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Abstract

The objective of this study is to examine whether and to what extent Australian banks use loan loss provisions (LLPs) for capital management, earnings management and signalling. We examine if there were changes in the use of LLPs due to the implementation of banking regulations consistent with the Basel Accord of 1988 which made loan loss reserves no longer part of Tier I capital in the numerator of the capital adequacy ratio. We find some evidence to indicate that Australian banks use LLPs for capital management, but no evidence of a change in this behaviour after the implementation of the Basel Accord. Our results indicate that banks in Australia use LLPs to manage earnings. Further, listed commercial banks engage more aggressively in earnings management using LLPs than unlisted commercial banks. We also find that earnings management behaviour is more pronounced in the post-Basel period. Overall, we find a significant understating of LLPs 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.

Key words: capital management, earnings management, signalling, Australian banks

JEL classification numbers: C23, G14, M41

Luottotappiovarausten käyttö, tulosjohtaminen ja signalointi australialaisissa pankeissa

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Asokan Anandarajan – Iftekhar Hasan – Cornelia McCarthy
Rahapolitiikka- ja tutkimusosasto

Tiivistelmä

Tässä tutkimuksessa pyritään tarkastelemaan luottotappiovarausten käyttöä, tuloshallintaa ja viestittämistä australialaisissa pankeissa. Työssä tarkastellaan erityisesti, muuttuiko pankkien luottotappiovarausten käyttö, kun vuoden 1988 Baselin sopimuksen mukainen pankkisäätely toteutettiin Australiassa. Tuolloisen Baselin sopimuksen mukaan luottotappiovarauksia ei enää luokiteltu ykköstason pääomaksi pankin vakavaraisuussuhdetta laskettaessa. Tutkimuksessa esitetyn näytön mukaan australialaiset pankit käyttävät luottotappiovarauksia omaisuuden hoidossa, mutta eivät muuttaneet käyttäytymistään tässä suhteessa vuoden 1988 Baselin sopimuksen voimaantulon jälkeen. Australialaiset pankit eivät nähtävästi myöskään käytä luottotappiovarauksia viestiäkseen sijoittajille tulonäkymien parantumisesta. Sen sijaan tulokset viittaavat siihen, että ne käyttävät luottotappiovarauksia tulosjohtamisessaan. Lisäksi listautuneet yksityiset pankit käyttävät luottotappiovarauksia tulosjohtamisessa aggressiivisemmin kuin listautumattomat yksityiset pankit. Pankkien käyttäytyminen on myös voimakkaammin painottunut tulosjohtamiseen vuoden 1988 Baselin sopimuksen voimaantulon jälkeen kuin sitä ennen. Kaiken kaikkiaan australialaiset pankit ilmoittavat luottotappiovarauksensa aiempaan nähden liian vähäisiksi vuoden 1988 jälkeen. Tämä viittaa siihen, että pankkien julkaisemat tulokset eivät ehkä ole sopusoinnussa taustalla olevien taloudellisten realiteettien kanssa.

Avainsanat: omaisuuden hoito, tulosjohtaminen, viestittäminen, australialaiset pankit

JEL-luokittelu: C23, G14, M41

Contents

1 Introduction

Loan loss provisions (LLPs) are expected to reflect anticipated losses by bank managers. However, federal banks 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 et al, 1995; Moyer, 1990; among others), for earnings management (see Ahmed et al, 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 managing risk, reducing earnings volatility, 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 US financial institutions use LLPs. Research on European bank behaviour followed the implementation of the Basel Accord of 1988. These US 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 US and European countries, this arrangement acted as a constraint on the use of LLPs for capital and earnings management. For example, with the introduction of 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 US 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. As noted by Ahmed et al (1999) with this change, earnings management could now be achieved without costs. Several researchers examined if the new rules in the US and Europe affected the use of LLPs for

capital management, caused banks to adopt more aggressive earnings management techniques, and the use of LLPs for signalling.

There is no significant difference between the US 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 capital management, earnings 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 LLPs in line with deterioration in loan quality will reduce the retained earnings of the bank entity. Weaker banks face a strong incentive to understate LLPs 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 US 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 US used LLPs to manage capital and earnings 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 use an approach similar to that of Ahmed et al (1999) to examine if Australian bank managers use LLPs for the same purposes. 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. We present our conclusions in Section 7.

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

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. 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

[1] The Commonwealth Government established the Wallis Inquiry in 1996 and the *Financial System Inquiry Final Report* was published in 1997.

[2] Padoa-Schioppa (1996) 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.

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%.[3]

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 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 decreasing LLPs are shown in Figure 1.

[3] 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 tangible assets. Tier II 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.

Figure 1. **Impact of reduction in loan loss provisions on numerator and denominator of the capital adequacy ratio pre-basel and post-basel**

	Numerator of capital adequacy ratio*			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**		
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 LLPs are lower, net accounts receivable (Gross accounts receivable less LLPs) will be inflated)	**Lower** (because numerator does not change and the denominator is higher)
Post-Basel (Tier I 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 LLPs are lower, net accounts receivable (gross accounts receivable less LLPs) 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)			
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.					

3 Literature review

Our study examines capital management, earnings management and signalling by Australian banks. We now discuss the findings of relevant prior studies in these three areas. Table 1 provides a summary of these papers.

Table 1. **Summary of the findings of prior studies**

Panel A: Studies that examined the association of LLPs with capital management

Authors	Research Question Examined	Findings
Studies that use data from before the change in capital adequacy regulation		
Moyer (1990) Scholes et al (1990)	Are accounting adjustments using LLPs, loan charge-offs and securities gains and losses utilized for capital ratio management?	LLPs are used as a tool for capital management. In particular, banks use LLPs to manage capital ratios and prevent it falling below the minimum desired level. However, banks do not use loan write-offs for this purpose.
Beatty et al (1995)	How do banks alter the timing and magnitude of transactions and accruals to achieve capital management?	Managers' accrual decisions are complicated by other capital-raising activities. However, loan charge-offs and LLPs are used as mechanisms for capital management.
Collins et al (1995)	How are loan charge-offs, securities issuances, and LLPs used as tools for capital management?	Main difference between this study and Moyer (1990) is that the authors find that while loan write offs are used as a tool for managing capital ratios, LLPs are not.
Studies that use data from after the change in capital adequacy regulation		
Kim and Kross (1998)	What is the relationship between LLPs and capital ratio management after the 1989 capital regulation came into effect?	The authors found that after the new regulation there was no significant association between LLPs and capital management. They found that banks with low capital ratios show lower LLPs post 1989 regulation relative to the pre 1989 period.
Ahmed et al (1999)	What is the association of LLP with capital management, pre and post 1989 capital adequacy regulation?	Ahmed et al (1999) found a negative relationship between LLPs and the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital and unexpectedly found no change in this association after the change in U.S. capital regulations.

