lending to the rate of change of asset prices. Or equally, the question arises whether monetary policy can deal with asset price bubbles – many central bankers seem to oppose the idea that monetary policy should aim to deflate nascent bubbles.

Beyond macroprudential surveillance, policy lessons over the last decade have been widespread. For example:

- The ongoing Japanese experience showed that resolution of a banking crisis is best undertaken rapidly, and as in the Savings and Loan crisis in the US, generous deposit insurance and forbearance can lead to worse problems.

¹⁹ See part 2, section (c).

²⁰ 105 countries are covered by data spanning 1979-2003 which yields 72 or 102 systemic banking crises depending on the crisis definition used.

- The Asian crisis illustrated the dangers of currency mismatch in corporate as well as bank balance sheets, as well as problems of weak corporate governance and the dangers of relying on the international interbank market for finance.
- The Russia/LTCM crisis, besides bringing market liquidity risk to the fore, showed that systemic risk can arise from unregulated hedge funds.
- The Argentine crisis showed how difficult renegotiation among bondholders can be for a defaulting country, as opposed to international banks as in 1982.
- The Sub-Prime crisis shows the possibility that the domestic interbank market can fail, and has necessitated innovations in lender of last resort policy, such as the Bank of England swapping government bonds for illiquid mortgage backed securities.

The question also arises of what banking regulation is for. Is it useful for preventing crises? Clearly lower capital adequacy makes banks more vulnerable to failure, but equally the past decade has also shown the adverse incentive effects of capital adequacy, maximising risk in the buckets, for example and possibly banks skimping liquidity protection. And the procyclicality of the financial system, which is already apparent with Basel I, seems set to worsen with Basel II (Goodhart 2005). International accounting standards seem to obstruct earlier hopes (implemented in Spain) to link provisions to the cycle.

Conclusion

The past decade has seen an unprecedented focus on financial instability, its nature and its early detection. Whereas this is clear progress compared to the blind manner in which many countries encountered financial instability in the late 1980s, there is still a long way to go. This was illustrated by the failure of Financial Stability Reviews (e.g. of the UK, ECB and the IMF) to detect the liquidity aspect of the Sub-Prime crisis, even though they did give warnings of the credit risk issues arising. See Banque de France (2008) for an assessment of liquidity issues in the wake of the sub-prime crisis. Also, the crisis has shown a rich array of adverse incentive effects on risk taking, often arising from regulation. It is suggested that the role of incentives is an emerging issue which warrants close focus (Chai and Johnston (2000) gave an early approach to it). And even if vulnerability had been detected, experience has also shown that the means by which authorities can address macroprudential concerns are quite limited.

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