

Financial sector amplification and credit cycles in New Zealand

Rebecca Craigie and Anella Munro¹

This article explores some of the channels through which the financial system may amplify business cycles in New Zealand. Such amplification ('procyclicality') has been of interest for decades when considering financial booms and crises. There has been particular interest recently in understanding mechanisms through which the financial sector contributed to both the expansion of credit in 2003-07 and the subsequent pressure to reduce leverage during the financial crisis. This article focuses the discussion on New Zealand with emphasis on the credit boom of 2003-07 and the recent fall in credit growth, though the latter has been modest by international standards.

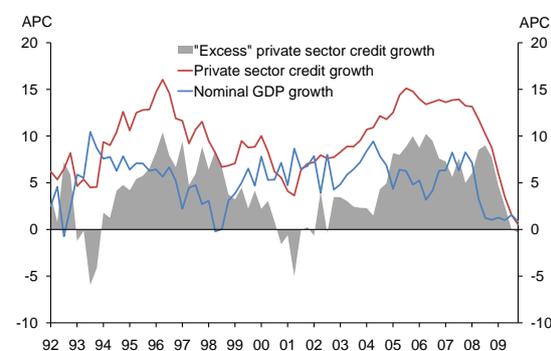
1 Introduction

The recent international financial crisis has illustrated a variety of mechanisms through which financial markets and institutions can amplify macroeconomic cycles, with potentially severe impacts on the real economy.² This article provides an overview of the main procyclical mechanisms being discussed in the international literature, sets them in a New Zealand context, and takes a preliminary look at the data.³ Here the term 'procyclicality' is used to mean amplification rather than moving with the cycle. In the same spirit, countercyclical policy refers to policies that dampen the cycle.

While New Zealand's financial system has not been as affected by the financial crisis compared with some countries, credit in New Zealand grew considerably faster than the economy during the boom of 2003-07 (figure 1).⁴ Rapid credit growth was subsequently followed by periods of weak nominal output growth (figure 1) and negative real growth. This article considers how the financial sector may contribute to credit booms and, in turn, business cycles in New Zealand.

Figure 1

Credit booms in New Zealand (1992Q1 - 2010Q1)



Source: RBNZ, Statistics New Zealand.

Note: Annual percent change. 1/Private sector credit growth minus nominal GDP growth.

In a world characterised by perfect information and efficient markets, financial structure would be irrelevant, and the financial sector would not affect real economic developments. The recent credit boom and financial crisis, however, belie such a frictionless world.

So how can the credit boom of 2003-07 be understood? One potential source of amplification is the interaction between bank lending and cyclical variation in the value of borrowers' collateral. During expansions, rising house prices increase households' net worth, increasing the value of collateral and households' ability to borrow. In turn, the expansion in credit feeds back into higher house prices and so on. Similarly, when New Zealand's agricultural commodity prices rise, farm incomes and land prices rise, increasing both debt service capacity and the collateral value of land. In turn, the expansion of farm credit may feed back into higher rural land prices and so on.

¹ This article has benefited from comments and advice from Richard Fabling, Nicolas Groshenny, David Hargreaves, Ian Harrison, Bernard Hodgetts, Kirdan Lees, John McDermott, Ian McIlraith, Adam Michalski, Christie Smith, Jeremy Richardson, Charles Rosa, Christie Smith and Grant Spencer.

² These mechanisms are not new. See Hunt (2009) for an historical perspective of banking crises in New Zealand.

³ Excellent background and review papers are Borio and Lowe (2002), Borio, Furfine and Lowe (2009) and CGFS (2009).

⁴ Credit continued to expand rapidly after the onset of the Asian crisis (mid-1997) and the international financial crisis (mid-2007) as credit lines were drawn down, delaying the subsequent fall in credit growth.

Cyclical variation in the financial condition of banks is another potential source of amplification. Since banks are highly leveraged institutions,⁵ fluctuations in banks' net worth can lead to large effects on lending. Cyclical variation in banks' cost of funding and loan demand, and the cyclical nature of loan losses, contribute to high profits during expansions and lower profits in downturns. Profits, in turn, feed into net worth and banks' capacity to lend. Pressures to grow balance sheets to generate a return on capital in good times or to reduce leverage in times of stress can further contribute to credit cycles.

A third potential source of financial sector amplification is cyclical variation in external funding markets. New Zealand relies on external funding markets to finance a large net external debt. There is considerable co-movement between New Zealand's credit cycles and those in other countries, suggesting that external factors matter. External funding flowed smoothly during the boom years. After the bankruptcy of Lehman Brothers in 2008, external funding markets became illiquid and funding costs rose sharply. For a given interest margin, higher funding costs imply lower lending volumes (lower demand for loans at the higher interest rate), higher loan losses (some borrowers are unable to service their debts at the higher rate) and, in turn, lower bank profits. In practice, interest margins tend to rise during downturns as lending appears more risky. This provides a buffer for bank profits, but amplifies the rise in borrowing costs for borrowers, with feedback effects to banks through loan losses.

Finally, some aspects of the regulatory framework may also be a source of amplification. The recent focus on macro-prudential policies to enhance the stability of the financial system as a whole has partly been an acknowledgement that micro-prudential regulation (focused on the stability of individual institutions) may have been more procyclical than expected. For example, regulatory limits on capital and loan-loss provisioning have probably been a source of amplification in downturns.

⁵ This means that banks' assets are financed in large part by debt and less by equity (net worth).

New Zealand's credit cycles may be viewed as a combination of these mechanisms that can reinforce each other. For example, a shock to the cost of funds in external markets might erode banks' profits and, in turn, the availability of credit to households. A reduction in the availability of credit may then have feedback effects through the impact of house prices on household net worth and the quality of bank capital.

While the financial system may be inherently procyclical, the degree of amplification could be small if the financial structure or a conservative approach to prudential regulation limits the scope for amplification. In terms of structure, New Zealand's financial banking sector is dominated by four traditional banks that hold relatively few assets subject to swings in market prices. These banks hold almost no currency risk and little interest rate risk.⁶ On the supervisory side, the Reserve Bank's approach to the implementation of the Basel II capital regime has been conservative, potentially dampening procyclical behaviour. Furthermore, securitisation activity is very limited due to conservative rules on securitisation. If the scope for financial sector amplification is small, then periods of rapid credit growth can be viewed as a reasonably efficient response to loan demand when funding is cheap and risks are low, with banks playing a fairly passive intermediation role.

An understanding of the mechanisms through which the financial sector may amplify business cycles is important for the Reserve Bank in fulfilling its monetary policy and financial stability roles.⁷ In the near term, such an understanding is important for assessing the potential dampening roles of proposed policy changes. More generally, such an understanding aids interpretation of macroeconomic fluctuations (and, in turn, inflationary pressure); assessment

⁶ The New Zealand banks have maturity mismatch since they borrow at short maturities to fund loans that have longer maturities. Hedging is used to almost eliminate currency risk associated with foreign currency borrowing and to largely reduce interest rate risk. The main risk associated with the maturity mismatch is refinancing risk. Because foreign currency borrowing is hedged, the required refinancing is for local currency funding. This means that the Reserve Bank can act as an effective lender of last resort.

⁷ See Hunter, Orr and White (2006) on a framework for promoting financial stability in New Zealand.

of risks; design of policies to increase the resilience of individual financial institutions; and the stability of the financial system as a whole. The interactions between these areas of responsibility are many and complex. Monetary policy has effects on asset prices and credit cycles; policies that aim to enhance financial stability can have important cyclical effects on the economy.⁸

The rest of the article is set out as follows. Section 2 briefly discusses the conceptual roots of financial sector amplification. Section 3 takes a more practical look at the main mechanisms through which the financial system is widely thought to amplify business cycles, set in the context of New Zealand's financial system and regulatory environment. These mechanisms involve the key role of leverage and balance sheet management, the price of risk and risk management, the trend to fair value accounting, approaches to loan-loss provisioning, and the cyclical variation in the supply of external funding. Section 4 provides a brief discussion of proposed changes to the domestic and international policy frameworks in the context of New Zealand. Section 5 concludes.

2 Theoretical underpinnings

In a perfect-information, efficient-markets world with costless bankruptcy and no taxes, households' and firms' capital structures would be irrelevant (Modigliani and Miller 1958, 1963). The risks associated with leverage and liquidity would be efficiently priced and reflected in share prices and bond spreads. Theoretical models of business cycle variation, however, depart from the perfect-information, efficient-markets paradigm to match the observed macroeconomic data.

The mechanisms of financial sector amplification of business cycles can be traced to two fundamental sources: limitations in risk measurement and distortions in incentives (FSB 2009). Observed measures of risk tend to be procyclical. In good times, projects look relatively safe, and the variance of asset prices and the co-movement among asset prices tend to be low. In economic downturns, projects look risky and variance and co-movement rise. Observable measures of risk tend to

be low during expansions and tolerance for risk tends to be high, even as vulnerabilities build up.⁹ As strains become apparent, risk tolerance falls rapidly. Risk-taking behaviour in good times may sow the seeds for future financial stress when the economy slows.