Table 1. (continued)

Panel B: Studies that examined association of LLPs with earnings management

Authors	Research Question Examined	Findings
Studies that found positive association		
Ma (1988)	Do banks utilize LLPs to smooth reported earnings?	Both LLPs and charge-offs are used as mechanisms to smooth earnings.
Collins et al. (1995)	How are loan charge-offs, securities issuances, and LLPs used as tools for earnings management?	Found only LLPs used as a tool to manage earnings.
Greenawalt and Sinkey (1988)	Are LLPs used to smooth income? If so, does income smoothing behaviour differ by bank type?	After controlling for characteristics of banks' portfolios and economic environment, they conclude that LLPs are used to smooth earnings. Further, regional banks tend to engage in income smoothing using LLPs more aggressively than money centred banks.
Bhat (1996)	Do banks engage in earnings management using LLPs, if so what are the characteristics of those banks engaging in earnings management?	Banks that manage earnings and engage in income smoothing using LLPs are characterized by low growth, low book to asset ratio, high loans to deposit ratio, high debt to asset ratio, and low return on assets.
Studies that found no association		
Wetmore and Brick (1994)	What factors are associated with income smoothing by banks?	With reference to LLPs, found no evidence that LLPs are used as a tool for earnings management.
Beatty et al. (1995)	How do banks alter timing and magnitude of transactions and accruals to achieve earnings management?	Found no association between LLPs and earnings management by the banks in their sample
Ahmed et al. (1998)	Do banks use LLPs as a tool for earnings management after the 1990 change in capital adequacy regulation came into effect?	Found no evidence that LLPs are used as a tool for earnings management post 1990 capital adequacy regulation.

Table 1. (continued)

Panel C: Studies that examined the use of LLPs as signalling mechanism

Authors	Research question examined	Findings
Beaver et al (1989) Wahlen (1994)	How do investors react to unexpected increases in LLPs by banks?	Beaver et al (1989) found that, after, controlling for nonperforming loans, banks with higher allowances for loan losses have higher market to book ratios. Wahlen (1994) found that, after controlling for unexpected changes in non-performing loans, banks with higher unexpected LLPs have higher abnormal returns. Both conclude that, among other findings, unexpected increases in LLPs are viewed positively by investors
Liu and Ryan (1995)	How does a bank's financial condition influence the signal sent by changes in LLPs? Is the banks' financial condition a moderating variable?	They concluded that LLP increases are good news only for banks that the market perceives to have loan default problems; if prognosis is already good, no significant stock market reaction occurs.
Beaver and Engel (1996)	Does the capital market assign different prices to estimates of the two components of loan losses? (ie, discretionary and nondiscretionary components, surrogating for discretionary and nondiscretionary behaviour). Built on prior studies but refined methodology by breaking down LLPs into two components.	They found that the capital market assigns significantly different prices to each component. Nondiscretionary components are negatively priced and discretionary components are positively priced. Conclude that increases in discretionary components of LLPs are viewed as good news items.
Liu et al (1997)	How are the characteristics of banks that utilize discretionary LLPs for signalling?	The good news signalled by discretionary LLPs are most prominent for banks that have greater incentive to signal good news, namely, banks characterized by low regulatory capital and potential loan default problems.
Griffen and Wallach (1991) Elliott et al (1991)	Did stock market react to disclosures about decisions to increase loan loss reserves for Latin American governments to recognize higher probability of default?	Griffen and Wallach (1991) found that the stock market reacted positively to announcements of additional LLPs. They conclude that this is consistent with banks' use of LLPs as credible signals about their intentions, ability, and resolve to solve the Latin American debt situation. Elliott et al (1991) came to the same finding. They concluded that an increase in LLPs is considered good news because they imply that a bank is dealing constructively with loan default problems
Ahmed et al. (1999)	Are LLPs used as a tool for signalling?	Found results that conflicted with Wahlen (1994) and Beaver and Engel, (1996) discussed above. The difference in results may be attributed to the difference in the time periods covered by the studies

3.1 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. Prior to 1989, there was an incentive to manipulate LLPs to improve the capital adequacy ratio. However, studies that

examined how banks used LLPs during this period produced conflicting results. Moyer (1990) and Scholes et al (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. 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). Kim and Kross (1998) 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. Ahmed et al (1999) found a negative relationship between LLPs and the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital and unexpectedly found no change in this association after the change in U.S. capital regulations.

3.2 Studies that examined the association of LLPs and earnings management

Overall, the results on the association of LLPs and earnings management are conflicting. 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.

Other studies found no association between LLPs and earnings. Wetmore and Brick (1994) studied what factors might be associated with income smoothing by banks and found no evidence that LLPs were 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. Ahmed et al (1999), however, attribute this difference in result to, perhaps, the different model used in their study.

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

Some prior studies 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 LLPs and positively related to abnormal LLPs (see Beaver et al, 1989; Wahlen, 1994; Liu and Ryan, 1995; Beaver and Engel, 1996; Liu et al, 1997). Griffen and Wallach (1991) and Elliott et al (1991) concluded that when the LLPs were related to Latin American countries, an increase in LLPs was viewed by the bank positively. They concluded that the market considered it as good news because the banks were dealing constructively with government loan default problems. In contrast to these other studies Ahmed et al (1999) found that LLPs were not used for signalling. They found a negative relationship between LLPs and future earnings for both total LLPs and for non-discretionary provisions. Therefore, their results contradict those of Wahlen (1994). They also found evidence that contradicted the conclusion of a positive relationship between market value of equity and discretionary LLPs found by Beaver and Engel (1996).

4 Hypotheses

4.1 Capital management

As mentioned above, Moyer (1990) and Ahmed et al (1999), using financial data on banks in Europe and the U.S., found that in the pre-Basel era banks used loan loss reserves for the purpose of managing capital adequacy ratios. Given that 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 changes in LLPs have no impact on the capital adequacy ratio. Accordingly, Ahmed et al (1999) hypothesized that in the post-Basel period there would be a less negative relationship between LLPs and capital but found no evidence to support this hypothesis. Since Australian banks have also adopted the guidelines of the Basel Accord, there is no reason to expect a divergence in US, European and Australian bank behaviour. Our hypothesis, stated in the alternate, is as follows:

H1: *The relation between loan loss provisions 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. To do this 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.

4.2 Earnings management

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

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 (see 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, 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, we 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. 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 (2002) 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 difference between listed and unlisted commercial banks 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. The literature notes that a motive for the choice of LLPs is to signal financial strength (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. In particular additional LLPs convey a signal of conservatism and confidence that management can withstand a 'hit' to earnings. Ahmed et al (1999) note that signalling is an important reason for choosing LLPs. 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 Data and model specifications

5.1 Data

We used the data from bank financial statements provided by Thomson's (Bureau van Dijk) Bankscope database. This, also known as Fitch's International Bank Database, required substantial editing before a reliable sample could be constructed.[4] The data were carefully reviewed to avoid double counting of institutions, 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 were used wherever available and, if this was not available, inflation-adjusted local accounting standards data were used. Third, commercial banks with incomplete data with respect to our key variables were excluded from the sample. Finally, central banks, government development banks, export-import banks and cooperative banks 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

[4] Problems encountered included multiple listing of commercial banks, and double reporting by some banks using both international accounting standards (IAS) and domestic accounting practices. In addition, the problems in the latter case were compounded because multiple entries often reflected different levels of consolidation. Further finance companies are sometimes included in the source dataset and designated as commercial banks.

total number of bank-year observations are 441 for commercial banks (79 for listed and 362 for unlisted).

