ASSET PRICE BUBBLES AND PRUDENTIAL REGULATION

Jeffrey Carmichael and Neil Esho

Working Paper 2001 – 03

Australian Prudential Regulation Authority

The views and opinions expressed in this paper are those of the authors and do not necessarily reflect those of APRA. The authors thank Wayne Byres, Anthony Coleman, Marianne Gizycki, Alvin Liaw and Terry Pittorino for helpful comments, and Patrick D’Arcy for providing data.

Email: jeffrey.carmichael@apra.gov.au; neil.esho@apra.gov.au.
ABSTRACT

This paper outlines the arguments in favour of using prudential regulation to influence asset price bubbles. We examine the costs and benefits of placing restrictions on portfolio composition, adjusting capital requirements, introducing a system of counter-cyclical provisioning, and more extensive use of stress testing and internal models, as possible options to influence the behaviour of the banking system and therefore asset prices. We argue against the use of portfolio restrictions and find that adjustments to capital requirements are difficult to implement in a systematic way. However, we suggest that a case exists for a counter-cyclical provisioning regime similar to that introduced by the Spanish banking regulators. We also argue that more extensive use of stress testing and internal models may have a role to play in minimising the risks of asset price bubbles as these become better integrated into the toolkit of financial regulators.

JEL Classification: E32, G28, N27

Keywords: Asset Price Bubbles, Prudential Regulation, Australian Economic History
1. INTRODUCTION

In the nine years to December 2000, real GDP grew at an annual average rate of 3.8% in the United States, 2.0% in the major European economies, 2.7% in the UK, 6.1% in Taiwan and at 4.3% in Australia. Against the trend of strong economic growth the Japanese economy has struggled throughout the past decade, with real GDP growth averaging only 1.2%\(^1\). The relatively low growth rate has occurred despite the Japanese Government’s large fiscal stimulus packages and the reduction of nominal interest rates to almost zero. The cause of Japan’s decade of poor economic performance has been attributed, *inter alia*, to the collapse of property and stock price bubbles in 1990, which led to a massive increase in bad debts and a severely weakened financial system that continues to constrain the real economy\(^2\). Japan, of course, is not alone in having had its economic progress and financial stability severely disrupted by sharp reversals in asset prices. The dramatic currency reversals of several South East Asian countries and subsequent economic turmoil in 1997 are familiar to all\(^3\).

While a considerable amount of research has been devoted to the question of whether or not pre-emptive monetary policy should be used to influence asset prices, there has been comparatively much less discussion of the effectiveness, desirability and nature of pre-emptive regulatory policy in this context\(^4\). What literature there is generally supports the use of regulatory policy based on three main propositions: (i) monetary policy is either inappropriate or relatively ineffective in bursting bubbles; (ii) pro-cyclicality of the financial system can be reduced with appropriate regulatory policies; and (iii) a strong banking system that correctly measures and prices risk can reduce the likelihood of asset price bubbles developing. Beyond this consensus they offer a wide range of possible approaches.

Justifying a role for prudential regulation in controlling bubbles, however, requires more than just the ineffectiveness of monetary policy. It requires evidence:

- that bubbles actually cause damage to the real economy;
- of a reliable relationship between the formation and bursting of bubbles and the behaviour of banks; and
- that regulation can influence this behaviour without material side effects, either for the economy or for the other objectives of prudential regulation.


\(^3\) See, for example, Miller (1998).

\(^4\) The questions of how to recognize asset price bubbles and whether or not monetary policy should respond to bubbles has been addressed in both the academic literature and the popular press by, among others, Bernanke and Gertler (1999), Goodhart (2001), Kent and Lowe (1997), Frank and Browning (2001), Kaufman (1998), Bordo and Jeanne (2001) and Schwartz (2001).
In what follows we take as given that asset price bubbles can cause damage to the real economy. We also avoid any debate over the definition of bubbles and whether or not they are rational or otherwise. For our purposes it is sufficient that asset prices can and do fall sharply from time to time and that these falls cause economic disruption; whether these falls are simply excessive price swings or genuine bubbles is not addressed. Our focus is primarily on the relationship between these price movements and the behaviour of banks and on the way in which prudential regulation might affect that relationship.

We begin in Section 2 with a brief review of the existing literature on bubbles and economic policy. In Section 3 we draw on the Australian experience to add to the evidence about the relationship between asset price swings and the behaviour of banks. While this evidence amounts to casual rather than rigorous empiricism, it does highlight some interesting aspects of the relationship. In particular it suggests that, on the Australian experience at least, banks have been neither the sole cause of bubbles, nor the main victims of them. There is nonetheless some evidence of a positive relationship between rapid credit expansion and price bubbles and therefore a prima facie case for regulatory intervention.

Section 4 turns to the ways in which prudential regulation might seek to influence the banking system for the purpose of controlling price swings. We examine four possible sources of regulatory response: portfolio restrictions; adjustments in capital requirements; adjustments in provisioning requirements; and the use of stress testing. Of these we suggest that the first two are too blunt and potentially costly in terms of economic efficiency. We find that there is a case for using adjustments in provisioning requirements to control bubbles. The challenge is how best to calibrate the policy responses to avoid unnecessary side effects. In this respect, stress testing and internal risk models offer some prospects for refining this calibration as they become better integrated into regulatory methodology in coming years.

2. THE EXISTING LITERATURE

(i) The Relationship Between Asset Price Bubbles and the Financial System

Kindleberger's (1989) detailed account of the history of financial crises suggests that any reasonable reading of economic history would conclude that speculative bubbles occur and inevitably lead to crashes. Moreover, he finds that asset price bubbles are often, although not always, related to banking crises and are typically fuelled by some form of monetary expansion. Kindleberger's findings are supported by empirical evidence that bank failures are inversely correlated with the business cycle.  

A theoretical link between the behaviour of financial institutions and asset price bubbles is provided by Allen and Gale (2000) who argue that the existence of agency costs in the banking sector, combined with uncertainty about future credit expansion, determines the extent of asset price bubbles and subsequent effects on the real economy. In their model, agency costs between borrowers and lenders create an

5 For a review of the literature on this aspect, see Benston and Kaufman (1995), Bordo (1986) and Kaufman (1994).
incentive for borrowers to take on riskier assets. The risky asset (such as property) is assumed to be in fixed supply, leading to increases in prices above fundamental values. The bidding up of prices of risky assets in fixed supply is magnified by credit expansion. As the price increase accelerates, there comes a point at which uncertainty about future credit expansion (even a contraction in the rate of growth of credit) becomes sufficient to trigger a crisis.

Agency costs also play a role in the pro-cyclical relationship between the financial and real sectors in the model suggested by Bernanke, Gertler and Gilchrist (1996). They define the financial accelerator as the amplification of initial real shocks caused by changes in credit market conditions. In their framework the financial accelerator arises due to agency costs in bank-borrower relationships. An adverse macroeconomic shock reduces the net worth of non-financial firms and subsequently raises the cost of external finance (including bank debt). The greater the asymmetric information problem for a particular firm, the greater will be the rise in the cost of external finance and fall in credit availability. Tight credit conditions further reduce production and spending, thereby amplifying the effects of the initial shock.

In addition to the financial accelerator, Borio, Furfine and Lowe (2000) argue that the financial system amplifies the real business cycle due to the failure of current risk measures to account for changes in risk through time, and poor incentive mechanisms that lead to sub-optimal responses to changes in risk. The time dimension of systematic risk is generally ignored in bank internal loan ratings, in provisioning for bad loans and by regulators in bank risk assessment. While these risk assessments generally do a good job of measuring relative or cross-sectional risk, changes in the absolute level of risk in the system over time is generally ignored. As an economy moves through the expansion phase to the peak of a cycle, relative risk is low, with economic growth leading to healthy returns for banks and borrowers. At the same time, the level of systematic risk is likely to be increasing as the economy moves closer to its peak and subsequent downturn. The failure to properly measure the time dimension of risk leads banks to underestimate the true level of expected losses, leading to high profits and underprovisioning for loan losses through the growth period of the cycle. However, when the economy starts to contract, the accumulation of risk through the expansion is realised, leading to a large rise in loan losses, increased provisions and falling profitability. Weakness in the financial system amplifies the downturn in the real economy.

