The Use of Loan Loss Provisions for Earnings, Capital Management and Signalling by Australian Banks

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Abstract

This research is motivated by the fact that there is a paucity of research on the earnings management practices of banks in Australia. Research on the practices of North American, European and Asian banks provided conflicting evidence. In this study, we examine whether Australian banks engage in earnings, capital management and signalling, and, if so, the extent to which loan loss provisions (LLPs) are used for this purpose. Our results indicate that banks in Australia use loan loss provisions to manage earnings. Further, listed commercial banks engage more aggressively in earnings management using LLPs than other banks. We also find that earnings management behaviour is more pronounced after implementation of the Basel Accord. We do not find evidence to indicate a relationship between LLPs and capital management. This may be because loan loss reserves no longer constitute part of Tier I capital in the numerator of the capital adequacy ratio. Overall, however, we find a significant understating of loan loss provisions in the post-Basel period relative to the pre-Basel period. This indicates that reported earnings may not reflect the true economic reality underlying those numbers. Finally, Australian banks do not appear to use LLPs for signalling future intentions of higher earnings to investors.

Keywords: *Earnings management, capital management, signalling, Australian banks*

JEL classification: C23; G14, M41

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1. Introduction

Loan loss provisions LLPs are expected to reflect anticipated losses by bank managers. However, federal bank and securities regulators recognize that the provisions cannot accurately match actual losses and can include a margin for imprecision (see Montgomery, 1998). This margin for imprecision (referred to as the discretionary component of the allowance) has been exploited by banks. Previous researchers, most of whom concentrated on financial institutions in the United States and Europe, concluded that at one stage or another, LLPs were used as a tool for capital management (see Kim and Kross, 1998; Collins, Shackelford and Wahlen, 1995; Moyer, 1990; among others), for earnings management (see Ahmed, Takeda and Thomas, 1999; Beatty, Chamberlain and Magliolo, 1995; Greenawalt and Sinkey, 1988; among others) and for signalling future intentions to the stock market (Liu and Ryan, 1995; Wahlen, 1994).

To date, there is no research that examines if and how Australian banks use LLPs as a tool for reducing earnings volatility, managing risk and signalling future changes in earnings. It is important to understand whether Australian banks use LLPs as a tool to meet one or a combination of these objectives. It is of particular importance to regulators in Australia, because it would help them to discern whether reported accounting numbers reflect the true economic reality of the underlying risk conditions. Hence, in this paper we examine whether Australian banks use LLPs for any of these purposes.

Changes in capital adequacy regulation in 1990 provided the impetus for research on how U.S. financial institutions use LLPs. Research on European bank behaviour followed the implementation of the Basel Accord of 1988. The U.S. and European changes in capital adequacy regulations form a common strand with respect to the use of LLPs. Prior to these changes the total amount of a bank's LLPs was included in the numerator of the ratio used by regulators to compute a bank's "capital adequacy." Evidence suggests that for the U.S. and European countries, this arrangement acted as a constraint on the use of LLPs for earnings and capital management. For example, under this regulation, reducing LLPs for the purpose of increasing earnings would lower the bank's capital adequacy ratio, thus acting as a disincentive for banks with low capital adequacy ratios. Similarly, increasing LLPs would improve the bank's

capital adequacy ratio but would also cause reported earnings to be lower. Earnings management could only be achieved at the expense of risk management and vice versa. The U.S. act of 1990 and the Basel Accord of 1988 eliminated this imbroglio because they both reduce the direct role of loan loss reserves in the numerator of the capital adequacy ratio. With this change, earnings management could now be achieved without costs (see Ahmed et al., 1999). Several researchers examined if the new rules in the U.S. and Europe caused banks to adopt more aggressive earnings management techniques and affected the use of LLPs for capital management and signalling.

There is no significant difference between the U.S. capital adequacy regulations of 1990, the requirements of the Basel Accord of 1988, and the rules currently administered in Australia. The current rules in Australia were implemented in the 1990s and require Australian banks to follow the capital adequacy requirements of the Basel Accord of 1988. Therefore, we refer to the current regime in Australia as the post-Basel period. While there is no research that specifically examines how the post-Basel capital regulations changed the way Australian banks use LLPs for earnings management, capital management and signalling, there is some research on other aspects of Australian banking. Ford and Weston (2001) focused on performance of Australian bank stocks over the post-Basel period, and found evidence of low returns and high volatility. They noted that in the post-Basel period, Australian banks incurred large asset write-downs on non-performing loans following poor lending practices. Ford and Weston (2003) argued that research on the impact of the post-Basel regulations on transparency in financial reporting by banks is necessary. They wrote, “One area where this is most apparent is the provisioning for loan losses. Revisions to loan loss reserves represent charges against earnings for the period in which they are recognized. An increase in loan loss provisions in line with deterioration in loan quality will reduce the retained earnings of the bank entity. Weaker banks face a strong incentive to understate loan loss provisions because, under the Basel Accord risk based capital requirements, retained earnings are counted as core (Tier I) capital while loan loss reserves are counted as supplementary (Tier II) capital up to 1.25% of banks’ risk weighted assets (Ford and Weston, 2003, p.13)”.

As mentioned above, work was done on how the new rules in the U.S. and Europe affected the use of LLPs for capital management, earnings management and signalling. One important paper

in this area, Ahmed et al. (1999), examined how bank managers in the U.S. used LLPs to manage earnings and capital and to signal markets of future earnings changes. Ahmed et al. (1999) developed a model and estimated it using OLS regressions that included various dummy variables and interaction terms to exploit the regulation changes. In this study we examine if Australian bank managers use LLPs for the same purposes, using an approach similar to that of Ahmed et al. (1999). However, it should be noted that we did not replicate the Ahmed et al. (1999) methodology. As will be discussed later in the paper, our alterations to the Ahmed et al. (1999) approach were made primarily to accommodate our much smaller sample (50 commercial banks with only 10 listed).

The second section of this paper discusses capital adequacy regulation in Australia in greater detail. Section 3 discusses relevant prior literature. In Section 4 we state our hypotheses. The model specifications and the variables used in this study along with a description of our data are provided in Section 5. Section 6 discusses our empirical results and Section 7 discusses additional tests. We present our conclusions in Section 8.

2. Capital adequacy regulation in Australia

In Australia, banks are regulated by the Australian Prudential Regulation Authority (APRA) established in 1998. The creation of the APRA was one of the recommendations of the Wallis Inquiry of 1996, which sought to make major changes to the regulatory framework of the Australian financial system.[1] The other key changes recommended by the Wallis report and adopted by the government do not impinge on this study and hence are not discussed here. Prior to the establishment of the APRA, prudential supervision of the Australian financial system was organized around institution type, with separate agencies (the Reserve bank and the Insurance and Superannuation Commission, among others) regulating the activities of each class of financial institution. The amalgamation of these separate prudential agencies into a single entity was a major change in the regulatory framework pertinent to this study. The APRA required all banks to adopt the requirements of the Basel Accord of 1988. Published research indicates that as of 1996, all Australian banks had adopted the Basel Accord guidelines (see Padoa-Schioppa,

[1] The Commonwealth Government established the Wallis Inquiry in 1996 and its final report Financial System Inquiry was published in 1997.

1996).[2] There is no evidence that all Australian banks adopted at the same time, but we use 1996 as the cut off date assuming the bulk of banks adopted around this time as stated in the Padoa-Schioppa paper.

Capital adequacy refers to the amount of capital held by Australian depository institutions (ADIs) to cover losses. The APRA currently requires capital adequacy requirements for ADIs to be based on the Bank for International Settlements Basel Committee for Banking Supervision (1988) *International Convergence of Capital Measurement and Capital Standards*, commonly known as the Basel Accord. The intention of the Basel Accord was to ensure that a consistent standard be applied when determining minimum capital requirements across internationally active banks. Under the rules of the Basel Accord, capital for supervisory purposes is now considered in two tiers: Tier I and Tier II. Tier I (core capital) comprises the highest-quality capital elements. Tier I capital is defined as the sum of book value of equity (common stock and retained earnings), qualifying non-cumulative perpetual preferred stock, and minority interest in equity accounts of subsidiaries less goodwill and other intangible assets. Tier II (supplementary capital) is made up of other elements that contribute to the overall strength of a bank as a going concern but do not satisfy all of the characteristics of Tier I capital. Tier II capital is the sum of loan loss reserves (up to a maximum of 1.25% of risk weighted assets), perpetual preferred stock, hybrid capital instruments, perpetual debt, mandatory convertible debt securities, term subordinated debt, and intermediate preferred stock. A bank's capital base is the sum of its Tier I and Tier II capital less any deductions. At least 50% of a bank's capital base must be Tier I capital. The Basel Accord requires that the ratio of a bank's capital to risk weighted assets (referred to as the capital adequacy ratio) must be at least 8%.