Table 2 provides a description of the banking industry in Australia by category. As shown in Table 2, the commercial banks are by far the largest, possessing 87% of the share of industry assets. Even though Table 2 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 major change, namely the requirement to implement the guidelines of the Basel Accord. Australian commercial banks were also impacted by deregulation of the banking industry. However, this 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.

5.2 Methodology

5.2.1 Testing of capital management and earnings management

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

$$\begin{aligned} \text{LLP (or LLPR)} = {} & a_0 + a_1 \Delta\text{LLA} + a_2 \Delta\text{GDP} + a_3 \text{MCAP} + a_4 \text{EBT} \\ & + a_5 \text{LISTED} + a_6 \text{POST} + a_7 \text{TA} + a_8 \text{CFEER} \\ & + a_9 \text{LISTED} \cdot \text{MCAP} + a_{10} \text{LISTED} \cdot \text{EBT} \\ & + a_{11} \text{MCAP} \cdot \text{POST} + a_{12} \text{EBT} \cdot \text{POST} \\ & + a_{13} \text{LISTED} \cdot \text{MCAP} \cdot \text{POST} + a_{14} \text{LISTED} \cdot \text{EBT} \cdot \text{POST} \end{aligned} \tag{5.1}$$

where,
LLP = Natural logarithm of loan loss provisions
LLPR = Ratio of loan loss provisions to average loans outstanding
ΔLLA = Change between each sample year in the ratio of actual loan losses to total assets
ΔGDP = Change in gross domestic product, a proxy for the change in economic growth

Table 2. **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

* The frequency distribution for the commercial banks relative to all types of banks with information available in our data set. 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.

MCAP = Ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital
EBT = Ratio of earnings before taxes and LLPs to total assets
LISTED = Dummy variable (1 if listed commercial bank; 0 if unlisted 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 = Ratio of commission and fee income to assets
LISTED·MCAP = Interaction of type of commercial bank with MCAP
LISTED·EBT = Interaction of commercial bank type EBT
MCAP·POST = Interaction of MCAP with type of regime
EBT·POST = Interaction of EBT with type of regime
LISTED·MCAP·POST = Interaction of type of commercial bank with MCAP and type of regime
LISTED·EBT·POST = Interaction of type of bank EBT and type of regime

The rationale for including the independent variables and the predicted association with the LLPs are summarized in Table3.

5.2.2 Test of signalling theory

Ahmed et al (1999) test their signalling hypothesis by examining the association of LLPs to one-year-ahead changes in earnings. They use two models. In their first model they examine the association of LLPs with the change in earnings before and interest and tax and LLPs, after including control variables. Our version of this model is shown below.

$$\begin{aligned} LLPR = {} & a_0 + a_1 \Delta LLA + a_2 \Delta GDP + a_3 MCAP + a_4 EBT + a_5 LISTED \\ & + a_6 EBTP \end{aligned} \tag{5.2}$$

In this model ΔEBTP is the change in the ratio of earnings before taxes and LLPs to total assets and the other variables are as previously defined. We estimate this model using an OLS regression with and without the variable LISTED.

Table 3. **Discussion of independent variables**

Variable	Predicted sign	Prior research	Rationale for predicted sign
ΔLLA Change in loan losses to total assets	+	Ahmed et al (1999)	Surrogate for level of risk faced by institutions. If loan losses are higher the bank would have to increase LLPs to take account of the additional risk.
ΔGDP Change in Gross Domestic Product	+		Proxy for change in economic growth. When GDP is growing firms may increase borrowing to expand activities. Banks would have to increase LLPS to take account of the additional risk.
MCAP Ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital	Pre-Basel – Post-Basel Either	Ahmed et al (1999) Moyer (1990) Beatty et al (1995)	In the pre-Basel regime, low levels of capital may provide incentive for banks to increase LLPs since loan loss reserves were part of the numerator of the capital adequacy ratio. This no longer applies in the post-Basel regime since loan loss reserves are now an insignificant part of the numerator of the capital adequacy ratio.
EBT Ratio of earnings before taxes and LLPs to total assets	+	Ahmed et al (1999)	In the post-Basel period there is no constraint to or costs of earnings management. This may provide an incentive to use LLPs to increase earnings.
LISTED Dummy for type of bank: takes the value 1 for listed and the value 0 for unlisted commercial banks	+	No prior research in this area has examined difference in behaviour between listed and unlisted commercial banks	Listed commercial banks use the stock market as a source of funds while unlisted commercial banks do not. Hence listed banks would have a greater incentive to engage in earnings management to convey a signal of success and stability to shareholders.
POST Dummy for nature of regime: takes the value 1 for 1996 to 2001 and the value 0 otherwise	+	Ahmed et al (1999)	In the post-Basel period we expect significant use of LLPs for earnings management due to elimination of constraints to practice earnings management.
TA Natural logarithm of total assets	+	Liu and Ryan (1995)	Larger banks may have higher levels of business and hence be expected to have higher LLPs to take account of increased activity and risk
CFEER Ratio of commission and fee income to total assets	+	Hasan and Hunter (1999)	Higher commission income may indicate an interest in non-depository banking activities. These banks may allocate additional loan loss reserves to provide an image of a safer institution providing multiple services.
LISTED·MCAP Interaction of bank type with MCAP	?	No prior research has examined this interaction*	This interaction variable is included to examine whether listed commercial banks use LLPs for capital management differently than unlisted commercial banks. There is no clear prior expectation.

LISTED·EBT Interaction of bank type with EBT	+	No prior research has examined this interaction*	This interaction variable is included to examine whether listed commercial banks engage in earnings management more aggressively than unlisted commercial banks. Since listed commercial banks use the stock market as a source of funds, we anticipate they have a greater incentive to use LLPs to manage earnings than unlisted commercial banks.
MCAP·POST Interaction of MCAP and type of regime	+	Ahmed et al (1999)	This interaction variable indicates whether LLPs are associated with level of capital adequacy differently in the post-Basel regime. We assume the association will be less negative in the post-Basel period.
EBT·POST Interaction of EBT with type of regime	+	Ahmed et al (1999)	This interaction variable indicates the association of LLPs and earnings in the post-Basel period. We assume that there will be a greater incentive to manipulate earnings in the post-Basel period.
LISTED·MCAP·POST Interaction of bank type with MCAP and regime	_	No prior research has examined this interaction*	This variable indicates the interaction of listed commercial bank with capital adequacy ratio in the post-Basel regime. If the incentive to use LLPs to manage capital is lower for listed commercial banks relative to unlisted commercial banks, we would expect the coefficient of this variable to be negative.
LISTED·EBT·POST Interaction of bank type EBT and type of regime	+	No prior research has examined this interaction*	This variable indicates the interaction of listed commercial banks relative to unlisted commercial banks with earnings in the post-Basel regime. If commercial banks use LLPs to more aggressively manage earnings relative to unlisted commercial banks in the post-Basel regime, we should expect the coefficient to be positive.

* These variables are unique to this study because we dichotomize Australian commercial banks into listed and unlisted for the purpose of examining differences in earnings and capital management behaviour.