Distortions to incentives arise from a variety of principal-agent problems, due to information asymmetries. Information asymmetries between borrowers and banks (banks don't know whether loans will be repaid) lead banks to demand collateral. In turn, both the collateral value of borrowers' assets and borrowers' access to credit become sensitive to cyclical variations in asset prices. Information asymmetries between banks and their creditors (creditors do not know if banks will default on their debt) lead creditors to demand collateral, or require banks to hold enough capital to cover potential losses (value at risk). Both can lead to amplification as banks' cost of funding is affected by a range of cyclical factors that affect their profitability. Information asymmetries between bank shareholders and bank management (shareholders don't know if management is acting in shareholders' interests) lead shareholders to engage in frequent monitoring, setting observable, short-term targets for bank management that can, in turn, contribute to short horizons in measuring risk.

Some elements of regulatory frameworks may also contribute to procyclicality. Regulatory constraints aim to increase transparency, limit risk taking, and limit potential economic costs of insolvency and illiquidity. Some regulations, however, can contribute to procyclicality by embedding cyclical measures of risk in prudential standards, or by being easy to meet in boom times, but binding in times of stress.

⁸ See the article by Grant Spencer in this *Bulletin*.

⁹ While variation in risk tolerance (or risk aversion) is widely accepted in the finance literature, risk preferences are typically viewed as stable (not time-varying) in the micro-economic literature.

3 Amplification mechanisms in practice

In this section, several potential amplification mechanisms that have been widely discussed in the aftermath of the international financial crisis are discussed in the context of New Zealand. Each potential amplification mechanism arises from deficiency in risk measurement or distortions to incentives, or a combination of the two. Mechanisms involve leverage, risk measurement and risk management practices, market-sensitive accounting valuation, provisioning rules, and cyclical variation in the supply of external funding. These mechanisms can, of course, interact in reinforcing ways, amplifying shocks to balance sheets, but the scope for amplification is moderated by regulatory limits designed to dampen credit cycles and limit risk taking. Regulatory responses currently in place are discussed in each subsection, and proposed changes are noted in section 4.

An important point is that many of the mechanisms may be highly nonlinear and asymmetric. While the build-up of risk during the boom phase of credit cycles may be relatively smooth, the contraction phase can be sharp when systemic interaction among institutions comes into play and risk is repriced more frequently. Modelling such mechanisms is complex, but an explosion in research post-crisis is increasingly providing the required tools. While bank interconnectedness is not the topic of this article, the interactions between the time dimension (our focus here) and the cross-sectional dimension of financial stability (interaction among financial institutions) are important, especially during times of stress.

Leverage and capital

The role of leverage

Leverage measures the degree to which assets are funded by debt rather than equity. Leverage can lead to amplification either through borrowers' balance sheets because banks require collateral, or through banks' balance sheets because of limits on capital imposed by regulators or markets. Both arise because of creditors' inability to monitor borrowers. A large macroeconomic literature focuses on 'financial accelerator' amplification mechanisms, whereby household

or business borrowers' access to credit or cost of borrowing is limited by aspects of their financial condition, such as cash flows or the cyclical collateral value of their assets.^{10,11} In the aftermath of the financial crisis, a fast-growing literature has focused on the role of bank balance sheets and cash flows in the supply of credit.¹² The potential for amplification is considerably higher for a bank because leverage (the ratio of assets to capital) is much higher. In New Zealand, banks' gross leverage averages about 12, while households' average leverage is about one and a quarter. The latter includes some households with no debt, and some with much higher leverage whose credit is more likely to be limited by collateral value.¹³

To understand the potential amplification role of leverage, it is useful to think about a simple balance sheet. A stylised household balance sheet might look like the following:

Assets	Liabilities
House = 100	Debt = 20
	Equity = 80
Total Assets = 100 = Total Liabilities	

If house prices increase by 1 unit to 101, then, with debt unchanged, the household's equity increases to 81. Leverage falls from 1.25 (=100/80) to 1.247 (=101/81). The household might be passive in the face of higher asset values (not actively manage balance sheet leverage). In this case, leverage would be expected to fall as assets increase. Alternatively, the household might actively manage balance sheet leverage by borrowing an additional 0.25 units

¹⁰ For examples, see Aoki *et al.* (2004), Bernanke *et al.* (1999), Kiyotaki and Moore (1997), Calstrom and Fuerst (2001), and Iacoviello (2005).

¹¹ In the Reserve Bank's main model (KITT, <http://www.rbnz.govt.nz/research/kitt/index.html>), there is a role for collateral. A rise in the ratio of external debt to housing value increases the premium over the policy rate that banks charge borrowers. Conversely, an increase in house prices reduces the premium, lowering the interest rates facing the household and thus fuelling consumption.

¹² For example, see Adrian and Shin (2009), Gerali *et al.* (2009), Goodfriend and McCallum (2007), and Van den Heuvel (2009).

¹³ See the Reserve Bank of New Zealand Survey on Household Assets and Liabilities.

against the increase in equity (to modernise the kitchen, for example), increasing leverage back to 1.25 (=101.25/81). This increase in leverage, in turn, is likely to support greater demand for housing and further increases in house prices.

For a farm, there may be more scope for amplification. In a stylised farm balance sheet, with land assets and debt and equity liabilities, a similar amplification process arises in response to variations in commodity prices. For a farm, however, the amplification process is potentially stronger because agricultural commodity prices affect both land (collateral) values and farm incomes. While households are employed in many sectors, farm incomes tend to move together with commodity prices, so debt service capacity is more correlated among farms. Therefore, feedback effects between access to credit, land collateral values and debt service capacity may be stronger. Farm lending accounts for about 15 percent of bank lending in New Zealand compared to about 50 percent for housing. When adjusted for risk, housing and farm loans account for similar proportions of banks' risk weighted balance sheet.¹⁴

Now consider a stylised bank balance sheet:

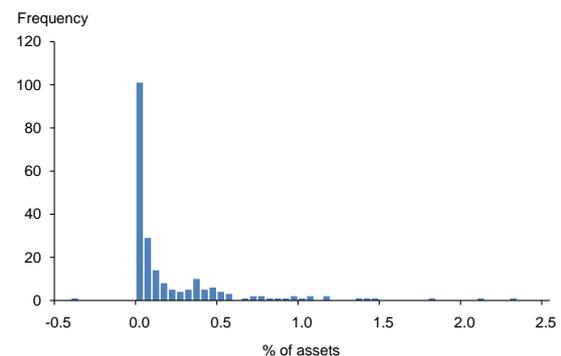
Assets	Liabilities
Loans = 100	Bonds & deposits = 92
	Equity (capital) = 8
Total Assets = 100 = Total Liabilities	

For a bank, the scope for amplification is larger still because of much higher leverage. Suppose the bank's assets fall by 1 percent (for example, because of loan losses). The fall in the value of assets reduces capital to 7. Assuming that the value of the bank's debt (deposits and bonds) is unchanged, leverage increases from 12.5 (= 100/8) to 14.1 (= 99/7). To restore leverage to 12.5 (to satisfy a capital adequacy requirement, or avoid rising funding costs), the bank needs to either sell assets and pay back loans, or raise new capital. Raising capital can be difficult, so capital may be fixed in the short term, particularly during a crisis. Pressure to reduce

leverage to the original 12.5 would force the bank to reduce lending by 11.5 units and repay 11.5 units of bonds or other liabilities, resulting in a total 12.5 percent balance sheet contraction. The degree of potential balance sheet expansion from an initial 1 percent change in assets is directly related to leverage. While this 'constant leverage' model is simplistic (it ignores factors such as demand for loans, the supply of funding and risk weighting of assets), it provides a tractable modelling set-up that captures the considerable potential for amplification through banks' balance sheets.

For leverage to play the amplifying role described above, there needs to be an imperfect market for bank capital and bank balance sheets need to be affected by cyclical factors. In principle, banks could respond to pressure to reduce leverage by raising new capital. In practice, capital is usually more expensive than debt and considerably more expensive in times of stress, when there is a high degree of uncertainty about banks' exposures.¹⁵ New Zealand's four major banks are unlisted subsidiaries of Australian banks. The subsidiaries transfer profits to the parents, but parents rarely transfer funds to the subsidiaries (figure 2), due to high profitability of the subsidiaries and tax disincentives. New Zealand

Figure 2
Distribution of profits to Australian parent banks (1996Q1–2009Q4)



Source: Bank general disclosure statements.

Note: A negative value is a capital injection from the Australian parent to the New Zealand subsidiary.

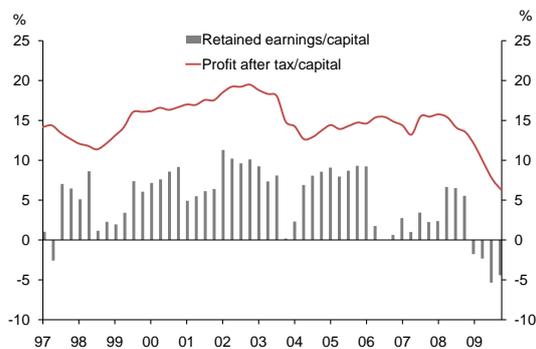
¹⁴ See Hoskin and Irvine (2009).

