Financial instability and macroeconomics: bridging the gulf

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Abstract

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Introduction

Mental habits die hard. And our minds often work in separate compartments. Maybe this is what Darwinian evolution is all about. What does not work gets weaned out in the relentless pursuit of efficiency. No doubt, habit and compartmentalisation reduce the degree of energy spent in performing tasks. They protect our mental machines from overheating: low energy, low maintenance. But all this comes at a cost. We may, at times, fail to see critical interconnections and similarities between tasks. Important gains may simply go unnoticed as we mechanically go about our daily activities. Until, of course, something goes badly wrong.

Turn now to the approaches to macroeconomics and to financial stability that have prevailed for so long: the parallels are striking. In each case, there have been some unquestioned “truths”. And while the two approaches share some common features, they have proceeded along quite separate tracks.

Consider first the prevailing approach to macroeconomics. The macroeconomy is mostly well-behaved and self-correcting. The economic system is buffeted by continuous shocks but converges quickly to equilibrium. Make a few additional standard assumptions and a monetary policy that focuses exclusively on delivering short-term price stability works best, as it stabilises the real economy. If financial instability materialises, it must be the result of an outsize, very improbable shock. And even once it does, it is unlikely to have a large macroeconomic effect. Thus, either way, it is not worth incorporating it into the framework. In fact, financial factors may be dispensed with altogether.

Consider next the approach to financial (in)stability. The financial system can be fragile and is not self-correcting. Small shocks can generate large effects – the very essence of financial instability. The system need not return to equilibrium. Make a few additional assumptions and a prudential policy that focuses exclusively on individual institutions works best, as it stabilises the system. Even if macroeconomic instability triggers, or results from, financial instability, its role is inconsequential: so much of the action takes place within the financial system anyway. Thus, it is not worth incorporating the macroeconomy into the framework. And monetary factors may be dispensed with altogether.

Clearly, this portrayal is intentionally highly stylised. But it does contain an important kernel of truth. We are confronted with the same economic system, and yet look at it through completely different eyes. To be sure, efforts to bridge this gulf have been underway for some time. And at the BIS we have been among those pushing in this direction more vigorously. Yet, in the big scheme of things, the road ahead is much longer than that already travelled. The recent financial crisis – what has gone badly wrong – holds forth the promise of changing mindsets. The process has gained momentum. However, is still hard to say how far it will proceed.

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This paper is intended as a small contribution to efforts to bridge the gulf between approaches to financial stability and macroeconomics. There are many possible starting points for this exercise. Here, we begin the intellectual journey from a practical question: how can financial (in)stability be defined and measured? Measurement betrays perspectives. It brings out what we know and do not know. And is a precondition for operational policy frameworks. It is, therefore, a good candidate to highlight differences in approaches and areas for possible reconciliation.

We argue that three steps can help to bridge the gulf between the two approaches. First, it is important to make a clear distinction between financial instability, on the one hand, and financial distress (or financial crises), on the other. Financial instability is a property of the financial system; financial distress is an event. The system may be unstable for long periods even if financial distress does not materialise. The lag between the two is critical. Second, it is best to build on the endogenous cycle view of financial instability. This view highlights the mutually reinforcing dynamic interplay between the financial sector and the macroeconomy (“procyclicality”) and the boom-bust nature of business fluctuations. It has significant implications for measurement and modelling. Finally, policies should be adjusted to take into account the close interactions between the financial sector and the macroeconomy. We argue for a macrofinancial stability framework, in which the macroprudential orientation of financial policy would be strengthened and monetary policy would lean against the build up of financial imbalances and associated risks even if near term inflation was under control (BIS (2008)).

The paper is organised as follows. The first section briefly defines financial (in)stability and financial distress. Section II explores current measurement technologies and highlights parallels and differences with frameworks designed to deliver price and macroeconomic stability. That section ends with a call for a marriage between the two traditions. Section III draws out the policy implications of the analysis. The conclusions consider future prospects.

I. Financial (in)stability: definition

Definition

Ever since financial stability as a public policy objective has risen to prominence, efforts to define it have multiplied. Even so, a generally agreed definition that could be the basis for an operational framework has remained elusive.

Most definitions of financial stability share three useful elements. First, they focus on the financial system as a whole, as opposed to individual institutions. Second, they do not consider the financial system in isolation, but ultimately measure the economic (welfare) benefits and costs in terms of the

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2  This and the next section draw heavily on Borio and Drehmann (2009a).
“real economy” (output foregone). Third, they make an explicit reference to financial instability, the converse of stability, which is seen as more concrete and observable than its converse.

At the same time, differences abound. Some definitions are very broad, including any allocative distortions arising from financial “frictions” relative to an ideal benchmark (Haldane (2004)); others are more restrictive, focusing on the absence of episodes of acute distress and significant disruptions to the functioning of the system (eg, Mishkin (1999)). Some highlight the robustness of the financial system to external shocks (eg, Allen and Wood (2006), Padoa-Schioppa (2003)); others see the financial system as a possible source of shocks (eg, Schinasi (2004)). Some tie the definition closely to the equally common but elusive notion of “systemic risk” (eg, Group of Ten (2001), De Bandt and Hartmann (2000)); others avoid it.

For the purposes of developing an operational framework some definitions are more helpful than others. Broad definitions unnecessarily widen the policy objective and hinder accountability. And definitions that rule out the possibility of the financial system being a source of shocks risk being too restrictive and misleading.

In this paper we will use the following terminology. We define financial distress/a financial crisis as an event in which substantial losses at financial institutions and/or the failure of these institutions cause, or threaten to cause, serious dislocations to the real economy, measured in terms of output foregone. We define financial instability as a set of conditions that is sufficient to result in the emergence of financial distress/crises in response to normal-sized shocks. These shocks could originate either in the real economy or the financial system itself. Financial stability is then defined as the converse of financial instability.

While the definition is only very rough, it provides a reasonable starting point for our analysis. Three characteristics of this definition are worth noting.