Borio et al note that pro-cyclicality of the financial system is also affected by accounting policies that do not allow forward-looking provisioning based on expected losses. Provisions based on actual losses (rather than expected losses) further build pro-cyclicality into bank profits.

---

6 Alternatively, the financial accelerator may also work through effects on collateral rather than cash flows. To illustrate, a downturn in economic activity reduces the value of collateral leading to a contraction in credit, which further contracts economic activity and collateral values.

7 The incentives for forward-looking provisioning are also affected by taxation rules. Where loan loss provisions are not allowed as an expense, banks have an incentive to minimize provisions. Conversely, the tax deductibility of provisions creates an incentive to reduce tax liabilities by reducing variability in profits.
Although a pro-cyclical financial system does not necessarily imply the existence of asset price bubbles, the same tendencies that lead to pro-cyclicality are likely to exaggerate asset price swings and to contribute to their destructive aftermath.

(ii) Policy Responses to Asset Price Swings

The general consensus of the literature cited above is that public policy should be directed towards reducing the magnitude of swings in the real economy caused by pro-cyclicality of the financial system.

The existing literature is generally against the use of monetary policy to control or burst bubbles. Using simulations based on a “Dynamic New Keynesian” model, Bernanke and Gertler (1999) show that monetary policy should not respond to changes in asset prices, except when asset prices signal changes in inflationary expectations. The bursting of an asset price bubble that does not have implications for expected inflation is strongly rejected by the Bernanke and Gertler model. Using a collateral constrained “Dynamic New Keynesian” model, Bordo and Jeanne (2001) show that, in the event of a sudden decline in asset prices, monetary policy may be ineffective in increasing output and, further, that the pre-emptive use of monetary policy is likely to be ineffective in avoiding a market crash. The conclusions of the model are driven by a “collateral constraint”\(^8\). In their model monetary policy cannot affect output because it is unable to affect disposable income, which is linked to output and, because all debt is backed by collateral, is itself linked to asset prices. Kaufman (1998) also argues against the use of monetary policy to burst bubbles. Schwartz (2001) argues that monetary policy is not only ineffective, it is inappropriate for bursting bubbles, on the grounds that, unless the bubble has been caused by lax monetary conditions, market prices should correct themselves based on projections of earnings growth.

A dissenting voice in this literature comes from Kent and Lowe (1997) who argue that monetary policy may be used as a pre-emptive tool to burst an asset price bubble. In their model, the early bursting of the bubble brings forward a decline in output, however the effects on output and inflation are smaller than if the bubble is allowed to proceed and ultimately bursts when it is larger.

The same literature is generally positive about using prudential regulation to respond to bubbles:

- Borio et al suggest that one benefit of using prudential regulation to respond to asset price bubbles is that the costs of poor regulatory policy choices are likely to be smaller than the cost of poor monetary policy choices; they also argue that the effects of regulatory policy changes are more predictable.

- Bordo and Jeanne suggest capital requirements and risk-based deposit insurance should be used to account for capital losses from a sudden fall in asset prices, although their argument in favour of regulation (and fiscal policy) is based more on demonstrating the ineffectiveness of monetary policy, than on demonstrating the effectiveness of regulation.

\(^8\) The model assumes that all borrowing is backed by collateral, that borrowers do not benefit from inflation (all debt is short term or floating rate), and that disposable income can only be increased by increasing entrepreneurial output.
Kent and Lowe suggest that prudential regulation may support monetary policy by minimising the adverse impact of asset price bubbles on the financial system by, in turn, ensuring that the banking system is healthy and not overexposed to the risks associated with the bursting of a bubble.

While these arguments are generally positive about using prudential regulation to respond to bubbles, the case is based as much on the ineffectiveness and high cost of using monetary policy in this way as it is on a detailed analysis of how regulatory policy can achieve better outcomes at lower cost. The policy options under a prudential approach are explored further in Section 4.

3. Asset Prices, Banking and Economic Swings – the Australian Experience

In this section we provide a brief historical overview of the relationship between asset prices and economic and banking performance in Australia over the past 120 years. Given the unavoidable changes in data reporting and range of sources associated with collecting historical data, the aim is to present the data in a manner which maximises comparability within each of four time periods 1880-1920, 1920-1944, 1960-1980, and 1980-2001. The discussion focuses on the state of the financial system and the development of asset price bubbles, with brief reference to the macroeconomic causes of the depressions and recessions during the last 120 years. The data are summarised in Figures 1 to 4, and data definitions and sources are contained in the Appendix.

(i) First episode: 1880-1920

In April and May 1893, Australia experienced a widespread collapse of its banking system, with 12 out of 22 note-issuing banks (banks which issued notes that were used as a medium of exchange and subject to legislation) suspending payment. The catalyst for the banking panic was the suspension of payment by the Commercial Bank of Australia on 5 April 1893. By 17 May, a further 11 banks had suspended payment (due mainly to depositor runs) and remained closed for periods ranging from 31 to 130 days. At this time, the note issuing banks controlled roughly 70% of total financial institution assets, while the banks that suspended payment accounted for roughly 50% of deposits with the note issuing banks. The suspending banks went through a process of reconstruction, which allowed them to recapitalise and increase liquidity before reopening. Depositors, however, faced substantial delays in gaining access to their funds. While most depositors were repaid by 1901, some were not repaid until 1918.

---

9 The Federal Bank of Australia had previously been liquidated on January 18, 1893 (Boehm, 1971). Another two banks were liquidated and one acquired in 1892, and one bank failed in 1891 (see Butlin 1971).

10 It is interesting to note that the Commercial Bank's 300,000 shares of £10 each were only partly paid to £4. While depositors viewed this as a sign of strength, no call on shareholders was made prior to suspension. A feature of the reconstruction of the bank was a fully paid £6 per share.

11 Boehm (1971).


briefly, the City of Melbourne Bank failed a second time and was liquidated in 1895. Six banks merged between the period 1917-1927, while the remaining five reconstructed banks were still operating in 1945.\footnote{Butlin (1971, p. 104).}

Figure 1 contains four charts showing movements in asset prices, bank portfolio composition, capital ratios, economic growth, interest rates, and bank credit over the period 1880 to 1920. In the 10 years from 1880 to 1889 real GDP grew at an average rate of roughly 5% per annum, but with considerable yearly variation. Despite these annual fluctuations, there was little inter-state variation in real GDP growth between NSW and Victoria, the two dominant Australian colonies leading up to 1889. In 1890, however, the Victorian economy moved into a much deeper and more sustained depression than NSW.\footnote{Butlin (1962), Australian real GDP at factor cost fell by 24% from 1891 to 1893 and did not return to 1891 levels until 1904. According to Boehm (1971), real per capita GDP did not pass pre-depression peaks until 1907-1909.} The financial boom and collapse was also more concentrated in Victoria, which in part explains the steeper and more prolonged fall in Victorian output\footnote{Haig (2001, p.22).}. It is interesting to note that 7 out of 8 note-issuing banks with head offices in Melbourne failed in 1893, while only 6 out of 13 note-issuing banks with head offices outside Victoria failed\footnote{Boehm (1971, p.272).}.