¹⁵ A variety of proposals have been put forward to address the high cost of bank capital in times of stress. These include issuance of interest-bearing debt that could be transformed into capital under certain circumstances (contingent convertible bonds), collateralised insurance policies, and to address systemic issues, living wills for large financial institutions and forming subsidiaries across borders.

subsidiary banks' ability to raise new capital in a crisis would depend on the financial position of the parents, which is likely to be subject to similar stress.

Banks' balance sheets and profitability are affected by a variety of cyclical factors. For a traditional bank with assets mainly in the form of loans (rather than tradable securities), there is not a lot of scope for assets to increase in value (loans pay an agreed rate of interest). In the expansionary phase of business cycles, bank balance sheet expansion is more likely to be driven by rising profitability or banks' responses to reductions in perceived risk. Rising loan demand supports balance sheet expansion, which feeds into higher profits (for a given interest margin). As shown in figure 3, banks' profits were strong through the 2003–07 expansion. Higher profits, in turn, feed into retained earnings and capital, enabling banks to further expand credit. When monetary policy tightens, rising funding costs moderate the expansion process. However, rising policy rates have tended to be offset somewhat by benign supply conditions in external funding markets.

Figure 3
New Zealand major bank profitability (1997Q1–2009Q4)



Source: Bank general disclosure statements.

Note: Profit and retained earnings are four quarter running totals divided by average capital assets over the period. 'Profits after tax' does not account for extraordinary items. Notably, this excludes extraordinary items in 2009 related to provisions for, and payment of, a one-off tax settlement unrelated to the financial crisis. 'Retained earnings' are profit after tax and extraordinary items net of transfers to the Australian parent banks. The negative retained earnings in 2009 reflect a combination of weaker profitability, one-off tax payments (not included here in profits) and the funds transferred to parent banks.

During expansions, rising house and farm prices make banks' existing loan portfolios look safer, as collateral values rise. At the same time, rising incomes and low unemployment strengthen borrowers' debt service capacity. As a result, existing loans appear both less likely to default (borrowers have growing equity stakes and strengthening debt service capacity) and losses are expected to be smaller when defaults occur. Falling perceived credit risk may encourage banks to take on riskier loans, allowing further expansion in credit.

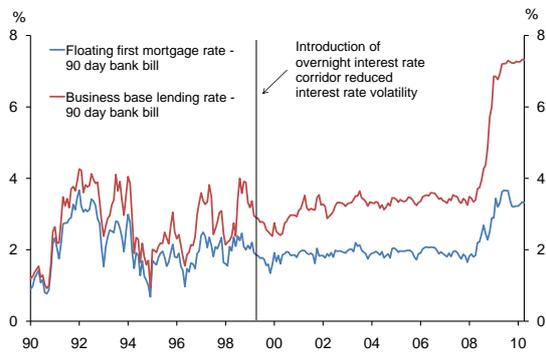
In downturns, similar effects may happen in reverse and can be reinforced by the direct effect of loan losses on the value of bank assets and, in turn, profits as provisions for loan losses are made. In expansions, the growing net worth of borrowers does not directly affect bank assets (which are loans at an agreed interest rate), but in downturns, rising loan losses can lead directly to falls in the value of bank assets.¹⁶ Loan losses may, in turn, have large effects on bank lending through leverage, as described above. The effect on bank profits will depend on both the rate of loan losses and the approach to building up a buffer to absorb loan losses through provisioning or capital (see section on provisioning below).

Falling loan demand further erodes bank profits, reducing the ability of the bank to build capital through retained earnings. Lower loan volumes imply lower profits for a given interest margin. While monetary policy interest rates are reduced in downturns, they are typically offset by rising risk premia in funding markets. Marginal bank funding costs have increased by about 150 basis points relative to the official cash rate (see May 2010 *Financial Stability Report* for a detailed account) and considerably more for longer-term funding (see discussion on funding liquidity and external funding markets that follows on pages 28-29). Moreover, bank lending margins (as proxied by the spreads to 90-day rates in figure 4) may rise in response to greater risk, further reducing the cushioning impact of cuts in policy interest rates on loan demand.¹⁷

¹⁶ In New Zealand, household borrowers cannot walk away from a negative equity position (as is the case in some US states). The scope for legal recourse reduces the riskiness of household lending.

¹⁷ From July 2008 to May 2009, the official cash rate was cut by 5.75 percent. While lending margins rose, borrowing costs have not risen.

Figure 4
New Zealand bank lending margins (Jan 1990–Apr 2010)



Source: RBNZ.

Note: Floating first mortgage rate is an average of rates for new customers. Business base lending rate is the base rate on new overdraft loans for small-to-medium size non-farm enterprises. These rates on new loans overstate the change in average interest margins as they account for a small part of total loans and bank funding costs have increased relative to the 90-day bank bill.

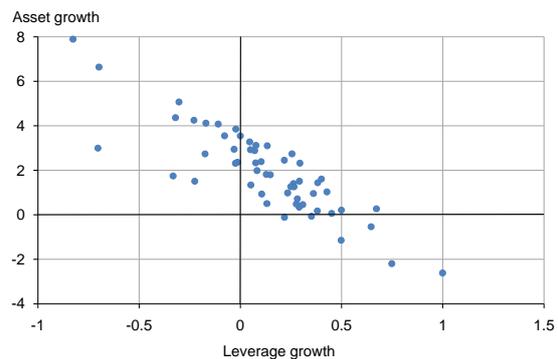
Balance sheet management

The amplification described above relies on leverage being restored to a constant level. Does this “constant leverage” model hold in practice? Adrian and Shin (2009) ask whether balance sheets adjust passively in response to changes in leverage, or whether leverage is actively managed by US households, non-financial firms, commercial banks and (the former) investment banks (also called broker dealers). More specifically, they examine the variation in leverage as balance sheets expand and contract.

Adrian and Shin find that aggregate US household leverage falls as assets increase, suggesting that at least some households do not increase leverage back to the original level when house prices rise. For US non-financial firms, they find no relationship between changes in leverage and changes in assets. For US commercial banks, they find little change in leverage, consistent with constant leverage. For the former US investment banks, they find that leverage increased as assets increased, which they call ‘procyclical leverage’. Given that constant leverage is procyclical (it is amplifying), ‘procyclical leverage’ here means even more amplifying.

What about New Zealand households and banks? Figures 5 and 6 show the relationships between asset growth and leverage growth for New Zealand households and financial institutions respectively.¹⁸ The graph for households is similar to Adrian and Shin’s graph of US households (as assets increase, leverage falls). However, the changes in leverage are small (as in the US data), suggesting behaviour close to constant leverage. Moreover, if we account for a time lag in the response (it takes time to plan a new kitchen when access to credit increases), then the relationship moves a bit closer to a constant leverage model. To what extent this reflects active balance sheet management by households, or passive behaviour by existing borrowers and extension of credit by banks to new borrowers, is an interesting but unresolved microeconomic question.

Figure 5
Asset growth and leverage growth: New Zealand households (1996Q1–2009Q4)



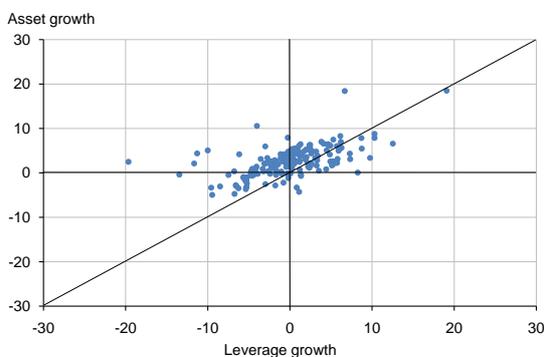
Source: RBNZ Survey of Household Assets and Liabilities.
 Note: Gross assets and gross leverage. Percent per quarter.

For New Zealand financial institutions, leverage increases as assets increase (figure 6). This pattern is similar to that of the US investment banks examined by Adrian and Shin, and holds for the four large banks, the smaller banks, and for non-bank financial institutions. As credit (that is, the assets of financial institutions) has expanded, financial institutions have become more leveraged. The mechanism behind this relationship, however, is likely to be rather different from that described in Adrian and Shin. Adrian and Shin

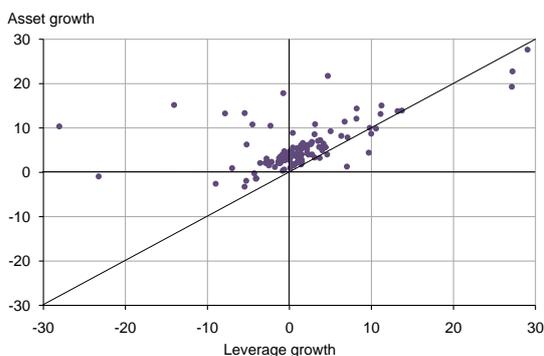
¹⁸ While Adrian and Shin use flow of funds data, we use data from the Reserve Bank Survey of Household Assets and Liabilities and financial institutions’ balance sheets. Flow of funds data is not available for New Zealand.