In their second model Ahmed et al (1999) use the change in earnings before taxes and LLPs as the dependent variable and discretionary LLPs as the independent variable. Following their work we use our model shown below.

$$\Delta EBTPMVE_{t+1} = a_0 + a_1 \Delta EBTPMVE_t + a_2 ULLPMVE \quad (5.3)$$

In this model $\Delta EBTPMVE_{t+1}$ is the one year ahead change in the ratio of earnings before taxes and LLPs; $\Delta EBTPMVE_t$ is the current change in the ratio of earnings before taxes and LLPs (both divided by market value of equity at the beginning of their respective years); ULLPMVE is the unexpected or discretionary LLPs measured as the residuals from regression of LLPs on expected change in actual loan losses deflated by beginning of year market value of equity. This model is also similar to the valuation approach used by Beaver and Engel (1996).

5.2.3 Descriptive statistics

Table 4 provides descriptive statistics for the dependent and independent variables. As can be seen from the statistics on the variable LLPR, on average LLPs are 0.41% (pre-Basel) and 0.74% (post-Basel) of outstanding loans overall. These findings appear to be roughly similar to the US sample of Ahmed et al (1999), who reported a loan loss percentage of 0.8%. For unlisted commercial banks on average LLPs are 0.13% of outstanding loans in the pre-Basel period and 0.17% in post-Basel periods. For listed commercial banks on average LLPs are 0.67% of outstanding loans in the pre-Basel period and 0.94% in post-Basel periods.

Table 5 provides Pearson correlation coefficients of the variables in our sample. Among the independent variables, the change in GDP, ΔGDP, the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital, MCAP, and the ratio of commission and fees to total assets, CFEER, are significantly and positively associated with the standardized LLP variables, LLP and LLPR. As GDP growth increases, companies may borrow more money, resulting in banks increasing their provisions to take bad debt into consideration. The ratio of earnings before taxes and LLPs to total assets, EBT, is significantly and negatively associated with the standardised LLP variables, LLP and LLPR. 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 5, 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.

Table 4. **Descriptive statistics for commercial bank observations**

	Pooled Mean (Std. Deviation)		Unlisted Mean (Std. Deviation)		Listed Mean (Std. Deviation)	
	Pre-Basel	**Post-Basel**	**Pre-Basel**	**Post-Basel**	**Pre-Basel**	**Post-Basel**
LLP Natural logarithm of loan loss provisions	8.2905 (2.0808)	8.3773 (2.0053)	7.7538 (1.2365)	7.8946 (1.0422)	10.1643 (1.2544)	10.5268 (1.8769)
LLPR Ratio of loan loss provisions to average outstanding loans	0.0041 (0.0051)	0.0074 (0.0772)	0.0013 (0.0066)	0.0017 (0.0011)	0.0067 (0.0051)	0.0094 (0.0895)
LLA Ratio of actual loan losses to total assets	0.0083 (0.0123)	0.0071 (0.0214)	0.0098 (0.0176)	0.0077 (0.0123)	0.0058 (0.0214)	0.0067 (0.0038)
ΔLLA Change in the ratio of actual loan losses to total assets	0.2041 (0.1316)	0.0863 (0.0210)	0.1653 (0.5081)	0.1576 (1.6292)	0.2893 (0.6421)	0.0688 (0.2760)
ΔGDP Change in GDP	0.0225 (0.0312)	0.0105 (0.0287)	0.0225 (0.0312)	0.0105 (0.0287)	0.0225 (0.0312)	0.0105 (0.0287)
MCAP Ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital	0.0194 (0.0025)	0.0185 (0.0043)	0.0201 (0.0023)	0.0158 (0.0079)	0.0135 (0.0017)	0.0119 (0.0017)
EBT Ratio of earnings before taxes and LLPs to total assets	0.0262 (0.0132)	0.0244 (0.0417)	0.0298 (0.0177)	0.0214 (0.0265)	0.0268 (0.0179)	0.0197 (0.0186)
TA Natural logarithm of total assets	13.9534 (2.0012)	16.7447 (1.3991)	8.9575 (0.8864)	8.5750 (1.1325)	14.2531 (1.5768)	17.1214 (1.3976)
CFEER Ratio of commission and fees income to total assets	0.0186 (0.0841)	0.0373 (0.0541)	0.0291 (0.0210)	0.0266 (0.1368)	0.0095 (0.0013)	0.0425 (0.0180)
ΔEBT Change in ratio of earnings before taxes and LLPs to total assets one year before	0.0031 (0.0052)	0.0042 (0.0034)	0.0075 (0.0034)	0.0068 (0.0022)	0.0090 (0.0047)	0.0101 (0.0055)
ULLPMVE Unexpected loan loss provisions measured by the residuals from a regression of LLPs on expected change in actual loan losses (all deflated by the beginning of year market value of equity).	1.7124 (0.8452)	1.7824 (1.0231)	1.3134 (0.8093)	1.2749 (0.9873)	1.9653 (1.0745)	2.0365 (0.8467)
$\Delta EBTPMVE_t$ This is the change in the ratio of earnings before taxes and LLPs to the market value of equity at the beginning of year	0.0001 (0.0004)	0.0003 (0.0002)	0.0002 (0.0006)	0.0003 (0.0001)	0.0001 (0.0000)	0.0000 (0.0004)
Number of Observations	164	277	136	226	28	51

Table 5. **Pearson correlation coefficients of key variables of the sample commercial bank observations**

LLP is the natural logarithm of loan loss provisions; LLPR is the ratio of loan loss provisions to outstanding loans; LLA is the ratio of actual loan losses to total assets; ΔLLA is the change between each sample year in the ratio of actual loan losses to total assets; ΔGDP is change in gross domestic product; MCAP is the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital; EBT is the ratio of earning before taxes and LLPs to total assets; TA is the logarithm of total assets; CFEER is the ratio of commission and fee income to total assets

	LLP	**LLPR**	**ΔLLA**	**ΔGDP**	**MCAP**	**EBT**	**TA**	**CFEER**
LLP	1.0000							
LLPR	0.7023 ***	1.0000						
ΔLLA	0.3621 ***	0.0179	1.0000					
ΔGDP	0.2399 ***	0.3206 ***	0.1754 **	1.0000				
MCAP	0.3165 ***	0.2862 ***	-0.0875 *	0.0432	1.0000			
EBT	-0.1848 ***	-0.3210 ***	-0.0212	0.2518 ***	-0.4703 ***	1.0000		
TA	0.0813 *	0.0525	0.0542	0.0326	-0.4018 ***	0.0521	1.0000	
CFEER	0.2257 ***	0.1714 ***	-0.0054	0.2665 ***	0.0928	0.2325 ***	-0.3271 ***	1.0000

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

6 Empirical results

6.1 Capital management and earnings management

Estimates of the model using four OLS regressions are reported in Table 6. 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 and present these results in Columns 1 through 4 of Table 6. We subsequently ran the four regressions with the ratio of loan loss provisions to average loan outstanding, LLPR, as the dependent variable and present these results in Columns 5 through 8 of Table 6.

The adjusted R^2 for the first regression with LLP as the dependent variable reveals that the basic model, Column 1 in Table 6, explains 25.85% 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 26.51%; the third explains 27.99%; and the fourth, 28.95%. The adjusted R^2 for the model with LLPR as the dependent variable has higher explanatory power overall: the adjusted R^2 for these four regressions are 30.94%, 32.18%, 33.19%, and 34.12%, respectively.