First, it is pragmatic. Thus, the scope is narrowed to the performance of financial institutions. It goes without saying that large fluctuations in asset prices and the exchange rate or problems in the balance sheets of governments, households and non-financial enterprises can by themselves have a sizeable impact on output, even if the financial sector is not seriously disrupted. Pure sovereign and exchange rate crises are examples of the genre. But including them would arguably broaden the definition too much from an operational perspective. Financial stability mandates are probably best defined narrowly in terms of the financial sector so as to avoid broadening the scope of regulation too far.3

Second, the definition distinguishes episodes of financial distress as events from financial instability/stability as properties of the financial system. By their nature, properties are harder to

3 This, of course, does not imply that authorities should not consider carefully the implications of developments outside the financial sector for its stability. Far from it! Moreover, the broader macroeconomic consequences of strains in the balance sheets of other sectors that do not impinge of the financial sector’s stability can be taken into account through other policies, not least monetary policy.
identify than events, as they may involve the appeal to a counterfactual. For example, the system can be unstable even if no financial distress materialises for quite some time (see below).

Finally, it is crucial that distress is generated in response to a shock that is not of extraordinary size. For, it is unreasonable to expect the financial system to function effectively regardless of the size of exogenous shocks that hit it (eg, Goodhart (2006)). Moreover, all analytical approaches to financial instability share this characteristic, ie a normal-sized shock can generate financial distress through the amplifying mechanisms in the system. At one end of the spectrum, in models that stress self-fulfilling processes, there is a multiplicity of equilibria without a clear basis to choose among them: in this sense, the shock is not even well defined (eg, Diamond and Dybvig (1983)). At the other end, according to the endogenous-cycle view of financial instability, the shock itself is largely seen as one stage in a bigger dynamic process, ie the “financial cycle”. The boom generates the subsequent bust (eg, Kindleberger (1996) and Minsky (1982)). In between, other models describe how small shocks can have large effects, given the inherent fragility of the system. This is true regardless of whether the models stress the role of aggregate or systematic shocks, which affect all institutions (eg, Allen and Gale (2004)), or the role of contagion, as idiosyncratic shocks ripple through the system owing to the informational and balance-sheet linkages that keep it together (eg, Rochet and Tirole (1996)).

II. Financial (in)stability: measurement and modelling

Role of measurement
Any operational framework designed to secure financial stability requires a mapping of the definition of the goal into a measurable, or at least observable, yardstick. Measurement performs two quite distinct roles. It helps ensure the accountability of the authorities responsible for performing the task. And it supports the implementation of the strategy to achieve the goal in real time. The former calls for ex post measurement of financial instability, ie for assessments of whether financial instability prevailed or not at some point in the past. The latter relies on ex ante measurement, ie on assessments of whether the financial system is fragile or not today. While both ex ante and ex post measurement are “fuzzy”, the challenges in supporting strategy implementation are tougher. Here, the distinction between episodes of financial distress (events) and financial instability (a property) is critical and often overlooked.

If an episode of financial distress has occurred within any given window, ex post measurement difficulties are challenging but manageable. In order to conclude that the system was unstable policymakers should be able to (i) recognise financial distress ex post; and (ii) reach a judgement that the distress was out of proportion with the original exogenous (unavoidable) “shock”, ie that financial

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4 For a discussion of different analytical perspectives on financial stability, see eg, Borio and Drehmann (2009a) and Wagner (2009).
distress was the result of financial instability rather than extreme shocks. To be sure, even this assessment can involve considerable fuzziness. How “large” should be the losses among financial intermediaries and the associated costs for the real economy before the episode can qualify as one of “financial distress”? How large should the “shock” be? But overcoming this “fuzziness” should not be too hard.5

By contrast, if financial distress has not emerged, ex post measurement is much harder. The main drawback is that the system may actually be unstable (fragile) even if no financial distress has materialised. Episodes of financial distress are rare and the window during which the system may be fragile without experiencing a financial crisis may last years. As a result, it can be hard to judge how well the authorities are performing for quite a long time. Judging whether the system was unstable during any given recent tranquil period requires policymakers to answer the same kind of counterfactual as for real time implementation, and hence for ex ante measurement: what would have happened had the system been hit by a shock? Or, in the endogenous cycle view of financial instability, were imbalances building up that simply happened not to unwind during the period? In effect, during tranquil periods, the demands on ex ante and ex post measurement are qualitatively equivalent.

While qualitatively equivalent, the demands on ex ante measurement are tougher. Implementing the chosen strategy in real time requires that real-time proxies for financial instability be developed. This is necessary to take remedial action well before the episode of distress materialises, so as to reduce its likelihood.6

Another way of highlighting the challenges in ex ante measurement is to consider its implications for the properties of measures of financial instability. Ex ante measurement calls for good leading, as opposed to contemporaneous, measures of episodes of financial distress, ie for good barometers rather than thermometers of distress. Given the lead-lag relationships involved, such measures would also be good thermometers of financial instability; that is, they would be able to capture the financial system’s fragility before financial distress actually emerges.

As we shall see, a key challenge here is what might be called the “paradox of instability”: the financial system can appear strongest precisely when it is most fragile. This puts a premium on the policymakers’ ability to read the “tea leaves” correctly (eg, Knight (2007)).

5 This fuzziness is apparent when comparing papers that identify financial crises ex post; eg. Reinhart and Rogoff (2008) and Laeven and Valencia (2008)).