It is of interest to this study that in both the pre- and post-Basel periods, retained earnings are included in the numerator of the capital adequacy ratio. In the pre-Basel period, the numerator of the capital adequacy ratio also included the entire amount of a bank's LLPs (referred to in the

[2] In this study Padoa-Schioppa noted that the results of a survey involving 129 countries showed that most non-Basel member countries had adopted the guidelines during the period 1992 – 1996 though the implementation year for each country varied. Most banks, including those in Australia, adopted closer to 1996; by 1996 all banks had adopted the guidelines. Therefore, we refer to the period before 1996 as the pre-Basel period and the period starting in 1996 as the post-Basel period.

Australian regulation as general provision for doubtful accounts). Under these conditions, a decrease (increase) in LLPs would result in no change in the numerator but would decrease (increase) a bank's capital adequacy ratio. This meant that in the pre-Basel period, LLPs acted as a constraint to earnings management. As mentioned above, in the post-Basel period a bank's LLPs are not part of Tier I capital and are only an insignificant part of Tier II capital; thus, increasing or reducing the LLPs for the purpose of managing earnings has no effect on the capital adequacy ratio.

The mechanism of the double entry and the impact of increasing and decreasing LLPs are shown in Figure 1.

<< Insert Figure 1 here >>

3. Literature review

We categorize the literature into earnings management, capital management and signalling.

3.1 Studies that examined the association of LLPs and earnings management

Ma (1988) examined if LLPs were used as a tool to reduce volatility of earnings by banks. He concluded that LLPs, together with loan charge-offs, were used by banks for income smoothing. Collins et al. (1995) examined whether, in addition to LLPs, other tools such as loan charge-offs and securities issuances were used for earnings management. They found a positive association only between LLPs and earnings management, and concluded that the other tools were used primarily for capital management. Some studies sought to examine the *characteristics* of banks that indulged in earnings management. Greenawalt and Sinkey (1988) found that regional banks engaged in more aggressive income smoothing than money-centred banks. Bhat (1996) found that banks that engaged in aggressive income smoothing were in poorer financial health relative to others. All these studies had one common feature: they all found a positive association between LLPs and earnings management.

Not all studies on LLPs and earnings management came to the same conclusion. Wetmore and Brick (1994) studied what factors might be associated with income smoothing by banks and found no evidence that LLPs are used as a tool for earnings management. Beatty et al. (1995) considered whether banks alter timing and magnitude of transactions and accruals to achieve

earnings management, but found no association between LLPs and earnings management by the banks in their sample. Ahmed et al. (1999), the only study to use data that included the period after the change in capital adequacy regulations, also found no evidence that banks used LLPs to manage earnings. Their finding of no association was surprising, since the capital adequacy regulation removed the costs of earnings management.

3.2 Studies that examined the association of LLPs and capital management

Studies in the area of capital management can be dichotomised into those that examined the association before the capital adequacy regulation change and those that examined association after said change. Moyer (1990) and Scholes, Wilson and Wolfson (1990) examined the use of LLPs and other related tools for capital management. They found that banks used LLPs by inflating loan loss reserves when capital levels were close to violating minimum capital regulations. They did not find significant association with other tools, such as charge-offs. Beatty et al. (1995) concluded that, while managers' accrual decisions are complicated by other capital-raising activities, loan charge-offs and LLPs are used as mechanisms of capital management. Not all studies reached the same conclusions. For instance, Collins et al. (1995) found the opposite results; namely that while tools such as charge-offs were associated with capital management, LLPs were not.

Two studies that examined the association of LLPs with capital management after the new regulation came into effect are Kim and Kross (1998) and Ahmed et al. (1999). They found no association. This result is not surprising since, under the new regulation, loan loss reserves are no longer a component of the capital adequacy ratio.

3.3 Studies that examined the use of LLPs as a tool for signalling

Some studies in this area examined whether LLPs are used as a signalling device to clients and investors regarding future expected cash flow. These studies also decomposed LLPs into discretionary and nondiscretionary components. Most studies concluded that stock returns were negatively related to normal loan loss provisions and positively related to abnormal loan loss provisions (Liu, Ryan and Wahlen, 1997; Beaver and Engel, 1996; Liu and Ryan, 1995; Wahlen, 1994; Beaver, Eger, Ryan and Wolfson, 1989). However, Ahmed et al. (1999) found evidence to the contrary. Thus, the results in this area are mixed.

4. Hypotheses

4.1 Capital management

Using financial data on banks in the pre-Basel era, Moyer (1990) concluded that banks use loan loss reserves for the purpose of managing capital adequacy ratios. On the other hand, Ahmed et al. (1999) found that in the post-Basel period there appeared to be no significant association between loan loss reserves and capital adequacy ratios. This difference in findings can be explained by regime differences in capital adequacy regulation. In the post-Basel period, loan loss reserves are not included in Tier I capital and can make only a limited contribution to Tier II capital and, therefore, changes in LLPs have no impact on the capital adequacy ratio. Since Australian banks have also adopted the guidelines of Basel Accord, there is no reason to expect a divergence in U.S., European and Australian bank behaviour. Our hypothesis, stated in the alternate, is as follows:

H1: The relation between loan loss provision and primary (Tier I) capital for commercial banks will be less negative in the post-Basel regime relative to the pre-Basel regime.

Ahmed et al. (1999) tested two other hypotheses dealing with whether the association between the cost of violating capital constraints and capital management was less negative in the post-Basel regime. They broke down their Tier II sample into banks with loan loss reserves in excess of 1.25% of risk weighted assets versus those with 1.25% or less. We could not do this because our sample was limited to only 50 commercial banks, of which only 10 were listed. Ahmed et al. (1999) had a total of 113 banks in their sample. However, we did examine the relationship between loan loss reserves and capital management (measured as Tier I and Tier II). The results are discussed in Section 7.

4.2 Earnings management

There are many ways to define earnings management. We follow the Ahmed et al. (1999) and define it as smoothing earnings. We look at the relationship between LLPs and earnings before taxes and LLPs.

The inherent assumption is that managers have an incentive to engage in earnings management. Since reduced volatility is assumed to convey a signal of lower risk, less volatile earnings are a

fundamental predicate for stable stock prices (Greenawalt and Sinkey, 1988; Beatty et al., 1995; Collins et al., 1995; Ahmed et al., 1999). As mentioned in the prior section, in the post-Basel regime, since LLPs are not included in Tier I capital and can make only a limited contribution to Tier II capital, changes in LLPs will not change the capital adequacy ratio; therefore, there is no constraint or costs associated with earnings management. Hence, one would expect more aggressive earnings management in the post-Basel period. Evidence of this behaviour has been witnessed in countries representing the Organization for Economic Cooperation and Development (OECD), a Paris-based, European-dominated organization (Ford and Weston, 2003), and in Asian countries (Delhaise, 1998). In Australia, we posit that commercial banks have an incentive to engage in earnings management to send a reassuring signal to investors. Hence, our hypothesis, stated in the alternate, is as follows:

H2: The relation between loan loss provisions and earnings (before loan loss provisions) will be more positive in the post-Basel regime relative to the pre-Basel regime.

In the economic literature it is argued that corporate decisions are affected by the type of corporate ownership (Rozeff, 1982; Kim and Sorensen, 1986). In particular, a high correlation was observed between the vested interest of an individual and firm performance (Rosen and Quarrey, 1987; Oswald and Jahera, 1991). This can be explained by agency theory, which suggests that managers acting as agents for owners exhibit tendencies to pursue strategies that meet their own goals, rather than those of the owners (Jensen and Meckling, 1976; Fama, 1980). With respect to this study, listed commercial banks are monitored more carefully by regulators. Managers acting as agents for the owners of banks are under more pressure to post higher returns for the company. Most owners try to provide incentives to managers by incorporating "pay for performance" compensation contracts based on average performance over a short period of time (Core and Gauy, 2002; Yermack, 1995). Holderness and Sheehan (1988) and Jensen and Murphy (1990) note that this type of performance measure is common in most publicly-traded companies, including listed commercial banks. Hasan and Lozano-Vivas (1998) note that for non-traded institutions, given the lack of direct monitoring and pressure, managers may have different goals and strategies relative to the managers of traded institutions. This applies to unlisted commercial banks as well. In this study, we assume that listed commercial banks will have a vested interest in reporting stable income numbers due to the fact they obtain capital by issuing shares; unlisted commercial banks do not. We infer from this interest, based on the

theory discussed above, that listed commercial banks may have a much greater incentive to engage in earnings management to convey a signal of stability to investors. Hence, we propose an additional hypothesis on earnings management stated in the alternate form as follows:

H2a: The relation between loan loss provisions and earnings (before loan loss provisions) will be more positive for listed commercial banks relative to unlisted commercial banks.