Figure 6
Asset growth and leverage growth: New Zealand financial institutions (1996Q1–2009Q4)

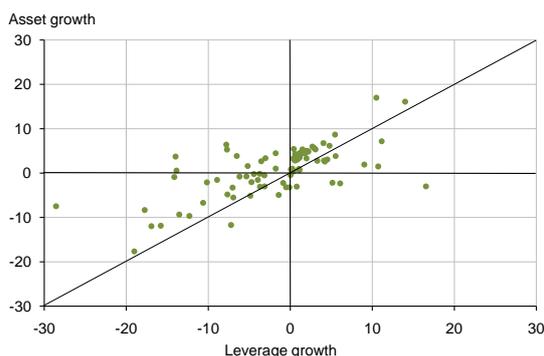
(a) Four large banks



(b) Other banks



(c) Non-bank financial institutions



Source: General disclosure statements for banks; standard statistical returns for non-banks.

Note: Gross assets and gross leverage. Percent per quarter (a) ANZ National Bank, ASB Bank, Bank of New Zealand, Westpac New Zealand. Growth is defined as the percentage change from one quarter to the next.

emphasise the role of mark-to-market trading securities on the asset side and very short-term (repo) borrowing by the former investment banks. Only a small share of New Zealand banks' assets are traded securities, and very short-term repo borrowing accounts for a much smaller share of their liabilities. It should also be noted that the level of leverage (and hence potential amplifying power and the absolute changes in the level of leverage) of New Zealand banks is considerably lower than the leverage in the former US investment banks.

If the banks were constrained period to period by a capital adequacy constraint, we would expect to see a vertical line (constant leverage). In practice, New Zealand banks hold capital well above the minimum Basel requirements.¹⁹ Thus, relatively high capitalisation helps to explain the departure from a constant leverage relationship (vertical line).

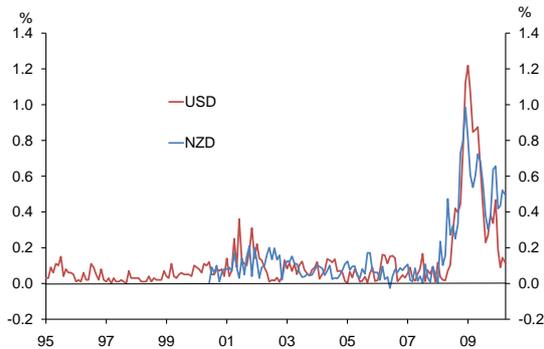
An understanding of the positive relationship between asset growth and leverage growth requires further investigation. There are several possible explanations. For some banks, an initial capitalisation and subsequent expansion in lending has meant that leverage has increased as assets have increased. Thus the relationship may reflect a trend rather than cyclical variation. Another explanation is the interaction of leverage with the price of risk (see next section), where banks target a given 'Value-at-Risk' (VaR) to achieve a given credit rating (as in Adrian and Shin).²⁰ Other potential drivers of the positive relationship include competitive pressures to generate a return on equity or increase market share in expansions,²¹ and pressures to preserve capital and liquidity in downturns. Finally, there are measurement issues related to capital and therefore leverage. Since New Zealand's major banks are not listed, variations in capital depend on internal decisions within the banking group and are characterised by accumulation of retained earnings in the subsidiary followed by occasional transfers of profits to parent banks.

¹⁹ The Reserve Bank imposed a 6 percent tier one ratio for banks covered by the wholesale guarantee from October 2008 to April 2010. In practice, capital ratios have been well above that level.

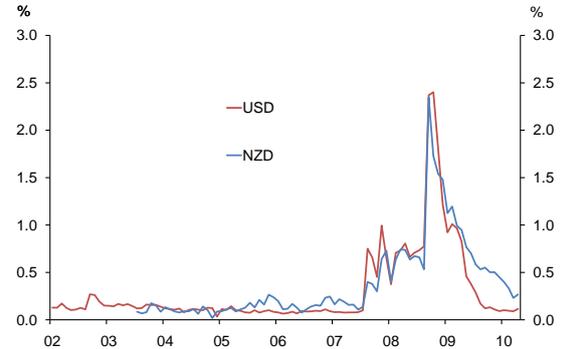
²⁰ VaR is an estimate of the maximum loss for a given portfolio, probability and time horizon in normal market conditions. For example, if a portfolio has a 1-week 1 percent VaR of \$1 million, there is a 1 percent probability that the portfolio will fall in value by more than \$1 million over a one-week period.

Figure 7
Common measures of risk

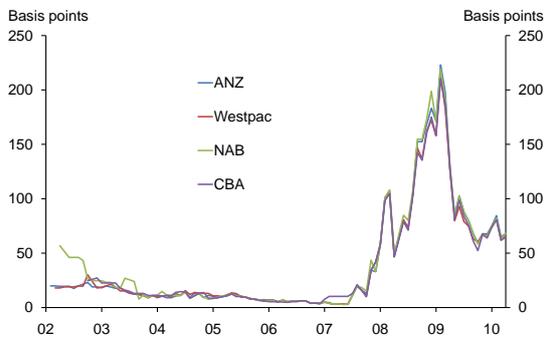
(a) AA-AAA bond spreads



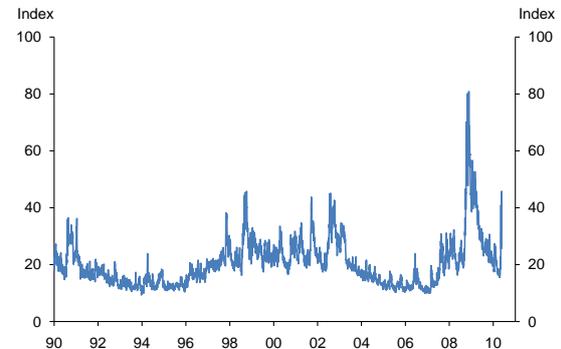
(b) 90-day Libor-OIS spreads



(c) Australian major banks: CDS spreads



(d) Implied US stock market volatility (VIX)



Source: Bloomberg.

Note: (a) 5-year. Based on industrial curve for the USD, Euro (offshore) curve for NZD. Jan 1995–Apr 2010. (b) Jan 2002–Apr 2010. (c) 1-year, Feb 2002–Apr 2010. (d) 1 Jan 1990–24 May 2010.

Risk measurement and risk management

Limitations in risk measurement are widely recognised as a potential source of financial sector amplification. Observable measures of risk tend to be low during expansions and tolerance for risk tends to be high, even as vulnerabilities build up. As strains become apparent, however, risk aversion can rise rapidly among both borrowers and creditors. As a result, risk-taking behaviour in good times may sow the seeds of future financial stress as the economy slows.

Figure 7 shows some common measures of risk. Panel (a) shows the spread between the yields on five-year bonds issued by AA-rated borrowers and those issued by AAA-rated borrowers. The panel shows the spread for bonds issued in both New Zealand dollars and US dollars. The spread includes the difference in credit risk (reflecting probability

of default and loss given default) as well as other risks such as market liquidity risk. During the credit boom of 2003 to 2007, the risk premium for the lower rated borrower was compressed. As the financial crisis developed, premiums for lower rated issuers of both NZD and USD bonds rose sharply. The co-movement between the two spreads was low during the boom period, and then rose during the crisis.

Panel (b) shows the cost of 90-day uncollateralised borrowing among internationally active banks (Libor) relative to the near risk-free overnight indexed swap (OIS) rate, for both NZD and USD instruments. The Libor-OIS spread provides a measure of credit risk and liquidity pressures in money markets. Again, spreads are compressed during the boom, and rise during the crisis. Panel (c) shows credit default swap spreads (CDS) for the four major Australian banks, providing a measure of credit default risk, similar to the cost of insuring against default. Again, spreads are compressed during the

²¹ For example, see Mandelman (2006).

boom, and rise together during the crisis. Finally, panel (d) shows the VIX index which is a forward-looking measure of US stock market volatility derived from options prices. VIX is often used as a proxy for risk aversion.

Several factors contribute to cyclical variation in the price of risk. First, observable indicators and estimates of risk such as probability of default and loss given default tend to fall as asset prices rise in expansions. For example, as house prices rise, household equity rises (leverage falls), reducing the borrower's probability of default. Moreover, if the household does default, then the higher market value of the house translates into a higher recovery rate for the bank, and conversely a lower loss given default. Rising employment during a boom supports debt service capacity, further reducing the expected probability of default. In New Zealand, the Reserve Bank has emphasized a through-the-cycle (medium-term) approach in its prudential supervision of banks under both the Basel I and Basel II capital adequacy frameworks. In the shift to Basel II in 2008, the major banks' risk models reduced risk weights on mortgages to well below the Basel I level of 50 percent. In response, the Reserve Bank imposed an additional capital requirement of 15 percent of risk weighted residential mortgages, and minimum capital requirement of 90 percent of the Basel I level. Risk models are required to use through-the-cycle estimates of probability of default, and minimum estimates of loss given default on mortgages of 10 to 40 percent compared to the 10 percent minimum set out in Basel II.²²

A second factor is myopic measurement of risk. Variation in indicators of risk over the cycle need not generate amplification if risk is priced through the cycle. Inability to forecast conditions at longer horizons, a lack of price history or short-term incentives interact with cyclical variation in observed indicators of risk to give cyclical variation in the price of risk (see CGFS (2009) for a detailed discussion).

