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A Framework for Assessing Financial Stability?

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CROATIAN NATIONAL BANK

A Framework for Assessing Financial Stability?

By C.A.E. Goodhart

I Introduction

An inflation target has provided an excellent focus for organising the work of the Macro Monetary Policy and Analytical wing of a Central Bank. It offers a natural basis for the internal procedures of forecasts, intermediate assessments and decision-making meetings. Depending on the nature of the set target, it provides a clear 'bottom-line', and hence generates opportunities for transparency about the factors affecting decisions, and accountability. Of course, in order to hit the desired inflation target, the instrument which (the Monetary Policy Committee of) the Central Bank can wield, i.e. its control over short-term interest rates, has to be capable of doing so, despite ongoing shocks. While there are certain problems in this respect, e.g. zero bound, lags, asymmetric effects on differing sectors, inability to forecast, etc., etc., the record of inflation targeting countries has been rather good.

Contrast this satisfactory state of affairs with the much more complex and amorphous structural position facing those in Central Banks charged with concern about financial stability. To begin with, there is no generally accepted definition of financial stability, or of its converse financial instability. While financial stability concerns tend to concentrate on banking problems, the focus is less precise than with inflation targeting. This is partly because the dividing lines between banks and other financial intermediaries have become blurred; partly because spill-overs between problems abroad and in the domestic country are hard to assess; partly

because imbalances in other sectors, and in other financial markets, can affect financial stability even if the banking sector remains robust; and no doubt for a host of other reasons. There is, therefore, no similar natural basis for structuring the pattern of internal work, except a periodic general look at stability issues at home and abroad. There is no clear 'bottom line', except a negative one of trying to avoid instances of instability. There is no clear instrument for a Central Bank to wield unilaterally.

Financial stability may be affected by the interest rate decisions of the MPC, but such concerns are subsumed within the wider macro framework of the inflation targets. Changes in regulatory structure, e.g. at the Basel Committee, also affect financial stability, but in a world without exchange controls such decisions need to be taken internationally, not nationally. Moreover, such changes take the form of bureaucratic regime shifts, which are by their nature occasional and slow-moving in process. While such regime changes are vitally important, and rightly play a key part in the work of any financial stability (FS) department, they cannot, almost by definition, inform the regular, month by month, work of an FSD.

In this context it is possible to be transparent, in the sense of publishing work, assessments and decisions, but much more difficult to be accountable. How does anyone (outside) know whether FSD is doing a good job, except in terms of (i) the quality of its published assessments and analysis (i.e. a Financial Stability Review (FSR)), and (ii) the absence of instances of financial instability (whether, or not, they occurred as a result of any shortcomings in FSD)?

The above brief analysis may, perhaps, exaggerate the structural complications of focussing and managing the ongoing work of an FSD, but even so there is a strong wish to explore whether some additional structure, or framework, can be applied to the work of FSD. The rest of this paper reflects an initial exploration, a cock-shy, in that direction.

II A Definition of Financial Stability

The definition of price stability is conceptually easy, but complicated in practice, (e.g. index number problems, `core' inflation, asset prices, etc.). One reason why it is conceptually simple is that it is a positive concept involving measurement of an existing set of elements. In contrast, financial stability is usually perceived as a negative concept, involving the absence of something unwanted. Thus Prof. E.P. Davis of Brunel University initiated an internet discussion of this concept last year, and his initial proposal was "The absence of an adverse impact on the real economy from dysfunction in the financial system, or risk thereof", and his first respondent (Hans Christiansen at the OECD) tried, "(1) Financial stability is the absence of financial crises, and (2) A financial crisis is defined as a sequence of events, or the risk thereof, that impairs credit intermediation or capital allocation."

Such a negative, rather than a positive, definition has, I would contend, an analogue in terms of quantitative procedures to explore the relative likelihood of financial, as compared with price, stability. When one is trying to examine how inflation is likely to develop in future, the analyst is concerned with central tendencies, i.e. mode,

median or mean, though the choice between these three, and the proper response to asymmetric risk is, as yet, not well developed in theory or in practice. That leads on to standard, and well-known, forecasting procedures. By contrast when the analyst is concerned about price stability, she is focussing on the (adverse) tail of the potential distribution of outcomes. That means that the usual analytical medium is not the (conditional) forecast of what is most likely to happen in the present conjuncture, but what might happen if the unusually adverse circumstance (X) should occur. In short FSD simulates, whereas MPC forecasts.