The results in Columns 1 and 5 of Table 6 are for the regressions with intercept dummies LISTED and POST but no interactive dummy variables. These regressions indicate that on average LLPs, measured as either LLP or LLPR, are higher for listed than for unlisted commercial banks and lower in the post-Basel period than in the pre-Basel period. The results show a negative relationship between the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum, MCAP, and both dependent variables. However, the coefficient on MCAP is significant only when LLPR is the dependent variable. This provides some evidence of the use of LLPs for capital management over the entire period. The results also show a positive and significant relationship between the ratio of earnings before taxes and LLPs to total assets, EBT, and both dependent variables over the entire period. If banks use LLPs to manage earnings, then we would expect a positive relationship between earnings and LLPs. Therefore, our findings support the conclusion that LLPs are used as a tool for earnings management. (An alternative explanation is that they are related to riskier loans.)

Table 6. **Determining factors of loan loss provisions of Australian banks OLS regressions (t-statistics in parentheses)**

LLP is the natural logarithm of loan loss provisions; LLPR is the ratio of loan loss provisions to outstanding loans; LLA is the ratio of actual loan losses to total assets; ΔLLA is the change between each sample year in the ratio of actual loan losses to total assets; ΔGDP is change in gross domestic product; MCAP is the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital; EBT is the ratio of earning before taxes and LLPs to total assets; TA is the logarithm of total assets; CFEER is the ratio of commission and fee income 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; and several interactive variables are added in some of the estimates.

	Dependent Variable – LLP				Dependent Variable – LLPR			
	1	2	3	4	5	6	7	8
Intercept	0.0176 (1.85)*	0.0379 (1.89)*	0.0414 (2.01)**	0.0402 (2.51)**	0.0233 (1.62)	0.0261 (1.60)	0.0612 (1.97)**	0.0652 (2.00)**
ΔLLA	0.094 (2.86)***	0.0742 (3.14)***	0.0964 (2.93)***	0.1075 (3.02)***	0.1122 (2.81)**	0.0923 (2.90)***	0.0853 (3.12)***	0.0831 (3.08)***
ΔGDP	0.0261 (1.84)*	0.0271 (1.89)*	0.0236 (1.93)*	0.0252 (1.72)*	0.0345 (1.58)	0.0332 (1.62)	0.0355 (1.59)	0.0384 (1.66)*
MCAP	-0.8833 (1.91)*	-0.7633 (1.69)*	-0.8051 (1.63)	-0.7543 (1.60)	-0.6533 (2.05)**	-0.6344 (2.06)**	-0.6232 (1.93)*	-0,6142 (1.87)*
EBT	0.0504 (2.48)**	0.0510 (2.62)**	0.0617 (2.59)**	0.0661 (2.63)**	0.0472 (2.36)**	0.0526 (2.41)**	0.0546 (2.34)**	0.0494 (2.17)**
LISTED	0.0282 (2.91)***	0.0312 (2.86)***	0.0298 (2.71)**	0.0224 (2.54)**	0.0221 (2.65)**	0.0253 (2.70)**	0.0333 (2.67)**	0.0290 (2.56)**
POST	-0.025 (4.14)***	-0.0241 (4.18)***	-0.0281 (4.09)***	-0.0305 (4.08)***	-0.0305 (4.05)***	-0.0352 (4.13)***	-0.0287 (4.06)***	-0.0281 (3.97)***
TA	0.0241 (1.45)	0.0268 (1.42)	0.0284 (1.50)	0.0243 (1.46)	0.0216 (1.38)	0.0226 (1.36)	0.0242 (1.49)	0.0244 (1.51)
CFEER	-0.2550 (2.42)**	-0.2535 (2.49)**	-0.2632 (2.64)**	-0.2421 (2.70)**	-0.2052 (2.00)***	-0.2345 (2.04)***	-0.2862 (2.11)**	-0.2652 (2.09)**
LISTED·MCAP	-	-0.1562 (2.23)**	-0.1651 (2.26)**	-0.1677 (2.17)**	-	-0.1970 (1.98)**	-0.1987 (1.97)**	-0.2001 (1.96)**
LISTED·EBT	-	0.0167 (2.25)**	0.0204 (2.18)**	0.0226 (2.12)**	-	0.0162 (2.09)**	0.0155 (2.04)**	0.0155 (2.11)**

	Dependent Variable – LLP				Dependent Variable – LLPR			
	1	2	3	4	5	6	7	8
MCAP·POST	-	-	0.1873 (1.63)	0.1764 (1.60)	-	-	0.1582 (1.46)	0.1643 (1.74)*
EBT·POST	-	-	0.0565 (2.55)**	0.0583 (2.67)**	-	-	0.0420 (2.75)**	0.0482 (2.85)***
LISTED·MCAP·POST	-	-	-	0.7446 (1.86)*	-	-	-	0.6734 (1.61)
LISTED·EBT·POST	-	-	-	0.0074 (2.02)**	-	-	-	0.0256 (1.85)*
ADJUSTED 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			

***, **, * significantly different at the p = 0.01, 0.05, 0.10 levels respectively. The absolute values of the t-statistics are in parentheses.

ΔGDP and TA are included as proxies for economic growth and bank size, respectively. The coefficient on ΔGDP is positive for both dependent variables, LLP and LLPR, but only significant in the regression with LLPR. The coefficient on TA is insignificant in both regressions. The change in the ratio of actual loan losses to total assets, ΔLLA, has a positive and significant association with both dependent variables. 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. In both regressions the coefficient on the ratio of commission and fee income to total assets, CFEER, is negative and significant at the 5% level. 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. For the most part, these results hold in all versions (Columns 2 through 4 and 6 through 8) of our model presented in Table 6.

In the second form of the model, Columns 2 and 6 of Table 6, we incorporate two interaction terms, LISTED·MCAP and LISTED·EBT the coefficients of which estimate the differences in the relationships between LLPs and MCAP and between LLPs and EBT. The coefficient of the LISTED·MCAP variable is negative and significant at the 5% level. This indicates that the relationship between LLPs and MCAP is more negative for listed banks than for the unlisted commercial banks. The coefficient of the interaction variable LISTED·EBT is positive and significant at the 5% level indicating a more positive relationship between LLPs and EBT for listed commercial banks than for unlisted commercial banks. 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 6, incorporates two additional interaction terms, MCAP·POST and EBT·POST. The coefficient on MCAP·POST is positive as expected, but not significant. This means that there is insufficient evidence to conclude that LLPs are used to manage capital adequacy ratios differently in the post-Basel period. The coefficient of the interaction term EBT*POST is positive and significant at the 5% level. If managing earnings is an important driver of LLPs, we would expect to see a larger positive coefficient on EBT in the new regime since the costs of managing earnings in terms of adverse effects on regulatory capital have declined. Therefore, our results provide evidence of a significant difference in earnings management behaviour in the post-Basel period.

The fourth form of the model, Columns 4 and 8 of Table 6, incorporates two 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 differently from unlisted commercial banks in the post-Basel regime. The interaction variable LISTED·EBT·POST variable is positive and significant at the

5% level, indicating that listed commercial banks engage more aggressively in earnings management relative to unlisted commercial banks in the post-Basel period.