Finally, we infer that this association will be more pronounced in the post-Basel period relative to the pre-Basel period. Hence, out next hypothesis, stated in the alternate, is as follows.

H2b: The relation between loan loss provisions and earnings (before loan loss provisions) will be more positive for listed commercial banks relative to unlisted commercial banks in the post-Basel period.

4.3 Signalling

Management uses various tools to signal intent. Loan loss provisions have long been heralded in the literature as a tool used by management for this purpose (Beaver et al., 1989; Wahlen, 1994; Beaver and Engel, 1996; Ahmed et al., 1999). Signalling theory postulates that increases in LLPs are used to signal good news about future earnings changes. Ahmed et al. (1999) note that signalling is an important reason for choosing loan loss provisions. Hence, our hypothesis, stated in the alternate form, is as follows:

H3: Loan loss provisions are positively related to one-year ahead changes in earnings before loan loss provisions.

5.0 Data and Model Specifications

5.1 Data

We used the data from bank financial statements provided by Thompson's BankScope and Bureau van Dijk for Australia. The data required substantial editing before a reliable sample could be constructed. Problems encountered included multiple listings of large commercial banks in the data set, and double reporting by some banks using both international accounting standards (IAS) and domestic accounting practices. In addition, the problem in the latter case was compounded because multiple entries often reflected different levels of consolidation. Hence, the

data was carefully reviewed to avoid double counting of institutions, in order to ensure that the banks reported according to the same accounting standards, and to exclude various types of non-bank financial institutions. We use the following criteria to obtain a cleaner sample. First, data from the consolidated bank or bank holding company was used whenever more than one set of accounts was provided. Second, IAS data was used wherever available and, if this was not available, inflation-adjusted local accounting standards data was used. Finally, commercial banks with incomplete data with respect to our key variables were excluded from the sample. Our final data set consists of annual end-of-year information for all Australian commercial banks covering the period 1991 to 2001. The final sample comprised a total of 50 commercial banks, of which 10 are listed and 40 are unlisted. The total number of bank-year observations are 441 for commercial banks (79 for listed and 362 for unlisted).

Table 1 provides a description of the population of the banking industry in Australia by category. As shown in Table 1, the commercial banks are by far the largest, possessing 87% of the share of industry assets. Even though Table 1 provides descriptions of investment banks and cooperative and specialized banks, these were not used in our study. Different categories of banks may be subject to different regulation changes, which would complicate this study. The sample in our study is limited to commercial banks only. The commercial banks are subject to one regulatory change, namely the requirement to implement the guidelines of the Basel Accord. It should also be noted that Australian commercial banks were subject to major regime changes. One change was the implementation of the Basel Accord requirements, which is the focus of this study. Another was deregulation of the banking industry. Deregulation occurred in the mid 1980s (see Williams, 1998) and hence does not affect the results of this study, because the initial date of our sample was 1991, after deregulation occurred

<< Insert Table 1 here >>

5.2 Methodology

We use the following model to examine how LLPs are used in earnings management and capital management. We estimate this model using OLS regressions, initially using the natural logarithm of loan loss provisions as the dependent variable, and then using loan loss provisions to average loans outstanding as the dependent variable.

$$\text{LLP (or LLPR)} = a_0 + a_1\Delta\text{LLA} + a_2\,\Delta\text{GDP} + a_3\,\text{MCAP} + a_4\,\text{EBT} + a_5\,\text{LISTED} + a_6\,\text{POST} + a_7\,\text{TA} + a_8\,\text{CFEER} + a_9\,\text{LISTED} * \text{MCAP} + a_{10}\,\text{LISTED} * \text{EBT} + a_{11}\,\text{MCAP} * \text{POST} + a_{12}\,\text{EBT}*\text{POST} + a_{13}\,\text{LISTED} * \text{MCAP} * \text{POST} + a_{14}\,\text{LISTED} * \text{EBT} * \text{POST} \quad (1)$$

where,

LLP (model one)	=	Natural logarithm of loan loss provision
LLPR (model two)	=	Loan loss provision / average loans outstanding
ΔLLA	=	Change in loan losses / Total assets
ΔGDP	=	Change in gross domestic product, a proxy for the change in economic growth
MCAP	=	Ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital
EBT	=	Earnings before taxes and loan loss provision divided by average total assets
LISTED	=	Dummy variable (1 if listed commercial bank; 0 if non-listed commercial bank)
POST	=	Dummy variable (1 for post-Basel regime years 1996-2001; 0 for pre-Basel regime years 1991-1995)
TA	=	Natural logarithm of total assets
CFEER	=	Commission and fee income to total assets
LISTED * MCAP	=	Interaction of type of commercial bank with capital adequacy ratio
LISTED * EBT	=	Interaction of commercial bank type with earnings
MCAP * POST	=	Interaction of capital adequacy ratio with type of regime
EBT * POST	=	Interaction of earnings with type of regime
LISTED*MCAP*POST	=	Interaction of type of commercial bank with capital adequacy ratio and type of regime
LISTED * EBT * POST	=	Interaction of type of bank with earnings and type of regime

Table 2 provides descriptive statistics for the dependent and independent variables. As can be seen in Table 2, LLPs are 0.6% of outstanding loans overall. Listed commercial banks appear to have a higher ratio of LLPs (2.6%) relative to unlisted commercial banks (0.2%). The overall loan loss provision percentage appears to be roughly similar to the U.S. sample of Ahmed et al. (1999), who reported a loan loss percentage of 0.8%.

<< Insert Table 2 here >>

Table 3 provides Pearson correlation coefficients of the variables in our sample. Among the independent variables, the change in GDP, the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital, and commission and fees are significantly and positively associated with the standardised LLPs variable. As GDP growth increases, companies may borrow more money, resulting in banks increasing their provisions to take bad debt into consideration. The variable earnings before taxes and loan loss provisions standardised by assets is significantly and negatively associated with the standardised LLPs variable. A decrease in earnings is consistent with increase in LLPs, since bad debt expenses would be increased. With respect to the rest of the correlations shown in Table 3, the magnitude, economic and statistical significance of the correlations across the independent variables are consistent with similar studies in the literature. Overall, we conclude that the correlations are not sufficiently high to bias our results.

<< Insert Table 3 here >>

We now discuss each of the independent variables and the reasons for their inclusion in our model.

Change in loan loss (ΔLLA)

The first independent variable in our model, change in loan losses, is standardised by total assets. This variable was used by prior researchers (see Ahmed et al., 1999) as a control variable. It is a surrogate for the level of risk faced by a bank. We would expect LLPs to be a function of loan losses. If loan losses are higher, the bank would have to increase LLPs to take account of the additional risk, and vice versa. We expect a positive and significant association between standardised loan losses and LLPs.

Change in gross domestic product, a proxy for the change in economic growth (ΔGDP)

Change in gross domestic product is used to represent changes in economic activity. A positive change in GDP could indicate a boost in the economy. Companies may increase their borrowing to expand their activities. Banks would have to increase their loan loss provisions to take

account of the higher borrowing. Thus, we would expect an increase in LLPs to take account of this additional risk and, consequently, to see a positive association between change in GDP and LLPs.

Ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital (MCAP)

Prior research examined the association between LLPs and the capital adequacy ratio before and after the Basel Accord. We include this ratio to see if a relationship exists between LLPs and the capital adequacy ratio. If banks with low capital use LLPs to boost their capital, then we would expect to see a negative coefficient on this ratio. Further, if this incentive declines in the post-Basel regime, then we would expect to see a positive coefficient on the interaction of this variable with the dummy variable representing regime (POST). See below for a discussion of the dummy variable POST.