The rapid, though sporadic, growth in the Australian economy in the 1880s was driven by rapid population growth, urbanisation, a private investment boom in the pastoral and building construction industries, and a public investment boom in communications (mainly railways). This period was also characterised by the development of asset price bubbles in both property and stock markets. The extent of speculation in the 1880s is shown in Figure 1 by the sharp spike in property prices and mining share prices, and to a lesser extent by the spike in commercial and industrial share prices.\footnote{Fisher and Kent (1999) provide an Australia-wide measure of property prices which shows a similar spike in property prices. Their capital value indicator includes changes in volume and quality of properties and tends to lag the series presented. The capital value indicator, reflecting valuations by city councils for tax purposes, are likely to have lagged changes in market prices.}

In the decade leading up to the depression, the condition of the banking system was generally deteriorating, with both capital and liquidity ratios declining steadily. The rapid growth in bank credit, both in nominal terms and as a percentage of nominal GDP, highlights the role of credit growth in fuelling the investment boom. Moreover, the data understate the deteriorating condition of the financial system and true expansion of credit, as they exclude “other” banks (often referred to as “land” banks and “fringe” banks) and non-bank financial intermediaries such as building societies and finance companies. These institutions grew rapidly prior to the depression, were not regulated or supervised, and were highly exposed to the investment boom. As a result, a large number of these “other” banks and non-banks failed
when the property price boom collapsed and the economy contracted. During the period July 1891 to March 1892, 41 companies in Sydney and Melbourne which were involved in building and real estate finance and which accepted deposits from the public suspended payments.\(^{19}\)

At the risk of oversimplification, the depression and banking collapse of the 1890s followed a common pattern. Rapid growth in investment, stock prices and property prices was financed by a rapid expansion in both domestic and external credit. Note-issuing banks responded to greater competition from non-banks and “other” banks by increasing risk, by rapidly expanding branching networks, and by relying more heavily on external deposits from Britain.\(^{20}\) The condition of the financial system deteriorated throughout the economic expansion and, following the rapid contraction in real output, the financial system collapsed. Initially (between 1891 and 1892), non-banks and “other” banks failed as a result of their financing of building and land transactions, reliance on short-term deposits, direct speculation in land, fraud, embezzlement and other unsound practices. The financial crisis spread to the note-issuing banks in 1893, leading to a widespread financial system collapse, which amplified and prolonged the economic downturn.\(^{21}\)

(ii) **Second episode: 1920-1944**

In contrast with the earlier period, a feature of the 1930s depression in Australia was the resilience of the banking system. Unlike the widespread banking collapses experienced in the US and UK, only three banks failed in Australia. This included the failure of two small trading banks with combined deposits of less than 1% of total Australian trading bank deposits and the failure of the Government Savings Bank of New South Wales (GSB). The GSB was the largest savings bank in Australia and the second largest savings bank in the British empire, with total deposits of £70.6m in June 1930 which, by the time of its closure in April 1931, had fallen to £54.2m.\(^{22}\) The GSB was a strong and prudently managed bank, with over 70% of its credit exposure directly related to, or guaranteed by the NSW Government. Ironically, the heavy exposure to the NSW Government was the main reason for the bank’s failure. In the midst of the 1930 state election campaign and deliberations about government responses to the depression, the operation of the GSB became a political battleground. Rumours prior to the election led to a steady deposit drain from the bank, while the incoming NSW government’s policy of debt repudiation meant the bank was destined to fail. The failure of the GSB had more to do with political instability and insolvency of the NSW Government than with the solvency of the bank.

\(^{19}\) Boehm (1971, p.262). Due to a combination of fraudulent and unsound practices, changes in legislation and easing of the money market in 1889-90, the institutions were able to conceal and delay their failure until July 1891, almost two years after the peak of the speculative boom.

\(^{20}\) Boehm (1971, p.303) argues that “the banking crisis in Australia in 1893 would have occurred largely as it did whether British depositors had intended to withdraw or not.”

\(^{21}\) The depression was also prolonged by the severe drought of 1895.

\(^{22}\) Sykes (1988, Table 12.2).
The Australian financial system was more concentrated in the 1930s than it had been in the 1890s, with only 10 trading banks in operation. Non-bank financial institutions were also less important, following their severe collapse in the 1890s, and conservatively operated savings banks had grown in importance (Fisher and Kent (1999)).

The data in Figure 2 show a steady increase in stock prices up to their quarterly peak in September 1929, before declining sharply. In the nine years to its peak, the stock market grew at an average quarterly rate of 2%. Property prices grew at a similar rate to equity prices prior to the depression. Property prices, however, declined at a slower rate than stock prices and took substantially longer to recover to their pre-depression peaks23.

Although nominal bank credit, and to a lesser extent bank credit as a percentage of GDP, grew quickly in the 1920s, bank capital ratios increased steadily, while the ratios of loans to total assets increased marginally. Moreover, banks maintained a high proportion of government securities on their balance sheets; though, as noted above, this was not always a source of strength.

The 1930s depression in Australia was driven largely by external developments24. The combination of large overseas borrowing by governments, sharp falls in world commodity prices and a drying up of external capital inflow were the main factors behind the severity of the depression. While it is true that domestic factors also weakened the economy, these domestic weaknesses had little to do with the health of the financial system or unrealistic asset price increases. There are no obvious signs of a domestic asset price bubble, and both bank and non-bank financial institutions acted prudently and survived the depression relatively unscathed.

(iii) Third episode: 1960-1980

The Australian financial system in the 1970s again experienced difficulties. These difficulties were, however, largely confined to the failure of finance companies that had become heavily exposed to the booming property market in the early 1970s, and to several Queensland-based building societies. While the major banks were not directly involved in the property boom in a major way, some banks had substantial exposures to the property market via their direct equity holdings in finance companies. Most noteworthy among the banks to experience trouble through their subsidiaries were the Commercial Banking Company of Sydney (CBCS) and the Bank of Adelaide. The CBCS experienced a severe reduction in profitability and increased leverage (97% debt in 1978) as a result of its large shareholding in the failed finance company, Commercial and General Acceptance. CBCS merged with the National

---

23 It should be noted that the property price measure used in this period is the capital value indicator developed by Fisher and Kent (1999). In the earlier period, these data suggested a slower rate of price increases and lagged the data obtained from Silberberg (1975).

24 See Valentine (1987) for a brief discussion and references on the role of domestic and external factors in causing and prolonging the 1930s depression.
Australia Bank in 1982\textsuperscript{25}. Similarly, the Bank of Adelaide experienced severe financial difficulty as a result of large losses made by its finance company subsidiary, the Finance Corporation of Australia. The Reserve Bank of Australia arranged for its orderly exit in 1979 via a merger with the ANZ Bank\textsuperscript{26}.

The finance companies experienced difficulties in large part because of a shift away from their traditional hire-purchase financing business to a heavy concentration on financing property development. The combination of falling property prices and high interest rates meant that property developers faced rapidly increasing development costs, which they were unable to meet because of the long-term, illiquid nature of their investments. The failure of the property developers in turn led to the failure of the finance companies.

The failure in September 1974 of the Cambridge Credit Corporation, which was both a property developer and financier, reduced public confidence in the financial system. The following day, simultaneous depositor runs began on building societies in South Australia, Victoria and Queensland. It is unclear why the runs occurred in South Australia and Victoria, given that the societies were fundamentally strong and eventually survived. The building societies in Queensland were, however, less sound and found it difficult to operate in the high interest rate environment of 1974. While the societies survived the initial runs, between March 1976 and September 1977, eight Queensland building societies were either closed, forced to merge, or suspended payments.