Third, risk models for new financial instruments may not adequately capture risk. Prior to the recent crisis, markets clearly did not correctly assess the risks inherent in some asset-backed securities. Some new financial instruments increase the accuracy of risk measurement. For example,

credit default swaps are useful indicators of the price of credit risk; overnight index swaps provide a good measure of the risk-free rate. Indeed, these swaps are now commonly employed in measuring risk (figure 7). However, they have been widely quoted for less than a decade. A considerable period of data may be required to identify cyclical variation. Deficiencies in risk measurement have long been recognised by banks' shareholders and prudential supervisors. These deficiencies have been addressed through limits on risk taking (such as limits on currency mismatches and loan-to-value ratios) and risk-modelling practices.

Finally, cyclical variation in the price of risk reflects not only risk fundamentals such as the probability of default, but also cyclical variation in risk tolerance (or risk aversion). Kim *et al* (2009) find that market estimates of the probability of default and loss given default account for only a small part of the variation in spreads on CDS contracts (the cost of insuring against credit risk) in Asia-Pacific names. They interpret this as evidence that time variation in risk tolerance may be large. This is consistent with the cyclical variation in the VIX index (figure 7) which is often used as a proxy for risk aversion.

Looking forward, estimates of risk are likely to have improved over the crisis period as extreme events are now better captured by the data. Should we experience another period of relative stability, however, average measures of volatility and risk spreads will slowly decline, as will the estimated probability of extreme events. Moreover, problems of model risk will likely re-emerge as new instruments, for which we have no historical experience, are introduced.

The price of risk feeds into financial prices and flows, but its cyclical effect depends critically on the approach to risk management. To avoid cyclical amplification, risk management would need to account for risk over the medium term. The supervisory approach in New Zealand has emphasised through-the-cycle measurement of risk.

Some aspects of risk management can lead to the sort of 'procyclical leverage' discussed above. For example, Adrian and Shin (2009) show how a bank targeting a given level of VaR over a typically short horizon will exhibit procyclical leverage if asset values vary with credit supply. While VaR

²² See Hoskin and Irvine (2009).

is commonly used to manage market risk, market risk accounts for only about 5 percent of New Zealand banks' risk exposure.²³

New Zealand banks' main risk exposure is credit risk associated with large loan portfolios. Perceptions of credit risk on existing loan portfolios may vary over the cycle as collateral values and borrowers' debt service capacity rise in expansions and fall in downturns. Falling perceived credit risk during expansions may encourage banks to take on riskier borrowers, to offer larger loans relative to collateral value,²⁴ and to reduce interest margins in response to competitive pressures, reinforcing the expansion in credit supply. Conversely, in downturns banks naturally reassess lending risks, shun more risky lending practices and seek to hold larger buffers, reducing credit supply. At the same time, borrowers reassess the risks of borrowing, and seek to hold less debt, reducing credit demand.

Another aspect of risk management that can lead to strong cyclical effects is 'trigger clauses' embedded in financial contracts designed to protect creditors when conditions deteriorate beyond a pre-set threshold (see CGFS (2009)). Examples are collateral or margin requirements that depend on credit ratings. New Zealand banks both post and demand collateral in their funding, lending and market operations. These could become material in extreme conditions, as was the case in the event of rating downgrades for some foreign financial institutions in the recent crisis.²⁵

Accounting frameworks

Some aspects of accounting frameworks can increase the sensitivity of financial institutions' incomes and balance sheets to cyclical developments. Accounting standards aim to overcome information asymmetries by improving the quality of information about firms' financial positions, serving the interests of many parties, including shareholders, creditors, and tax authorities. The same aspects of the accounting framework that enhance accuracy and transparency, however, can increase sensitivity to cyclical developments and lead to amplification of business cycles. Two aspects of the accounting framework that are being widely discussed are the trend toward fair value accounting and the incurred-loss model of provisioning.

Fair value accounting

Traditional historical cost (amortised cost) accounting provides relatively stable values for assets and liabilities held to maturity, but is criticised for its inaccuracy in the face of changing market conditions. To better reflect changing valuations, accounting standards have trended toward greater use of fair value accounting (CGFS 2009). The increased accuracy and transparency, however, goes hand in hand with more volatility in assets and liabilities, which can interact with leverage to amplify shocks in asset values.

An extreme version of such amplification was seen in the recent crisis when falling asset prices were immediately reflected on the balance sheets of investment banks through mark-to-market valuation of large portfolios of traded securities. The fall in asset values eroded equity and increased leverage, forcing asset sales to reduce leverage, further depressing asset prices and reinforcing market and funding liquidity stresses.²⁶ During the crisis, international accounting standards were eased to allow some assets to be shifted to historical cost (the value if held to maturity) to ease liquidity pressures and avoid under-valuation of assets in illiquid markets.

²³ See Hoskin and Irvine (2009).

²⁴ In New Zealand, about 20 percent of new loans have loan-to-value ratios above 80 percent, and loan-to-value ratios do not exceed 100 percent.

²⁵ A contract that emerged in recent years and may indirectly affect the New Zealand banking system is 'power-reverse dual currency notes'. These notes help investors to manage their NZD currency risk by automatically selling NZD when the foreign currency return on NZD assets falls below a threshold. Such sales, however, put further pressure on the NZD, triggering more clauses and so on. Moreover, as noted by CGFS (2009), the presence of a trigger can facilitate more debt financing because the trigger makes the (NZD) debt appear less risky, further supporting credit expansion in good times. Such clauses may amplify exchange rate volatility and, in turn, the price of NZD risk, but are thought to apply to only a small part of the market.

²⁶ See BIS (2009) for a detailed account of the recent crisis, and Brunnermeier and Pedersen (2009) for a recent model.

Table 3

Major banks' aggregate balance sheet

Assets	% of total	of which at fair value	Liabilities	% of total	of which at fair value
Liquid assets	2%	0%			
Due from other financial institutions	2%	61%	Due to other financial institutions	4%	22%
Trading securities	6%	100%	Deposits and other borrowings	60%	19%
Derivative financial institutions	8%	100%	Derivative financial instruments	9%	100%
Available for sale assets	1%	100%	Bonds and notes	11%	21%
Net loans and advances	77%	8%	Other liabilities	9%	1%
Other assets	4%	7%	Equity	6%	0%
TOTAL	100%	22%	TOTAL	100%	24%

Source: General disclosure statements, September and December 2009. Three of the four major banks report full disclosure statements in the September quarter and one bank reports in the December quarter. For that bank, the fair value share is estimated from the December 2009 disclosure statement.

For traditional banks that invest in long-term loans that are held to maturity, the effect of changes in asset prices on balance sheets may be small. The asset portfolios of New Zealand banks are dominated by mortgages and other long term loans, with mark-to-market traded securities averaging only about 6 percent of assets (see table 3).²⁷ As a result, there is considerably less scope for the type of interaction with market prices experienced by US investment banks during the recent crisis.

However, the widespread use of derivatives to hedge exposures has increased the share of assets and liabilities that are reported at fair value. Under the International Financial Reporting Standards (IFRS), financial instruments held at fair value are those that either enter fair value through profit or loss (including traded securities and derivatives) or are available for sale. Derivative financial instruments are marked-to-market with movements recorded in the income statement. Variations in the values of derivatives used as hedges and the underlying instruments are designed to be offsetting in an economic sense. If, however, derivatives are reported at fair value, but the underlying instruments are reported at historical cost, then variations in their recorded values will not be offsetting, leading to volatility in reported income.

²⁷ Securitisation of mortgages has not been common in New Zealand. However, the major banks have sold securitised mortgages to their Australian parents (or related entities) and, since October 2008, have used securitised mortgages as collateral in Reserve Bank liquidity operations.

New Zealand banks use derivatives to hedge the currency and interest risk associated with foreign currency funding, and to hedge the credit risk associated with lending operations, particularly business lending. Derivatives average 8 percent of major New Zealand banks' assets and nine percent of liabilities (table 3). To avoid income volatility associated with reporting derivatives at fair value, banks have two options: report the underlying instruments at fair value or use hedge accounting. Some of the underlying funding instruments and loans are reported at fair value, as shown in Table 3. Across the four banks, the shares vary depending on the composition of loan portfolios (derivatives are widely used to hedge credit risk on business loans) and on the use of hedge accounting. Overall, the four major banks' share of assets reported at fair value averaged 22 percent of assets in September 2009, and the share of liabilities reported at fair value averaged 24 percent. These figures are in about the middle of the range reported by CGFS (2009) for advanced economies.

Hedge accounting provides an alternative approach to avoid income volatility by matching the mark-to-market movement in the derivative to the underlying instrument in the profit and loss statement. Hedge accounting, however, requires heavy documentation and implementation requirements (CGFS 2009). For example, the requirement that derivatives be entered into with an external party to qualify for hedge accounting can be expensive compared to managing risk (for example, interest rate risk) internally. Some of the banks

report in the general disclosure statements that hedge accounting is used but it is reported to apply to only a small share of their assets and liabilities. The small shares are associated either with substantial use of fair value reporting for underlying instruments or with centralisation of wholesale operations in parent banks. Such centralisation allows the group to internalise the costs of booking derivatives with external parties.