Earnings before taxes and loss loan provision (EBT)

Earnings before taxes and LLPs are standardised by average total assets. The implementation of the capital adequacy regulation in the U.S. in 1990 and the Basel Accord of 1988 in Europe resulted in the deletion of LLPs from primary (Tier I) capital and limited its contribution to Tier II capital. Therefore, in the post-Basel period, the capital adequacy ratio is not changed by changes in LLPs. Prior to this change in capital regulation, the total amount of loan loss reserves were a component of the numerator of the capital adequacy ratio computed by regulators. Thus, in the pre-Basel period, a decrease in LLPs to increase earnings would cause a downward push on the capital adequacy ratio, and vice versa. This effect acted as a constraint on earnings management behaviour in the pre-Basel period. Under the post-Basel capital adequacy regulation, this constraint on earnings management is removed. We would expect more aggressive earnings management in the U.S. and Europe after the change to capital adequacy regulations, though Ahmed et al. (1999) did not find sufficient evidence to support this hypothesis. In Australia, since the capital adequacy ratio does not act as a constraint to earnings management for reasons discussed in Section 3, we would assume a positive association between LLPs and earnings. Positive relationships have been found in studies involving banks in OECD countries (Goldstein, 1997) and Asian countries (Delhaise, 1998).

Type of bank (LISTED)

In our study we use a dummy variable to control for bank type. This variable takes the value of 1 for listed commercial banks and a value of 0 for unlisted commercial banks. We expect listed commercial banks to be more aggressive in using LLPs for earnings management relative to unlisted commercial banks. This is because listed commercial banks use the stock market as a source of funds relative to unlisted commercial banks. Thus, there is a greater incentive to engage in earnings management to convey a signal of success and stability to shareholders.

Nature of regime (POST)

We use a dummy variable to control for the nature of the capital adequacy regime. This variable takes a value of 1 for observations in the post-Basel period and a value of 0 otherwise. We expect significant earnings management in the post-Basel period. This follows from the lack of constraint or costs associated with aggressive earnings management behaviour by banks in Australia. While the countries in Europe implemented the capital requirements of the Basel Accord shortly after its signing in 1988, and the U.S. adopted similar guidelines in 1990, most other countries that adopted these capital requirements did so in later years. Based on a survey of 129 countries, Padoa-Schioppa (1996) found that even though many non-member countries were not formally required to adopt the Basel Accord guidelines, all of the countries, including Australia, had adopted them between the years 1992 and 1996. We use 1996 as the date when all commercial banks in Australia had fully implemented the capital regulations of the Basel Accord. Therefore, the dummy variable POST takes the value 1 for observations in the period 1996 to 2001, and the value 0 for observations in the period 1991 to 1995.

Total assets (TA)

The natural logarithm of total assets is another control variable that measures the size of the bank. In general, larger banks may have higher levels of business and may be expected to have higher loan loss provisions than smaller banks (see Anandarajan, Hasan and Lozano-Vivas, 2003). Thus, we would expect a positive association between the natural logarithm of total assets and LLPs.

Commission and fee income to total assets (CFEER)

Commission and fee income is measured as a proportion of total assets. A higher income in this category may indicate an interest in non-depository banking activities and, thus, relatively less dependency on traditional lending activities. Anandarajan et al. (2003) note that it is plausible that these institutions may be more active in allocating appropriate loan loss reserve estimates in order to provide an image of a safer institution providing multiple services for clients. We expect a positive association between CFEER and LLPs.

Interaction of bank type with capital adequacy ratio (LISTED*MCAP)

The purpose of this interaction variable, which has been used by Moyer (1990), Beatty et al. (1995) and others, is to test whether the level of the capital adequacy ratio (either high or low) influences how listed commercial banks use LLPs relative to unlisted commercial banks. Since we stated that changes in loan loss reserves brought about by increasing or decreasing LLPs do not affect the numerator of the ratio, we do not expect to find a significant association here.

Interaction of bank type with earnings (LISTED*EBT)

The purpose of including this interaction variable is to test whether listed commercial banks engage in earnings management more aggressively than unlisted commercial banks. Since, as mentioned, listed commercial banks use the stock market as a source of funds there would be a greater incentive to use LLPs to manage earnings relative to unlisted banks. Hence, we assume a significant and positive association here.

Interaction of capital and type of regime (MCAP*POST)

This interaction variable, which was also included by prior researchers (Ahmed et al., 1999), tests whether, in the post- Basel regime, changes in LLPs are significantly associated with the level of the capital adequacy ratio. We assume that there will be no significant association.

Interaction of earnings with type of regime (EBT*POST)

The purpose of this variable is to examine how LLPs are affected by earnings in the post-Basel era. We assume that there will be a greater incentive to manipulate earnings in the post deregulatory time period. Hence, we predict a positive association.

Interaction of type of bank with ratio of regulatory capital and type of regime (LISTED*MCAP*POST)

This variable indicates the interaction of listed commercial bank type relative to unlisted commercial banks with the capital adequacy ratio in the post-Basel regime. If the incentive to use LLPs to manage capital is more reduced for listed commercial banks than for unlisted commercial banks, we would expect the coefficient of this interaction to be significant and negative.

Interaction of type of bank with earnings and type of regime (LISTED*EBT*POST)

This variable indicates the interaction of listed commercial banks relative to unlisted commercial banks with earnings in the post-Basel environment. If commercial banks use LLPs to more aggressively manage earnings than do unlisted commercial banks in the post-Basel regime relative to the pre-Basel regime, we would expect the coefficient to be positive.

6.0 Empirical Results

6.1 Earnings management and capital management

Estimates of the model using four OLS regressions are reported in Table 4. The first regression equation does not include any interaction variables. In the second equation, two interaction variables, LISTED*MCAP and LISTED*EBT, are added. The third equation incorporates two more interaction variables, MCAP*POST and EBT*POST. The fourth regression includes the previous interaction variables and two three-way interaction variables, LISTED*MCAP*POST and LISTED*EBT*POST. We first ran these four regression equations with the natural logarithm of loan loss provisions, LLP, as the dependent variable. We subsequently ran the four regressions with the ratio of loan loss provision to average loan outstanding, LLPR, as the dependent variable.

<< Insert Table 4 here >>

The adjusted R^2 for the first regression with LLP as the dependent variable reveals that the basic model, Column 1 in Table 4, explains 25.8% of the variation in LLP. There are marginal increases in explanatory power with the addition of the dummy and interaction variables: the second form of the model explains 26.5%; the third explains 27.9%; and the fourth, 28.9%. The

adjusted R^2 for the model with LLPR as the dependent variable has higher explanatory power overall: the adjusted R^2 are 30.9%, 32.1%, 33.1%, and 34.1%, respectively.

The results in Columns 1 and 5 of Table 4 indicate that the change in loan losses and the level of earnings have a positive relationship with LLP, and that the coefficients are significant at the 1% and 5% levels, respectively. Greater LLPs when there are higher loan losses intuitively makes sense, since the purpose of the loan loss reserve is to account for anticipated loan default. The finding that earnings are positively and significantly associated with LLPs supports the conclusion that LLPs are used as a tool for earnings management. The coefficients on the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital, MCAP, and on the commission and fee income to total assets, are negative and significant at the 10% and 5% levels, respectively. Fees and other income received by banks are negatively associated with LLPs, implying that loan loss reserves are lower when fees and other banking income are higher. The coefficient on the dummy variable LISTED is positive and significant at the 1% (and 5%) level, indicating that the LLPs are higher for commercial banks listed on the capital market than for unlisted commercial banks. This means that listed commercial banks appear to use LLPs more aggressively relative to unlisted commercial banks. The coefficient on the dummy variable POST is negative and significant at the 1% level, indicating that LLPs are lower in the post-Basel period.

In the second form of the model, Columns 2 and 6 of Table 4, we incorporate two interaction terms, LISTED*MCAP and LISTED*EBT. The relationships described above for the variables in the basic model hold in the second form of the model. With respect to the additional variables, the coefficient of the LISTED*MCAP variable is negative and significant at the 5% level. This appears to indicate that the capital adequacy of the listed banks in our sample is lower relative to the unlisted banks. The coefficient of the interaction variable LISTED*EBT is positive and significant at the 5% level. This means that listed commercial banks use LLPs for earnings management more aggressively than those that are unlisted.

The third form of the model, Columns 3 and 7 in Table 4, incorporates two additional interaction terms, MCAP*POST and EBT*POST. All prior relationships hold. The coefficient of MCAP*POST variable is not significant. In the post-Basel regime, there is insufficient evidence

to indicate that LLPs are used to manage capital adequacy ratios. This result intuitively makes sense: since loan loss reserves are not a component of the numerator of the capital adequacy ratio, there is no incentive to use LLPs for capital management. The coefficient of the interaction term EBT*POST is positive and significant at the 5% level. In the post-Basel period, there is evidence of significant earnings management behaviour.