6 At the same time, the demands may vary depending on how far the system is based on rules or discretion (see below)
A taxonomy

In considering the possible range of measurement tools, it might be helpful to start from what an ideal measure would be. This measure would be the output of a fully structural model of the economy mapping instruments into the goal. More precisely, it could be written as follows

\[ M \leftarrow f (X, I, u) \]

where the measure of financial (in)stability \( M \) is some transformation of the output of a structural model of the economy, \( f (.) \), linking a set of variables \( X \) to policy instruments \( I \) and exogenous shocks \( u \). Such a model would permit the ex post identification of financial instability by decomposing the past into “shocks” and the endogenous response of the system. It could also be used to generate the ex ante probability distribution of outcomes, and hence of financial distress, through the simulation of the shocks. It could be the basis for generating scenarios (i.e., trace the behaviour of the system conditional on specific shocks). And it could be relied upon to design appropriate policies, by seeing how the system would behave under different configurations of the instruments. For example, ideally the tools would generate an “expected cost of financial distress” metric over a specific horizon, combining the likelihood of financial distress with its cost in terms of economic activity. The authorities could then use this measure as the basis for the calibration of both automatic stabilisers and discretionary actions aimed at keeping it within a desired range.

The obvious parallel with the way monetary policy is carried out is no coincidence. Recall that the costs of financial instability have been defined in terms of output. We are, therefore, ultimately dealing with the same goal variable. But, beyond this, the two worlds could not appear to be further apart. In fact, rightly or wrongly, monetary policy frameworks are often indicated as the Nirvana to which financial stability frameworks should aspire. In monetary policy, the quantitative side of the job is much more extensive. Policymakers have models that link instruments to the goal (some varying combination of inflation and output) and routinely use them to make forecasts and carry out policy simulations (Nelson (2008)). Typically not just one, but a variety of such tools are employed, exploiting their relative strengths and weaknesses in forecasting and policy analysis. The tools are seen as helpful in disciplining the inevitable and crucial role of judgement. And they can be used to keep measures of price stability, such as a point-estimate for inflation over a given horizon, within desired ranges. This is what is typically done in inflation-targeting regimes.

By contrast, the picture appears quite different in financial stability analysis. There are no satisfactory models of the economy as a whole linking balance sheets in the financial sector to macroeconomic variables. Even the empirical modelling of financial instability within the financial sector, for given (exogenous) macroeconomic factors, is often very primitive, hardly going beyond rather mechanical exercises with very limited behavioural content (e.g., Upper (2007)).

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7 The workstream by Goodhart and coauthors (e.g., Goodhart et al. (2004)) provides an interesting exception. However, given its inherent complexity, it still falls short of satisfactory implementation. Moreover, since the models are based on “endowment” economies, they rule out feedback effects on output.
the model at all, this is the interest rate, whose primary function is to achieve price stability. All this makes it virtually impossible to do meaningful risk analysis and policy simulations within a single framework. Policymakers need to fall back on to a variety of much more limited quantitative tools that put little discipline on judgement.

As we will discuss later, such a sharp contrast between sophistication and success, on the one hand, and coarseness and failure, on the other, may be partly deceptive. Not everything that shines is gold. But the perception has been quite real.

In order to assess the state of measurement in financial stability analysis, we next survey the landscape of the tools used. It is useful to classify them along three dimensions. First, how far do they provide leading, as opposed to contemporaneous, measures of episodes of financial distress? In other words, how far do they act as barometers rather than thermometers of financial distress? This is important for the use to which those measures can be put. Second, how far do the tools take into account, directly or indirectly, the behavioural interactions that underlie episodes of financial distress? Failure to capture such interactions, ie the endogenous nature of aggregate of risk with respect to collective behaviour, can easily underestimate the likelihood of financial distress. Third, how far do the tools actually “tell a story” about the transmission mechanism of financial distress? Being able to tell a convincing story can influence their effectiveness in communicating risks and can give more confidence in the measures. However, sometimes a trade-off may exist between the granularity and degree of detail needed for story telling and accuracy in measurement.

We focus on tools that are actually used at present in policy institutions. We start with a variety of indicators, ranging from traditional balance sheet variables and market prices, at one end, to more ambitious early warning indicators, at the other. We then discuss vector autoregressions (VARs), which amount to very simple representations of the economy and could, in principle, perform both risk and policy analysis. We finally consider current system-wide multi-module measurement models, with macro stress tests being the prime example.

**From balance-sheet to market-price indicators**

The simplest type of indicator comprises statistics based on *balance sheet items*. These would include, for example, measures of banks’ capitalisation, non-performing loans, loan loss provisions, items of the balance sheets of households and corporations, etc. Most of the IMF’s “Financial Soundness Indicators” fall in this category (IMF (2008)). In addition, national authorities would have data for individual institutions at a more granular level.

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8 This is close to the distinction between structural and reduced form models. The term structural model is often used to refer to models whose parameters are invariant with respect to policy interventions (“deep parameters”), so that policy simulations can be properly carried out. Given the state of modeling of financial stability, this would simply mean setting the bar too high. We return to this issue in the next section, where we discuss briefly the implications for monetary policy of the inability to model financial distress satisfactorily.
Clearly, at best, these variables can be used as inputs into a richer analysis of vulnerabilities (eg, Carson and Ingves (2003)). Crucially, given accounting rules, variables such as loan loss provisions, non-performing loans and levels of capitalisation are rather backward looking. At best, they are contemporaneous rather than leading indicators of financial distress, ie thermometers rather than barometers. Indeed, profits tend to be rather high, and provisions low, when risk is taken on; the recent experience has been no different in this respect (Graph II.1). The same is true for variables such as balance sheet and income leverage.9 By construction, similar limitations apply to indices which combine balance sheet variables into a single number to generate an index of stress (eg, Bordo et al (2000)).

*Ratings* for individual borrowers go one step beyond balance sheet variables. Relative to balance sheet variables, ratings have the advantages of combining information into a single statistic and of being designed to be forward-looking, providing estimates of the probability of default or expected loss. Their most important limitation is that they relate to individual institutions taken in isolation. Thus, a measure of the strength of the financial system as a whole requires the bottom-up aggregation of ratings that do not take systematic account of similar exposures and interactions. Questions also arise regarding their reliability as truly leading indicators of financial distress, at least for credit agencies’ ratings. In practice, downgrades tend to be rather “sticky” compared with the arrival of information.