Overall, fair value accounting has probably not been a major source of procyclicality for New Zealand banks. On average, a small share of assets and liabilities are marked directly to market prices. Most of the assets and liabilities that are reported at fair value are the result of hedging operations that contribute to stability in the banks' economic value. Finally, healthy capital buffers mean that variations in balance sheet values and incomes have not compromised capital adequacy.

Provisioning

The accounting approach to loan-loss provisioning is a widely discussed source of procyclicality. Interest rates charged on loans include a premium to account for expected loan losses. Under IFRS, the full contractual interest is treated as revenue until there is objective evidence that the loan has become impaired.²⁸ This 'incurred loss' model then leads to a drop in income once provisions are eventually made. Incurred loss provisioning tends to be low during booms (when loan losses are low) and high during downturns (when loan losses increase). Since provisions are written against profits, low provisioning during good times supports profits and retained earnings, reducing leverage and supporting credit expansion. Conversely, a high rate of provisioning during downturns erodes profits and capital at a time when bank balance sheets may already be stressed, reducing banks' capacity to lend. While the incurred loss model increases transparency and reduces the opportunity for profit manipulation,²⁹ it may amplify balance sheet expansion during booms and balance sheet contraction during downturns.

²⁸ See IASB Exposure draft "Financial instruments: amortised cost and impairment", November 2009.

An alternative approach to provisioning is an 'expected loss' model, where provisioning is done according to expected future losses. The expected loss model implies higher rates of provisioning during expansions, when loan losses are low, providing a buffer during downturns when loan impairment rates are expected to be higher.

Before 2005, New Zealand banks followed an expected loss model. As shown in figure 8, total provisions as a percentage of lending for the four major banks followed a predominantly downward trend between March 1996 and March 2003, rising only briefly in response to the Asian Crisis in 1997. In June and December 2003, steep increases were driven by transfers of collective provisions from overseas parents.³⁰

By July 2007, New Zealand banks were required to report according to the New Zealand equivalents to IFRS, including the incurred loss model of provisioning. The four major banks adopted NZ IFRS in 2005,³¹ after which provisions were adjusted downward (figure 8).³² With hindsight, the timing of this shift to incurred loss provisioning was unfortunate, given the ensuing global financial crisis.³³ As the crisis developed, provisions increased in response to increasing levels of impaired assets, eroding profitability at a time of heightened perception of risk in funding markets. By international crisis standards, however, non-performing loans are still modest at below 2 percent of lending.³⁴

²⁹ There is no tax incentive to provision in New Zealand (provisions are taxed and a tax credit is used when the provision is written against losses).

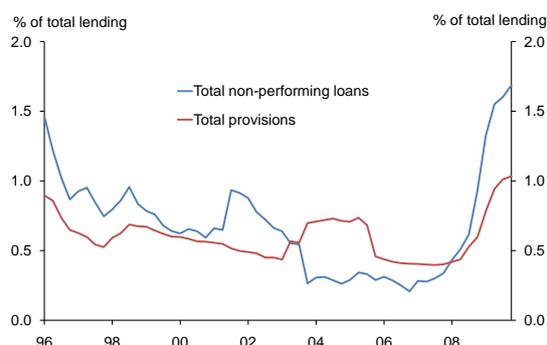
³⁰ In June 2003, Westpac NZ Banking Group received \$177.6m in general provisions from its Australian parent. In December 2003, ANZ acquired National Bank and received \$247m in general provisions from Lloyds Bank.

³¹ The early adoption by the major banks coincided with adoption of IFRS by their Australian parents (see the November 2006 *Financial Stability Report*).

³² These adjustments mainly affected general provisions, and were between 27 and 49 percent of the individual banks' general provisions prior to the shift to NZ IFRS (data taken from banks' general disclosure statements for the affected quarter). The balance of the earlier provisions was shifted into Tier 1 capital (*FSR* November 2006).

³³ See Saurina (2009) for a discussion of the dynamic provisioning approach to credit losses adopted by Spanish banks in 2000. This allowed the build-up of loan-loss buffers during the credit boom. While revised in 2004 to be consistent with IFRS, the statistical regulatory buffer mitigated the effect of the shift to an incurred loss model under IFRS.

Figure 8
Major banks' loan-loss provisioning (1996Q1–2009Q4)



Source: General disclosure statements.

Note: Total provisions as a percentage of total lending. Non-performing loans include impaired assets and other assets that are 90 days past due, but not classified as impaired. 'Non-performing loans' contain the entire value of loans, whereas provisions are made only against the proportion of loans not expected to be recovered.

Building capacity to absorb loan losses can be achieved through capital buffers as well as through interest margins and loan-loss provisioning. Such capital buffers are included in the Internal Ratings Based (IRB)³⁵ approach to the Basel II capital adequacy framework. The IRB approach recognises a variety of cyclical factors that affect loan losses. For example, rapid growth in lending can be followed by growth in loan losses several years later due to "seasoning effects" (bad loans become apparent with a lag, after the loan has been drawn down and subsequent ability to repay shown to be inadequate). If expected losses under the Basel II approach are greater than incurred loss provisions under NZ IFRS, the difference must be deducted from regulatory capital (leading banks to increase gross capital to meet a given regulatory capital adequacy standard).

The Reserve Bank required New Zealand banks to implement the Basel II capital adequacy framework from the first quarter of 2008, and the four major banks adopted the IRB approach. The major banks are required to take cyclical factors into account in their risk models and adjust regulatory capital accordingly. Therefore, the major banks

are now, in principle, building buffers for expected loan losses rather than only incurred loan losses. How this affects the scope for amplification from cyclical loan losses remains to be seen. If expected losses merely lead incurred losses by a few quarters, then there may be little scope for reducing amplification. If, during expansions, risk models effectively anticipate rising loan losses through downturns, however, the scope for cyclical loan losses to amplify the credit cycle should be reduced.

Funding liquidity and external funding markets

Cyclical variation in the liquidity of funding markets can have large cyclical effects on the condition of financial institutions with maturity mismatch.³⁶ Funding is relatively easy to raise in good times but funding may be expensive or unavailable in times of stress. A sharp rise in the cost of funding, or, in the extreme case, closure of funding markets, can rapidly erode the financial condition of a bank with maturity mismatch. If the bank carries the interest rate risk (higher funding costs are not automatically passed on to borrowers), the higher interest costs may sharply erode profits and, in turn, equity. If the bank passes on higher funding costs to its customers, subsequent pressure on borrowers' financial conditions feed back into deteriorating asset quality for the bank, in turn eroding equity. So funding liquidity strains can rapidly erode equity, increase leverage and ultimately lead to solvency problems.

The refinancing risk associated with New Zealand banks' funding grew in the decade before the international financial crisis.³⁷ The share of funding from relatively stable retail deposits gradually declined and was replaced by

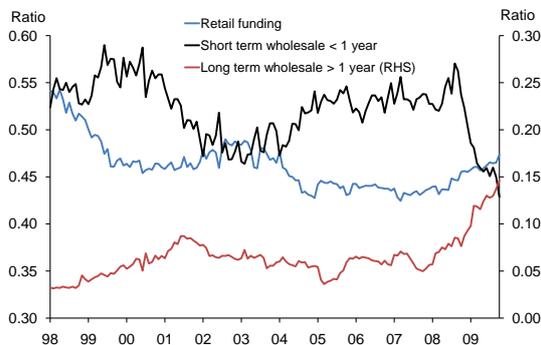
³⁴ See IMF (2010).

³⁵ Under the IRB approach to Basel II, banks use their own risk models, subject to supervisory adjustment. See <http://www.rbnz.govt.nz/finstab/banking/regulation/2265555.html>. The smaller banks adopted the standard approach.

³⁶ We focus here on the availability of credit from external funding markets rather than liquidity pressures among financial institutions in New Zealand, because of the large role of external funding. For a discussion of the 'fire sale' phenomenon associated with both funding and market liquidity pressures, see Minsky (1974). See also Brunnermeier and Pedersen (2009) for a recent model, and Aikman *et al* (2009) for a discussion of funding liquidity and systemic interaction in the Bank of England model.

³⁷ The maturity mismatch on New Zealand banks' balance sheets is associated with refinancing (funding liquidity) risk, but currency risk is almost completely hedged and interest rate risk is mostly hedged.

Figure 9
New Zealand banks' retail and wholesale funding ratios (Jun 1998–Mar 2010)



Source: RBNZ.

Note: As a share of loans and advances. Short term wholesale funding is wholesale funding maturing in less than one year. The long term wholesale and retail funding ratios do not add exactly to the new CFR because of slight differences in definitions between reported data and the legal requirements.

wholesale funding, including a large share of short-term external wholesale funding (figure 9). In contrast, New Zealand banks' assets are mainly residential mortgages and other long-term loans.

Variations in conditions in external funding markets have potentially had a considerable effect on funding conditions in New Zealand. In periods of rapid credit growth, both the cost of external funding and external measures of risk have tended to be low (figure 10).