The fourth form of the model, Columns 4 and 8 of Table 4, shows that the prior results continue to hold. This regression incorporates two additional three-way interaction variables, LISTED*MCAP*POST and LISTED*EBT*POST. LISTED*MCAP*POST is not significant at the 5% level. The lack of significance of the LISTED*MCAP*POST variable shows that there is no evidence to indicate that listed commercial banks use LLPs to manage capital adequacy ratios in the post-Basel regime. The interaction variable LISTED*EBT*POST variable is positive and significant at the 5% level, indicating that listed banks engage more aggressively in earnings management relative to unlisted banks in the post-Basel period.

6. 2 Signalling

To test our hypothesis on the use of LLPs for signalling changes in future earnings, consider the following model:

$$LLPR = a_0 + a_1 \Delta LLA + a_2 \Delta GDP + a_3 MCAP + a_4 EBT + a_5 LISTED + a_6 \Delta EBTP \quad , \qquad (2)$$

where ΔEBTP is the change in earnings before taxes and loan loss provisions one year before, and the other variables are as previously defined. We estimate this model using an OLS regression with and without the variable LISTED. Our results for the model without LISTED are presented in Columns 1 and 2 of Table 5.

<< Insert Table 5 here >>

If signalling is an important factor in determining LLPs, then we should observe a positive relation between the one-year ahead change in earnings and LLPs as reported by Wahlen (1994) and others. The coefficient of change in earnings before tax (Δ EBTP) is negative and significant

at the 1% level. The sign of the coefficient is not consistent with the signalling hypothesis in the Australian context. These results show that an increase in LLP is associated with lower reported earnings. Column 2 of Table 5 contains our results when a dummy variable (LISTED) that represents the nature of commercial banks (1 if listed; 0 otherwise) is included. The coefficient on this variable is significant and negative indicating that listed commercial banks reported significantly lower loan loss provisions than unlisted commercial banks.

We also considered the following model:

$$\Delta EBTPMVE_{t+1} = a_0 + a_3 LISTED + a_1 EBTPMVE + a_2 ULLPMVE \quad , \qquad (2)$$

where Δ EBTPMVE is the change in earnings before taxes and LLPs divided by the market value of equity at the beginning of year, and ULLPMVE is the unexpected or discretionary loan loss provision measured as the residuals from regression of the expected change in nonperforming loans on five loan composition variables, all deflated by beginning-of-year market value of equity on LLPs. This model is the valuation approach used by Beaver and Engel (1996) and Ahmed et al (1999). The results in Columns 3 and 4 of Table 5 show that the relation between future earnings and the discretionary component of the LLP is negative (5% level). This result is also not consistent with the signalling hypothesis, which assumes a positive relationship.

6.3 Discussion of hypothesis

6.3.1 Capital management

The MCAP*POST interaction variable is not significant at the 1% or 5% levels. This shows that there is no significant difference, in the post-Basel period, in the association between LLPs of commercial banks and capital adequacy ratios. We conclude that in the post-Basel period, there is insufficient evidence to indicate a significant change in association between LLPs and primary (Tier 1) capital. This finding does not support Hypothesis 1. Similarly, in the fourth form of the model (see Columns 4 and 8 of Table 4) the interaction variable LISTED*MCAP*POST is not significant. This indicates that in the post-Basel regime, the association between LLPs and capital adequacy ratios is not significantly more pronounced for listed banks relative to unlisted banks.

6.3.2 *Earnings management*

Hypothesis 2 postulates that, overall, the relation between LLP and earnings (before loan loss provisions) will be more positive in the post-Basel period relative to the pre-Basel period. A positive and significant association between earnings and LLPs would mean that LLPs are used as a tool for earnings management. In Table 4, the coefficient for the variable EBT is positive and significant at the 5% level and the coefficient for the dummy variable EBT*POST is also positive and significant at the 5% level. These findings indicate that LLPs are used as a tool for earnings management in both periods, but more aggressively so in the post-Basel period, thus supporting H2.

Hypothesis 2a postulates that listed commercial banks have a greater incentive to use LLPs for managing earnings relative to unlisted banks. In all the models reported in Table 4, the dummy variable for listed commercial banks, LISTED, is positive and significant at the 5% level. This indicates that commercial banks use LLPs as a tool more aggressively relative to unlisted banks. Further, in the models that include the interaction term LISTED*EBT, the coefficient for this variable is positive and significant at the 5% level. This means that reported earnings of listed commercial banks have a significantly more positive association with changes in LLP relative to unlisted banks, irrespective of the type of regime (pre- or post-Basel). Thus, we conclude that there is sufficient evidence to support the hypothesis (H2a) that commercial banks use LLPs to a greater extent than other types of banks in the pre- and post-Basel regimes.

Hypothesis 2b postulates that, in the post-Basel environment, LLPs are used more aggressively for earnings management relative to the pre-Basel period. The POST dummy variable in Table 4 is negative and significant at the 1% level across all models. This indicates that LLPs are negatively associated with regulatory change. Further, the interaction term between earnings and regulatory regime (EBT*POST) is significant at the 5% level in the third and fourth models. In model 4, the interaction term LISTED*EBT*POST is significant at the 1% or 5% level. This indicates that listed commercial banks have higher earnings relative to unlisted banks in the post-Basel period relative to the pre-Basel period. We conclude that there is sufficient evidence to support H2b, namely that listed commercial banks use LLPs more aggressively in the post-Basel period.

6.3.3 *Signalling*

Signalling theory assumes that LLPs are used to signal future positive changes in earnings. Thus, we would expect a positive association between LLPs and the one-year-ahead change in earnings (ΔEBTP). However, the results in Table 5 show a significant *negative* association, not positive association, at the 1% level. This finding contradicts the direction of our stated hypothesis. Hence, we conclude that hypothesis (H3) is not supported. LLPs do not appear to be used as a signalling device, since the evidence does not show a significant positive association between LLPs and one-year-ahead changes in earnings.

7. Additional tests

7.1 Test of panel data bias

In this study our data represent pooled cross-sectional and time series data. As a result, the t-statistics could be overstated. In order to take account of this, we conducted a panel data analysis using a fixed effects model. The results are shown in Table 6.

<< Insert Table 6 here >>

As shown in Table 6, we include a dummy variable (POST) with the value 1 for observations from the post-Basel period (1996 – 2001) and 0 otherwise (i.e., the pre-Basel period 1991 – 1995). We include this dummy variable for both forms of the dependent variable, LLP and LLPR (the natural logarithm of LLPs and loan loss provision divided by the average loan outstanding, respectively). In both cases, the coefficient for the dummy variable POST is negative and significant at the 1% level. This shows that, overall, loan loss provisions were significantly lower in the post-Basel era. This finding indicates that banks may have had an incentive to understate loan loss provisions to inflate earnings. In the fixed effects regressions, the coefficients of the other variables were in the same direction and still significant. Hence, our earlier findings still hold.

7.2 Test of the impact of Tier II capital in the association between LLPs and capital management

In order to test the association of LLPs with capital management measured as Tier II capital, which, in the post-Basel period, includes loan loss reserves but is limited to a maximum of 1.25% of risk weighted assets, we re-run the four regressions reported in Table 4 with MCAP re-

defined as the ratio of regulatory capital (secondary or Tier II) to the minimum required regulatory capital. We present our results in Table 7. For the purposes of comparison, we repeat our earlier results with MCAP defined as the ratio of regulatory capital (primary of Tier I) to the minimum required regulatory capital in Columns 1 to 4 of Table 7. The results of our estimation with MCAP defined as the ratio of regulatory capital (secondary or Tier II) to the minimum required regulatory capital are presented in Columns 5 to 8 of Table 7. Our objective is simply to examine whether holding loan loss reserves to a maximum of 1.25% of risk weighted assets significantly changes the relationship between the dependent variable (loan loss provision divided by average loans outstanding) and the independent variables previously discussed.

<< Insert Table 7 here >>

Overall, we find that change in loan losses (Δ LLA) is positive and significant at the 5% level in the presence of Tier I and Tier II capital. This shows that an increase in non-performing loans provides an incentive to increase loan loss provisions. Earnings before tax (EBT) is positive and significant at the 5% level in the presence of Tier I capital but not Tier II capital. This indicates that banks with lower earnings have an incentive to lower LLPs when MCAP includes Tier I capital, but there is no evidence to support this for Tier II capital. This is because, as Ahmed et al. (1999) mentioned, including loan loss reserves acts as a constraint to earnings management. (This is a weak argument since, if this was truly so, we would expect EBT to be negative and significant rather than weakly positive and insignificant. The insignificant level of loan loss reserves may very marginally influence behaviour, but not significantly.) The dummy variable LISTED is significant at the 5% level in the presence of both Tier I and Tier II capital. This implies that the inclusion of loan loss reserves does not significantly alter the association, again perhaps due to the very minimal level of loan loss reserves that can be included. The dummy variable POST is negative and significant at the 1% level in the presence of Tier I capital and significant at the 5% level in the presence of Tier II capital. This implies LLPs are deliberately understated in the post-Basel regime relative to the pre-Basel regime. This is consistent irrespective of whether the capital adequacy ratio is measured with respect to Tier I or Tier II capital. Again, the implication is that the very low levels of loan loss reserves permitted in Tier II capital are not sufficient to significantly alter behaviour. The interaction variable EBT*POST is positive and significant at the 5% level in the presence of Tier I capital but not Tier II capital.

