Macro-financial stability and macroprudential analysis

Ian Woolford,[1] Financial Markets Department

The Reserve Bank has recently extended its efforts to monitor and analyse financial stability issues. This article discusses the establishment of the Macro-Financial Stability (MFS) section in the Reserve Bank and some of the potential financial instability issues New Zealand faces. The role of macroprudential analysis is also discussed, along with a limited number of macroprudential indicators for illustrative purposes.

1 Introduction

This article outlines how the Reserve Bank is extending and developing its understanding of the financial system, and the points of potential vulnerability. A new section, called Macro-Financial Stability, has recently been established to carry this work forward.

The article:

- discusses the establishment of the MFS section;
- briefly recaps the concept underlying macroprudential analysis, and lays out the Bank's broad approach to macroprudential analysis, including a cautionary note about the use and interpretation of macroprudential indicators;
- discusses some potential sources of financial instability for New Zealand;
- introduces a number of examples of macroprudential indicators;
- discusses stress testing in the context of macroprudential indicators; and
- discusses the phenomenon of contagion.

2 Background

One of the key lessons of recent financial crises, including the Asian crisis, was to remind policy-makers of the important linkage between financial system soundness and macroeconomic stability. In one respect this is common sense, and economic historians can point to an unfortunately long list of financial crises and macroeconomic disruptions in many countries in various stages of economic development. In another respect, however, there was a feeling in some quarters of the international community that it was not so much that policy-makers had 'forgotten' about the linkage, as that there was something 'new' about the crisis (if only the magnitude of the disruption). The growing concern over the extent of financial crises led to pressures to reform the global financial system, with the aim of decreasing the likelihood of major disruptions.[2]

While there were some aspects of the Asian crisis that were unique, its origins go back to the gathering pace of financial liberalisation around the world over the 1980s and the 1990s. With liberalisation came the increasing role of wholesale financial markets, and an increase in the share of portfolio flows in total capital flows. With increased integration, the incidence of the so-called 'twin crisis' – a combined banking and balance-of-payments (currency) crisis – rose. Thailand during the Asian crisis is an example of a twin crisis, but so too was Finland in 1992, Mexico in 1994, and Turkey this year.

Research into the twin crisis phenomenon finds that they are typically far more severe than banking or currency crisis in isolation, and therefore more costly, but that early warnings of imbalances and vulnerabilities can help limit financial instability. Research into indicators of financial instability, whether it is of a twin or single crisis nature, has gained

[1] I thank Michael Reddell and Geof Mortlock for comments.

[2] See Mortlock (2000) for a detailed treatment of reforms to the international architecture.

increasing prominence in the last few years, and the IMF also began to encourage member countries to adopt the macroprudential analysis approach to surveillance.

3 Establishment of the MFS section

Against this backdrop, some central banks, including the Reserve Bank of New Zealand, have re-examined the way in which they assess the health and stability of the financial system as a whole; that is, not only individual banks nor the banking segment of the financial system, but the system in its entirety and the linkages from the financial system to the real economy.[3] The Bank has taken a broader view of financial stability issues for some years, and, in part, this led to the establishment of the Financial System Oversight (FSO) Committee in 1996 to oversee a wide range of matters relating to financial stability. The FSO committee is made up of Governors and senior managers from across the Bank's core policy departments, and is the main internal 'client' of the macroprudential analysis.

This interest has also been reflected in the Bank's research, speeches, and Bulletin articles on financial crisis issues, including in respect of vulnerabilities surrounding the balance of payments and the structure of capital flows. To strengthen further the Bank's ability to analyse these issues, a small Macro-Financial Stability section was established last year to enhance our understanding of the financial system and to monitor potential vulnerabilities at the system and economy-wide level.

This requires drawing together the various strands of analysis and interests. One way in which the MFS section will seek to achieve this is by developing a framework for monitoring macroprudential indicators that are relevant to New Zealand. This article describes in some detail the nature of macroprudential indicators and analysis, and makes the point that important indicators cover both domestic and international developments. In this regard, the role of the section is broader than just the compilation and monitoring of some standard set of domestic macroprudential indicators, and extends into the monitoring and analysis of international developments. Developments in international capital markets (including institutional trends, and the role of highly leveraged institutions) and the capital account of the balance of payments are particularly relevant for macroprudential analysis.

The MFS section is part of the Financial Markets Department of the Bank, but by the very nature of the job, its interests span across the various activities and responsibilities of the Bank's three policy departments: the Banking System Department, Economics Department, and Financial Markets Department. The Banking System Department's primary role is to regulate individual banks, promote financial system soundness, manage the disclosure regime, and maintain the capacity to respond to a bank distress or failure event, if and when one arises. The role of the MFS section is broader in one sense, in that the monitoring role covers the financial system as a whole, draws external vulnerability more fully into the analysis, and brings the macroeconomic and financial market linkages into sharper focus.

While the two areas are separate in some respects, they are related in that the Bank is seeking to build a more holistic and integrated assessment of financial stability factors, and generally making itself better informed of how financial markets operate. Individual institutions that get into difficulty could transmit financial instability pressures to the wider system in many ways. Enhancing our understanding of the way in which market decision-makers structure their balance sheets and address attendant risks, and the general interaction of the various segments of financial markets, will assist in our analysis.

This year, work has concentrated on establishing an internal reporting framework for macroprudential analysis. In the initial developmental stage, the work of the section was focussed on the identification, collection, and compilation of relevant macroprudential indicators. Looking ahead, two priorities are to develop our understanding of the New Zealand financial system from a macroprudential analysis

[3] For many years, the Bank's supervisory efforts have focussed not only on individual institutions but also on issues of systemic soundness. The Reserve Bank of New Zealand Act, for example, requires the Bank to use its supervisory powers to promote the maintenance of a sound financial system. Of course, the soundness of individual institutions and the systems as a whole are closely related, as the failure of a specific institution could affect the stability of the system and vice versa.

perspective, and to give greater transparency to macroprudential indicators.

