Effect of the Basel Accord capital requirements on the loan-loss provisioning practices of Australian banks

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Abstract

There are two distinct regimes for bank provisioning in Australia: a forward-looking model for regulatory purposes and an incurred loss model for financial reporting. This study examines the former using a unique but confidential database. We find evidence that: (i) regulatory provisions reflect the default risk of banks' loan portfolios, (ii) banks allocate part of surplus capital above Basel minimum requirements to pre-fund future credit losses through provisions (which holds for banks using either external or internal ratings-based approaches), and (iii) banks allocate part of higher earnings for the same purpose. These findings suggest that bank managers use their discretion in setting provisions to dampen the impact of fluctuations in credit market conditions on their lending activities.

JEL classification: G21, G28

Keywords: Commercial banks, Bank regulation, Loan-loss provisions, Bank capital requirements

1. Introduction

In its Basel III reform package, the Basel Committee on Banking Supervision (BCBS) is seeking to improve the banking sector's ability to absorb shocks arising from financial and economic stress, thus reducing the risk of spill-over from the financial sector to the real economy. A major focus of the reforms is to raise both the quality and size of the regulatory capital base, as well as to build capital buffers at individual banks that can be used in stressed economic conditions and to protect banks at times of excess credit growth. The outcome of these reforms relies upon the timeliness and reliability of banks' provisioning practices for loan losses. This follows because provisions (whether they be specific provisions or general loan-loss reserves) are deducted directly from equity capital via retained earnings. Consequently, to the extent that a bank's provisioning levels are inadequate to absorb expected credit losses in its business, the bank's capital adequacy will be overstated.

In contrast to previous studies that focus on bank provisioning practices under accounting standards for reporting to the market (for example, Moyer, 1990; Collins, Shackelford and Wahlen, 1995; Kim and Kross, 1998; Hasan and Wall, 2004), this study focuses on practices under prudential standards for reporting to the banking regulator. The change in focus is important for examining the role of provisioning in supporting the Basel capital requirements, because our study covers a period when accounting standards in Australia and internationally moved to an incurred loss model of provisioning. The incurred loss model is problematic for supervisory review and the market-enforced discipline of banks' capital adequacy; because it delays the recognition of losses until financial assets are close to default.[1]

To address this shortcoming, the Australian banking regulator has maintained a forward-looking provisioning model to capture expected future credit losses in a bank's business, by decoupling its provisioning requirements from Australian accounting standards. The forward-looking model is consistent with the expected loss approach to provisioning advocated by the BCBS under Basel III (see paragraphs 23-25 of the Basel III capital rules).[2] This study

[1] The incurred loss provisioning model is backward-looking, in the sense that it requires that a loss event occurs before a provision can be made (see International Accounting Standards Board, IAS 39 *Financial Instruments: Recognition and Measurement*, December 2003).

[2] A similar approach was proposed by the Turner Review in the United Kingdom. The Review recommended that existing accounting rules for provisioning be augmented by the creation of a non-distributable economic cycle reserve (ECR), which would set aside profit in good years to anticipate losses likely to arise in future. See the UK Financial Services Authority's publication, *The Turner Review: A Regulatory Response to the Global Banking Crisis*, released in March 2009.

provides a practical test of the forward-looking provisioning model, by examining the responsiveness of these types of provisions to bank-specific measures of credit risk. Such a test is not available in many countries, including the United States, which continue to rely on accounting standards for both financial reporting and prudential review.

Using a confidential dataset, this study investigates the role of the regulatory provisioning model in supporting the risk-based capital requirements for Australian banks.[3] Previous studies find evidence that bank managers take account of regulatory and market expectations concerning their capital adequacy and earnings when setting accounting provisions (see Wahlen, 1994; Robb, 1998; Ahmed, Takeda and Thomas, 1999; Anandarajan, Hasan and McCarthy, 2007). Since the regulatory provisions examined in this study are not disclosed to the market as part of a bank's half year and full year financial results, the bank may have less incentive to smooth reported earnings or to manage earnings expectations using these provisions.[4] However, the greater discretion afforded to banks when setting regulatory provisions warrants a closer examination of their quality and their relationship with regulatory capital under the Basel rules.