III A Macro Stress Test?

Much simulation usually goes on in FSDs, but this is rarely organised in a coherent, unified framework. One aspect of simulation is “stress (or sensitivity) testing”. This is part of the prudential approach towards banks, (and of course rightly so); and such an exercise is done as part of most FSAPs, e.g. as carried out under the aegis of the IMF. But my understanding of such ‘stress testing’ is that it is currently macro/micro in form, by which I mean that individual banks (institutions) are usually asked to assess how their own positions (e.g. balance sheets, profits, etc.) would respond to a given chosen change in some external (macro) variable, often a single factor exercise¹, e.g. a sudden rise in domestic interest rates of, say, 2%, see CGFS

¹ In this respect historical stress tests, ie based on certain extreme past events (eg October 1987), have a potential advantage since all the associated movements in financial markets around the world, (ie the covariances), can be taken into account simultaneously. In practice, however, many stress tests, and most sensitivity tests, examine the effect on the individual institution of a sudden change (variance) in a single financial, ignoring entirely the associated effects (covariances) in other markets, both financial and real.

(2001)². But such a rise will also affect all other banks, financial institutions, borrowers, and other economic agents. Just how the individual banks are supposed (and do) assess the resulting interlinkages within the whole economy is totally unclear to me. For example, does Bank A say to itself that in a stress test of a particular kind that in isolation I could survive the shock, but Bank B could not, and Bank B's failure would then affect me in certain ways?

As Martin Hellwig has repeatedly emphasized, what may appear sound at the micro level may be totally fragile and flawed at the macro level, involving the full set of interlinkages in the economy. In so far as individual banks do try to take any such interlinkages into account in their individual responses, their internal assumptions (e.g. about each others' reactions) are likely to be inconsistent. Whereas an individual bank supervisor, say the UK's FSA may, indeed, be satisfied with a macro/micro stress testing exercise, an FSD, charged with systemic stability, should not be.

What we need, for systemic stability purposes, are macro/macro simulations, or stress tests. This would entail a study, for the economy as a whole, including the real economy, as well as for the banking and financial system, of the effect of a given shock on all the main component section of the economy simultaneously, (including

² Committee on the Global Financial System, Report of a Task Force on 'A survey of stress tests and current practice at major financial institutions', (BIS:Basel), April

the banking sector).

Such work could be done both analytically via (theoretical) models, and empirically, again in part through macro-economic forecasting models, but perhaps at times rather different models using rather different approaches. Perhaps surprisingly, the area, where to my mind systemic, macro stress-testing is least advanced, and most needed, is in the banking system. So much attention has been given to the micro stress testing of individual banks that I am hardly aware of any work aiming to do a similar exercise for the banking system as a whole. The same problem, I believe, is broadly true of the insurance sector. Given the manifold inter-linkages within the system, with risks layed-off, and reinsured, do we have any idea of how the overall insurance system, as contrasted with individual insurance companies would respond to some aggregate shock. Increasingly moreover, the banks and insurance companies are intertwined via the derivatives markets.

Assuming that we do want a systemic, macro/macro stress test for the financial sectors in any country, just how could we best go about that exercise? Would it be better to start looking at the banking sector as if it were a single, consolidated entity; or should we build in intra-banking linkages from the start; or try both simultaneously? There is also the viewpoint that what determines the strength of a

system is that of its 'weakest link'. How can one seek to go about identifying what the weakest links maybe?

Discussing, and perhaps deciding on, the appropriate form of macro-level stress tests for the banking system strikes me as a first order of necessary business.

IV The Assessment of the Effect of Shocks

The purpose of the whole exercise, as I see it, is to be able to answer the question, if shock X occurs what is the likely effect on the economy, Y, involving both real, nominal and asset price implications, i.e.

$$dY = f(X),$$

where the functional form is quite likely to be non-linear, and is, of course, stochastic rather than deterministic

A partial definition of financial stability, or instability, concerns this functional form linking the original shock to the final, set of, outcomes. The less the adverse effect on the economy at large of a given external shock, the more stable it could be said to be, and vice versa. An economy would be more stable with respect to such an external shock, if, over time, the simulation indicated a declining multiplier. Of course, there is a vector of economic outcomes, and a vector of potential shocks, so measurement would be complex.