An alternative procedure is to build indicators of financial distress from *market prices*. There are various possibilities. At one end, raw indicators can be considered in isolation, or combined, with little or no theoretical restrictions, such as volatilities and quality spreads. More ambitiously, by imposing some structure, prices of fixed income securities and equities can be used to derive estimates of probabilities of default or expected losses for individual institutions10 and, by taking into account correlations, for sectors as a whole.

On the face of it, such indicators have a number of advantages over those discussed so far. They are forward-looking measures that incorporate all the information available to market participants at a particular point in time, ie they are comprehensive, point-in-time measures of risk. They therefore also implicitly embed views about any similarities in exposures and interactions that may exist within the sector covered. They are also available at high frequencies. But they have drawbacks too. The most important one is that any biases in the market’s assessment are embedded in the estimates. If, as seems natural, excessive risk-taking is the source of financial instability, then estimates of risk derived from market prices would tend to be unusually low as vulnerabilities build up and would tend to behave more like *contemporaneous* indicators of financial distress.

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9 In order to become useful from a forward-looking perspective, they need to be embedded in a “theory” of the dynamics of instability, such as the endogenous cycle view, that links them explicitly to future episodes of financial distress (see below).

10 To do so, one needs to rely on a pricing model that “reverse engineers” the various outputs, based on some assumptions. For example, so-called expected default frequencies (EDFs, in effect probabilities of default) can be obtained from equity prices, recalling that equity can be regarded as a call on the firm’s assets just as its debt is a put on them (Merton (1974)).
Available evidence tends to confirm that the lead with which market prices point to distress is uncomfortably short for policy. For example, unusually low volatilities and narrow spreads prevailed across a broad spectrum of asset classes until the turmoil started in the summer of 2007, when they finally rose sharply (BIS (2009a) and Graph II.2). As discussed in Borio and Drehmann (2009a), these drawbacks are naturally reflected also in more sophisticated measures that combine indicators based on market prices (eg, Illing and Liu (2006), Tarashev and Zhu (2008)).

**Early Warning Indicators**

One possible way of overcoming these limitations is to develop formal *early warning indicators* (EWIs) of financial distress. These are specifically designed to identify episodes of financial distress in advance. There has been a growing literature on EWIs. Although most of it was initially concerned with exchange rate and sovereign crises, banking crises have been attracting growing attention (eg, Bell and Pain (2000), Demirguc-Kunt and Detragiache (2005), Davis and Karim (2008)). The basic approach consists in using reduced-form relationships linking a set of explanatory variables to a “financial distress” index, often a zero/one variable.11

Potentially, EWIs have some attractive features. They represent statistically rigorous attempts to identify basic relationships in the historical data. They are explicitly forward-looking. They implicitly capture any interactions that have existed in previous episodes. And as long as their structure is not purely data-driven but inspired by some analytical view of distress, they might be able to help frame broad stories about financial instability.

Their performance so far, however, has also revealed shortcomings. The forecasting horizon in often quite short, more relevant for investors than policymakers (eg, typically not exceeding one year and sometimes as short as one month). The prediction may include information that is actually not available at the time the prediction is made (eg, Kaminsky and Reinhart (1999)). The choice of independent variables may be excessively data driven, so that the “story” is not obvious and there may be a risk of overfitting at the cost of out-of-sample performance. They have a tendency to produce too many “false positives”, ie to predict crises that do not occur, and their performance tends to be rather poor (Bell and Pain (2000)). More generally, they are open to the criticism that there is no guarantee that past relationships will hold in the future.12

In research with colleagues at the BIS we have sought to develop simple indicators that overcome some of these limitations (eg, Borio and Lowe (2002a and 2002b)). The indicators aim to predict banking crises over horizons that, depending on the calibration, range from 1 to 4 years ahead. They

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11 The statistical methodology varies. They range from threshold models calibrated based on noise-to-signal ratios (Kaminsky and Reinhart (1999) to multivariate logit or probit models (eg, Demirguc-Kunt and Detragiache (1998, 2005)). Mixtures of the two are also possible (Borio and Lowe (2004)).

12 Likewise, they cannot be used consistently to generate counterfactual stories based on alternative policy responses, as they normally do not include instruments I. In fact, changes in policy regimes may be one reason why past relationships need not hold in future.
rely exclusively on information that is available at the time the predictions are made, i.e., they are truly real-time. They are quite parsimonious, being based on two or at most three variables, as they draw heavily on the endogenous cycle view of financial instability. The basic idea is that the coexistence of unusually rapid credit expansion and asset price increases points to the build-up of financial imbalances that at some point are likely to unwind. The indicators are intended to measure the coexistence of asset price misalignments with a limited capacity of the system to absorb the asset price reversal. Misalignments are simply captured by deviations of asset prices from a (one-sided) trend; the absorption capacity of the system by deviations of the ratio of private sector debt to GDP from a similar trend, both exceeding certain thresholds. The precise timing of the unwinding is impossible to predict, hence the use of flexible, long horizons.

Our work indicates that these indicators perform rather well both in and out of sample (Borio and Drehmann (2009b)). In sample, they exhibit a comparatively low noise-to-signal ratios despite their parsimony, alleviating the “false positive” problem. Out-of-sample, they do a rather good job in detecting the general build-up of risks ahead of the current crisis.

The out-of-sample analysis suggests at least two conclusions. First, the indicator does identify with a lead of at least a couple of years the emergence of problems in the United States, the country at the epicentre of the crisis. This is shown in Graph II.3. Based on the credit-to-GDP and property-price gaps jointly exceeding critical thresholds, signs of the build-up of risk emerged in the early to mid-2000s, depending on the precise property price index and thresholds used. Second, the indicator picks up most of the countries that have taken measures to prop up their banking systems, but it misses those where the problems have originated exclusively in foreign exposures, in this case to strains in the United States. This highlights an obvious limitation in an increasingly globalised world: it is implicitly assumed that the banks resident in one country are only exposed to financial cycles in that country. In Borio and Drehmann (2009b) we suggest how this shortcoming can be addressed, by using information on cross-border exposures.