In particular, we explore the extent to which banks use the regulatory provisioning model for risk management, by building a buffer against future credit losses that supports the stability of the bank capital base. Although regulatory provisions have a direct negative impact on a bank's regulatory equity capital in the current period; by providing a loss-absorbing buffer, the provisions may reduce the extent to which capital is depleted in the event of a future economic downturn. Consequently, a sufficient provisioning buffer may help alleviate the extent to which capital requirements act to restrict lending activities as a result of credit losses realised in future periods. This argument derives from the finding by Beatty and Liao (2011) that bank lending is less sensitive to regulatory capital constraints during economic downturns for banks that provision proactively. We argue that this form of risk management is more likely to be effective if the provisions are drawn from surplus regulatory capital, because in this case the bank avoids being subjected to greater regulatory and market scrutiny in the short-term. Therefore, this study tests whether the strength of a bank's capital base in

[3] We thank the Australian Prudential Regulation Authority for allowing us access to the data for this study.
[4] Note that the regulatory provisions are reported to the market on a quarterly basis as part of the bank's Pillar 3 disclosures. However, for listed domestic banks these disclosures are made up to twenty business days after the corresponding financial results.

excess of Basel minimum requirements is a relevant factor when the bank raises provisions against credit exposures.

To our knowledge, this study is the first to examine bank provisioning practices for banks that use the internal ratings-based (IRB) approach to credit risk under the Basel II capital framework. Previous research examines bank provisioning in the pre-Basel period before 1989 (for example, Beatty, Chamberlain and Magliolo, 1995) and under the Basel I capital framework (Ahmed, Takeda and Thomas, 1999; Shrieves and Dahl, 2003; Fonseca and González, 2008). The Basel II framework was developed to improve the risk-sensitivity of the capital requirements and provide greater incentives for banks to develop their risk management capabilities (see paragraphs 5 and 6 of the Basel II capital framework). Under Basel II, banks that receive approval from the regulator are permitted to use their own risk assessments in the capital calculations. The IRB approach also establishes a direct linkage between regulatory provisioning and expected losses derived from the bank's credit risk modelling. This study tests whether the adoption of the IRB approach has reduced the incentives for these banks to drawdown from surplus capital to cover future credit losses.

Based on quarterly data for twenty-two banks operating in Australia from March 2004 to December 2012, we find that regulatory provisions reflect meaningful information about the default risk associated with banks' loan portfolios. We also find evidence that banks use provisions as a counter-cyclical buffer; allocating higher provisions in periods when their risk-based capital ratios and earnings are higher than average and adjusting provisions downwards in periods when these indicators are weaker. Larger banks in our sample maintain higher provisions than smaller banks, suggesting that larger banks are more closely monitored by the regulator and the market. For banks that receive approval from the regulator to use the IRB approach to credit risk, the provisioning behaviour of these banks suggests that they continue to use surplus regulatory capital for funding both specific provisions and general reserves after they adopt the IRB approach. Thus, there is no evidence that the greater alignment of regulatory provisioning requirements with banks' internal risk assessments has reduced the incentive for banks to allocate part of surplus capital for covering future loan losses.

2. The impact of bank discretionary behaviour on loan-loss provisions

This section discusses characteristics which may influence a bank's decision-making for provisioning. In principle, loan-loss provisions are a buffer to preserve a bank's solvency by absorbing existing and estimated future credit losses in its business. To the extent that provisions reflect the quality of the loan portfolio, they are likely to be susceptible to short-term fluctuations resulting from changes in macroeconomic conditions and developments in the solvency of individual counterparties. Provisioning may also be affected by country-specific circumstances with regard to accounting, regulatory and tax rules and by bank behaviour with regard to its performance and risk management practices.

The conceptual framework underlying the Basel Accord is that expected future losses will be covered by provisions, while unexpected future losses will be covered by capital. Despite this rationale, provisioning practices may be backward-looking if banks mainly set provisions in response to problem loans. During periods of economic expansion, fewer problem loans are identified and the level of provisions is usually low. Conversely, during economic downturns provisions increase because defaults are more widespread across the bank's lending business. Using bank-level data from 29 OECD countries, Bikker and Metzemakers (2005) show that provisioning levels vary significantly with the business cycle. This pattern implies that banks' buffers need to be restored during downturns, meaning that fewer profits are available to supplement existing capital, possibly forcing banks to reduce lending.[5] However, credit risk arises when loans are made; not only during a downturn when more defaults are experienced. In this case, banks may under-provision during periods of economic expansion (Laeven and Majnoni, 2003). Alternatively, provisioning may be forward-looking if it takes account of the intrinsic risk which might be estimated to exist in the bank's loan portfolio regardless of the stage in the business cycle. This study tests the extent to which regulatory provisions are influenced by credit risk, measured in relation to both problem loans and overall asset quality.