This indicates that in the post-Basel period, there is evidence to support aggressive earnings management via LLPs, but not sufficient evidence to support aggressive earnings management in the presence of Tier II capital. The overall conclusion is that there is not sufficient evidence to indicate that earnings and capital management behaviour change significantly in the presence of Tier II capital. Tier II capital is relatively small, and the limitation of loan loss reserves to 1.25% of risk weighted assets does not significantly change behaviour or the associations previously discussed.

7.3 Additional sensitivity tests

A final issue relates to survivorship bias. We note that none of the sample banks filed for bankruptcy during our sample period. In our sample, there were nine cases of mergers/acquisitions. We estimated several models as sensitivity tests. In the estimates discussed above, we deleted these nine banks from our sample. In another estimate (results not shown) we kept these banks in the sample, but created a dummy variable (representing 1 if banks engaged in mergers or were acquired, and 0 otherwise) for those observations associated with them. The coefficient of the dummy variable was not statistically significant. Hence, we conclude that the results are not affected by inclusion of banks that have experienced mergers or been acquired. Although this does not eliminate "survivorship bias," we conclude that our results are not influenced by this bias.

8.0 Conclusions

Much research has been conducted in the U.S. in the area of earnings management, capital management and signalling via loan loss provisions. There is very little research on these topics conducted for other countries. It is important for regulators to understand if and how mechanisms such as the loan loss provision are used to manage earnings to inflate stock prices and as a tool to manage capital. Such knowledge can help regulators understand if the reported numbers are truly meaningful or are subject to manipulation. In this study, using a methodology adapted from the approach used by Ahmed et al. (1999), we test whether LLPs are used for earnings management, capital management and signalling by banks in Australia.

In the U.S., capital adequacy regulation enacted in 1990 could have influenced banks' behaviour by ruling that loan loss reserves would not constitute an integral part of the required minimum

capital that banks are required to hold. This may have had the unintended consequence of stimulating more aggressive earnings management behaviour by banks. In Australia the impact is similar: the capital adequacy ratio does not act as a constraint to earnings management. Further, we find evidence of earnings management behaviour using LLPs by Australian banks, and by listed commercial banks in particular relative to other types of banks. Finally, we find evidence of accentuated earnings management behaviour using LLPs in the post-Basel period. Overall, the findings indicate that reported financial numbers may not reflect the underlying economic reality of the financial institution. Regulators may have to take these factors into consideration when evaluating overall financial risk. We also note that a new Basel Accord was enacted in 2004, subsequent to the conclusion of this research. However, the changes resulting from the new Accord have not impacted the issues touched on in this study.

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Table 1
Frequency Distribution of the Banking Industry in Australia*

Commercial Banks	Listed Commercial Banks	Unlisted Commercial Banks	Investment Banks	Other Banks (Cooperatives and Specialized Banks)
Number of Institutions				
50	10	40	29	13
Number of Observations With Complete Data				
441	79	362	279	99
Percentage Share of Industry Assets by the Sample Institutions				
87.06	34.12	52.94	8.74	4.20
Percentage Share of Bank Assets held by the Sample Commercial Bank Observations				
	39.68	60.32	n.a.	n.a.
Average Total Assets of Commercial Banks ($ Millions)				
16,051	20,486	15,242	1,443	7,676

Note: The frequency distribution here is only for banks with available information in our data sets. Columns 2 and 3 are components of Column 1. Percentage share of assets held by commercial banks are average components of assets held by the bank observations as a percentage of the overall commercial banking sector over the sample years. "n.a." means not applicable.

Table 2
Descriptive Statistics for Commercial Bank Observations

LLPR is loan loss provision to outstanding loan ratio; LLA is actual loan loss to total assets ratio; ΔLLA is the change between each sample year in actual loan losses to total assets; ΔGDP is change in gross domestic product, a proxy for the change in economic growth; MCAP is the ratio of actual regulatory capital (primary or Tier 1 capital) before loan loss reserves to the minimum required regulatory capital; EBT ratio of earning before taxes and loan loss provisions to total assets; TA is the logarithm of total assets, a proxy for firm size; CFEER is the ratio of commission and fee income to total assets; BVETA is the book value of equity to assets. In Columns 5 and 6, we report standard deviations in parentheses.

	All Commercial Bank Observations				**Listed Bank Observations**	**Unlisted Bank Observations**
	Mean	**Standard Deviation "std"**	**Minimum**	**Maximum**	**Mean (std)**	**Mean (std)**
	1	**2**	**3**	**4**	**5**	**6**
LLPR	0.0060	0.0512	0.0005	0.1414	0.0265 (0.0142)	0.0029 (0.0563)
LLA	0.0071	0.0103	0	0.1148	0.0125 (0.0054)	0.0064 (0.0139)
ΔLLA	13.056	2.621	-1.0	43.267	9.542 (2.907)	14.840 (2.936)
ΔGDP	0.0192	0.0281	0.0107	0.04927	0.0192 (0.281)	0.0192 (0.281)
MCAP	0.0134	0.0046	0.0090	0.0531	0.0159 (0.0061)	0.0103 (0.0036)
EBT	0.0168	0.0653	-0.1062	0.1995	0.0205 (0.0320)	0.0095 (0.0158)
TA	10,623	26,785	6.08	194,687	32,792 (51,822)	3,767 (8,185)
CFEER	0.0042	0.0116	-0.0006	0.0253	0.0138 (0.0163)	0.0012 (0.0078)
BVETA	0.0774	0.0251	0.0501	0.3137	0.0674 (0.0365)	0.0797 (0.0324)
Number of Observations	441				79	362

Table 3
Pearson Correlation Coefficients of Key Variables of the Sample Commercial Bank Observations

LLPR is loan loss provision to outstanding loan ratio; LLA is actual loan loss to total assets ratio; ΔLLA is the change between each sample year in actual loan losses to total assets; ΔGDP is change in gross domestic product, a proxy for the change in economic growth; MCAP is the ratio of actual regulatory capital (primary or Tier 1 capital) before loan loss reserves to the minimum required regulatory capital; EBT ratio of earning before taxes and loan loss provisions to total assets; TA is the logarithm of total assets, a proxy for firm size; CFEER is the ratio of commission and fee income to total assets; BVETA is the book value of equity to assets. In Columns 5 and 6, we report standard deviations in parentheses.

	LLPR	**ΔLLA**	**ΔGDP**	**MCAP**	**EBT**	**TA**	**CFEER**
LLPR	1.00						
ΔLLA	0.0179	1.00					
ΔGDP	0.3206***	0.1754**	1.00				
MCAP	0.2862***	-0.0875*	0.0432	1.00			
EBT	-0.3210***	-0.0212	0.2518***	-0.4703***	1.00		
TA	0.0525	0.0542	0.0326	-0.4018***	0.0521	1.00	
CFEER	0.1714***	-0.0054	0.2665**	0.0928	0.2325***	-0.3271***	1.00

***, **, * significantly different at the p = 0.01, 0.05, 0.10 levels respectively.

Table 4
Determining Factors of Loan Loss Provisions of Australian Banks
OLS Regressions (t-statistics in parentheses)

LLP is natural logarithm of loan loss provision; LLPR is loan loss provision to outstanding loan ratio; LLA is actual loan loss to total assets ratio; ΔLLA is the change between each sample year in actual loan losses to total assets; ΔGDP is change in gross domestic product, a proxy for the change in economic growth; MCAP is the ratio of actual regulatory capital (primary or Tier 1 capital) before loan loss reserves to the minimum required regulatory capital; EBT ratio of earning before taxes and loan loss provisions to total assets; LISTED is a dummy variable that takes the value 1 for banks that are listed on the capital market and takes the value 0 for unlisted banks; POST is a dummy variable that takes the value 1 for the sample years in the new regulation era, 1996-2001, and the value 0 otherwise; TA is the logarithm of total assets, a proxy for firm size; CFEER is the ratio of commission and fee income to total assets. Several interactive variables are added in some of the estimates.