**Single-module measures: VARs**

In the absence of structural econometric models, a potentially useful tool to carry out stability analysis could be VARs. VARs are largely data-driven representations of the economy, with few theoretical restrictions. Typically, a rather small set of variables are allowed to interact dynamically, with the dynamics ultimately driven by a set of exogenous shocks. If financial distress could be defined in terms of some of those variables (e.g., as financial institutions’ losses exceeding a certain threshold), the tool could be rather versatile. Through simulations, it could generate a probability distribution of outcomes for the endogenous variables and hence a measure of the probability of distress over any given horizon. And it would allow for the computation of value-at-Risk metrics or the simulation of stress tests.

In principle, VARs are quite appealing. Depending on the horizon over which the forecasts are made, they should act as barometers rather than as thermometers of financial distress. They take into account interactions between variables and hence feedback effects. And they can provide the basis
for some story telling, tracing the impact of propagation of shocks through the system, although the parameters of the VAR are not amenable to a structural interpretation.

In practice, however, VARs fall well short of this promise. Data limitations are a problem. The variables typically used to capture financial distress are rather rudimentary, such as non-performing loans or aggregate defaults in the corporate sector, and are poorly modelled. The representation of the financial sector is cut to the bone and the range of possible shocks is quite limited: the models have to be kept manageable for estimation and often exclude asset prices or proxies for liquidity. The lack of structure implies that the models have very little to say about the dynamics of distress. And the assumptions on which they are built make it very hard to detect any fundamental non-linearities associated with it.\(^13\) By construction, given their very nature and the estimation methods, the models capture average relationships among the data series, rather than how the series interact under stress, and are unable to incorporate boom-bust cycles.\(^14\)

**Multiple-module measures: Macro stress tests**

The absence of fully-fledged structural models and the limitations of VARs have encouraged the use of multiple-module approaches to the assessment of financial distress: so-called macro stress tests generally fall in this category. By analogy with the stress tests for the portfolios of individual institutions, macro stress tests are designed to form a view of how the system as a whole would behave under exceptional but plausible adverse circumstances ie in response to negative “shocks” drawn from the tail of the underlying probability distribution (eg, IMF and World Bank (2003)).\(^15\) These measures are thus inspired by the “negative exogenous shock-amplification” view of financial instability. They effectively seek to replicate for the financial system the stress tests individual firms carry out on their portfolios.

Despite considerable differences, all macro stress tests share some characteristics (Drehmann (2009)).\(^16\) A macro engine, be this a VAR (eg, Pesaran et al (2006)), a traditional macro model (eg, Bunn et al (2005)) or a macro model linked to market risk drivers (Elsinger et al. (2006)), is used to generate the shock and/or to trace out a scenario for macroeconomic variables, ie the change in the assumed “systematic risk factors”. These are then used to shock the balance sheets of the relevant

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\(^13\) Specifically, the models generally assume that the underlying relationships interact in a (log)linear fashion, so that, say, a three standard deviation shock has exactly the same impact as three times a one standard deviation shock. This assumption would be acceptable if the underlying data generating process was linear or the VAR was used to study the impact of small shocks around the equilibrium of the process. However, stress tests do not consider small shocks, and it is not likely that the relevant data generating processes are all log-linear over the relevant range. However, some papers have channeled this assumption (eg, Drehmann et al. (2006) and Misina and Tessier (2008)).

\(^14\) See Borio and Drehmann (2009a) for representative examples.

\(^15\) This view can take the form of a point forecast conditional on some unusually large shocks or of a whole probability distribution, with its tail representing the outcomes of interest (eg, a Value-at-Risk (VaR) measure)

\(^16\) For surveys of the range of practices, see Sorge (2004) and Drehmann (2008 and 2009).
sector so as to assess more precisely their impact on its financial strength, measured in a variety of ways (Cihak (2007)).

Just like the stress tests for individual institutions, macro stress tests have become quite popular. They are explicitly forward-looking. They have the potential to cover a broad range of scenarios, not constrained by the probability distributions derived from historical relationships. They are quite helpful in tracing the propagation mechanism from shock to outcome and hence in story telling and communicating concerns. Above all, they can be much more granular than other approaches, relating scenarios to features of individual balance sheets. For example, information about interlinkages in the banking sector can be used to calculate knock-on effects from losses at individual institutions (Elsinger et al (2006)). The ultimate measures of distress, therefore, are closer to those that capture the concerns of policymakers, such as the erosion in the degree of capitalisation in the banking system.

Even so, their limitations should not be underestimated. Some of these have to do with the shortcomings of the individual modules. For example, as already noted, the macroeconomic modules do a very poor job of incorporating financial variables. Others relate to how the modules are linked. For one, the modular structure can easily result in internal inconsistencies, both conceptual and empirical, such as those that can arise from piece-wise estimation. Moreover, there is a clear danger of excessive complexity, undermining robustness and ease of communication, both within the organisation and with the public.

But most importantly, greater granularity and relevance are bought at the expense of ruling out interactions and feedback effects. After all, it is these interactions, within the financial system and between the financial and the real economy, that lie at the heart of the dynamics of financial distress. This is especially serious when the horizon of the simulation exceeds one period, as it realistically should. The very fact that unusually large shocks are needed to produce any action suggests that the current generation of macro stress tests is missing essential elements of financial instability. As a result, there is a serious risk that, as carried out now, macro stress tests may underestimate the likelihood of financial distress and its potential magnitude.

This is consistent with recent experience. To our knowledge, all the macro stress carried out before the recent financial turmoil failed to anticipate it as a possible relevant outcome. The tests indicated that the capital buffers in the system were perfectly adequate, and yet they came under considerable strain once the turmoil erupted.

**Overall assessment: from a financial stability to a macroeconomics perspective**

The discussion of quantitative measurement tools points to a number of conclusions.