The welfare implications follow in the normal way, in that welfare will be affected by the (vector of) economic outcomes. Again the absolute effect on welfare will depend

on the combination of the initial external shock and its subsequent transmission through the (financial) system. The scale of the welfare effect which is directly related to financial stability, however, concerns the additional effect on outcomes caused by aspects of the transmission mechanism which are less stable than they could be. Let me give simplistic example. Suppose that the size of the initial shock is (normalised to) 1, but that is amplified by internal financial instabilities to an effect on output of 3, whereas, under the best case of a robust financial system, the effect on output would be 2. Then I would count the welfare cost of financial (in)stability as 1, and the inherent cost of the shock itself as 2.

This definition of financial stability is only partial, since it ignores the fact that some shocks are more likely than others. For example a large asteroid hitting the earth would send all economic variables to zero, but we would hardly describe the present system as totally unstable as a result!

Thus, in addition to simulating the effects of a given shock on the economy, we need some idea of the probability, potential virulence, and time scale of the shocks, a form of early warning system, but of the arrival of shocks³, not of crises, since the latter in my view improperly conflates the two separable effects, i.e. the shock itself and the reaction of the system to that shock.

What are the shocks that I have in mind. Let me give a (non-exhaustive) selection.

³ Committee on the Global Financial System, Report of a Task Force on 'A survey of stress tests and current practice at major financial institutions', (BIS:Basel), April 2001.

- (1) Oil prices
- (2) Demand abroad
- (3) Productivity
- (4) Labour militancy
- (5) A shift in (equity) risk aversion
- (6) A shift in exchange rate preferences

Note that, although (5) and (6) above represent, roughly, an add-on to equity prices and exchange rates, I have consciously tried to avoid a stress test based on a given change in asset prices, since the final 'equilibrium' change in asset prices should be one of the key

endogenous outcomes, not an initial input. Moreover, even at the micro stress test level, any institution asked how it would fare if, say, domestic interest rates rose by 2% should be asking itself exactly what the context was which could plausibly lead to such a change, (n.b. it could be a response to most of the above factors, and which of them it was would make a major difference). Thus any stress test should identify the economic context in which an (initial) asset price change is presumed to have occurred.

Also note that I have excluded demographics (e.g. some new disease, or shift in the gender ratio) from the list of shocks, since demographic effects take so long to unfurl that they can hardly be treated as shocks. Also I have excluded natural disasters, (asteroid, collapse of Canary Islands, Tokyo earthquake), as too improbable to care

about, but would be perfectly content if someone wanted to run such a simulation.

Shocks of the kind described earlier have a number of parameters, e.g. the probability of a shock of a particular virulence occurring, and, if it did, the potential speed of effect (normally the slower, and more easily anticipated, is the shock, the easier it is to contain, and the less the likely contagion, e.g. Russia 1998 as compared with Argentina 2002/3). Should an FSD keep a 'register of shocks', trying to identify the (time-varying) likelihood of shocks, and their possible virulence and speed of arrival? Such an exercise, if done, would in my view combine econometric testing of historical time series with current conjunctural assessment. Only by doing such an exercise, can one reach a reasonable judgment on what shock, or set of shocks, it is most worth simulating on each occasion, because one cannot do everything at the same time.

V Models?

Because my own background is in applied, quantitative work, I have emphasized so far the potential for empirical testing, probably within an expanded macro-economic framework, (where the central need is to embed a reasonable macro-systemic sectoral version of the banking and insurance sector within it). But there is also a need to look at the problem within the context of more theoretical and analytical models. Models themselves develop over time, and no one theoretical model is better in all respects than some other. So with enough resources one should let 'a thousand flowers bloom'. But are there enough resources in an FSD?

Certainly it will be desirable to continue work on modelling financial stability issues; it is rather the question of how this might be best organized that, in my view, needs extra consideration. At present such modelling is scattered around different groups and different models. This is expensive in resources, but competition and heterogeneity are a spur to innovation and success.