The charts in Figure 3 show the rapid increase in property prices from the late 1960s to their peak in 1974, followed by a crash and the beginning of a recovery in 1978. The stock market, which had risen sharply in the late 1960s on the back of a mining boom and rising property prices, also collapsed in 1974, falling to levels not experienced since mid 1959.

The Government responded to rising inflation in mid 1973 with a rapid series of interest rates increases. The high interest rate policy, however, was also directly targeted at the property price bubble\textsuperscript{27}. The tight interest rate policy was short lived, but did contribute to bursting the property price bubble.

Regulatory restrictions on bank lending insulated the banking sector from problems in the real economy, but led to the growth of non-bank financial intermediaries. This is reflected in the widening gap between total credit to GDP and bank credit to GDP from 1970 to 1980.

The portfolio composition of banks shows a gradual increase in the ratio of loans to assets, as banks reduced their holdings of Commonwealth Government securities. While capital adequacy generally increased over the period, the highly regulated bank environment severely limited opportunities for bank risk taking.

\textsuperscript{25} Sykes (1988, pp. 482-490).

\textsuperscript{26} Fitz-Gibbon and Gizycki (2001).

\textsuperscript{27} On 9 September 1973, the Australian Prime Minister, Gough Whitlam said “If as a consequence, the higher interest rates have the effect of curbing the speculative rush into land and property, that will be all too good.” Quoted from Sykes (1988, p437).

The 1990s saw the largest failures of the Australian financial system since the crash of the 1890s, and many authors have commented on the similarities of these two episodes of Australian economic history. By the mid 1980s the Australian financial system had undergone major deregulation: restrictions on interest rates and foreign exchange markets were removed; ceilings on bank interest rates and limits on bank lending volumes were removed; and 16 foreign banks were invited to enter the local market. The banks responded to the increased freedom and competition by competing vigorously for market share. However, after decades of rationing credit to high-quality borrowers, banks did not have the credit risk assessment expertise or sufficiently developed risk management systems in place to appropriately price and manage the large volume of new lending that followed. The accumulation of risky loans in the mid to late 1980s resulted in a large increase in bad debts in the early 1990s. By March 1991, non-performing loans totalled $25 billion or 5% of banking assets.

The State Bank of Victoria (SBV) and State Bank of South Australia (SBSA) required large capital injections from their respective State Governments to avoid failure, while the second and third largest Australian banks (Westpac and ANZ) incurred heavy losses as a result of lending exposures to the property market. As with the experience of the 1970s, most of the losses in Westpac, SBSA and SBV were due to property exposures in finance company and merchant bank subsidiaries, rather than direct bank exposures. The new foreign banks also incurred large losses. Losses at four of the new bank entrants exceeded initial start-up capital and retained earnings, requiring capital injections from their foreign parent institutions.

Non-bank financial institutions fared equally badly. In 1990 the Farrow group of building societies, which controlled over 50% of building society assets in Victoria, failed. At the time of its failure, the balance sheets of the Farrow group of building societies bore little resemblance to those of traditional building societies; they were dominated by high-risk commercial loans and had a heavy reliance on large wholesale deposits for funding.

The asset price series in Figure 4 shows the rapid increase in commercial property prices in the late 1980s. The boom in construction led to an oversupply of office space in the early 1990s, followed by a dramatic fall in property prices and a deep recession. The rapid rise and fall in stock prices preceded the collapse of property prices and real GDP by several years. From September 1983 to September 1987 the value of the Australian stock market increased by more than 200%. However, as was the case elsewhere in the world, the collapse of stock prices in October 1987 had little immediate effect on either property prices or economic output.

30 Ferguson (1991, p.159).
31 Fitz-Gibbon and Gizycki (2000, p.56).
Bank credit increased at an average quarterly rate of 4.9% in the seven years to March 1990, despite very high nominal and real interest rates (in December 1985 nominal and real interest rates were 18% and 10% respectively). The growth in credit was due to both an increase in the supply of credit following deregulation, and increased demand for credit. Credit demand was fuelled by rising share prices and later by rising property prices. Another factor affecting the demand for credit was the increased demand for highly leveraged, tax-driven asset acquisitions in an environment of high inflation expectations. The easing of monetary policy which followed the collapse in stock prices also contributed to the growth in credit and GDP. Monetary policy was subsequently tightened in early 1988 and continued to be restrictive up until the beginning of the downturn in 1990.

As already noted, the condition of the banking system leading up to the recession in 1991 was heavily influenced by deregulation. From June 1983 to June 1988 significant shifts occurred in the portfolio composition of Australian banks. The ratio of business loans to total assets increased from 56% to 68%, while the ratio of housing loans and personal loans to total assets declined from 38% to 30%. The economy-wide shift to business lending is even more apparent when non-bank lending is included. The ratio of total business credit to GDP doubled between 1980 and 1990, from 26% to 58%. Thus, while overall credit growth appears to have been important in fuelling the property price boom in the late 1980s, changes in the portfolio composition of banks were possibly even more so.

(v) Asset Price Bubbles, Financial Activity and Regulation: Lessons from the Australian Experience

This brief summary of Australia’s experience with asset price bubbles and banking crises is far from definitive. It nonetheless suggests a few features that are relevant in considering the role that might be played by financial regulation in addressing asset price bubbles:

• First, heavy-handed regulation does not necessarily prevent bubbles. While the heavy-handed regulatory approach of Australian banking regulation in the 1960s and 1970s may have shielded banks from participating in the credit expansion associated with the sharp rises in property prices, other unregulated institutions were quick to fill the void.

• Second, even when the expansion in total credit is not excessive, asset price bubbles in a particular sector may be fuelled – or at least accommodated – by changes in portfolio composition, such as occurred in the Australian banking system in the late 1980s.

• Third, provided the banking sector, and indeed the financial sector as a whole, is well regulated and fundamentally sound, the bursting of asset price bubbles need not result in financial chaos.

difference in the resilience of the Australian financial system in the four periods is particularly instructive in this respect. In short, there is no substitute for a well-regulated financial system.

4. Using Regulation to Control Bubbles – Consideration of the Options

The first issue to be resolved is whether or not dealing with bubbles lies within the normal responsibility range of prudential regulators. While there is no universally agreed definition of what should motivate prudential regulation, there is growing acceptance of the idea that all forms of financial regulatory intervention should be justified in terms of counteracting market failure. Thus competition regulators intervene to correct market failure arising from market dominance and to ensure that competitive forces prevail in financial markets. Market conduct regulators intervene to correct market failure arising from market misconduct and to ensure that markets are fair and efficient. The market failure associated with prudential regulation is usually described as asymmetric information failure.

This form of market failure arises where products or services are sufficiently complex that disclosure, by itself, is insufficient to enable consumers to make informed choices. This arises where buyers and sellers of particular financial products or services will never be equally well informed, regardless of how much information is disclosed. The issue is one of complexity of the product and of the institution offering it. This problem is common in areas such as drugs and aviation and is particularly relevant in the area of financial services. The regulatory response in these cases is to interpose a regulatory body between the supplier of the service and the consumer to establish a set of behavioural rules for the supplier, to ensure that the promises being made by the supplier have an acceptably high probability of being met.

But systemic instability also involves a type of market failure. It is a fundamental characteristic of parts of the financial system that they operate efficiently only to the extent that market participants have confidence in their ability to perform the roles for which they were designed. The more sophisticated the economy, the greater its dependence on financial promises and the greater its vulnerability to failure of the financial system to deliver against its promises. The importance of finance and the potential for financial failure to lead to systemic instability introduces an ‘overarching externality’ that warrants regulatory attention. The most familiar case of such an externality is that associated with bank runs. In this case, instability arises when failure of one institution to honor its promises leads to a general panic as individuals fear that similar promises made by other institutions may also be dishonored. A crisis occurs when contagion of this type leads to the distress or failure of otherwise sound institutions.