These developments are consistent with one of the recommendations in the Svensson Report. The main focus of the report was on the conduct of monetary policy, accountability and governance issues, but Professor Svensson also advocated a heightened profile for macroprudential indicators and the associated analysis:

"The current prudential-supervision arrangements are fully consistent with the price stability objective, but the profile of prudential policy could be raised. *I recommend that the Reserve Bank summarize its information about the financial system, including a number of macro-prudential indicators of financial stability, in a regular report, modelled on those published by the Bank of England and Sveriges Riksbank."* [4]

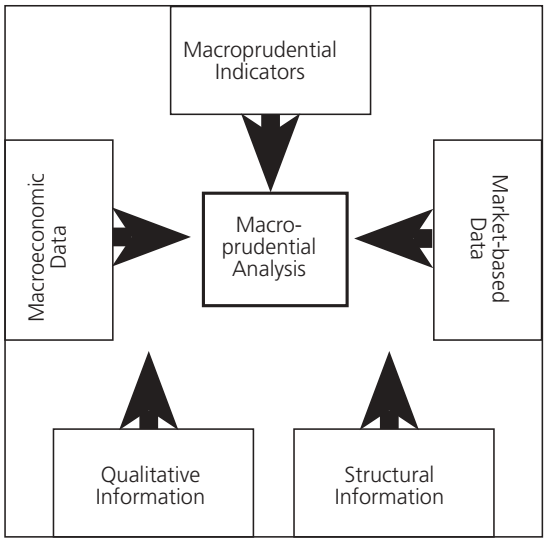
We envisage publishing an annual Bulletin article reviewing key indicators and trends in financial stability, augmented by occasional articles on specific MPI-related issues. The recommendation to publish a stand-alone report was not considered practical given the relatively modest size of the Bank's resources.

4 Macroprudential analysis

In a Bulletin article last year, the causes and costs of financial instability were discussed, and the conceptual framework underpinning macroprudential indicators was introduced.[5]

Macroprudential indicators include aggregated micro-prudential data (the aggregated prudential data of individual institutions), but extend beyond this to include a broad range of indicators that help us assess the potential vulnerability of the financial system to a wide range of possible shocks. The indicators come from several sources, including banking system data, data from the corporate and non-bank financial institutions, and macroeconomic and market-based data. As one example, macroprudential analysis looks at the same data that is used by the Economics Department for monetary policy formulation, but through a different lens. For example, growth in the credit or monetary aggregates can influence how we think about the current state of the economy, whereas household debt ratios provide information about household balance sheets, and potential vulnerabilities to financial stability.

Figure 1
Macroprudential analysis



Source: IMF (2001).

Our approach to macroprudential analysis is to monitor indicators from a variety of sources and seek to identify broad patterns in the indicators that might suggest growing imbalances and the potential for financial instability (figure 1 illustrates this). An important facet of the analysis is the inclusion of structural and qualitative information into macroprudential analysis. Structural information helps put the shape and size of the financial system in context – examples for New Zealand might be the foreign ownership of the banking system, or that four retail banks each have approximately 20 per cent of market share. Qualitative information also helps frame the analysis; an example could be judgements on bank management quality. These two inputs are very important for a number of reasons.

New Zealand has important differences from many of the countries where research on macroprudential indicators originates. Our economy is very dependent on foreign capital and is highly, and increasingly, indebted. Our financial

[4] See Svensson (2001).

[5] See Hawkesby (2000) for background on macroprudential indicators, and a definition of financial instability.

markets are small but quite highly developed and that makes us unusual in that most of the borrowing can be hedged, leaving few direct foreign currency exposures. Our banking sector is pre-dominantly subsidiaries and branches of foreign-owned multinational banking groups. Banks owe most of the private sector foreign debt (often in the form of funding from the parent company). Information about the ownership structure of institutions, and the relative size of industries, the main segments of the financial system, and exposures also feed into macroprudential analysis.

Evidence suggests that the mechanical application of macroprudential indicators cannot predict a period of instability.[6] For example, some researchers have estimated 'early-warning system' models (EWS) that focus on a number of variables to help predict an impending crisis.[7] More recently, the IMF has been developing its Financial Soundness Indicators, which it hopes will help governments and international investors detect financial crises at an early stage, although they are unlikely to be operational for approximately two years. These models are often used to try to predict the likelihood of a currency crisis, rather than purely as indicators of domestic financial instability. However, as noted earlier, a banking crisis and currency crisis often go hand in hand, with either one able to cause the other. That is, a currency crisis could put pressure on domestic balance sheets and lead to a banking crisis, or a banking crisis could cause sharp movements in the currency.

Any models are prone to mechanical interpretation, and although they can be useful as a tool for organising the way to think about the relationship between variables, they can give rise to false signals. Because of this, particular care must be exercised in analysing their output. Macroprudential indicators—or any indicators, for that matter—are a tool to provoke further enquiry. To extend the analysis beyond mechanical interpretations requires experience and judgement. Part of the reason for setting up a small team to follow developments in macroprudential analysis theory and practice, and to liaise with others in Banking System and Financial Market Departments, is to concentrate on developing just such judgement.

A second reason why more searching information and judgement are so important in macroprudential analysis is that every crisis is different, and the causes and dynamics of financial instability are complex. The policy adviser should look for the kind of broad patterns that *may* indicate emerging stresses, imbalances, or vulnerabilities, desirably in sufficient time to enable an effective response to be implemented so as to reduce the extent of financial turbulence.[8] In practise, one has to strike a balance between providing enough data to be general enough to capture the warning signals in the next crisis – a crisis that may be quite different from the last – against swamping decision-makers with too much information. The latter risk is really one of losing sight of the forest for the trees.

Another way in which qualitative information comes into the analysis is through an assessment of the extent to which a country's regulatory frameworks and institutional arrangements comply with international standards and codes. A cornerstone of the reforms to the global financial architecture has been for the international community to place more emphasis on a framework of standards and codes, as a means by which countries can assess their own regulatory frameworks against international 'good practice'. Gaps or deficiencies in those frameworks may help identify potential vulnerabilities.