In addition, the research literature identifies three discretionary actions bank managers may take when setting provisions. The first action is concerned with capital management. Both specific provisions and general provisions reduce equity capital via their effect on retained earnings. Thus, a poorly capitalised bank may be less willing to make loan-loss provisions

[5] Beatty and Liao (2011) find that during the period after implementation of Basel risk-based capital regulations, banks with greater delays in expected loss recognition reduce their lending during recessions more than banks with smaller delays.

(Kim and Kross, 1998). However, to the extent that general provisions count towards non-equity regulatory capital, a bank may raise more general provisions to preserve its total regulatory capital base (Ahmed, Takeda and Thomas, 1999). Reasons for managing the capital ratio through provisions include the high cost of raising new capital, implicit and explicit guarantees that make debt funding cheaper and shareholder preferences for dividend payments. The second action is income smoothing. Bank managers may seek to reduce earnings variability; to signal lower business risk, reduce funding costs, reduce tax expense or improve management rewards. Consistent with this prediction, several studies document a positive relationship between non-discretionary bank earnings and provisions (Greenawalt and Sinkey, 1988; Ma, 1988; Collins, Shackelford and Wahlen, 1995 for United States banks; Shrieves and Dahl, 2003 for Japanese banks; Pérez, Salas-Fumás and Saurina, 2008 for Spanish banks; Hess, Grimes and Holmes, 2009 for Australian banks).[6] The third action occurs when bank managers use provisions to signal their financial strength to investors (Wahlen, 1994; Beaver, Ryan and Wahlen, 1997; Liu, Ryan and Wahlen, 1997).

Recent studies investigate a counter-cyclical explanation for a bank's discretionary behaviour in setting loan-loss provisions (Bikker and Metzemakers, 2005; Bouvatier and Lepetit, 2008). The counter-cyclical view is that credit risk is built up in a boom and materialises in a downturn. Favourable conditions associated with an economic expansion could lead to excessive increases in lending and a relaxation of lending standards. These practices may result in higher risks, which increase the likelihood of an economic recession. If banks set aside greater provisions in response to strong earnings, they are likely to increase provisions at a time when risks are building up in credit markets. In effect, this form of discretionary behaviour may reduce the pro-cyclicality of bank lending. A similar role may be performed by the allocation of surplus regulatory capital. For poorly-capitalised Japanese and European banks respectively, Shrieves and Dahl (2003) and Bouvatier and Lepetit (2008) find a positive relationship between surplus capital under the Basel I regulatory framework and loan-loss provisions. The findings of these studies suggest that banks increase provisions when their regulatory capital ratios improve. In this study, we test whether banks with surplus regulatory capital and above-average earnings set aside part of these surpluses to cover future credit losses.

[6] In the United States, Beatty, Ke and Petroni (2002) find that publicly listed banks use discretion in their loan-loss provisions to avoid reporting small declines in earnings. Fonseca and González (2008) find that the extent of income smoothing by banks varies from country-to-country depending on investor protection and accounting disclosure, restrictions on bank activities and the extent of official and private supervision.

3. Capital adequacy regulation in Australia

In Australia, banks are regulated by the Australian Prudential Regulation Authority (APRA), which was established in 1998. APRA has the power under federal legislation to set prudential standards, which underpin its approach to supervising depository institutions. The prudential standards set out minimum capital, governance and risk management requirements, which are legally binding.

3.1 Implementation of the Basel Accord capital requirements

Capital adequacy refers to the amount of capital maintained by depository institutions to absorb unanticipated losses. Prior to 1 January 2008, APRA's approach to assessing a bank's' capital adequacy is based on the Basel I capital framework (the Basel Accord of 1988).[7] Under the rules of the Basel Accord, capital for supervisory purposes is considered in two tiers: tier 1 and tier 2.[8] Tier 1 (core capital) comprises the highest quality capital elements. A bank's capital base is the sum of its tier 1 and tier 2 capital less any deductions. At least fifty per cent of a bank's capital base must be tier 1 capital. Under Basel I, all banks use standardised risk weights to calculate the capital requirement. The Basel Accord requires that the ratio of a bank's capital to risk-weighted assets (referred to as the risk-based capital ratio) be at least 8 per cent.[9]

From 1 January 2008 to 31 December 2012, APRA's approach to assessing a bank's capital adequacy is based on the Basel II capital framework.[10] An innovation of the revised framework is the greater use of risk assessments provided by banks' internal systems as

[7] For details of the Basel I capital framework, refer to Basel Committee on Banking Supervision's publication, *International Convergence of Capital Measurement and Capital Standards*, released in July 1988.