While bank runs are the most common form of this type of market failure, they are by no means the only one. Asset price bubbles also have some of the characteristics of this type of market failure. For example, it may be optimal for individual banks to contract credit to a sector that has just experienced a sharp
downturn in prices but, if all banks follow the same policy, the economic downturn will be amplified by the contraction of credit.

It has become increasingly common in recent years among countries that have separated banking supervision from their central banks to assign the correction of asymmetric information failure to the prudential regulator and the correction of systemic instability to the central bank. To the extent that asset price bubbles fall into the systemic instability category and to the extent that they contain genuine market failure, they would appear on this allocation of responsibilities to be more in the bailiwick of monetary policy than of prudential regulation. This separation, however, has been more a matter of practicality than of principle. There can be little argument that sound prudential regulation adds to systemic stability. Thus regulation to correct asymmetric information failure and to correct systemic instability are complementary rather than mutually exclusive. The message, however, is that using an existing tool of prudential regulation to deal with an explicit aspect of systemic instability will result in its having two objectives rather than one. While we might expect those objectives to be complementary, whether or not they are in practice is a proposition that needs to be tested.

It remains to assess how prudential tools might be used to deal with bubbles. Supervisors assess and influence risk taking in financial institutions through a range of qualitative and quantitative methods. These techniques include restrictions on portfolio composition, risk-based capital requirements, loan loss provisioning, and stress testing of market risk exposures. In this section we examine the appropriateness of these regulatory policy options for dealing with asset price bubbles.

(i) Restrictions on Portfolio Composition

Portfolio restrictions have historically been used as a tool of both bank supervision and monetary policy. To limit the risk of asset price bubbles, Schwartz (2001) suggests that regulation should be particularly concerned with bank portfolio composition and that regulators should give financial institutions an incentive for self-regulation by linking deposit insurance premiums to a benchmark asset portfolio, where the weights for loans secured by each class are set by the regulator.

The argument for influencing portfolio composition in this way is based on the US experience of the 1920s and more recently the Japanese experience of the 1980s. In both periods, shifts in bank lending towards the funding of speculative investment in equity and property markets facilitated the asset price booms and left their respective financial systems in critically weakened positions when the booms ended. Moreover, Schwartz notes that it is not necessarily an increase in the total supply of bank credit that facilitates rising prices, but rather portfolio shifts; an observation that is consistent with the Australian experience in the late 1980s.

By linking bank portfolio composition to capital requirements or deposit insurance premiums, regulators would impose increased costs on banks that deviate from the benchmark portfolio. There are, however, several practical difficulties in applying portfolio constraints as suggested by Schwartz.

First, the construction of a suitable set of weights for the benchmark portfolio is problematic. It requires regulators to form judgments about the optimal structure of the real sector—an area in which their expertise would have to be questioned. Secondly, it involves substituting the judgement of regulators for the judgement of bank management—something that runs counter to the risk-based philosophy that has been emerging in banking regulation over recent decades. Thirdly, high-growth industries, by definition, tend to make greater demands on new credit than do stable or declining industries. A decision to effectively limit the amount of new credit supplied to a particular sector may inhibit growth in areas of the economy in which the country has a genuine comparative advantage. Fourthly, institutions that wish to deviate from the benchmark portfolio because of their expertise in a particular market segment, such as small business lending, would be penalised for doing so.

While we accept that shifts in portfolio composition can play an important role in facilitating the development of asset price bubbles, introducing a system of benchmark portfolio weights and penalising deviations from these benchmarks would be an extremely costly and inefficient way of dealing with the problem. It would also be a retrograde step in the evolution of regulatory philosophy away from directives that substitute the commercial judgements of regulators for those of bank management.

(ii) Capital Adequacy

Minimum capital ratios have been a mainstay of banking regulation for many years. Several options for varying these minima have been suggested as ways of dealing with asset price bubbles. Kaufman (1998) has been one of the main proponents of this approach.

Kaufman points to the high leverage of banks as the source of most bank failures and suggests that increasing the required minimum capital ratio is a relatively costless but effective way of insulating banks and the real economy from the bursting of bubbles. His assertion that additional capital is effectively costless is based on the proposition that regulated banks are able to exploit lower capital ratios than unregulated institutions because of their implicit government guarantee through deposit insurance. He also recommends a wider application of structured early intervention, with higher trigger capital ratios as a fundamental element of this strategy. We have several reservations about the general applicability of this approach.

First, while there is nothing magical about 8%, and it is certainly true that higher capital is safer than lower capital (a truism), increasing required capital is not costless in practice. While Kaufman may be correct that alterations to the capital ratio of banks is largely a pricing issue from the perspective of the markets, the cost of credit is not independent of the debt/equity combination of the bank; in the extreme, a pure
equity bank is likely to charge considerably more for credit than a very highly leveraged bank. Raising the required capital ratio is likely to result in either a rise in the price or a reduction in the availability of credit. Secondly, this framework offers no guidance as to how much capital is sufficient. Thirdly, structured early intervention is not universally accepted. There is a strong case for its application in countries where regulatory forbearance has resulted in repeated losses, or in which banks are particularly uncooperative in working through problems with their regulators. There are, however, examples where forbearance – combined with action plans and cooperation from the banks involved – has resulted in the recovery of banks that might otherwise have been closed down or merged at considerable cost to depositors, taxpayers and shareholders. The benefits of structured early intervention are very much situation specific. Finally, while higher capital requirements and structured early intervention may reduce the cost of bursting bubbles, they do not address the questions of why bubbles form and how these might be prevented.

Another aspect of capital adequacy that has been discussed in this respect is the way in which the regulatory minimum ratio is treated over the business cycle. It has long been recognised that there is an element of contradiction in the idea of a minimum capital requirement that is invariant across the cycle. The minimum capital adequacy ratio is supposed to provide a buffer of lower priority claimants to protect depositors in times of distress and to provide a buffer of time for regulators to merge troubled banks with stronger banks before they become insolvent. This buffer, however, is not independent of the stage of the cycle. In the upswing, retained earnings are likely to add to capital, while in the downswing, losses are likely to reduce capital. The very idea of capital as a buffer suggests that it should absorb such movements over time. However, if the capital requirement is a strict minimum, banks will need to hold higher than the minimum on average, in order to remain above the minimum during downswings.

This has led some to argue that the 8% minimum capital required by the Basle Accord should be reinterpreted as an average over the cycle, rather than as a strict minimum. This suggestion does not have wide acceptance for two main reasons – both of them practical. First, as noted by Kaufman above, any alteration to capital regulations that lowered the average holding of capital would increase the probability of failures. Secondly, the business cycle in most countries is insufficiently regular to permit precise regulatory calibration. The less costly resolution appears to be to accept that the 8% represents a fixed lower bound and to leave it to individual banks to establish their own buffers above that level, with the knowledge that choosing too low a buffer may result in the loss of their franchise.

(iii) Loan Loss Provisioning

During an economic expansion, bank credit increases, while loan losses and provisions for loan losses typically fall. This counter-cyclical tendency for provisions arises because traditional provisioning methodology, based on fixed and specific provisions, tends to be backward looking, rather than based on
future expected losses. The traditional approach to provisioning for loan losses is based on the view that provisions should reduce the value of loan assets to the lower of cost and net realisable value. Under this approach provisions are not generally established until a loan is recognised as impaired. The behaviour of reserves under the traditional approach accentuates the boom and bust cycle and can therefore contribute both to creating price bubbles and to bursting them.