The number of standards and codes has grown dramatically over the last few years, but some of the main ones that relate to the financial system include:

- transparency of monetary, fiscal, and financial policies;
- macro-financial data standards;
- banking supervision;
- securities regulation;
- corporate governance;
- payment system principles;
- insurance industry;
- accounting and auditing standards; and
- financial crime.[9]

[6] See Hawkesby op cit for a discussion of the effectiveness of macroprudential indicators as leading indicators.

[7] See Kaminsky *et al* (1996) for examples.

[8] See, primarily, Davis (1999), but also BIS (2001), and IMF (2000).

[9] See Mortlock (2000) for a discussion of standards and codes in the context of the global financial architecture.

Standards and codes are potentially useful tools. However, they are only a tool and not a panacea for poor policy or surveillance. One of the natural tensions that arises with standards and codes intended for international application is that they need to be general enough to be broadly applicable, but detailed enough to be useful. Another issue is whether codes should be set as minimum benchmarks for (developing) countries to strive for, or as international best practice (which is difficult to define). Finally, there is always the concern that standards and codes will be applied in a rigidly prescriptive manner.

Notwithstanding these reservations, the Bank has conducted a self-assessment of its banking supervision and transparency arrangements against relevant international standards, and has also been involved in similar exercises on money laundering and financial crimes.[10] It is likely that an in-depth, external, assessment will be done some time over the next two to three years. These assessments are led by the IMF and World Bank and are known as Financial Sector Assessment Program (FSAP) assessments. They have been likened to a health check of a country's financial sector.

Sources of instability

Stable financial systems may become unstable for a variety of reasons, individually or in combination. Many of the main sources of potential financial instability are domestic, although there are also important external channels by which vulnerabilities can arise and crises can spread. Even so, to some extent the choices that the domestic authorities make influence to some degree a country's exposure to external sources of instability.

Some of the common causes of financial instability include:

- rapid financial sector liberalisation unsupported by measures to encourage prudent risk management in the financial sector;
- unsustainable macroeconomic policies, such as loose monetary policy and excessive fiscal spending – such policies can contribute to asset price volatility and a subsequent erosion of asset quality in the financial system;
- exchange rate arrangements that lack credibility, including unsustainable exchange rate pegs – this is particularly important where financial institutions and corporations have come to rely on an exchange rate peg, and fail to hedge their currency risk, only to sustain currency losses when the peg collapses;
- poor banking supervision;
- inadequate financial disclosure arrangements, including poor quality accounting and auditing standards; and
- weak market disciplines in the banking and corporate sectors, reducing the incentives for high quality risk management by banks.[11]

The New Zealand financial sector experienced difficulties at the end of the 1980s and early 1990s following the period of rapid financial liberalisation over the latter half of the 1980s. This experience is not unusual, as liberalisation exposes the financial system of a country to new markets, products, and opportunities – nor is it comfortable (see figure 5, which shows the high level of impaired assets in the New Zealand banking system in the early 1990s, compared to recent years). Like so many other countries, financial liberalisation in New Zealand found risk management processes and skills wanting, especially in the face of large swings in asset prices that were seen in the share market and commercial and housing property markets. As is often the case, the quality of lending decisions by banks deteriorated in the lead up to the share and property market crashes (a form of 'irrational exuberance' that often accompanies pronounced market upswings).

External vulnerabilities

Over the last decade there have been a series of financial crises that have had at least one thing in common: a crisis in one country had a tendency to spread to other countries. An important dimension of monitoring the health of the financial system therefore is to pay adequate attention to external vulnerabilities. In broad terms these stem from the

[10] See Dench (1999), Griffin (1998), and Ledingham, Rodgers, and Stinson (2000) for a discussion of the self-assessments against financial crime, banking supervision, and payments systems, respectively.

[11] See Brash (2001).

two mechanisms of interdependence (actual substantive linkages between economies) and contagion (effects over and above those warranted by substantive linkages).

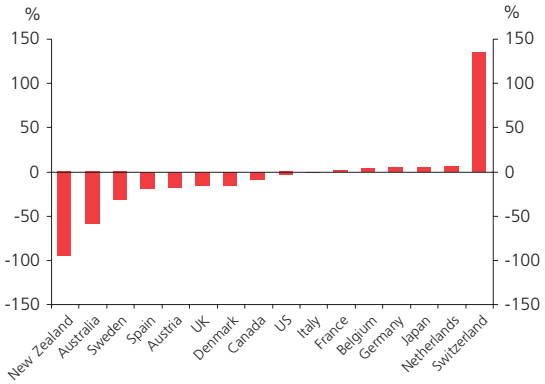
In the context of New Zealand, interdependence is probably the greater threat, given the various international linkages, and this is one of the central areas of vulnerability. As a relatively open economy, these linkages include the foreign ownership of the banking sector, the extent of exposures within the banking system to connected parties, the extent of trade linkages between New Zealand and other countries and the extent of foreign company involvement in our economy.

One channel by which New Zealand's financial system is potentially vulnerable is through exogenous shocks such as a sharp contraction in overseas demand for our exports, and consequently an exchange rate shock. At the time of the Asian crisis, exports to Asia accounted for approximately 40 per cent of total New Zealand exports, and consequently exports to the countries most affected declined sharply. The increased uncertainty and generalised slowdown in regional growth that followed also affected growth in New Zealand, and contributed to the New Zealand dollar falling by around 30 per cent from the 1997 peak. Fortunately, the adjustment was relatively orderly and didn't place undue stress on the financial system, in large part due to good risk management practices by banks and corporates.