6.1.1 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-ran the four regressions reported in Columns 5 to 8 of Table 6 but now with MCAP 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 for the regressions with LLPR as the dependent variable and 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 (Columns 5 to 8 in Table 6). 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 (the ratio of loan loss provisions to average loans outstanding, LLPR) and the independent variables previously discussed.

Overall, we find that the change in ratio of actual loan losses to total assets, ΔLLA, 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 LLPs. The coefficient on the ratio of earnings before taxes and LLPs to total assets, 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 not a strong 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

Table 7. **Determining factors of loan loss provisions of Australian banks Tier I versus Tier II capital (t-statistics in parentheses)**

LLPR is the ratio of loan loss provisions to outstanding loans; LLA is the ratio of actual loan losses to total assets; ΔLLA is the change between each sample year in the ratio of actual loan losses to total assets; ΔGDP is change in gross domestic product; MCAP is the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital; EBT is the ratio of earning before taxes and LLPs to total assets; TA is the logarithm of total assets; CFEER is the ratio of commission and fee income 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; and several interactive variables are added in some of the estimates.

	Dependent Variable – LLPR							
	Tier I capital				Tier II capital			
	1	2	3	4	5	6	7	8
Intercept	0.0233 (1.62)	0.0261 (1.60)	0.0612 (1.97)**	0.0652 (2.00)**	0.0092 (1.08)	0.0102 (1.12)	0.0111 (1.14)	0.0062 (0.95)
ΔLLA	0.1122 (2.81)**	0.0923 (2.90)***	0.0853 (3.12)***	0.0831 (3.08)***	0.0843 (3.07)***	0.0734 (3.12)**	0.0594 (3.25)***	0.0524 (3.19)***
ΔGDP	0.0345 (1.58)	0.0332 (1.62)	0.0355 (1.59)	0.0384 (1.66)*	0.0121 (1.32)	0.0182 (1.38)	0.0273 (1.43)	0.0311 (1.54)
MCAP	-0.6533 (2.05)**	-0.6344 (2.06)**	-0.6232 (1.93)*	-0,6142 (1.87)*	-0.5714 (1.84)*	-0.5264 (1.74)*	-0.5236 (1.59)	-0.5110 (1.58)
EBT	0.0472 (2.36)**	0.0526 (2.41)**	0.0546 (2.34)**	0.0494 (2.17)**	0.0332 (1.83)*	0.0271 (1.74)*	0.0292 (1.69)*	0.0243 (1.60)
LISTED	0.0221 (2.65)**	0.0253 (2.70)**	0.0333 (2.67)**	0.0290 (2.56)**	0.0183 (2.18)**	0.0164 (2.00)**	0.0155 (1.90)*	0.0146 (1.77)*
POST	-0.0305 (4.05)***	-0.0352 (4.13)***	-0.0287 (4.06)***	-0.0281 (3.97)***	-0.0174 (2.44)**	-0.0122 (2.41)**	-0.0082 (2.13)**	-0.0064 (2.19)**
TA	0.0216 (1.38)	0.0226 (1.36)	0.0242 (1.49)	0.0244 (1.51)	0.0091 (0.81)	0.0106 (0.94)	0.0086 (0.76)	0.0152 (0.97)
CFEER	-0.2052 (2.00)***	-0.2345 (2.04)***	-0.2862 (2.11)**	-0.2652 (2.09)**	-0.0313 (1.76)*	-0.0404 (1.71)*	-0.0352 (1.62)	-0.0436 \(1.57)
LISTED·MCAP	-	-0.1970 (1.98)**	-0.1987 (1.97)**	-0.2001 (1.96)**	-	-0.1423 (1.76)*	-0.1554 (1.42)	-0.1612 (1.40)

	Dependent Variable – LLPR							
	Tier I capital				Tier II capital			
	1	2	3	4	5	6	7	8
LISTED·EBT	-	0.0162 (2.09)**	0.0155 (2.04)**	0.0155 (2.11)**	-	0.0034 (1.85)*	0.0072 (1.66)*	0.0115 (1.54)
MCAP·POST	-	-	0.1582 (1.46)	0.1643 (1.74)*	-	-	0.1041 (1.51)	0.1184 (1.54)
EBT·POST	-	-	0.0420 (2.75)**	0.0482 (2.85)***	-	-	0.0141 (1.88)*	0.0173 (1.94)*
LISTED·MCAP·POST	-	-	-	0.6734 (1.61)	-	-	-	0.5313 (1.46)
LISTED·EBT·POST	-	-	-	0.0256 (1.85)*	-	-	-	0.0195 (1.78)*
ADJUSTED 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.

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

6.1.2 Test of panel data bias

In this study our data represents 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 8.

As shown in Table 8, we include a dummy variable, POST, with the value 1 for observations from the post-Basel period, 1996–2001, and 0 otherwise, ie, the pre-Basel period 1991–1995. We include this dummy variable for both forms of the dependent variable, the natural logarithm of LLPs, LLP, and the ratio of loan loss provisions to the average loan outstanding, LLPR. In both cases, the coefficient for the dummy variable POST is negative and significant at the 1% level. This shows that, overall, LLPs were significantly lower in the post-Basel era. This finding indicates that banks may have had an incentive to understate LLPs 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.

We also perform some robustness tests by estimating additional fixed effect regressions by including firm fixed effects in the regression. We also perform the regressions reported in Table 8 for both Tier I and Tier II as a measure of MCAP and then adding year fixed effect as well as both year and firm fixed effects in the model. The magnitude and the significance of the key variables reported in the text are not significantly different to change our conclusions.

Table 8. **Determining factors of loan loss provisions of Australian banks. Fixed effect regressions (t-statistics in parentheses)**

LLP is the natural logarithm of loan loss provisions; LLPR is the ratio of loan loss provisions to outstanding loans; LLA is the ratio of actual loan losses to total assets; ΔLLA is the change between each sample year in the ratio of actual loan losses to total assets; ΔGDP is change in gross domestic product; MCAP is the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital; EBT is the ratio of earning before taxes and LLPs to total assets; TA is the logarithm of total assets; CFEER is the ratio of commission and fee income 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; and several interactive variables are added in some of the estimates.