	Dependent Variable – Natural Logarithm of Loan Loss Provisions LLP				Dependent Variable – Loan Loss Provisions to Outstanding Loan Ratio, LLPR			
	1	2	3	4	5	6	7	8
Intercept	0.0176 (1.85)*	0.0379 (1.89)*	0.041 (2.01)**	0.040 (2.51)**	0.023 (1.62)	0.026 (1.60)	0.061 (1.97)**	0.065 (2.00)**
ΔLLA	0.094 (2.86)***	0.074 (3.14)***	0.096 (2.93)***	0.107 (3.02)***	0.112 (2.81)**	0.092 (2.90)***	0.085 (3.12)***	0.083 (3.08)***
ΔGDP	0.026 (1.84)*	0.027 (1.89)*	0.023 (1.93)*	0.025 (1.72)*	0.034 (1.58)	0.033 (1.62)	0.035 (1.59)	0.038 (1.66)*
MCAP	-0.883 (1.91)*	-0.763 (1.69)*	-0.805 (1.63)	-0.754 (1.60)	-0.653 (2.05)**	-0.634 (2.06)**	-0.623 (1.93)*	-0,614 (1.87)*
EBT	0.050 (2.48)**	0.051 (2.62)**	0.061 (2.59)**	0.066 (2.63)**	0.047 (2.36)**	0.052 (2.41)**	0.054 (2.34)**	0.049 (2.17)**
LISTED	0.028 (2.91)***	0.031 (2.86)***	0.029 (2.71)**	0.022 (2.54)**	0.022 (2.65)**	0.025 (2.70)**	0.033 (2.67)**	0.029 (2.56)**
POST	-0.025 (4.14)***	-0.024 (4.18)***	-0.028 (4.09)***	-0.030 (4.08)***	-0.030 (4.05)***	-0.035 (4.13)***	-0.028 (4.06)***	-0.028 (3.97)***
TA	0.024 (1.45)	0.026 (1.42)	0.028 (1.50)	0.024 (1.46)	0.021 (1.38)	0.022 (1.36)	0.024 (1.49)	0.024 (1.51)
CFEER	-0.255 (2.42)**	-0.253 (2.49)**	-0.263 (2.64)**	-0.242 (2.70)**	-0.205 (2.00)***	-0.234 (2.04)***	-0.286 (2.11)**	-0.265 (2.09)**
LISTED * MCAP	-	-0.156 (2.23)**	-0.165 (2.26)**	-0.167 (2.17)**	-	-0.197 (1.98)**	-0.198 (1.97)**	-0.200 (1.96)**
LISTED * EBT	-	0.016 (2.25)**	0.020 (2.18)**	0.022 (2.12)**	-	0.016 (2.09)**	0.015 (2.04)**	0.015 (2.11)**
MCAP * POST	-	-	0.187 (1.63)	0.176 (1.60)	-	-	0.158 (1.46)	0.164 (1.74)*
EBT * POST	-	-	0.056 (2.55)**	0.058 (2.67)**	-	-	0.042 (2.75)**	0.048 (2.85)***
LISTED * MCAP * POST	-	-	-	0.744 (1.86)*	-	-	-	0.673 (1.61)
LISTED * EBT * POST	-	-	-	0.007 (2.02)**	-	-	-	0.025 (1.85)*
ADJU.S.TED R^2	0.2585	0.2651	0.2799	0.2895	0.3094	0.3218	0.3319	0.3412
F-STATISTICS	5.82***	5.90***	5.83***	5.95***	6.83***	6.74***	7.05***	7.00***
NUMBER OF OBSERVATIONS	441				441			

Table 5
Test of Signalling Theory

LLPR is loan loss provision to outstanding loan ratio; ΔLLA is the change between each sample year in actual loan losses to total assets; ΔGDP is change in gross domestic product, a proxy for the change in economic growth; MCAP is the ratio of actual regulatory capital (primary or Tier 1 capital) before loan loss reserves to the minimum required regulatory capital; EBT ratio of earning before taxes and loan loss provisions to total assets; LISTED is a dummy variable that takes the value 1 for banks that are listed on the capital market and takes the value 0 for unlisted banks; ΔEBTP is the change in earning before taxes and loan loss provisions one year before; Δ EBTPMVE is the change in earnings before provision and taxes divided by the market value of equity at the beginning of year t. ULLPMVE is the unexpected loan loss provision measured by the residuals from regression of loan loss provisions on expected change in actual loan losses (all deflated by the beginning of year market value of equity).

	Dependent Variable LLPR		Dependent Variable Δ EBTPMVE (t+1)	
	1	2	3	4
Intercept	0.019 (1.46)	0.023 (1.59)	0.016 (3.48)***	0.016 (3.45)***
ΔLLA	0.171 (3.92)***	0.175 (3.89)***	-	-
ΔGDP	0.025 (1.55)	0.024 (1.60)	-	-
MCAP	-0.038 (1.91)*	-0.039 (1.90)*	-	-
EBT	0.025 (2.77)**	0.026 (2.81)**	-	-
LISTED		-0.051 (2.18)**	-	-0.054 (1.88)*
ΔEBTP (1 year ahead)	-0.018 (3.19)***	-0.016 (3.28)***	-	-
Δ EBTPMVE	-	-	-0.024 (2.64)**	-0.025 (2.62)**
ULLPMVE	-	-	-0.383 (2.49)**	-0.394 (2.47)**
ADJU.S.TED R^2	0.0461	0.0467	0.0288	0.0299
F-STATISTICS	3.45**	3.61**	2.99**	3.02**
NUMBER OF OBSERVATIONS	79			

***, **, * significantly different at the p = 0.01, 0.05, 0.10 levels respectively.

Table 6
Determining Factors of Loan Loss Provisions of Australian Banks
Fixed Effect Regressions (t-statistics in parentheses)

LLP is natural logarithm of loan loss provision; LLPR is loan loss provision to outstanding loan ratio; LLA is actual loan loss to total assets ratio; ΔLLA is the change between each sample year in actual loan losses to total assets; ΔGDP is change in gross domestic product, a proxy for the change in economic growth; MCAP is the ratio of actual regulatory capital (primary or Tier 1 capital) before loan loss reserves to the minimum required regulatory capital; EBT ratio of earning before taxes and loan loss provisions to total assets; LISTED is a dummy variable that takes the value 1 for banks that are listed on the capital market and takes the value 0 for unlisted banks; POST is a dummy variable that takes the value 1 for the sample years in the new regulation era, 1996-2001, and the value 0 otherwise; TA is the logarithm of total assets, a proxy for firm size; CFEER is the ratio of commission and fee income to total assets. Several interactive variables are added in some of the estimates.

	Dependent Variable – Natural logarithm of Loan Loss Provisions, LLP Year Fixed Effect +				Dependent Variable – Loan Loss Provisions to Outstanding Loan Ratio, LLPR Firm Fixed Effect +			
	1	2	3	4	5	6	7	8
Intercept	0.020 (1.60)	0.021 (1.63)	0.059 (1.88)*	0.061 (1.96)**	0.016 (1.27)	0.018 (1.31)	0.017 (1.25)	0.019 (1.20)
ΔLLA	0.110 (2.80)**	0.089 (2.86)***	0.081 (3.09)***	0.081 (3.06)***	0.108 (2.32)**	0.087 (2.35)***	0.076 (2.78)**	0.079 (2.86)***
ΔGDP	0.032 (1.54)	0.032 (1.63)	0.031 (1.60)	0.034 (1.63)	0.025 (1.50)	0.029 (1.56)	0.031 (1.53)	0.035 (1.60)
MCAP	-0.632 (2.09)**	-0.636 (2.10)**	-0.629 (1.95)**	-0.622 (1.89)*	-0.616 (1.97)**	-0.609 (2.00)**	-0.615 (1.85)*	-0.607 (1.77)*
EBT	0.042 (2.31)**	0.050 (2.38)**	0.051 (2.31)**	0.044 (2.19)**	0.037 (2.05)**	0.039 (2.06)**	0.033 (2.09)**	0.039 (1.97)**
LISTED	0.024 (2.69)**	0.027 (2.72)**	0.032 (2.73)**	0.030 (2.62)**	0.020 (2.55)**	0.021 (2.61)**	0.026 (2.50)**	0.022 (2.48)**
POST	-0.029 (4.01)***	-0.030 (4.05)***	-0.026 (4.00)***	-0.027 (3.96)***	-0.029 (3.27)***	-0.032 (3.25)***	-0.025 (3.29)***	-0.024 (3.30)***
TA	0.020 (1.35)	0.021 (1.35)	0.024 (1.50)	0.025 (1.52)	0.013 (1.00)	0.012 (1.06)	0.013 (1.05)	0.04 (1.11)
CFEER	-0.202 (2.02)**	-0.231 (2.03)**	-0.276 (2.18)**	-0.261 (2.15)**	-0.093 (1.89)*	-0.120 (1.86)*	-0.128 (1.84)*	-0.118 (1.79)*
LISTED * MCAP	-	-0.192 (2.01)**	-0.195 (1.94)*	-0.198 (1.97)**	-	-0.188 (1.90)*	-0.190 (1.91)*	-0.185 (1.87)*
LISTED * EBT	-	0.013 (2.14)**	0.014 (2.11)**	0.016 (2.13)**	-	0.009 (1.90)*	0.010 (1.93)*	0.012 (1.98)*
MCAP * POST	-	-	0.154 (1.44)	0.160 (1.70)*	-	-	0.144 (1.39)	0.149 (1.64)
EBT * POST	-	-	0.039 (2.69)**	0.042 (2.77)**	-	-	0.038 (2.59)**	0.041 (2.64)**
LISTED * MCAP * POST	-	-	-	0.666 (1.59)	-	-	-	0.646 (1.54)
LISTED * EBT * POST	-	-	-	0.022 (1.80)*	-	-	-	0.022 (1.90)*
ADJU.S.TED R^2	0.3281	0.3393	0.3501	0.3595	0.3523	0.3599	0.3608	0.3685
F-STATISTICS	6.95***	6.87***	7.23***	7.14***	7.88***	7.86***	7.90***	8.05***
NUMBER OF OBSERVATIONS	441				441			