A potentially more disruptive channel, and one that is less well understood, relates to the foreign funding of New Zealand consumption and investment. New Zealand has run large current account deficits for many years, the counterpart to which is overseas borrowing, or, capital inflows. Figure 2 illustrates that the level of New Zealand reliance on foreign capital (debt and equity) relative to GDP is large compared to other developed countries. As with an individual, the higher the level of debt, the more vulnerable the sector or country is to unfavourable developments and the potential for a sharp withdrawal of capital. At some point, foreign lenders could re-evaluate the level of indebtedness of the New Zealand corporate and household sectors against future earning prospects, potentially leading to a higher risk premium for borrowers.

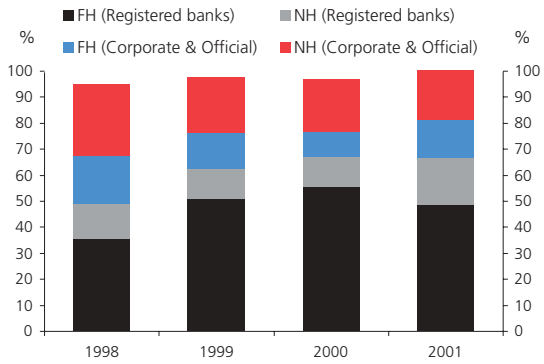
One way in which importers, exporters, and financial firms manage fluctuations in the exchange rate is by 'hedging'.[12] Hedging is used to reduce currency risk in international transactions, and can be accomplished with forward foreign exchange contracts, swaps, structural balance sheet hedges, invoicing export sales in local currency, and by the use of foreign exchange option contracts. Statistics New Zealand data suggest more than 95 per cent of foreign exchange exposures are hedged (see figure 3).[13] This level of hedging is relatively unusual by world standards, as often households and businesses in countries with a high dependence on foreign capital have to borrow in foreign currency, but can't

Figure 2
Ratio of net foreign assets to GDP



Note: March 1999 data, except for Switzerland, Italy, and France (December 1998), and Netherlands (December 1997).

Figure 3
Hedging of total foreign currency debt



[12] See Brookes, Hargreaves, Lucas, and White (2000) for a discussion of various types of hedging.

[13] Financial hedges (FH), such as swap arrangements, reduce the risk of adverse future price movements; natural hedges (NH) are balance sheet positions that provide offsets – for example borrowings in one currency offset by income in the same currency.

hedge away the risk of exchange rate movements.[14] This was the situation many businesses were in during the Asian crisis.

However, while the high level of hedging confers many benefits, it is contingent on the continued willingness of overseas market participants (in the main) to hold New Zealand dollar risk. If this willingness were to diminish, the loss of protection against exchange rate movements could expose corporate and bank balance sheets to uncomfortable pressures. This is another potential avenue by which financial stability might be threatened. One of the tasks ahead, therefore, is to try to understand the nature of these exposures better, including who ultimately holds the New Zealand dollar risk, and how behaviour might change if hedging became difficult.

Another potential external source of instability is the direct linkages between institutions, which can transmit shocks. This is true both for the corporate sector, mainly through multinational ties between New Zealand businesses abroad and foreign multinationals in New Zealand, and the banking sector. There are eighteen banks registered in New Zealand, and all but one are foreign owned. The high level of foreign ownership in the New Zealand banking system, on balance, is a source of strength for the sector. However, locally-incorporated banks and branches of foreign banks may transmit episodes of major instability in the banking systems of other countries where the parent bank has large exposures, particularly given the extent of the borrowings of the New Zealand operations from their parent banks.

So a central task of MFS will be to examine the role of capital flows and balance sheet vulnerabilities, along with market structure information. The high market share of Australian-owned banks in the New Zealand financial system is a good example. While the Bank has taken a close interest in the Australian banking system for a number of years, given the importance of these linkages in a macroprudential analysis setting, our monitoring in this area will continue to develop.

[14] In the literature this is often referred to as the 'original sin'. That is, countries without a track record of sound economic management find it impossible to persuade foreigners to take exposure to their local currency (directly or through hedges). This results in the country borrowing overseas in foreign currency without protection from exchange rate movements, thus exposing themselves to future potential crisis.

The phenomenon of contagion – the spillover from one country's crisis to other countries, independently of any effects warranted by the second economy's fundamentals – has received a great deal of attention over the last several years, especially after the Asian crisis. While one can theoretically distinguish between interdependence and contagion as two external sources of instability, in reality the two overlap quite a lot. For example, in Malaysia and the Philippines, weaknesses existed in the financial systems and real economies in the now familiar form of large exposures to commercial property, loans of dubious quality, and problems with corporate governance. While the imbalances were not as severe as those that had built up in Thailand and Indonesia, the crisis 'spilt over' to some extent from Thailand and Indonesia to the Malaysian and Philippine currencies. In the event, both countries avoided a full-blown crisis, albeit with some discomfort. In these cases, therefore, contagion was a factor, but it resulted from markets taking a closer look at the respective country fundamentals and re-pricing risk.

5 Macroprudential data

The indicators for macroprudential analysis come from three broad sources – banking system data, macroeconomic data, and financial market data (see table 1).

Table 1 presents a selection of indicators that are generally expected to be analytically relevant.[15] Most indicators will be relevant across a broad range of countries. However, as noted above, this is not an off-the-shelf product, and testing, judgement, and experience are important in determining the most appropriate indicators for New Zealand.

There are several issues that are important in identifying appropriate macroprudential indicators for New Zealand.

- Relevance. The indicators should be analytically relevant – that is there should be a sensible basis for expecting a relationship between the indicator and financial instability – and empirically relevant. One way in which indicators are empirically relevant is when they have predictive

[15] Based on a large-scale survey of IMF member countries, and research by academics, central banks, and supervisory agencies.