First, the technology to measure the likelihood of financial distress in real time is still rather rudimentary. The tools generally provide little comfort in the estimates. And with rare exceptions, the

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17 Current research is precisely seeking to incorporate these effects; see eg Aikman et al (2009).
lead with which distress is assessed is insufficient to take remedial action. Most behave more like thermometers than true barometers of distress and/or risk lulling policymakers into a false sense of security. Stress tests, as currently conceived, are no exception. Their inability to capture interactions and endogenous feedback effects is a major stumbling block.

Second, that said, those EWIs rooted in the endogenous cycle view of financial instability appear comparatively more promising. The key insight is using market prices and rapid credit expansion as contrarian indicators of financial instability. This turns the paradox of financial instability to the policymakers’ advantage: the system looks most robust precisely when it is most fragile. At that point, market prices are not an indication of unusually low risk, but of unusually high risk-taking.

Third, structural models of financial instability are in their infancy. Analytical models of financial instability have not gone much beyond stylised characterisations of the dynamics of financial distress. Most of these are in the exogenous-shock amplification tradition, which fails to capture the dynamic build-up of vulnerabilities during the boom phase, the essence of the more promising financial cycle tradition. And they are equally unable to model the interactions between the financial and the real economy. At the same time, the financial cycle view, while intellectually compelling, has as yet failed to provide canonical formal models that are considered “acceptable” by the prevailing standards of the profession.

Finally, if financial instability models are unable to reach out to macroeconomic models, the trip in the opposite direction is hardly more successful. One reason why the modelling of interactions between the financial and real economy is so poor is that the current generation of macroeconomic models has very little to say about financial instability (Table II.1). Recall the key features of those models (eg, Borio (2006), Borio and Zhu (2008), Goodhart (2008), Leijonhuvud (2008) and Buiter (2009)). Financial factors are hardly captured; in fact, often money and credit are excluded altogether. When the modelling is done, it is generally grafted onto a core structure that sees the business cycle as largely the result of shocks hitting a system that quickly returns to its steady-state equilibrium. Time-varying risk premia are dispensed with. There are no coordination failures, either across economic agents at a point in time or intertemporally. As a rule, expectations are model-consistent. Even when default is included, its impact is trivialised. By construction, these models cannot accommodate financial instability. It is simply not in their genetic code.

There is, of course, a natural argument to defend the current focus of macroeconomic models. After all, episodes of financial distress are infrequent. Why should one adapt models that are seen to work, say, 99.9% of the time, in order to capture developments that are expected to occur only 0.01% of the time? The cost-benefit calculus seems self-evident. And any lingering doubts would be dispelled by the inherent difficulties of modelling financial instability, with its complex non-linearities, especially if one was to build on “microfoundations”.

We do not find this argument convincing. It is not just that the episodes that occur so rarely are particularly costly. Or, in fact, that they have become less rare owing to deep-seated structural forces (eg, Borio (2006)). The idea that it is possible to have two separate models – one for fair weather and the other for turbulent conditions – is dubious. It relies on the notion that what occurs in good times is
not causally related to what occurs in bad times. It fits quite comfortably with the stylised exogenous shock-propagation paradigm so prevalent in current thinking. But it fits very uneasily with what one observes in reality: it is unchecked aggressive risk-taking in good times that sows the seeds of the bad times. The boom does not just precede the bust, it prepares the ground for it. Decisions in good times determine the likelihood and costs of bad times. And they do so with a typically very long fuse. As we shall see next, all this has important implications for policy frameworks.

III. Financial (in)stability: policy

Bearing in mind the tight interrelationship between the financial system and the macroeconomy, what policies are most conducive to sustainable financial and macroeconomic stability? In analysis at the BIS, we have argued for a long time that this calls for mutually reinforcing adjustments in both prudential and monetary frameworks – what has been sometimes referred to us a new “macrofinancial stability framework” (BIS (2008)). What follows takes each of the two frameworks in turn and reiterates why action on the two fronts appears desirable.

Towards a macroprudential framework of regulation and supervision

The key adjustment in prudential frameworks is to strengthen their macroprudential orientation (Crockett (2000), Borio (2003, 2009), Knight (2006) and BIS (2009)). A macroprudential approach has two distinguishing features. It focuses on the financial system as a whole, with the objective of limiting the macroeconomic costs of episodes of financial distress. And it treats aggregate risk as dependent on the collective behaviour of financial institutions (ie, as partly “endogenous”). This contrasts sharply with how individual agents treat it: they regard as set prices, market/credit conditions and economic activity as unaffected by their decisions, since, taken individually, agents are too small to affect them. It also contrasts with the predominant features of existing regulatory and supervisory arrangements, which tend to focus on individual institutions.

For present purposes, the most important dimension of a macroprudential approach is how it deals with the evolution of aggregate risk in the financial system over time – the “time dimension”. The key concern, highlighted in the previous analysis, is precisely that system-wide risk can be amplified by interactions within the financial system as well as between the financial system and the real economy – the core of the financial cycle view of instability. This is what procyclicality is all about (eg, Crockett (2000), Borio et al (2001), BIS (2001), Brunnermeier et al (2009)). Feedback effects are of the essence. During expansions, the mutually reinforcing process between declining risk perceptions, rising risk tolerance, weakening financing constraints, rising leverage, higher market liquidity, booming asset prices and expenditures feeds onto itself, potentially leading to the overextension of balance
sheets. This process, then, operates in reverse, and more abruptly, as financial strains emerge, amplifying financial distress. All along this sequence of events, actions that are rational and compelling for individual economic agents may result in undesirable aggregate outcomes, destabilising the whole system. Coordination failures, across agents and over time, are of the essence.

The guiding principle to dampen procyclicality is to calibrate policy tools so as to encourage the build-up of buffers in good times so that they can be drawn down as strains materialise. By allowing the system to absorb the shock better, this would help to limit the costs of incipient financial distress. Moreover, the build-up of the buffers, to the extent that it acted as a kind of dragging anchor or “soft” speed limit, could also help to restrain the build-up of risk-taking during the expansion phase. As a result, it would also limit the risk of financial distress in the first place.

Three guidelines could inform the implementation of a macroprudential orientation.