The counter-cyclical nature of the traditional provisioning methodology has raised concerns for regulators. In response, the Basle Committee first issued a consultative paper on the topic in October 1998 and a revised paper for further comment in July 1999. The Committee’s key guidance in this area was for banks to recognise impaired loans once it became probable that the bank would not collect all amounts due under the loan contract. Banks were encouraged to estimate the extent of probable losses and to set provisions to cover the expected losses. Despite the introduction of the concept of expected loss, provisioning tended to remain generally reactive rather than anticipative, for reasons largely related to tax and accounting rules (both of which deny recognition of expected losses as a basis for provisioning).

In recent years, however, banks have begun adopting variations of what is known as dynamic provisioning. The philosophy underlying dynamic provisioning is that provisions should cover expected losses, while capital should be available to cover unexpected losses. Dynamic provisioning recognises expected losses as a cost of being in the business of making loans. Under this line of thinking, for a bank to not recognise expected losses, “is equivalent to an insurance company writing premiums and then hoping that no one will claim” (Matten (2000)). Under dynamic provisioning, provisions are set equal to expected losses, where the expected loss, EL, for a particular borrower is defined as:

\[
EL = PCE \times EDF \times LIED
\]

where PCE is the potential credit exposure, EDF is the expected default frequency (probability of default) and LIED is loss in the event of default (as a percentage of the exposure). Dynamic provisions are more responsive to the true state of the credit portfolio, and recognise expected losses as a cost of doing business. In principle, a good dynamic provisioning model should recognise the business cycle and possible asset price bubbles in all three of the components of the expected loss calculation.

For example, consider the computation of potential credit exposure for a typical amortising mortgage. The PCE is estimated as the outstanding balance on the loan minus the worst case value of the collateral. Table 1 shows the calculation of PCE for a loan of $90,000 at 10% interest, with annual payments over 15 years. In credit models of this type the worst case value of the collateral is based on a given confidence level. In Table 1, the worst case collateral value is the price below which only 2.5% of outcomes lie, given an assumed volatility (standard deviation) of the underlying collateral price of 10%. Therefore, assuming

---

35 This example is relevant to all forms of collateralised lending, including the forms of lending most prone to bubbles, such as margin lending.
a normal distribution, the potential cumulative change in housing prices is equal to $1.96 \times 10% \times \sqrt{\text{years}}$. The table shows the collateral value based on its initial assumed value of $100,000 and the given historical price volatility. It also shows one way that the exposure, and therefore the required provisions, might be adjusted if the housing market were assumed to be experiencing a bubble.\textsuperscript{36}

In the bubble model, the entire pricing structure of the collateral is adjusted for the extent to which the current price of the collateral is assumed to have deviated from its historic trend (in the example this is assumed to be 15% as at the date of valuation). The impact of this adjustment on the estimated potential credit exposure is shown in Figure 5. Thus, in an upswing, prices would be above trend and, under this approach, would therefore be adjusted downwards. This would, in turn, increase the potential exposure calculation and also the loan loss provision. The net effect would be to dampen the amount of credit provided to areas of lending characterised by rapidly increasing prices and boost it in times of falling prices (or prices below trend).

The problem at this stage of development of the credit modelling technology is that models and modelling assumptions are still institution specific. One of the reasons that the Basle Committee has not progressed further than it has in the use of internal models for regulating risk is the lack of common standards and approaches among the models used by international banks. To add to the difficulty, many smaller and regional banks do not use models and would find it difficult to justify the expense and level of sophistication required, given the risks to which they are exposed.

The question is whether there is a relatively simple way for banking regulators to impose a provisioning rule that captures the essence of the modelling approach and does so in a way that has the opposite effect to that of the traditional approach to provisioning. Such an approach has been pioneered by the Spanish banking regulators. Fernández de Lis, Pagés and Saurina (2000) outline the statistical provisioning requirements introduced by the Spanish central bank. The essence of the Spanish approach is to require three levels of provisioning. The first two, specific and general provisions, are as conventionally defined. To these core provisions they add a statistical provision that is pro-cyclical – increasing in periods of expansion and being run off in downswings. While cyclicity is not necessarily eliminated, provisions are considerably smoothed over the cycle. The statistical provision is built up during the economic expansion phase, while specific provisions remain low. As the economy enters a downturn, and specific provisions start to increase, the statistical provision is run down. This not only ensures that banks are in a better position to manage an economic downturn, but also leads to lower volatility in bank profits.\textsuperscript{37}

\textsuperscript{36} This adjustment is simply a suggestion on our part and is not meant to imply that banks are necessarily using dynamic provisioning models in this way.

\textsuperscript{37} The methodology is outlined further in an attachment.
To test the impact of this approach, we simulated its application to Australian banks as a group over the period 1990 to 2001. In the absence of details about individual loan books we used actual provisions as a proxy for the general and specific provisions required by the Spanish model. The divergence between actual total provisions and the simulated total provisions is therefore due entirely to the simulated statistical provisions.

As illustrated in Figure 6, the actual provisions of Australian banks display a strong counter-cyclical pattern over the 1990s. The simulated total provisions, however, are considerably more stable over the cycle; the counter-cyclical pattern of general and specific provisions is offset by the pro-cyclical pattern of statistical provisions. Simulated total provisions including the statistical provision are relatively stable and are generally just below 2% while the balance in the statistical fund remains positive. An underlying assumption of the Statistical Provisioning Approach (SPA) is that the statistical fund should not be depleted. In the Australian simulation the fund is depleted by early 1992, leading to an immediate sharp rise in total provisions to the level of actual provisions. Actual provisions and provisions using the SPA are identical from this point until mid 1995, at which point the specific provisions again begin to accumulate.

Interestingly, for the most recent period, the SPA suggests that actual provisions in the Australian banking system, as at 2001, are almost half the levels that the Spanish approach suggests are appropriate to the current stage of the business cycle.

Given that the four major Australian banks all use a form of dynamic provisioning, we would have expected their total provisions to have been more stable than the total for all banks. In practice, however, our simulations showed a broadly similar pattern for each of the major banks individually to that shown in Figure 6 for Australian banks as a group. The one exception was the National Australia Bank (NAB), for which the simulated total provisions remained relatively stable, reflecting the smaller increase in specific provisions for the NAB during the early 1990s.

These results suggest that there could be a role for imposing a regulatory approach similar to that adopted by the Spanish authorities in helping to dampen the cyclical growth in credit associated with pro-cyclical provisioning practices and, through that, to dampen the potential for credit growth to underpin asset price bubbles.

38 In simulating the effects of the Spanish provisioning requirement we used the capital adequacy risk weight divided by 100 for each loan category as a proxy for $y$.

39 We also simulated the 1990 to 1995 cycle forward based on current provisioning levels, with very similar results. This suggests that a repeat of the cyclical increase in bad loans experienced in the first half of the last decade would produce a similar cyclical increase in provisions.
(iv) Stress Testing

In its report on stress testing by large internationally active financial institutions, the Bank for International Settlements (BIS, 2000), defines stress testing as “various techniques used by financial firms to gauge their potential vulnerability to exceptional but plausible events”. In essence, stress testing involves subjecting a bank’s model of its business to particular scenarios in order to gauge the responsiveness of its profitability and capital to those scenarios. Whereas statistically based risk measures such as value at risk (VaR) identify the maximum loss that is likely to be incurred at any given confidence level, stress testing identifies the precise loss that is likely to be incurred under a given scenario. It has the advantage of being able to test the bank’s resilience to extreme shocks. Common stress tests conducted at banks surveyed by the BIS are given titles such as “1987 stock market crash” and “1994 bond market crash”. The aggregation of firm level exposures to such risks provides potentially valuable information for supervisors to use in assessing the systemic risks faced by the banking sector in the event of an asset price bubble.