But this is an area where there may be a variety of views on how to proceed.

VI Market Dysfunction

To date I have not mentioned what many regard as the touchstone of financial instability, i.e. market dysfunction whereby some initial external shock is amplified to cause a larger change in market conditions, (think of October 19, 1987, autumn 1998 and fears for the implication of LTCM, the \$/Yen market at that time). Thus, in Prof. E.P. Davis' generated internet discussion of financial stability, Hans Blommerstein defined "A stable financial system is a system characterised by equilibrium situation that will not be destabilised by small shocks", and Johannes Priesemann agreed that for him a stable system is one whose "auto-referential feedback mechanisms/processes.... lead back to stability as a response to shocks (stable system) and vice versa the presence of auto-catalytic processes that lead to instability as a response to shocks (instable system)".

In my view such a definition is too narrow. Imbalances and excessive leverage can

lead a system to be less stable, in the sense that shock X has a greater multiplicative effect on outcomes Y, in one conjunctural situation than another, without there being any sign of auto-referential market dysfunction. Nevertheless it is clear, from history, that such self-referential dysfunctions can have major effects on the amplification of shocks. In some cases we can identify the likely source of such dysfunction. Much of FSDs' work on potential breakdowns in payments and settlement systems, and how to counter-act them lies squarely in this field.

The problem that concerns me is how to assess the sensitivity of various sectors to dysfunctional effects sufficiently to give some quantitative weight to their probability, and hence to incorporate them in any simulation, or theoretical, study of the effect of shocks. For example, when might the pressures cause a systemic problem in the banking sector? Or again, does the development of certain kinds of derivatives raise, or lower, systemic risks? We believe that sales driven by portfolio insurance, which had not been revealed to, or expected by, the market bore some of the responsibility for October 19, 1987. What else of a similar nature is out there in the financial system, and how could we best factor that into the kind of simulated, macro/macro stress test that I have advocated?

Again, I have focussed primarily on applied empirical approaches to this problem. This field is one where there has been considerable theoretical, and model, development. The work of Eisenberg and Noe (2001), and of Allen and Gale on banking interactions, fit in here. We certainly need to keep abreast of advances in this field. Nevertheless my own feeling is that, as practitioners, we in a FSD have to

focus on the question of how these theoretical models can be practically applied to reduce potential instabilities. So my query is, for example, how can we apply the Allen/Gale approach to, say, the structure of the inter-bank market?

VII Liquidity and Leverage

The failure of a major (bank) financial institution clearly has potential systemic implications. Insolvency, and failure, can be prevented/mitigated by adequate capital; and insufficient capital can lead to excessive risk-taking (gambling for resurrection). So capital adequacy requirements are clearly necessary. But at the macro-level attempts to shrink the book, and withdraw from riskier activities, could lead to adverse macro systemic effects (procyclicality) perhaps as, or more, severe than, say, a failure, especially if the latter was met by aggressive official injections of liquidity.

Moreover, absent a perceived risk of insolvency, from the point of view of an individual bank, liquidity is never a problem, because it can just borrow from the money market. So, in the conduct of macro/micro stress test, liquidity issues hardly surface. But they do with vengeance at the macro level, and also of course for other institutions (hedge funds, companies, persons) without unquestioned access to money markets, or bank assistance. It is the absence of liquidity, and the existence of high leverage (and imbalances), that threatens to amplify the market effect of external shocks.

Here I strongly share the view that, partly as a result of focussing so unrelentingly on bank capital adequacy, central banks have, to some considerable extent, taken their eye off liquidity. It is the availability of liquidity, I would conjecture, that moderates many (most?) financial shocks, and the absence of liquidity that often leads to market dysfunction.

But how should we go about measuring this? Even if we could measure it, what could an FSD do in order to maintain systemic stability? Remember that liquidity (and capital) that an institution is forced to maintain to meet regulators' requirements is not free to be used to meet adverse eventualities. This is key to the general procyclicality argument, and lies at the heart of the distinction between economic and regulatory capital/liquidity. But I have written separately on the need to relate capital/liquidity needs to upturns (increases) in, for example, asset prices with a concomitant relaxation during downturns.