Table 1
Data for macroprudential analysis

Banking System indicators
Capital adequacy
- Total and tier I capital to risk-weighted exposures
- Assets to capital

Asset quality
- Non-performing loans (NPL) to total loans
- Ratio of NPLs (net of provisions) to capital
- Specific provisions relative to NPLs
- Sectoral loan distribution
- Geographical loan distribution
- Related party exposures
- Concentration of exposures to individual borrowers

Earnings and profitability
- Return on assets
- Return on equity
- Interest margin to gross income
- Non-interest expenses to gross income

Liquidity
- Liquid assets to liquid liabilities
- Market segmentation
- Customer deposits to total (non-interbank) loans

Sensitivity to market risk
- Net open position in foreign exchange to capital
- Net open position in equities to capital

Macroeconomic data
Credit growth
Debt levels
- Corporate
- Household

Capital flows
External debt
- Maturity
- Composition
- Degree of hedging

Economic growth
Corporate sector
Household sector
- Disposable income
- House prices
- Financial assets and liabilities
- Net financial wealth
- Bankruptcies

External sector
- Current account
- Economic growth
- Investment

Market indicators
Bank share prices
Credit spreads
Credit ratings
Wholesale market liquidity
Market volumes
Asset prices

power, or can be classified as leading indicators.[16] However, good macroprudential indicators won't always be good leading indicators in isolation; they may be coincident indicators, and only of interest in combination with other indicators - in much the same way that a fire alarm isn't a leading indicator of a fire, but is very useful nonetheless.

- Country-specificity. While a lot of research on macroprudential indicators has been undertaken around the world, every policy-maker should ensure that they take account of the unique structural features of their own economy. These features should include institutional features, local laws, exchange rate regime and so on. Awareness of the New Zealand context is particularly important when benchmarking the indicators against other country experience.

- Data availability and quality. While the quality of statistics in New Zealand is generally good, as a small country we do not have the same depth or breadth of data as some larger developed countries. Some macroprudential indicators recommended by researchers and the IMF are not available for New Zealand. Banking system indicators vary across countries, but as the New Zealand approach to banking supervision relies to a high degree on information publicly disclosed by banks there is good coverage in this sector of the financial system. The macroprudential indicators principally come from the Quarterly Disclosure Statements of individual banks, aggregated for the system as a whole. On the other hand, the coverage and availability of macroprudential indicators for non-bank financial institutions in particular, and the corporate sector more generally, are not always at the same level as larger developed countries. Macroeconomic data are also generally available, as is financial market information, although much less than in many developed countries.

[16] That is, changes in one variable that precedes changes in another. For example, rapid credit growth may imply poor lending criteria and an increased likelihood of future bank losses, especially when the ratios reach unusual levels.

The banking system data are typically aggregated microprudential data, and reflect the banking sector as whole, rather than individual institutions. Like its microprudential counterpart, the banking macroprudential indicators can be thought of as based on the so-called CAMELS framework, which uses six categories of data to assess the health of the financial system. CAMELS is an acronym that denotes:

- Capital adequacy. Various ratios are used to measure the amount of capital to act as a buffer to absorb losses.
- Asset quality. Various direct and indirect indicators of asset quality are used to identify potential risks to the solvency of financial institutions.
- Management soundness. This category reflects how important good quality management is for a bank to be sound. In practice, it is difficult to have robust indicators of management soundness at the banking system level, and judgements in this area feed into the analysis by way of qualitative information (see figure 1).
- Earnings and profitability. Several indicators are used to monitor potential risks to solvency from deteriorating earnings and profitability.
- Liquidity. Market liquidity can impact on the capacity of the financial system to meet its obligations as they fall due and, in extreme situations, illiquid conditions can trigger or exacerbate a banking panic and potentially affect the solvency of institutions (and the system as a whole), and indicators can point to emerging problems.
- Sensitivity to market risk. Indicators of system-wide exposure to volatile assets can alert policy-makers to the vulnerability of the system to fluctuations in prices.

The macroeconomic data tend to be of two types: data of a sectoral nature (for example, household debt, or corporate foreign direct investment), and broader measures such as economic growth. The broader measures tend to reflect pressures on the market and credit risk banks face through various sectors.[17] For example, a contraction in GDP could reduce the household and corporate sectors' ability to service bank loans, and ultimately result in an increase in impaired assets.[18] Market data tend to be higher frequency information such as financial prices (interest rates, sovereign or private debt spreads over US treasury bills, and the like). Other types of financial market indicators, such as credit ratings, are useful, although they may be less timely and tend to be co-incident with financial instability, rather than leading indicators of problems.

6 Macroprudential analysis for New Zealand

In this section, some important New Zealand macroprudential indicators are presented and briefly discussed to illustrate the sort of information that is useful to assess broad trends in financial system stability. As noted above, future Bulletins will include regular macroprudential analysis articles that will cover a wider range of macroprudential indicators, with more in-depth analysis. However, for the purposes of this article, only a subset of the important macroprudential indicators is discussed.[19]

Banking system indicators[20]

The focus of banking system macroprudential indicators tends to be on developments in the banking system as a whole. However, a proper analysis of banking sector vulnerability needs to take into account individual bank data, particularly for banks of systemic importance. This is because the aggregate data might portray the banking system as a whole to be in good health, whereas individual banks may be feeling pressures, or building up ill-advised exposures, that can then lead on to wider financial system weakness.

17 Banks are exposed to different types of risk: market risk is the risk of losses arising from movements in interest rates, exchange rates, or equity prices; settlement risk reflects potential problems associated with the payments system; liquidity risk arises in part because of the mismatch of funding long-term assets through short-term liabilities; and credit risk reflects potential losses on loans to businesses and households.

18 See Hawkesby (2000) and IMF (2001) for a more detailed discussion of the intuition behind the various indicators.

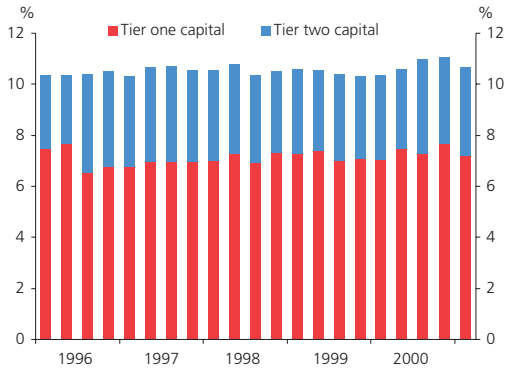
19 See IMF (2001) for an overview and numerous academic references.