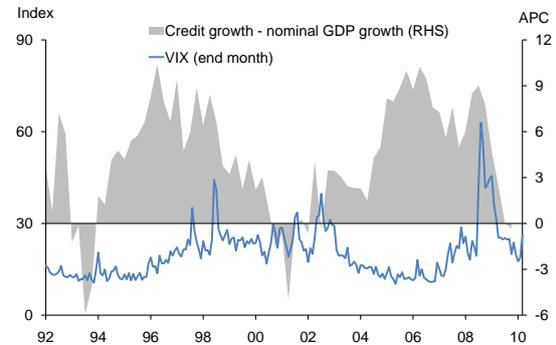
During the credit boom of 2003 to 2007, banks both outside and inside New Zealand increased reliance on relatively inexpensive short-term wholesale funding (see figure 9). The time-varying nature of funding liquidity and risk tolerance allowed banks to build up refinancing risk during good times, increasing vulnerability to subsequent disruptions in wholesale funding markets.³⁸

New Zealand banks were not exposed to sub-prime mortgages, and held relatively few traded securities. However, their funding markets were severely affected by the deleveraging of international banks. When wholesale funding markets became stressed, the supply of funding was maintained through a combination of well-timed pre-

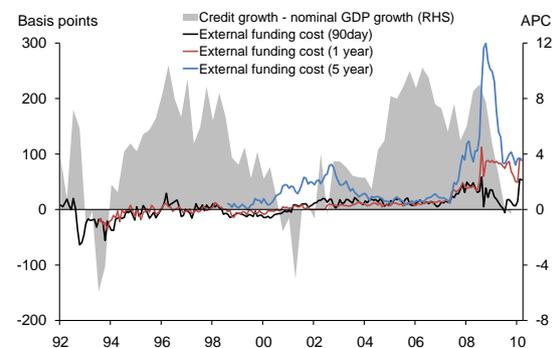
³⁸ Borio and Zhu (2008) discuss the potential for a liquidity multiplier in the face of time-varying term premia and tolerance for funding liquidity risk.

Figure 10
Cost of external funding, VIX and credit growth (Mar 1992 – May 2010)

(a) Credit cycles and VIX



(b) Credit cycles and external funding costs



Source: Bloomberg, CBOE, RBNZ.

Note: Credit growth is annual change in private sector credit. The cost of 5-year funding is estimated from the USD AA corporate bond index, less the 5-year USD interest rate swap (to convert interest structure from fixed to floating), plus the 5-year cross currency basis swap (to convert to floating NZD). The cost of 90-day and 1-year external funding is estimated from USD 90-day and 1-year Libor adjusted by the relevant foreign exchange swap.

funding by the banks in early 2008, Reserve Bank liquidity operations and Crown guarantees of deposits and wholesale debt.^{39,40} While these were successful in maintaining stability, the availability of government support during the crisis has likely increased moral hazard. This is because banks may take on more risk or be offered cheaper funding because of the implicit government guarantee.

³⁹ Because the banks required NZD funding, not foreign currency funding, when markets became stressed, the Reserve Bank was able to provide NZD liquidity as lender of last resort. Although New Zealand had access to a Fed swap line for USD liquidity, it was not drawn upon.

⁴⁰ New Zealand banks may also have received some funding support from Australian parents, but lending to New Zealand subsidiaries is limited by the Australian Prudential Regulatory Authority (APRA).

In response to the growing funding liquidity risk, new liquidity regulations were announced in 2009 and came into effect in April 2010 under the Prudential Liquidity Policy. The policy sets out minimum 1-week and 1-month maturity mismatch limits and a CFR. The CFR requires banks to fund at least 65 percent of loans and advances with relatively stable sources of funding (such as wholesale funding with maturity greater than one year and retail deposits). The higher share of more stable funding will increase the banks' resilience during times of stress, by reducing the rate at which debt needs to be refinanced.

While the aim of the CFR is financial stability, it will also affect the cyclical interaction between banks and their funding markets. First, by reducing the rate of rollover, it will delay the effects of adverse conditions in funding markets on bank income and balance sheets, allowing more time to adjust. Second, current pressures on banks to raise retail and term funding have raised the cost of funding, particularly spreads on retail funding costs. If these higher costs persist through the next expansion, they may dampen the expansion of credit generally. Third, although funding market stresses will feed through more slowly, the cost of rollover is likely to be higher for longer-term funding because term premia rise in times of stress.⁴¹ Finally, liquidity limits, like capital limits, can have amplification effects if they become binding and difficult to meet during downturns.⁴² In the event of extreme conditions in funding markets, it could become very difficult or expensive for banks to meet the CFR. Retail deposits are not very responsive to changes in deposit interest rates, so would be unable to offset the fall in external term funding. As a result, it is expected that the banks would have buffers of core funding above the minimum requirements. Currently, all banks well exceed the minimum CFR and liquidity mismatch thresholds. However, like many macro-prudential

tools under discussion internationally, the implementation of the CFR may at times need to be asymmetric. In the event of persistent extreme conditions in international markets, regulatory forbearance would clearly need to be considered as an option.

Since the bulk of New Zealand's external funding is channelled through the financial system, the behaviour of the banking system, and the banks' funding liquidity risk in particular, will determine the extent to which the procyclical supply of external funding is passed through to borrowers.

4 The evolving international regulatory framework

Potential sources of amplification have been or are being addressed through changes to both the domestic and international regulatory frameworks. The policy agenda includes both adjustments to policy elements that can be a source of amplification and introduction of countercyclical policies intended to dampen financial sector amplification. Within New Zealand, the Prudential Liquidity Policy was introduced on 1 April 2010, with the CFR expected to become more stringent in coming years.⁴³ International initiatives include the Basel Committee on Banking Supervision (BCBS) proposals to strengthen the resilience of the banking sector;⁴⁴ proposed changes to accounting standards for provisioning put forward by the International Accounting Standards Board (IASB);⁴⁵ and a range of initiatives coordinated by the Financial Stability Board (FSB).⁴⁶ This section provides a brief overview of some of the main proposed changes to the international regulatory framework. See FSB (2009) for a detailed account.

Capital

In response to the potential for amplification through leveraged balance sheets, prudential supervisors have imposed capital adequacy regulations for many years. The initial 'Basel I' framework aimed to reduce procyclicality by

⁴¹ While the market turmoil in 2008 began in money markets, it quickly spread to term markets. See Baba *et al.* (2008) and BIS (2009).

⁴² Bernanke and Gertler (1988) model the potential amplification effect of reserve requirements. In the model, banks' required holdings of liquid assets against deposits mean that shocks to liquid asset holdings can have multiplier effects on lending. While out of date (New Zealand banks are not subject to reserve requirements, and their funding is not limited to retail deposits), the model illustrates the type of amplification effects that can occur as balance sheet limits on liquidity become binding.

⁴³ See <http://www.rbnz.govt.nz/finstab/banking/index.html>.

⁴⁴ See BCBS (2009).

⁴⁵ See IASB (2009).

⁴⁶ See FSB (2009).

raising risk-weighted capital requirements (implicitly reducing leverage). Internationally, however, bank capitalisation has generally trended downward over time (CGFS 2009).

The subsequent 'Basel II' regulations aimed to provide a more granular measure of the riskiness of bank assets, tailoring the level of capital to exposures (Pillar 1), enhancing the supervisory review process (Pillar 2), and increasing disclosure and transparency (Pillar 3). Depending on the nature of risk measurement and risk management within banks, the conservatism of the supervisory process, and the degree of market-imposed discipline, the revised standards could have led banks to become more or less procyclical. While the international literature is divided, on balance, Basel II is thought to have made banks more procyclical (Borio and Zhu 2008, Drumond 2009).

In December 2009, the Basel Committee issued proposals to strengthen the resilience of the banking sector (referred to as 'enhanced Basel II' or 'Basel III'). These proposals aim to improve the quality, consistency and risk coverage of the capital base.⁴⁷ Some international banks did not hold enough capital to withstand the financial crisis. Since many banks held capital near the minimum, unexpected events quickly eroded buffers above the minimum level, leading to negative signalling effects as regulatory standards were violated. If potential signalling effects effectively constrained the banks to maintain the minimum requirement while facing pressure to reduce leverage during times of stress, then the binding minimum capital requirement was procyclical. In response, the proposed changes to the framework also include a time-varying buffer above the minimum requirement.⁴⁸ The buffer would be built up during good times, moderating balance sheet expansion and run down during downturns, cushioning pressure to reduce leverage. In addition, a maximum leverage ratio has been proposed to address the uncertainty inherent in risk modelling, and to limit the scope for gaming (underestimating risk to achieve higher profits by taking on more risk during the boom, increasing the risk of more severe deleveraging during a crisis with implicit public sector support).⁴⁹

⁴⁷ See <http://www.bis.org/publ/bcbs164.htm>

⁴⁸ See Tucker (2009) on the possibility of using time-varying risk weights on specific asset classes.

Liquidity

Under the Reserve Bank's Prudential Liquidity Policy introduced in 2010, the core funding ratio (relatively stable retail and term wholesale funding) is expected to be increased from the current 65 percent of loans and advances to 70 percent from July 2011 and 75 percent from July 2012.

The December 2009 Basel Committee proposals to strengthen the resilience of the banking sector include a proposal to establish international minimum standards for liquidity risk for the first time. These proposals include a liquidity coverage ratio and a net stable funding ratio that are broadly similar to the 1-month mismatch ratios and the CFR (respectively) under the Reserve Bank's Prudential Liquidity Policy.⁵⁰ As a result, the proposed changes would be expected to have little effect on New Zealand banks.