In Australia, for example, banks adopting the internal models approach to market risk are required to undertake a range of standard stress tests. For the equity portfolio, standard stress tests require banks to report changes in the market value of their portfolios to assumed shocks to prices and volatility. While these tests are limited to the traded market portfolios of banks, and therefore ignore the effects of the shocks transmitted through the banks’ lending portfolios, the data give at least some indication of the banking industry’s direct exposure to particular asset prices.

The use of stress testing as a regulatory tool is, however, still in the developmental stages and is subject to several limitations. First, its use is primarily in identifying risk rather than in controlling it. The response of the regulator to an assessed exposure of financial stability to the bursting of an asset price bubble is still a matter of judgement. Secondly, the results of stress tests are only as good as the risk models developed by the banks for their own internal use. As noted earlier, the cost of developing sophisticated risk measurement models may not be a justifiable expenditure for many banks. Thirdly, even where the models exist, the complexity, cost and time needed to run reliable stress tests make frequent testing infeasible and limit the scenarios that may be analysed. Thus, while they have a role to play in assessing the risk of an asset price bubble, they do not offer much beyond this at the present time.

5. Concluding Thoughts

We do not pretend to have produced a definitive coverage of the role of prudential regulation in controlling the emergence of asset price bubbles and the financial damage from their aftermath. We argued that the role required three foundations: first, that bubbles imposed a cost on the economy; secondly, that there is a relationship between bubbles and the behaviour of banks; and thirdly, that this relationship could be managed without undue cost through appropriate regulation.
The first of these we simply assumed. The second, concerning the relationship between bubbles and regulated institutions, is reasonably well supported. The evidence is reasonably convincing that credit expansion through banks can contribute to sharp increases in asset prices and that credit contraction can cause sharp reversals. We found the Australian experience to be generally in line with evidence from other countries. The evidence of this relationship is casual rather than causal and also suggests that compositional changes in finance can be as important as changes in the total volume of credit. Not only is there considerable empirical evidence of the relationship between credit swings and price swings, it is underpinned by a plausible theoretical case as well as a number of banking practices, including the traditional approach to provisioning for loan losses.

We examined four possible regulatory responses to managing bubbles: portfolio restrictions; adjustments in capital requirements; adjustments in provisioning requirements; and the use of stress testing. Of these we found that:

- The first approach, of setting portfolio composition restrictions, is contrary to the principles of modern risk-based banking supervision and potentially costly in terms of its impact on economic efficiency.

- While there is a case for using adjustments in capital adequacy as a counter-cyclical tool, the efficiency costs arising from imprecision militate against its use.

- A stronger case exists for introducing a counter-cyclical provisioning regime along the lines pioneered by the Spanish banking regulators. The case rests largely on the pro-cyclical tendencies of the traditional approach to provisioning and also on the fact that the counter-cyclical provisioning approach is compatible with the sorts of outcomes that should be produced by a cyclically adjusted dynamic provisioning model.

- Finally we found that stress testing – and indeed the wider use of internal models – has a role to play in helping to identify the systemic risks of price bubbles, but offers little by way of structured guidance for control of bubbles.

On balance we conclude that the role for financial regulation in controlling the emergence of, and damage from, assets price bubbles remains relatively limited.
Figure 1: Australian Economic Data (1880-1920)

- **Asset Prices**
  - Property Prices
  - Industrial Share Price Index
  - Mining Share Price Index

- **Bank Condition**
  - Loans/Total Assets (RHS)
  - Cash/Deposits (RHS)
  - Capital/Total Assets (LHS)

- **Economic Growth**
  - Real GDP (Victoria)
  - Real GDP (NSW)
  - Real GDP (Australia)

- **Bank Credit**
  - Nominal Bank Credit (LHS)
  - Bank Credit/Nominal GDP (RHS)
Figure 2: Australian Economic Data (1920-1944)

Asset Prices

Stock Price Index
Property Price Index

Bank Condition

Loans/Total Assets (RHS)
Cash/Deposits (LHS)
Capital/Total Assets (LHS)

Economic Growth and Interest Rates

3-Month Bank Loan Rate (RHS)
Real GDP (LHS)

Bank Credit

Nominal Bank Credit (LHS)
Bank Credit/GDP (RHS)
Figure 3: Australian Economic Data (1960-1980)

**Asset Prices**
- Stock Price Index (RHS)
- Commercial Property Prices (RHS)

**Bank Condition**
- Total Loans/Total Assets (RHS)
- Capital/Total Assets (LHS)
- Housing Loans/Total Assets (RHS)

**Economic Growth and Interest Rates**
- Real GDP (LHS)
- 13-Week Treasury Note Rate (RHS)

**Credit Growth**
- Nominal Total Credit (LHS)
- Nominal Bank Credit (LHS)
- Total Credit/GDP (RHS)
- Bank Credit/GDP (RHS)
Figure 4: Australian Economic Data (1980-2000)

Asset Prices

- Commercial Property (RHS)
- Share Price Index (RHS)
- Residential Property (LHS)

Bank Condition

- Risk-Based Capital Ratio (LHS)
- Business Loans/Total Assets (RHS)
- Housing Loans/Total Assets (RHS)
- Personal Loans/Total Assets (RHS)

Economic Growth and Interest Rates

- Real GDP (LHS)
- Cash Rate (RHS)
- CPI (RHS)

Credit Growth

- Nominal Bank Credit (LHS)
- Total Credit/GDP (RHS)
- Bank Credit/GDP (RHS)
- Nominal Total Credit (LHS)
Table 1: Potential Credit Exposure Calculation – Amortising Mortgage

<table>
<thead>
<tr>
<th>Year</th>
<th>Loan Balance</th>
<th>Potential Change in House Price (cum%)</th>
<th>Worst Case Value of Collateral</th>
<th>Potential Credit Exposure</th>
<th>Bubble-adjusted Collateral Value (15%)</th>
<th>Bubble-adjusted Potential Credit Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>90,000</td>
<td>-</td>
<td>-</td>
<td>85,000</td>
<td>5,000</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>87,167</td>
<td>19.600</td>
<td>80,400</td>
<td>6,767</td>
<td>68,340</td>
<td>18,827</td>
</tr>
<tr>
<td>2</td>
<td>84,051</td>
<td>27.719</td>
<td>72,281</td>
<td>11,770</td>
<td>61,439</td>
<td>22,612</td>
</tr>
<tr>
<td>3</td>
<td>80,624</td>
<td>33.948</td>
<td>66,052</td>
<td>14,572</td>
<td>56,144</td>
<td>24,480</td>
</tr>
<tr>
<td>4</td>
<td>76,854</td>
<td>39.200</td>
<td>60,800</td>
<td>16,054</td>
<td>51,680</td>
<td>25,174</td>
</tr>
<tr>
<td>5</td>
<td>72,706</td>
<td>43.827</td>
<td>56,173</td>
<td>16,533</td>
<td>47,747</td>
<td>24,959</td>
</tr>
<tr>
<td>6</td>
<td>68,144</td>
<td>48.010</td>
<td>51,990</td>
<td>16,154</td>
<td>44,192</td>
<td>23,953</td>
</tr>
<tr>
<td>7</td>
<td>63,126</td>
<td>51.857</td>
<td>48,143</td>
<td>14,983</td>
<td>40,922</td>
<td>22,204</td>
</tr>
<tr>
<td>8</td>
<td>57,606</td>
<td>55.437</td>
<td>44,563</td>
<td>13,043</td>
<td>37,878</td>
<td>19,728</td>
</tr>
<tr>
<td>9</td>
<td>51,534</td>
<td>58.800</td>
<td>41,200</td>
<td>10,334</td>
<td>35,020</td>
<td>16,514</td>
</tr>
<tr>
<td>10</td>
<td>44,855</td>
<td>61.981</td>
<td>38,019</td>
<td>6,836</td>
<td>32,316</td>
<td>12,539</td>
</tr>
<tr>
<td>11</td>
<td>37,508</td>
<td>65.006</td>
<td>34,994</td>
<td>2,514</td>
<td>29,745</td>
<td>7,763</td>
</tr>
<tr>
<td>12</td>
<td>29,426</td>
<td>67.896</td>
<td>32,104</td>
<td>-</td>
<td>27,288</td>
<td>2,138</td>
</tr>
<tr>
<td>13</td>
<td>20,536</td>
<td>70.669</td>
<td>29,331</td>
<td>-</td>
<td>24,932</td>
<td>-</td>
</tr>
<tr>
<td>14</td>
<td>10,757</td>
<td>73.367</td>
<td>26,664</td>
<td>-</td>
<td>22,664</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>0</td>
<td>75.910</td>
<td>24,090</td>
<td>-</td>
<td>20,476</td>
<td>-</td>
</tr>
</tbody>
</table>