First, a holistic approach is needed. The self-reinforcing mechanisms are multifaceted, and so are the contributing factors. Much attention has been paid to the role of capital requirements. How far can they be structured so as to induce countercyclical capital buffers? But many aspects of financial policy have a material impact on the degree of procyclicality of the financial system (BIS (2009b)). Liquidity, underwriting standards, marging and collateral practices, including loan-to-value restrictions, could be made less procyclical or countercyclical. Accounting standards could be made more consistent with sound risk management; here, the adoption of more forward-looking loan provisioning and a critical review of certain aspects of Fair Value Accounting, such as the recognition of day-one profits, are essential (eg, CGFS (2009)). Deposit insurance schemes could be prefunded. And resolution procedures could be tailored to the system-wide implications of distress.

Second, the approach should rely as far as possible, but no more, on rules rather than discretion. Automatic stabilisers are essential. For one, as long as they are not too ambitious, they would help address the limitations in the measurement of aggregate risks in real time, which can make discretionary action error-prone. The objective here is simply to edge the system in the right direction, not to strive for optimality. Dynamic provisions are a good such example. Above all, however, automatic stabilisers can act as effective pre-commitment devices. They reduce the huge political economy pressures on supervisors to refrain from acting during booms – pressures that are greatly magnified by the paradox of financial instability. At the same time, discretion has a role to play whenever effective rules cannot be developed. And it can help tailor intervention to the varying features of the financial cycle.

Third, careful thought should be given to the institutional set-up. It is crucial to align goals, know-how and control over instruments. The dispersion of responsibilities for financial stability and deep-seated differences in perspective complicate this task. The institutional set-up should be based on clear mandates and hold policymakers accountable. It calls for close cooperation between central banks and supervisory authorities. And it needs to secure a degree of operational autonomy from
government and the regulated, so critical to “take away the punchbowl when the party gets going”, as risks build up. At the same time, “fuzziness” in the measurement of financial stability and long lags between the accumulation of risks and their materialisation add to the difficulties involved in holding the authorities to account.

Towards a more pre-emptive monetary policy

The key adjustment to monetary policy frameworks is to allow for the possibility of tightening policy, leaning against the build-up of risks and associated financial imbalances, even if near-term inflation appears under control – the “response option”. Otherwise, the danger is that monetary policy could inadvertently accommodate the build-up of risks. Indeed, as argued elsewhere, it could positively encourage it, to the extent that interest rates that are low relative to equilibrium norms induce risk-taking – an element of the “risk-taking channel” of monetary policy, arguably an underappreciated aspect of the transmission mechanism (Borio and Zhu (2008))

In turn, the unwinding of the financial imbalances could cripple the effectiveness of monetary policy or, at a minimum, greatly complicate it. The Japanese experience and the recent adoption of so-called unconventional monetary policies have hammered this message home (Borio and Disyatat (2009)).

Implementing the response option calls for two modifications to the frameworks (Borio and Lowe (2002a)). One is to lengthen the operational policy horizon beyond the one-to-two years typical of some inflation targeting regimes. The key concept here is sustainable price stability. The other is to pay more attention to the medium-term balance of risks to the outlook. The lags between the accumulation of risks and their materialisation are quite long and variable. The cumulative processes take time to unfold, and the timing of their unwinding is highly uncertain. And given the obvious forecasting difficulties, the longer horizon should primarily be seen as a device to assess the balance of risks facing the economy in a more meaningful and structured way, not as a mechanical extension of point forecasts.

Four further points are worth highlighting.

First, implementing these adjustments does not require the explicit inclusion of financial stability in central bank mandates. As defined at the outset, the costs of financial instability are measured in terms of output foregone. This is no different from standard concerns with macroeconomic stability.

That is the ultimate metric to judge the success or failure of policy. At this level, the issue is equivalent

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19 It is critical here to make a distinction between prevention and crisis management. A degree of autonomy from government is essential in prevention, to take restraining action during the boom phase. Close coordination is both desirable and inevitable in crisis management, whenever dealing with the bust involves the use of public money.


21 Not surprisingly, Borio and Lowe (2004) show that the composite indicators of financial distress based on credit and asset prices have leading information content also for output and inflation even controlling for the past behaviour of these variables; the horizon varies between two and four years ahead.
to that of how to address any potential trade-offs between price and output stability over different horizons. Whether mandates are helpful or not depends on how this might affect the central bank’s perspective, the operational strategy chosen, communication and, above all, political economy constraints, such as its relation to the government. This is likely to vary across countries and circumstances. The lens through which the central bank views the workings of the economy is more important than the mandate. Past experience points to little correlation between the nature of the broad mandate and the central bank’s willingness to lean against the wind of financial imbalances (Borio (2006)).

Second, to characterise the response option as “pricking bubbles” or “targeting asset prices” is misleading. The real issue is how to respond to the build-up of risks in the financial system that could derail the real economy. Unusually high asset prices and low risk premia are one symptom of such a build-up. But the unusually rapid expansion of credit and leverage is a critical, and probably even more important, element (Borio and Lowe (2004)). The coexistence of the two provides the most reliable signal of the growing danger.

Third, while justified, objections couched in terms of the exceedingly demanding informational requirements for successful implementation appear overdone. The empirical evidence suggests that the build-up of risks can be identified, albeit fuzzily. Moreover, the comfort policymakers have with their current tools is partly illusory. It reflects more the force of habit and repetition than underlying reality. The margin of uncertainty surrounding unobservable concepts such as economic slack (output gaps), underlying productivity growth, natural unemployment rates and natural interest rates is simply huge. But as long as things do not go badly wrong, we turn a blind eye and learn to live with it. We are all creatures of habit. And we create intellectual norms to seek comfort in our daily struggle with uncertainty.