[8] Tier 1 capital is defined as the sum of the book value of equity (paid-up common stock and retained earnings), qualifying non-cumulative perpetual preferred stock and minority interests in the equity of subsidiaries less goodwill and other tangible assets. Tier 2 capital consists of other capital elements that contribute to the overall strength of a bank as a going concern but do not satisfy all of the characteristics of tier 1 capital. Tier 2 capital is the sum of the general reserve for credit losses (up to a maximum of 1.25 per cent of risk-weighted assets), perpetual preferred stock, hybrid capital instruments, perpetual debt, mandatory convertible debt securities, subordinated term debt and intermediate preferred stock.

[9] A bank's risk-weighted assets for credit risk is calculated as the sum of risk-weighted on-balance sheet assets and risk-weighted off-balance sheet credit equivalent amounts. Under Basel I, assets and credit equivalent amounts of off-balance sheet items are assigned to one of several broad risk categories, according to the nature of the obligors, guarantors and collateral. The dollar amount in each risk category is then multiplied by the risk weight associated with that category. The sum of the resulting weighted values from each of the risk categories is the bank's credit risk-weighted assets.

[10] For details of the Basel II capital framework, refer to the Basel Committee on Banking Supervision's publication, *International Convergence of Capital Measurement and Capital Standards: A Revised Framework*, revised in June 2006.

inputs to capital calculations. In particular, a bank that has received approval from APRA to use the IRB approach to credit risk is permitted to use its own internal models to quantify the capital required for credit risk. Aside from this feature, the revised framework retains key elements of the 1988 capital adequacy framework, including the requirement for banks to hold total capital equivalent to at least 8 per cent of risk-weighted assets and the definition of eligible capital.

After the period examined in this study (from 1 January 2013), APRA implemented the Basel III capital framework.[11] This reform package seeks to address lessons from the financial crisis of 2008-2009, by raising both the quality and quantity of the regulatory capital base. The new framework establishes a minimum requirement for common equity tier 1 capital (comprising common shares and retained earnings) of 4.5 per cent of risk-weighted assets and increases the minimum requirement for tier 1 capital to 6 per cent of risk-weighted assets. Furthermore, the new framework introduces a conservation buffer for common equity tier 1 capital of 2.5 per cent of risk-weighted assets that can be drawn down in periods of stress and a countercyclical buffer of between 0 and 2.5 per cent of risk-weighted assets to protect the banking sector from periods of excess credit growth.

APRA is empowered to impose a range of sanctions should a bank breach minimum capital requirements and intervenes at an early stage to prevent capital from falling below minimum levels. If a bank's capital ratio declines towards the Basel minimum, APRA would significantly increase its supervisory intensity and require the bank to develop and implement a plan to restore its capital ratio. In situations where the bank is unable or unwilling to respond, APRA may resort to the exercise of formal powers under the *Banking Act 1959*. These include the power to restrict bank operations and to suspend payments to shareholders. In more serious cases, it has the power to order a compulsory transfer of the business of a bank or to revoke a banking licence. Consequently, a bank with capital that APRA considers to be inadequate is likely to incur greater regulatory costs than a bank with adequate capital.[12]

[11] For details of the Basel III capital framework, refer to the Basel Committee on Banking Supervision's publication, *Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems*, released in December 2010 and revised in June 2011.

[12] This presumption assumes that regulators bestow no favours on commercial banks. If some favours are bestowed on commercial banks, the incentives to respond to regulatory costs are reduced but not eliminated (as noted by Moyer, 1990: 129).

3.2 APRA's forward-looking provisioning model

Australian banks use a forward-looking model of loan-loss provisioning specified by APRA for regulatory reporting purposes.[13] The regulatory model distinguishes between two types of provisions: specific provisions and a general reserve for credit losses (GRCL) (see *Prudential Standard APS 220 Credit Quality*, May 2006).[14] Specific provisions are provisions raised against credit losses that are expected to be realised in the short term (within the next 12-18 months). They include all provisions for impairment assessed by a bank on an individual basis in accordance with Australian accounting standards and a portion of provisions assessed on a collective basis which are not eligible to be included in the GRCL.[15] The GRCL is a reserve to cover credit losses that are expected but not certain to arise over the full life of the all the loans making up the business of the bank.