***, **, * significantly different at the p = 0.01, 0.05, 0.10 levels respectively. The absolute values of the t-statistics are in parentheses. The standard errors used in calculating the t-statistics are consistent estimates with White's Heteroskedasticity correction. + For the sake of brevity, year dummies and bank dummies are not added in the year fixed effect (Column 1-4) and bank fixed effect regressions (column 5-8) respectively.

Table 7
Determining Factors of Loan Loss Provisions of Australian Banks
Tier 1 versus Tier 2 Capital (t-statistics in parentheses)

LLPR is loan loss provision to outstanding loan ratio; LLA is actual loan loss to total assets ratio; ΔLLA is the change between each sample year in actual loan losses to total assets; ΔGDP is change in gross domestic product, a proxy for the change in economic growth; MCAP is the ratio of actual regulatory capital (primary or Tier 1 capital before loan loss reserves to the minimum required regulatory capital in regressions 1-4 and Tier II or capital other than Tier 1 in regressions 5-8); EBT ratio of earning before taxes and loan loss provisions to total assets; LISTED is a dummy variable that takes the value 1 for banks that are listed on the capital market and takes the value 0 for unlisted banks; POST is a dummy variable that takes the value 1 for the sample years in the new regulation era, 1996-2001, and the value 0 otherwise; TA is the logarithm of total assets, a proxy for firm size; CFEER is the ratio of commission and fee income to total assets. Several interactive variables are added in some of the estimates.

	Dependent Variable – Loan Loss Provisions to Outstanding Loan Ratio LLPR							
	Tier I capital				Tier II capital			
	1	2	3	4	5	6	7	8
Intercept	0.023 (1.62)	0.026 (1.60)	0.061 (1.97)**	0.065 (2.00)**	0.009 (1.08)	0.010 (1.12)	0.011 (1.14)	0.006 (0.95)
ΔLLA	0.112 (2.81)**	0.092 (2.90)***	0.085 (3.12)***	0.083 (3.08)***	0.084 (3.07)***	0.073 (3.12)**	0.059 (3.25)***	0.052 (3.19)***
ΔGDP	0.034 (1.58)	0.033 (1.62)	0.035 (1.59)	0.038 (1.66)*	0.012 (1.32)	0.018 (1.38)	0.027 (1.43)	0.031 (1.54)
MCAP	-0.653 (2.05)**	-0.634 (2.06)**	-0.623 (1.93)*	-0,.614 (1.87)*	-0.571 (1.84)*	-0.526 (1.74)*	-0.523 (1.59)	-0.511 (1.58)
EBT	0.047 (2.36)**	0.052 (2.41)**	0.054 (2.34)**	0.049 (2.17)**	0.033 (1.83)*	0.027 (1.74)*	0.029 (1.69)*	0.024 (1.60)
LISTED	0.022 (2.65)**	0.025 (2.70)**	0.033 (2.67)**	0.029 (2.56)**	0.018 (2.18)**	0.016 (2.00)**	0.015 (1.90)*	0.014 (1.77)*
POST	-0.030 (4.05)***	-0.035 (4.13)***	-0.028 (4.06)***	-0.028 (3.18)***	-0.017 (2.44)**	-0.012 (2.41)**	-0.008 (2.13)**	-0.006 (2.19)**
TA	0.021 (1.38)	0.022 (1.36)	0.024 (1.49)	0.024 (1.51)	0.009 (0.81)	0.010 (0.94)	0.008 (0.76)	0.015 (0.97)
CFEER	-0.205 (2.00)**	-0.234 (2.04)**	-0.286 (2.11)**	-0.265 (2.09)**	-0.031 (1.76)*	-0.040 (1.71)*	-0.035 (1.62)	-0.043 \ (1.57)
LISTED * MCAP	-	-0.197 (1.98)**	-0.198 (1.97)**	-0.200 (1.96)**	-	-0.142 (1.76)*	-0.155 (1.42)	-0.161 (1.40)
LISTED * EBT	-	0.016 (2.09)**	0.015 (2.04)**	0.015 (2.11)**	-	0.003 (1.85)*	0.007 (1.66)*	0.011 (1.54)
MCAP * POST	-	-	0.158 (1.46)	0.164 (1.74)*	-	-	0.104 (1.51)	0.118 (1.54)
EBT * POST	-	-	0.042 (2.75)**	0.048 (2.85)***	-	-	0.014 (1.88)*	0.017 (1.94)*
LISTED * MCAP * POST	-	-	-	0.673 (1.61)	-	-	-	0.531 (1.46)
LISTED * EBT * POST	-	-	-	0.025 (1.85)*	-	-	-	0.019 (1.78)*
ADJU.S.TED R^2	0.3094	0.3218	0.3319	0.3412	0.2851	0.2897	0.3002	0.3085
F-STATISTICS	6.83***	6.74***	7.05***	7.00***	5.31***	5.28***	5.36***	5.40***
NUMBER OF OBSERVATIONS	441				441			

***, **, * significantly different at the p = 0.01, 0.05, 0.10 levels respectively. The absolute values of the t-statistics are in parentheses. The standard errors used in calculating the t-statistics are consistent estimates with White's Heteroskedasticity correction. + For the sake of brevity, year dummies and bank dummies are not added in the year fixed effect (Column 1-4) and bank fixed effect regressions (column 5-8) respectively.

Figure 1
Impact of Reduction in Loan Loss Provision on Numerator and Denominator of the Capital Adequacy Ratio
Pre-Basel and Post-Basel

	Numerator of Capital Adequacy Ratio[1]			**Denominator of Capital Adequacy Ratio**	**Net Impact on Capital Adequacy Ratio**
	Loan Loss Provisions (LLPs)	**Retained Earnings**	**Net Effect on Numerator of Capital Adequacy Ratio**	Accounts Receivable (Part of the "Risk Weighted Assets"	
Pre Basel	**Lower**	**Higher** (because decline in LLPs results in lower bad debt expenses inflating earnings)	**No change** (Increase in retained earnings offset by lower loan loss reserves)	**Higher** (If loan loss provisions are lower, net accounts receivable [Gross accounts receivable less loan loss provisions] will be inflated	**Lower** (because numerator does not change and the denominator is higher)
Post Basel (Tier 1 Capital)	**No impact** (because loan loss reserves are not part of the numerator)	**Higher** (because decline in LLPs results in lower bad debt expenses inflating earnings)	**Higher** (Increase in retained earnings not offset by lower loan loss reserves)	**Higher** (If loan loss provisions are lower, net accounts receivable [Gross accounts receivable less loan loss provisions] will be inflated	**No change** (because increase in both numerator and denominators offset)
Post Basel (Tier II capital)	**No impact** (since LLR are limited to 1.25% of risk weighted assets)	**No Impact** (because retained earnings are not included in Tier II capital)			

[1] In the pre-Basel period, the full amount of LLP is included in the numerator of the Capital Adequacy Ratio. In the post-Basel period, LLP is included in Tier II capital up to a limit of 1.25% of the risk weighted assets and the numerator of the Capital Adequacy Ratio is the sum of Tier I and Tier II less any deductions.