20 See DeSourdy (2001) for a detailed discussion of developments in the New Zealand banking system over the year to December 2000.

Capital adequacy

The most common indicator used to assess the banking sector's ability to withstand shocks is the risk-weighted capital ratio.[21] Capital adequacy is also useful in that it shows how aligned the shareholders' incentives are with the health of the bank. If, for example, there is little capital in the bank then shareholders have little to lose if it fails and hence little incentive. On the other hand, if it is well capitalised shareholders have a lot to lose and hence the incentive to make sure systems are in place to keep the bank healthy. A decline in this indicator can suggest that the banking system as a whole, or particular banks within it, may be vulnerable to any future deterioration in asset quality or to market risk losses. Deterioration may arise from poor lending practices and/or economic shocks, such as a sharp contraction in the economy and a fall in asset prices. Figure 4 shows that New Zealand incorporated banks sit very comfortably above the tier one capital ratio of 4 per cent of risk-weighted exposures and an overall 8 per cent total capital ratio (measured using the standard Basel capital methodology).

Figure 4
Capital adequacy
(capital as a percentage of risk-weighted exposures)

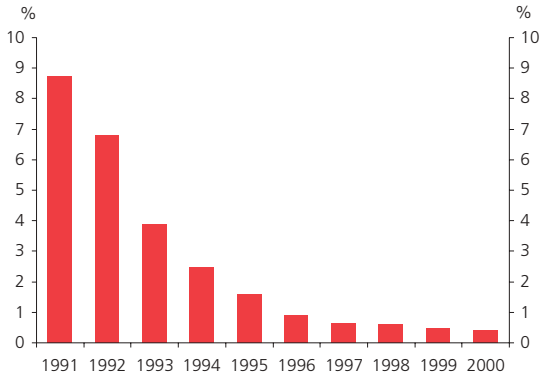


Asset quality

Asset quality is extremely important to banks and the economy more generally. Poor quality loans can be a leading indicator of erosion in profits and capital, and in extreme cases can threaten bank solvency. Poor asset quality also represents poor resource allocation in the economy, with potential implications for longer-term growth prospects and the health of the financial system.

One indicator that is used as a proxy for asset quality is impaired assets. In New Zealand a loan is classified as 'impaired' when interest or principals are in arrears for 90 days or longer. International definitions of impaired assets – or 'non-performing loans' as they are often known – vary, but the levels recorded over recent years in New Zealand are low by international standards.

Figure 5
Impaired assets of banks
(as a percentage of total assets)



Earnings and profitability

A variety of indicators are used to assess the financial performance and profitability of banks. Different measures can be used to derive various ratios, such as operating asset ratios, operating income ratios, and operating equity ratios. Banks are complex institutions and no single measure will capture, in a robust fashion, bank performance. Similarly, no single measure encapsulates banking system performance, and a variety of indicators needs to be examined. Figures 6 and 7 show that, across a few measures, banking system profitability has been growing over recent years, reflecting, in part, growth in interest earning assets. Profits are above the common benchmark of one per cent of total average assets for international banks.

[21] The risk-weighted capital ratio is the ratio of bank capital to on and off-balance sheet credit exposures, where the exposures are weighted by broad categories of relative credit risk.

Figure 6
Income and expenses

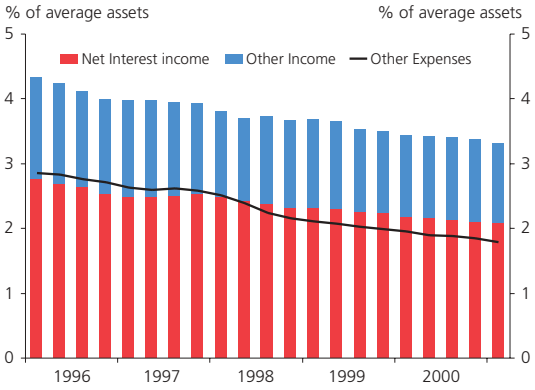
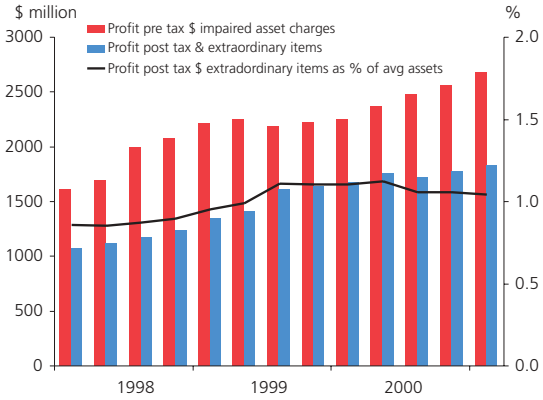


Figure 7
Profitability



Corporate sector

There is not as much information for the non-bank corporate sector as there is for banks. This is the case both in terms of coverage and timeliness. This limits our ability to monitor this sector comprehensively from the macroprudential analysis perspective (although there is obviously a lot of information available about individual companies). One area that we intend to collect data on and monitor more closely is the corporate debt and commercial paper markets.

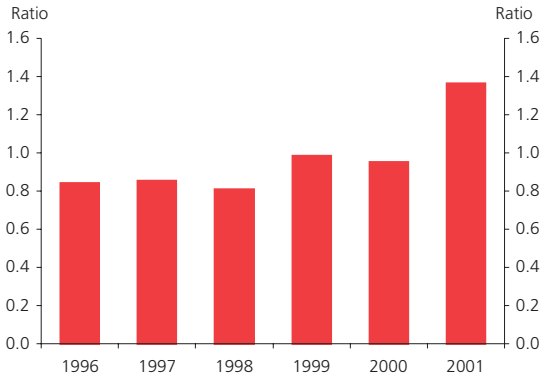
However, in general, corporate cash flow and balance sheet data are useful indicators of the soundness of the corporate sector, and, by extension, the credit risks faced by banks. While there are a number of indicators used by business and equity analysts to assess the soundness of individual companies, it is less easy to obtain a robust consistent measure of the corporate sector as a whole.