	Dependent Variable – LLP (Independent Variables Include Year Fixed Effect)				Dependent Variable – LLPR (Independent Variables Include Year Fixed Effect)			
	1	2	3	4	5	6	7	8
Intercept	0.0201 (1.60)	0.0214 (1.63)	0.0590 (1.88)*	0.0612 (1.96)**	0.0163 (1.27)	0.0181 (1.31)	0.0173 (1.25)	0.0192 (1.20)
ΔLLA	0.1102 (2.80)**	0.0895 (2.86)***	0.0814 (3.09)***	0.0814 (3.06)***	0.1084 (2.32)**	0.0870 (2.35)***	0.0761 (2.78)**	0.0790 (2.86)***
ΔGDP	0.0321 (1.54)	0.0321 (1.63)	0.0315 (1.60)	0.0346 (1.63)	0.0255 (1.50)	0.0292 (1.56)	0.0313 (1.53)	0.0351 (1.60)
MCAP	-0.6321 (2.09)**	-0.6364 (2.10)**	-0.6297 (1.95)**	-0.6221 (1.89)*	-0.6165 (1.97)**	-0.6094 (2.00)**	-0.6154 (1.85)*	-0.6074 (1.77)*
EBT	0.0425 (2.31)**	0.0506 (2.38)**	0.0512 (2.31)**	0.0440 (2.19)**	0.0372 (2.05)**	0.0391 (2.06)**	0.0335 (2.09)**	0.0392 (1.97)**
LISTED	0.0247 (2.69)**	0.0272 (2.72)**	0.0323 (2.73)**	0.0302 (2.62)**	0.0204 (2.55)**	0.0217 (2.61)**	0.0262 (2.50)**	0.0226 (2.48)**
POST	-0.0296 (4.01)***	-0.0303 (4.05)***	-0.0264 (4.00)***	-0.0274 (3.96)***	-0.0295 (3.27)***	-0.0322 (3.25)***	-0.0251 (3.29)***	-0.0245 (3.30)***
TA	0.0202 (1.35)	0.0211 (1.35)	0.0247 (1.50)	0.0254 (1.52)	0.0131 (1.00)	0.0126 (1.06)	0.0133 (1.05)	0.042 (1.11)
CFEER	-0.2027 (2.02)**	-0.2310 (2.03)**	-0.2768 (2.18)**	-0.2613 (2.15)**	-0.0930 (1.89)*	-0.1209 (1.86)*	-0.1280 (1.84)*	-0.1183 (1.79)*
LISTED·MCAP	-	-0.1923 (2.01)**	-0.1952 (1.94)*	-0.1985 (1.97)**	-	-0.1880 (1.90)*	-0.1902 (1.91)*	-0.1851 (1.87)*
LISTED·EBT	-	0.0130 (2.14)**	0.0141 (2.11)**	0.0162 (2.13)**	-	0.0092 (1.90)*	0.0107 (1.93)*	0.0127 (1.98)*

	Dependent Variable – LLP (Independent Variables Include Year Fixed Effect)				Dependent Variable – LLPR (Independent Variables Include Year Fixed Effect)			
	1	2	3	4	5	6	7	8
MCAP·POST	-	-	0.1549 (1.44)	0.1601 (1.70)*	-	-	0.1443 (1.39)	0.1490 (1.64)
EBT·POST	-	-	0.0393 (2.69)**	0.0424 (2.77)**	-	-	0.0386 (2.59)**	0.0412 (2.64)**
LISTED·MCAP·POST	-	-	-	0.6665 (1.59)	-	-	-	0.6464 (1.54)
LISTED·EBT·POST	-	-	-	0.0221 (1.80)*	-	-	-	0.0225 (1.90)*
ADJUSTED 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.

6.1.3 Additional sensitivity tests

A final issue relates to survivorship bias. We note that none of the banks in our sample filed for bankruptcy during our sample period. There were nine cases of mergers/acquisitions during the period of our sample. These nine banks were omitted from our sample used in the models discussed above. In another estimate (results not shown) we retained these banks in the sample, but created a dummy variable that took the value 1 if the bank engaged in mergers or were acquired and 0 otherwise. 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.

6.2 Signalling

Our results for the model, Equation (5.2) in Section 5.2.2, with and without LISTED are presented in Columns 1 and 2 of Table 9.

If signalling is an important factor in determining LLPs, then we should observe a positive relationship between the one-year-ahead change in earnings and LLPs as reported by Wahlen (1994) and others. The coefficient on the change in the ratio of earnings before tax and LLPs to total assets one-year-ahead, ΔEBTP 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 LLPs is associated with lower reported earnings. Column 2 of Table 9 shows our results when a dummy variable LISTED is included. The coefficient of this variable is significant and positive indicating that listed commercial banks reported significantly higher LLPs than unlisted commercial banks.

With respect to Equation (5.3) in section 5.2.2, the results in column 3 of Table 9 show that the relationship between the change in the ratio of earnings before taxes and LLPs to the market value of equity at the beginning of year, $\Delta EBTPMVE_{t+1}$, and the discretionary component of the LLPs is negative and statistically significant at the 5% level. This result is also not consistent with the signalling hypothesis, which assumes a positive association. A possible explanation for the inconsistent finding may be that signalling in the form of increasing LLPs is viewed as an expense rather than as a form of future profitability.

Table 9. **Test for signalling theory**

LLPR is the ratio of loan loss provisions to outstanding loans; ΔLLA is the change between each sample year in the ratio of actual loan losses to total assets; ΔGDP is change in gross domestic product; MCAP is the ratio of actual regulatory capital (primary or Tier I capital) before loan loss reserves to the minimum required regulatory capital; EBT is the ratio of earning before taxes and LLPs 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 ratio of earnings before taxes and LLPs to total assets one year before; ΔEBTPMVE is the change in the ratio of earnings before taxes and LLPs to the market value of equity at the beginning of year; ULLPMVE is the unexpected or discretionary LLPs measured as the residuals from regression of LLPs on expected change in actual loan losses, all deflated by beginning-of-year market value of equity.

	Dependent Variable LLPR		Dependent Variable $\Delta EBTPMVE_{t+1}$
	1	2	3
Intercept	0.0196 (1.46)	0.0232 (1.59)	0.0161 (3.48)***
ΔLLA	0.1712 (3.92)***	0.1750 (3.89)***	-
ΔGDP	0.0250 (1.55)	0.0242 (1.60)	-
MCAP	-0.0381 (1.91)*	-0.0391 (1.90)*	-
EBT	0.0253 (2.77)**	0.0264 (2.81)**	-
LISTED		0.0513 (2.18)**	-
ΔEBTP (1 year ahead)	-0.0184 (3.19)***	-0.0162 (3.28)***	-
Δ $EBTPMVE_t$	–	–	-0.0242 (2.64)**
ULLPMVE	–	–	-0.3834 (2.49)**
ADJUSTED R^2	0.0461	0.0467	0.0288
F-STATISTICS	3.45**	3.61**	2.99**
NUMBER OF OBSERVATIONS	441		79

***, **, * significantly different at the p = 0.01, 0.05, 0.10 levels respectively. The absolute values of the t-statistics are in parentheses.

6.3 Discussion of hypothesis

6.3.1 Capital management

Hypothesis H1 postulates that LLPs and primary (Tier I) capital for commercial banks will be less negative in the post-Basel regime relative to the pre-Basel regime. The MCAP·POST interaction variable is not significant at the 1% or 5% levels in any of our regressions. This shows that there is no significant difference in the post-Basel period. This finding does not support Hypothesis 1. We conclude that in the post-Basel period, there is insufficient evidence to indicate a significant change in association between LLPs and primary (Tier I) capital after the Basel Accord regulations were implemented in Australia.

6.3.2 Earnings management

Hypothesis H2 postulates that, overall, the relation between LLPs and earnings 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 6, 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 hypothesis H2.

Hypothesis H2a postulates that listed commercial banks have a greater incentive to use LLPs for managing earnings relative to unlisted commercial banks. In all the models reported in Table 6, the dummy variable for listed commercial banks, LISTED, is positive and significant at the 5% level. This indicates that listed commercial banks on average have higher LLPs relative to unlisted commercial 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 LLPs relative to unlisted commercial banks. 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 H2b 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 6 is negative and significant at the 1% level across all models. This indicates that LLPs are on average lower after the

regulatory change. Further, the interaction term between EBT and regulatory regime, EBT·POST, is positive and significant at the 5% level in the third and fourth models. This indicates that the relationship between LLPs and earnings is more positive after the implementation of the Basel Accord regulations. In the fourth regression, 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 commercial banks in the post-Basel period relative to the pre-Basel period. We conclude that there is sufficient evidence to support hypothesis 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. However, the results in Table 9 show a significant negative 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. As stated previously, these inconsistent findings may be attributed to the fact that signalling may be viewed as an expense rather than as a form of future profitability.