Finally, relying exclusively on macroprudential tools to address procyclically is not prudent. In our view, it is simply too much to ask from the prudential framework to take on the whole burden. There may be circumstances in which problems in the balance sheets of the non-financial sector are serious enough to cause crippling macroeconomic instability even if the financial sector does not experience a major financial crisis. And the ultimate anchor on credit creation is the central bank’s reaction function: prudential tools may not be enough if they have to fight against a monetary tide. Tinbergen’s (1952) dictum – two goals, two instruments – is often invoked out of context.22 His point was not that one should have tools exclusively devoted to a single objective, but that the interrelationships between objectives arising from the single economic structure had to be taken fully into account. A balance in the use of instruments is called for. The task is simply too large for any single one to do the trick on its own. Moreover, it is often argued that the interest rate tool is too blunt. But in sophisticated and open financial systems, in which the scope for regulatory arbitrage is high, the interest rate has the merit of setting the universal price of leverage. It reaches parts that other instruments cannot reach.

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22 On this, see also Shirakawa (2009).
Towards a common research agenda

We are now essentially back to the observation that prompted our intellectual journey. We are dealing with a single economic structure and tightly intertwined phenomena – financial and macroeconomic instability. And yet, until recently, there has been a tendency to approach them from very different perspectives. Better policy requires better analysis. What are the implications for the research agenda?

For one, there is an urgent need to develop models of the workings of the economy that fully incorporate the interplay between financial factors and the macroeconomy. These models should help to focus and discipline our thinking and to inform quantitative judgments about the strength of the various relationships at work. This does not mean that the models should be all encompassing and complex. On the contrary, ideally they would be parsimonious, would drill down to the core of the interrelationships and be tightly targeted. As an aside, we tend to be sceptical of the prevailing approach, which consists in adding yet another friction to a neoclassical underlying structure, as done in the DSGE tradition.23 As noted earlier, this structure is ill-suited to capture what we regard as the key cumulative disequilibrium processes involved. In addition, to help calibration, models should explicitly bring the various instruments into the picture. It would be very useful, in particular, to examine the extent to which prudential and monetary policy instruments can substitute or complement each other. This may also call for the exploration of new perspectives on old questions, such as the influence of monetary policy on risk perceptions and attitudes – the risk-taking channel of monetary policy.

Beyond this, certain specific analytical tools deserve special attention. Real-time measures of financial instability are a case in point. These can guide both monetary and prudential policies. Improving macro-stress test methodologies is worth pursuing. At the same time, we would caution against the risk of excessive complexity. The very nature of financial instability – small shocks trigger large responses – suggests to us that there is something fundamentally amiss with the stress testing approach. If so, adding layers of complexity in an attempt to model feed-back effects may not be the most promising way to go. By contrast, given their simplicity, transparency and track record so far, refining the basic structure of early warning indicators based on the endogenous cycle view of financial instability may yield a higher pay off. Potential avenues include the systematic inclusion of cross-border exposures, common global factors and a refined treatment of risk premia.

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23 The corresponding literature is expanding very fast; see Borio and Zhu (2008) for references. See also Cecchetti et al (2009). To be clear: adding the financial sector into DSGE models is a very helpful step that should be encouraged and pursued (eg, Goodfriend and McCallum (2007) and Christiano et al (2008)). The point here is that, given the underlying basic structure of the models, we are sceptical that the essence of the processes at the heart of financial instability can be captured.
Conclusion

Approaches to financial and macroeconomic stability have been worlds apart for far too long. It is high time they were brought together again. The financial crisis has given momentum to a process that had only proceeded very timidly and hesitantly hitherto. Policymakers have become much more keenly aware of the need to adjust policies to capture the tight and possibly destabilising interplay between financial and real factors. Since the crisis, addressing procyclicality head-on has become a priority of the international policy community (e.g., FSB (2009), G20 (2009), de Larosière (2009)). By the same token, the need to strengthen the macroprudential orientation of financial regulatory and supervisory frameworks has become widely accepted; several efforts are under way to make this shift operational. And monetary policymakers are reconsidering the merits of leaning against the build-up of risk and financial imbalances even if near-term inflation appears under control (e.g., Carney (2009), Trichet (2009) and Shirakawa (2009)). But better policy requires better analysis. And this has lagged behind. The road ahead is still a long one.
References


IMF (2008), Financial Soundness Indicators, IMF.


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### Tables and Graphs

#### Graph II.1

**Profits and provisioning**

As a percentage of total average assets

<table>
<thead>
<tr>
<th>Year</th>
<th>United States</th>
<th>United Kingdom</th>
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<th>Sweden</th>
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#### Graph II.2

**Buoyant asset markets**

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<th>Year</th>
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1 1995 = 100.
2 Sixteen OECD countries; weighted averages based on 2005 GDP and PPP exchange rates.
3 Goldman Sachs Commodity index, in US dollar terms.
4 Quarterly averages.
5 In basis points.
6 JPM Global High yield; spread to worst.
7 Estimated for 10-year zero coupon Treasuries.
8 Simple average of the United States and Germany.
9 Derived from the price of call option contracts on stock market indices.
10 Price volatility implied by the price of call options on 10-year government bond future contracts.
11 JPMorgan benchmark index for the level of G7 currencies' implied volatility.

Sources: OECD; Bloomberg; Datastream; Merrill Lynch; JPMorgan Chase; national data.
Out-of-sample performance of indicators of financial distress. The indicators are estimated over the period 1980-2003 and tested out of sample over the period 2003-2008. Data are quarterly. Gaps are estimated using a one-sided rolling Hodrick-Prescott filter with lambda set to 1600. The shaded areas refer to the threshold values for the indicators: 2–6 percentage points for credit/GDP gap; 15-25% for real property price gap. Both thresholds need to be exceeded for the signal to be on. The estimates for 2008 are based on partial data (up to the third quarter).

1 Weighted average of residential and commercial property prices with weights corresponding to estimates of their share in overall property wealth. The different gaps correspond to different indices for the residential property price component, as indicated.

Sources: Borio and Drehmann (2009b).

Table II.1

<table>
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<th>Two stylised paradigms for economic fluctuations</th>
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<td>Changing risk tolerance</td>
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<td>Rational expectations</td>
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<td>Source: Borio (2006)</td>
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