Corporate liquidity

Figure 8 presents the quick ratio (sometimes called the acid-test ratio).[22] This ratio is considered a relatively good indicator of a company's ability to meet its short-term financial obligations. The ratio is calculated as current assets minus inventories (as inventory can sometimes be difficult to liquidate at short notice), divided by current liabilities. Therefore, a ratio of 1:1 means the institution has a dollar's worth of easily convertible assets for each dollar of current liabilities. While low ratios may indicate liquidity problems, some sectors routinely operate on tight liquidity ratios (the retail and supermarket sectors for example). On the other hand, high ratios may point to poor management of funds.

As with all macroprudential indicators, care is needed in interpreting the data, and this is particularly true with an aggregate quick ratio, as the acceptable benchmark ratio will vary from industry to industry, is not particularly timely, and there is more than one way to calculate the aggregate measure. However, as a rough guide it is still illustrative to calculate these measures. They show that on a weighted basis, some of the large companies in the retail and natural resource sectors (where the ratios are typically lower) lower the ratio, but even then the corporate sector appears relatively liquid.

Figure 8
Aggregate 'quick ratio' of corporates



Source: Datastream and RBNZ estimates.

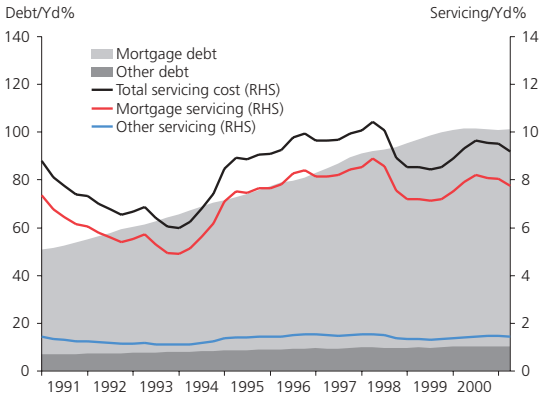
[22] The weighted average is calculated using total company assets, and the companies account for over 75 per cent of New Zealand market capitalisation.

Household sector[23]

There are several indicators of the health of the household sector, including financial and real assets, debt levels, income growth, and so on. The household sector linkage to overall financial stability occurs through two channels in particular. The first is through the credit risk that banks face – primarily by the level of household indebtedness and debt-servicing capacity. The second linkage is the market risk that households face in terms of their ability to withstand fluctuations in interest rates, asset prices, and equity prices. Real estate asset bubbles have played a significant role in several financial crises around the world over the last fifteen years.[24] In the New Zealand context, exposure to the housing market, housing-related debt, and interest rates are important indicators. The Bank has closely monitored developments in the New Zealand real estate market for many years because of the role house prices play in influencing inflation, and in shaping inflation expectations, and in part because of the potential linkage to financial instability.

Over the 1990s, New Zealand households increased their debt levels from approximately 60 per cent of disposable income in 1990 to around 110 per cent in 2000. This level of debt is not uncommon for developed countries, especially following a period of financial liberalisation, and it appears that, even in the face of ongoing growth in real disposable income the debt to income ratio has stabilized.[25] Much of the debt accumulated was in the form of bank mortgages, especially in the light of the relatively high house price inflation of the mid-1990s, potentially exposing both the household and banking sectors to vulnerabilities over the latter part of the 1990s as house prices fell.[26] However, the debt service burden is not high by historical standards (at least in nominal terms) and consumer defaults on housing debt are very rare in New Zealand. This latter point is important given that mortgages comprise approximately one third of bank assets and half of bank lending.

Figure 9
Household debt and servicing cost



(yd is household disposable income)

Market indicators

A range of market data provides useful information about financial system vulnerabilities. Share prices of banks or sectors and credit spreads provide timely information about the markets' assessment of the institution, sector, or country in question. They are also a tractable way of assessing developments in other countries; a sharp increase in emerging market sovereign spreads provides information about the perceived risks and vulnerabilities of a group of countries without having to directly monitor those countries. Prices, therefore, convey important information, but so do volumes. Both the threat of disorderly foreign exchange market behaviour (and hence the possible need for intervention) and the threat at times from restricted liquidity are good examples of when looking at market turnover and volumes is important.

Sovereign and corporate credit ratings can also provide useful information, but they are not generally good leading indicators of financial instability. The credit rating of registered banks in New Zealand is good, and improving, with 10 banks being rated at AA- or above, reflecting their strong capacity to repay interest and principal in a timely manner.

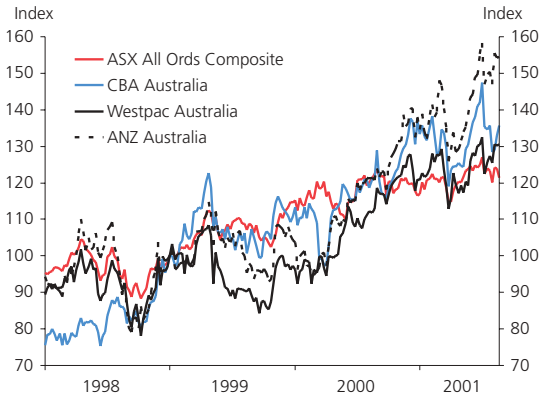
[23] See Thorp and Ung (2000) and Thorp and Ung (2001) for a detailed discussion of trends in household balance sheets since 1978.

[24] See Davis (2001).

[25] While debt levels are comparable to those of some other developed economies who have been through a similar process of financial deregulation, debt levels for those countries may also be a point of vulnerability – it is still too early to gauge what constitutes prudent levels in deregulated markets.

[26] Of course, some proportion of mortgage lending is for purposes other than housing.