7 Conclusions

Much research has been conducted in the U.S. on the use of LLPs for capital management, earnings management and signalling. In particular, Ahmed et al (1999) examined how changes in the US capital adequacy regulations enacted in 1990 that ruled that loan loss reserves would not constitute an integral part of the required minimum capital influenced banks' behaviour. 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 LLPs are used as a tool to manage capital and to manage earnings to inflate stock prices. 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 capital management, earnings management and signalling by banks in Australia.

We find some evidence to indicate that Australian banks use LLPs for capital management but we find no evidence of a change in this behaviour after the implementation of the Basel Accord. We also find evidence of earnings management behaviour using LLPs by Australian banks, and by listed commercial banks in particular to a greater extent relative to unlisted commercial banks. Earnings management behaviour using LLPs was accentuated in the post-Basel period. Finally, Australian banks do not appear to use LLPs for signalling future intentions of higher earnings to investors.

Overall, our findings indicate that reported financial numbers may not reflect the underlying economic reality of Australian financial institutions based on the results from our sample. 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.

References

Ahmed, A S – Takeda, C – Thomas, S (1999) **Bank loan loss provisions: A reexamination of capital management, earnings management and signaling effects.** Journal of Accounting and Economics 28, 1–25.

Bank for International Settlements Basel Committee for Banking Supervision (1988) **International convergence of capital measurement and capital standards.** Publication No. 4.

Beatty, A – Chamberlain, S – Magliolo, J (1995) **Managing financial reports of commercial banks: The influence of taxes, regulatory capital, and earnings.** Journal of Accounting Research 33, 231–262.

Beaver, W – Eger, C – Ryan, S – Wolfson, M (1989) **Financial reporting and the structure of bank share prices.** Journal of Accounting Research 27, 157–178.

Beaver, W – Engel, E (1996) **Discretionary behavior with respect to allowances for loan losses and the behavior of security prices.** Journal of Accounting & Economics 22, 177–206.

Bhat, V (1996) **Banks and income smoothing; An empirical analysis.** Applied Financial Economics 6, 505–510.

Collins, J – Shackelford, D – Wahlen, J (1995) **Bank differences in the coordination of regulatory capital, earnings and taxes.** Journal of Accounting Research 33(2), 263–292.

Core, J – Gauy, W (2002) **Estimating the value of employee stock option portfolios and their sensitivities to price and volatility.** Journal of Accounting Research, 40(3), 613–630.

Delhaise, P (1998) **Asia in crisis: The implosion of the banking and finance systems** (Wiley, Singapore).

Elliott, J A – Hanna, J D – Shaw, W H (1991) **The evaluation by the financial markets of changes in bank loan loss reserve levels.** The Accounting Review, October, 847–861.

Fama, E (1980) **Agency problems and the theory of the firm.** Journal of Political Economy, April, 288–307.

Financial System Inquiry (1997) **Financial system inquiry final report** (Australian Government Publishing Service, Canberra).

Ford, G – Weston, R (2003) **Risk adjusted performance of European banks under the Basel Accord.** Working paper (Macquarie University).

Ford, G – Weston, R (2001) **Capital requirements and bank performance: A regional analysis.** Paper presented at Conference of Economists, Perth.

Goldstein, M (1997) **The case for an international banking standard** (Institute for International Economics, Washington).

Greenawalt, M – Sinkey, J Jr (1988) **Bank loan loss provisions and the income smoothing hypothesis: An empirical analysis, 1976–1984,** Journal of Financial Services Research 1, 301–318.

Griffin, P A – Wallach, S J R (1991) **Latin American lending by major US banks: The effects of disclosures about nonaccrual loans and loan loss provisions.** The Accounting Review, October, 830–846.

Hasan, I – Lozano-Vivasa, A (2002) **Organizational form and expense preference: A note.** Bulletin of Economic Research (February), 58–73.

Holderness, C G – Sheehan, D P (1988) **The role of majority shareholders in publicly held corporations.** Journal of Financial Economics 20, 317–346.

Hasan, I – Hunter, W C (1999) **Income-smoothing in the depository Institutions: An empirical investigation.** Advances in Quantitative Analysis of Finance and Accounting 7, 1–16.

Jensen, M C – Meckling, W H (1976) **Theory of the firm: Managerial behavior, agency costs and ownership structure.** Journal of Financial Economics 3, 305–360.

Jensen, M – Murphy, K J (1990) **Performance pay and top-management incentives.** Journal of Political Economy 98, 225–264.

Kim, M – Kross, W (1998) **The impact of the 1989 change in bank capital standards on loan loss provisions and loan write-offs.** Journal of Accounting and Economics 25, 69–100.

Kim, W S L – Sorensen, E H (1986) **Evidence on the impact of agency costs of debt or corporate debt policy.** Journal of Financial and Quantitative Analysis 21, 131–144.

Liu, C – Ryan, S (1995) **The effect of bank loan portfolio composition on the market reaction to and anticipation of loan loss provisions.** Journal of Accounting Research 33, 77–94.

Liu, C – Ryan, S – Wahlen, J (1997) **Differential valuation implications of loan loss provisions across banks and fiscal agents.** The Accounting Review 72, 133–146.

Ma, C K (1988) **Loan loss reserve and income smoothing: The experience in the US banking industry.** Journal of Business Finance and Accounting 15, 487–497.

Montgomery, L (1998) **Recent developments affecting depository institutions.** FDIC Banking Review 11, 26–34.

Moyer, S E (1990) **Capital adequacy ratio regulations and accounting choices in commercial banks.** Journal of Accounting and Economics 13, 123–154.

Oswald, S L – Jahera, J S (1991) **The influence of ownership on performance: An empirical study.** Strategic Management Journal 12, 321–326.

Padoa-Schioppa, T (1996) **Address to the Conference.** Speech delivered at the Ninth International Conference of Banking Supervisors, Stockholm.

Rosen, C – Quarrey, M (1987) **How well is ownership working?** Harvard Business Review 65, 126–132.

Rozeff, M (1982) **Growth, beta and agency costs as determinants of dividend payout ratios.** Journal of Financial Research 5, 249–259.

Scholes, M – Wilson, G P – Wolfson, M (1990) **Tax planning, regulatory capital planning, and financial reporting strategy for commercial banks.** Review of Financial Studies 3, 625–650.

Wahlen, J (1994) **The nature of information in commercial bank loan loss disclosures.** The Accounting Review 69, 455–478.

Wetmore, J L – Brick, J R (1994) **Loan loss provisions of commercial banks and adequate disclosure: A note.** Journal of Economics and Business 46, 299–305.

Williams, B (1998) **Factors affecting the performance of foreign owned banks in Australia: A cross sectional study.** Journal of Banking and Finance 22, 197–219.

Yermack, D (1995) **Do corporations award CEO stock options effectively?** Journal of Financial Economics 39, 237–269.

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