Figure 5: Potential Credit Exposure – With and Without Cyclical Adjustment

Potential Credit Exposures

<table>
<thead>
<tr>
<th>Period</th>
<th>PCE Cyclically Adjusted</th>
<th>PCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>-5,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>0</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>5,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>10,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>15,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>20,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>25,000</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>30,000</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>
Figure 6: Actual and Statistical Provisioning: Australian Banks

A Comparison of Actual Provisioning and Statistical Provisioning

Aggregate of Local Banks - Fund Upper Limit = 3x Latent Risk

Actual Total Provisions

Total Provision (SPA)

Statistical Provision Only

Percent of Risk-Weighted Assets


ASSET PRICE BUBBLES AND PRUDENTIAL REGULATION

APRA

OCTOBER 2001
ATTACHMENT 1

THE SPANISH MODEL FOR BANK PROVISIONING

In addition to general and specific provisions, the Spanish Central Bank has introduced a system of statistical provisioning. Application of the methodology is relatively simple and is illustrated below.

\[ TP_{it} = SP_{it} + GP_{it} + StP_{it} \]

where \( TP_{it} \) is total provisions for bank \( i \) in period \( t \); \( SP_{it} \) is specific provisions for bank \( i \) in period \( t \); \( GP_{it} \) is general provisions for bank \( i \) in period \( t \); and \( StP_{it} \) is statistical provisions for bank \( i \) in period \( t \).

\[ SP_{it} = \sum_j e_j \Delta M_{jt} \]

\[ GP_{it} = \sum_j g_j \Delta L_{jt} \]

\[ StP_{it} = \sum_j s_j L_{jt} - SP_{jt} \]

where \( e_j, g_j \) and \( s_j \) are provisioning weights for loan category \( j \), which are multiplied respectively by the change in problem loans for each loan category (\( \Delta M_{jt} \)), the change in the volume of each loan category (\( \Delta L_{jt} \)), and the outstanding balance of each loan category \( L_{jt} \). The provisioning weights may be determined by a standard or internal-based model.

The annual statistical provision accumulates over time, so that:

\[ StF_{it} = StP_{it} + StF_{it-1}, \text{ subject to } 0 \leq StF_{it} \leq 3\sum_j L_{jt} \]

where \( StF_{it} \) is the balance of the statistical provision fund for bank \( i \) in period \( t \), and \( \sum_j L_{jt} \) is also referred to as latent risk.

In strong economic periods specific provisions will be below latent risk, with the result that the statistical provisions will be positive and the statistical fund will be built up, subject to the imposed limit. In periods of economic downturn, specific provisions increase above latent risks, implying a negative contribution to the statistical provision. That is, the statistical fund will be run down. In aggregate, this results in much less cyclical provisioning. It is important to note that the statistical provision is not a tax deductible expense.
REFERENCES


DATA APPENDIX

Figure 1: 1880-1920


Loans/Total Assets: Trading bank advances and other assets plus savings bank mortgage loans to total trading and savings bank assets. Reserve Bank of Australia (RBA), Occasional Paper 4A (OP4A). Tables 2(i), 2(ii) and 53(i). Annual Data.

Cash/Deposits: Trading bank cash to trading bank deposits, bills payable and other liabilities, OP4A, Tables 2(i) and 2(ii). Annual Data.

Capital/Total Assets: Trading bank shareholders equity to total assets, OP4A, Tables 2(i) and 2(ii). Annual Data.

Real GDP: All GDP series for this period are taken from Haig (2001). Annual data.

Nominal Bank Credit: Trading bank advances and other assets within Australia plus savings banks advances, OP4A, Tables 1 and 53(i). Annual Data.

Bank Credit/GDP: Nominal bank credit as defined above to nominal GDP at market prices. The GDP series is from Butlin (1962), page 6, Table 1, Column 2. Annual Data.

Figure 2: 1920-1944

Stock Price Index: All Ordinaries Share Price Index, RBA. Quarterly Data.


Loans/Total Assets: As per Figure 1.

Cash/Deposits: As per Figure 1.

Capital/Total Assets: As per Figure 1.

3-Month Bank Loan Rate: Australian trading bank 3-months loan rate, OP4A, Table 51. Annual Data (midpoint of reported months).
**Real GDP:** Butlin (1985), Table 23. Annual Data.

**Nominal Bank Credit:** As per Figure 1.

**Bank Credit/GDP:** As per Figure 1.

**Figure 3: 1960–1980**

**Stock Price Index:** As per Figure 2.

**Commercial Property Prices:** Capital value of Sydney commercial property prices. See data appendix in Kent and Lowe (1997). Quarterly data.

**Total Loans/Total Assets:** Total loans is loans, advances and bills discounted for trading and savings banks, RBA. Occasional Paper No. 8 (OPN8), Tables 3.8 and 3.9. Total assets for savings and trading banks from same tables. Annual Data.

**Housing Loans/Total Assets:** Savings bank housing loans to total assets of savings and trading banks, OPN8, Tables 3.8 and 3.9. Annual Data.

**Capital/Total Assets:** Trading banks total shareholders funds to total assets, RBA, Occasional Paper No. 4B (OP4B), Table 10. Annual Data.

**Real GDP:** Reserve Bank of Australia, Table G09. Quarterly Data.

**13-Week Treasury Note Rate:** RBA, OPN8, Table 3.23. Annual Data.

**Nominal Bank Credit:** Total bank loans and advances. From 1960 to 1976, RBA, OPN8, Table 3.2. From March 1977 to 1980, RBA website (www.rba.gov.au), Table D02.

**Nominal Total Credit:** All financial institutions credit. Sources as per nominal bank credit.

**Nominal GDP:** RBA website, Table G10. Quarterly data.

**Figure 4: 1980–2000**

**Commercial Property:** Sydney central business district, capital value indicator, JLW/JLL. Quarterly data.

**Share Price Index:** As per Figure 2.

**Residential Property:** Residential median housing price index of six Australian capital cities. Real Estate Institute of Australia (REIA). Quarterly data.

**Business Loans/Total Assets:** RBA, Table D02. Quarterly data.

**Housing Loans/Total Assets:** RBA, Table D02. Quarterly data.
Personal Loans/Total Assets: RBA, Table D02. Quarterly data.

Real GDP: As per Figure 3.

CPI: Consumer Price Index – All groups, RBA, G01. Quarterly data.

Cash Rate: Weighted average of Authorised Money Market Dealers up until 1989, RBA Bulletin, Table F1, monthly data. Cash Rate Target from 1990 onwards, RBA Website.

Nominal Bank Credit: As per Figure 3.

Nominal Total Total: As per Figure 3.

Nominal GDP: As per Figure 3.
Asset Price Bubbles and Prudential Regulation

Working Paper 3
September 2001

Jeffrey Carmichael
Neil Esbo