Figure 10
Bank share prices



Another indicator of health for a sector is the performance of its shares relative to a wider benchmark.[27] Figure 10 shows that over the last few years the share prices of Australian-owned banks registered in New Zealand have performed well relative to the Australian All Ordinaries index, suggesting the market perception is that the these banks are in good health.

However, as always, structural factors must be kept in mind, as foreign ownership of almost all New Zealand banks means that individual stock prices must be monitored in the relevant foreign equity markets. For example, while CBA is the owner of ASB Bank Limited and monitoring the performance of the parent is important, they are not the same legal entity. The linkage is important though: a strong parent company could provide additional support in times of stress, but a weak parent could transmit its own difficulties to its subsidiary.

[27] However, care in interpretation is needed, in that if the broad index is falling rapidly but the bank shares are falling a little less rapidly, this is not necessarily comforting (as a relative measure would suggest). That is, the absolute level of bank share prices also matter.

Box
Macroprudential analysis and stress tests

The approach the Bank takes to macroprudential analysis is to monitor a range of indicators to identify the kind of broad patterns and growing imbalances that precedes a period of financial instability. This approach recognizes that while there are recurrent signals in crisis, every event is unique in its own right.

Another way macroprudential indicators can be used to assess the soundness of the financial system is in 'stress tests.'[28]

A stress test is a mechanism to determine the system's robustness to a variety of shocks that would have a sizeable adverse impact on the system, and are of a plausible nature. A test of one macroprudential indicator against a given shock in a single market price or event is a type of stress test generally known as 'sensitivity analysis', whereas a test of a range of indicators in a more dynamic setting possibly including inter-linked shocks is known as 'scenario analysis.'[29]

Typically, the type of shocks reflect risks the financial system is exposed to:

- credit risk;
- liquidity risk; and,
- market risk (which includes interest rate risk, exchange rate risk, equity price risk, and commodity price risk).

Stress tests range from the very simple to the very complex, depending on the nature of the test and the methods employed. Scenario analysis may trace the transmission of the shock through various portfolios using the sort of sophisticated techniques individual institutions use for internal risk management purposes. In system-wide tests careful attention to model specification and aggregation issues is essential.

[28] Other analytical methods include Value-at-Risk (VaR) models, and sectoral balance sheet analysis.

[29] This section is based on the discussion of stress tests in IMF (2001) and Blaschke *et al* (2001).

An example of a simple, partial equilibrium, model would be to examine the actual impact of a shock on a macroprudential indicator, such as a large movement in the exchange rate and resultant movements in impaired assets. Of course, while the shocks could originate in the financial system and be transmitted to macroeconomic and financial variables the focus is on financial vulnerability stress tests, and therefore tends to examine macroeconomic and financial shocks on financial system balance sheets and indicators.

Banking system vulnerabilities from exchange rate risk arise directly by way of exposure to exchange rate fluctuations and indirectly by way of the credit risk from borrowers (although the impacts are multi-faceted and, at times, unexpected). Figure 11 illustrates that banks in New Zealand have only negligible exposures to foreign exchange positions (including off-balance sheet positions) compared to shareholder equity.[30] For example, over the period since the disclosure regime began the peak open foreign exchange position (as the percentage of equity) of 0.51 per cent was recorded in June 1997. Even if the exchange rate depreciated by 50 per cent, only one quarter of one per cent of equity would have potentially been lost. Of course, in such an event, the story would not end there, as other factors would come into play. For example, following a fall in the exchange rate of that magnitude, the New Zealand-specific credit premium would widen, borrowing for households and businesses would become more expensive, balance sheets would deteriorate, and credit and market risk would increase.

In terms of the indirect impact, figure 12 indicates that although the exchange rate first rose by some 14 per cent and then depreciated by more than 30 per cent the ratio of impaired assets fell by 70 per cent over the entire period. Appreciation and depreciation of the exchange rate affect importers and exporters in different ways of course, but the steady increase in asset quality suggests very good risk management by the corporate sector (which is consistent with the recorded financial and non-financial hedging of around 95 per cent).

Figure 11
Net open position

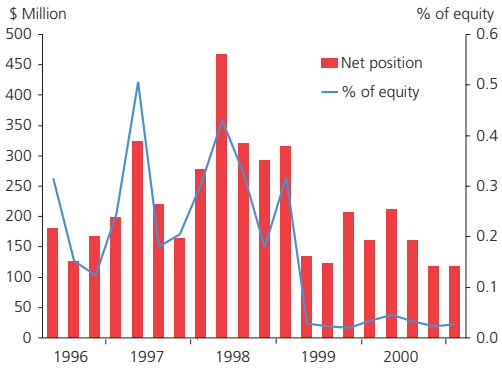
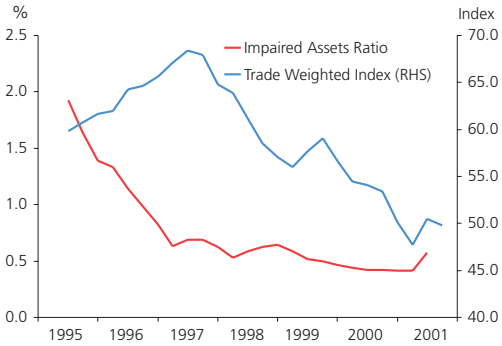


Figure 12
Impaired assets and TWI



[30] The percentage is an unweighted average of registered banks.

7 Conclusion

This article discussed the establishment and early work of the Macroeconomic Financial Stability section of the Bank, including an illustrative discussion about the challenges and issues surrounding the collection and analysis of New Zealand specific macroprudential indicators. Good progress has been made to date in identifying a core set of relevant macroprudential indicators, and work is continuing on extending data coverage, especially for the corporate sector. From next year, an annual Bulletin article will discuss in detail developments in New Zealand financial stability.

Some of the potential risks and vulnerabilities the New Zealand financial system faces were discussed. In particular, the potential risks that arise because of the high level of external indebtedness are a priority area for future research.

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