Accounting standards

In response to problems that arose during the international financial crisis, accounting standards setters have proposed changes to accounting measurement and reporting. In May 2010, the IASB published proposed changes to the fair value option for financial liabilities. The proposals aim to ensure that changes in the liabilities that an entity chooses to measure at fair value will not cause undue volatility in profit or loss. The exposure draft 'Fair Value Option for Financial Liabilities' is open for comment until July 2010. The IASB has also initiated a comprehensive review of hedge accounting. In response to concerns about the procyclicality of the incurred-loss model of provisioning, the IASB has proposed changes to IFRS to move towards an expected loss model.⁵¹ Under the proposals, provisions would be accumulated over the life of an asset based on expected losses, with expected losses being reassessed each period. The IASB plans to issue revised provisioning standards in 2010 that would become mandatory within three years. For New Zealand's

⁴⁹ Reserve Bank comments on the proposed changes, submitted to the BCBS, discuss potential problems associated with use of a uniform leverage ratio. See <http://www.rbnz.govt.nz/finstab/banking>.

⁵⁰ See <http://www.bis.org/publ/bcbs165.htm>

⁵¹ See IASB's press release "IASB publishes proposals on the impairment of financial assets" in November 2009. For other IASB crisis-related initiatives, see <http://www.iasb.org/Financial+crisis/>

major banks, the proposed changes would change only the accounting representation of buffers (from capital to provisions) for expected loan losses. For the smaller banks this would represent a shift from incurred- to expected-loss provisioning, reducing the scope for loan losses to amplify credit and business cycles.

The FSB has expressed concern that limits on the amount of provisioning that can be added to capital under Basel II may lead to disincentives to provision adequately during periods of low loan losses (FSB 2009). The removal of such a limit would further dampen the scope for procyclical provisioning in the major banks.

5 Conclusion

There are many ways in which the financial system can amplify business cycles. Evidence reviewed in this article suggests that there may be important influences on New Zealand business cycles from household balance sheets, from financial institutions' balance sheets, and from external funding markets. This preliminary exposition provides an overview and sets out some of the stylised facts for New Zealand. A more formal assessment of these potential sources of procyclicality requires further work, including structural modelling exercises. The Reserve Bank's main macroeconomic model explicitly includes a role for leverage in households' access to credit. Approaches to modelling other mechanisms are being explored. While the modelling approaches are typically more complex than for standard macroeconomic models, rapid growth in the modelling literature in response to the financial crisis is increasingly providing the tools required for developing understanding in this area.

The recent changes to the regulatory framework are designed to reduce the scope for financial sector amplification and their implementation will be monitored carefully. Proposed changes to the international regulatory framework are expected to have relatively small effects in New Zealand's already conservative regulatory environment, but may reinforce domestic countercyclical policies, particularly through their stabilising effects on external funding markets.

References

- Adrian, T and H S Shin (2009) "Liquidity and Leverage", *Staff Report* No 328. Federal Reserve Bank of New York.
- Aikman, D, P Alessandri, B Eklund, P Gai, S Kapadia, E Martin, N Mora, G Sterne, and G and M Willison (2009) "Funding liquidity risk in a quantitative model of systemic stability" preliminary *Bank of England Working Paper*.
- Allen, L and A Saunders (2003) "A survey of cyclical effects in credit risk measurement", *BIS Working Paper* No 126, Bank for International Settlements, Basel, Switzerland.
- Aoki, K, J Proudman and J Vlieghe (2004) "House prices, consumption, and monetary policy: a financial accelerator approach", *Journal of Financial Intermediation*, 13(4), pp. 414–435.
- Baba, F, F Packer and T Nagano (2008) "The spillover of money market turbulence to FX swap and cross-currency swap markets", *BIS Quarterly Review*, March 2008.
- BCBS (2009) "Consultative proposals to strengthen the resilience of the banking sector announced by the Basel Committee", *Basel Committee on Banking Supervision*, Basel Switzerland, December 2009. See <http://www.bis.org/press/p091217.htm>
- Bernanke, B and M Gertler (1989) "Agency costs, net worth, and business fluctuations", *American Economic Review*, 79(1), pp. 14–31.
- Bernanke, B, M Gertler and S Gilchrist (1999). "The financial accelerator in a quantitative business cycle framework", in *Handbook of Macroeconomics*, Volume 1C, *Handbooks in Economics*, Vol. 15, Amsterdam: Elsevier, pp. 1341–93.
- BIS (2009), *Annual Report 2008/9*, Bank for International Settlements, June 2009.
- Borio, C, C Furfine and P Lowe (2001) "Procyclicality of the financial system and financial stability: issues and options", *BIS Papers* No 1, Bank for International Settlements, Basel, Switzerland.
- Borio, C and P Lowe (2002) "Asset prices, financial and monetary stability: exploring the nexus", *BIS Working Paper* No 114, Bank for International Settlements, Basel Switzerland, July 2002.

- Borio C and H Zhu (2008) "Capital regulation, risk taking and monetary policy: a missing link in the transmission mechanism?", BIS Working Paper No 268, Bank for International Settlements, Basel, Switzerland.
- Brunnermeier, M and L Pedersen (2009) "Market liquidity and funding liquidity", *Review of Financial Studies*, 22(6), pp. 2201–2238.
- Carlstrom, C, and T Fuerst (2001) "Monetary Policy in a World without Perfect Capital Markets", *Working Paper* 0115, Federal Reserve Bank of Cleveland.
- CGFS (2009) "The role of valuation and leverage in procyclicality", Committee on the Global Financial System, *CGFS Papers* No 34, Bank for International Settlements, Basel, Switzerland.
- Drumond, I (2009) "Bank capital requirements, business cycle fluctuations and the Basel Accords: a synthesis", *Journal of Economic Surveys*, 23(5), pp. 798-830.
- Financial Stability Forum (2009), Report of the Financial Stability Forum on addressing procyclicality in the financial system, accessed at www.financialstabilityboard.org
- Gerali, A, S Neri, L Sessa and F Signoretti (2009) "Credit and Banking in a DSGE Model", paper presented at the IMF Macro-Linkages, Oil Prices and Inflation Workshop, January 6–9, 2009.
- Goodfriend, M, and B McCallum (2007) "Banking and interest rates in monetary policy analysis: a quantitative exploration", NBER Working Papers 13207, National Bureau of Economic Research.
- Hoskin, K and S Irvine (2009) "Quality of bank capital in New Zealand", Reserve Bank of New Zealand *Bulletin*, 73(3), pp. 5–16.
- Hunt, C (2009) "Banking crises in New Zealand – an historical perspective", Reserve Bank of New Zealand *Bulletin*, 72(4), pp. 26–41.
- Hunter, L, A Orr and B White (2006) "Towards a framework for promoting financial stability in New Zealand", Reserve Bank of New Zealand *Bulletin*, 69(1), pp. 5–17.
- Iacoviello, M (2005) "House prices, borrowing constraints and monetary policy in the business cycle", *American Economic Review*, 95(3), pp. 739–764.
- IASB (2009) "Financial instruments: amortised cost and impairment, exposure draft" ED/2009/12, November 2009.
- IMF (2010) *Global Financial Stability Report*, International Monetary Fund, Washington, D.C., April 2010.
- Kim, D, M Loretan and E Remolona (2009) "Contagion and risk premia in the amplification of crisis: Evidence from Asian names in the CDS market", forthcoming. Available at <http://www.bis.org/repoofficepubl/arpresearch200906.5.htm>
- Kiyotaki, N, and J Moore (1997) "Credit Cycles", *Journal of Political Economy*, 105(2), pp. 211–248.
- Mandelman, F (2006) "Business cycles: a role for imperfect competition in the banking system", Federal Reserve Bank of Atlanta *Working Paper* 2006-21.
- Minsky, H P (1974). "The modelling of financial instability: an introduction", modelling and simulation. Proceedings of the Fifth Annual Pittsburgh Conference.
- Modigliani, F, and M Miller (1958) "The cost of capital, corporation finance and the theory of investment", *American Economic Review*, 48(3), pp. 261–297.
- Modigliani, F, and M Miller (1963) "Corporate income taxes and the cost of capital: a correction", *American Economic Review*, 53(3), pp. 433–443.
- Ng, T (2009) "Automatic" cycle-stabilising capital requirements: what can be achieved?", *Discussion paper* 08/4, Reserve Bank of New Zealand.
- Reserve Bank of New Zealand (2006) *Financial Stability Report*, November 2006.
- Reserve Bank of New Zealand (2010) *Financial Stability Report*, May 2010.
- Saurina, J (2009) "Loan loss provisions in Spain. A working macroprudential tool", *Estabilidad Financiera*, 17, Bank of Spain.

Tucker, P (2009) "The debate on financial system resilience: macroprudential instruments", speech delivered at Barclays Annual Lecture, 22 October 2009.

Van den Heuvel, S (2009) "The bank capital channel of monetary policy", paper presented at the Federal Reserve System Conference on Macroeconomics, November 19–20, 2009, Federal Reserve Bank of Richmond.