The evidence required to substantiate the GRCL is less clearly defined than for specific provisions. In determining whether to raise specific provisions against a loan portfolio, the bank may consider factors such as the extent of non-compliance of loans with their contractual terms, the likelihood of loans which are not well secured being subject to administration or bankruptcy proceedings and internal or external credit ratings suggestive of a substantial increased risk of potential default. In contrast, the GRCL is to cope with latent losses for loans that are not currently in breach of contractual terms or exhibiting signs of distress. Factors relevant to determining the GRCL may include historical loss experience and recent trends in losses, but must also consider any factors that are likely to cause losses to differ from historical experience. These factors include amendments to lending policies, changes in the bank's risk profile and the impact of changes in economic and credit cycles. Assessing these factors necessitates the exercise of a range of subjective judgements. Consequently, the GRCL is potentially influenced by the discretionary behaviours of bank managers to a greater extent than specific provisions.

[13] APRA implemented its forward-looking model from 1 July 2006, when Australian accounting standards moved to an incurred loss model of provisioning consistent with International Financial Reporting Standards (IFRS). The adoption of IFRS meant that provisions for impairment must be based on loss experience and only recognised after an event on which the loss is based has occurred. This was a departure from previous practice under which general provisions were recognised where impairment was considered probable.

[14] In this study, we focus on the levels of specific provisions and GRCL rather than the quarterly changes in these measures, because the levels are more important for the financial soundness of the bank.

[15] Appendix 1 illustrates the movements in Australian accounting standards provisions used by the banks examined in this study. Appendix 2 illustrates the relationship between the two provisioning models used by Australian banks: the forward-looking model for regulatory purposes and the incurred loss model for reporting to the market.

3.3 Treatment of loan-loss provisions under Basel I and Basel II

The level of provisioning and reserves established by a depository institution against potential credit losses has significant implications for the assessment of its capital adequacy.

Table 1 shows the impact of increasing specific provisions and the GRCL on the risk-based capital ratios for all banks in the Basel I period and standardised banks in the Basel II period (panel A) and IRB banks in the Basel II period (panel B).[16] For Basel I banks and Basel II standardised banks (panel A), an increase in either specific provisions or the GRCL always reduces retained earnings by the after-tax amount of the provision or reserve. Although specific provisions reduce the amount of risk-weighted assets (RWA), the impact of an increase in specific provisions on the numerators of the capital ratios (through retained earnings) outweighs the impact on the denominator and lowers both the tier 1 capital ratio and the total capital ratio. The GRCL (on an after-tax basis) is eligible to be included in tier 2 capital up to 1.25 per cent of RWA. Consequently, an increase in GRCL decreases the tier 1 capital ratio but leaves the total capital ratio unchanged (provided the bank has not exceeded the reserving threshold for GRCL).

[16] A standardised bank is a bank that is required to apply risk weights to its on-balance sheet assets and off-balance sheet exposures according to the risk classes delineated in the capital standards. An IRB bank is a bank that has approval from the regulator to use its own credit risk models for determining the risk weights.

Table 1
Treatment of loan-loss provisions under Basel I and Basel II

Panel A: Basel I banks and Basel II standardised banks

	Impact of a one dollar increase in:	Impact of a one dollar increase in:
Impact on:	**Specific provisions**	**GRCL**
Tier 1 capital ratio		
Numerator	↓ Retained earnings	↓ Retained earnings
Denominator	↓ RWA	No impact on RWA
Net impact	↓ Tier 1 capital ratio	↓ Tier 1 capital ratio
Total capital ratio		
Numerator	↓ Retained earnings	↓ Retained earnings ↑ GRCL (to a max. of 1.25% of total RWA)
Denominator	↓ RWA	No impact on RWA
Net impact	↓ Total capital ratio	None

Panel B: Basel II IRB banks

	Impact of a one dollar increase in:		Impact of a one dollar increase in:	
Impact on:	**Step 1: EL defaulted**	**Step 2: EP defaulted**	**Step 1: EL non-defaulted**	**Step 2: EP non-defaulted**
Tier 1 capital ratio				
Numerator	↑ Shortfall in provisions (50%)	↓ Retained earnings ↓ Shortfall in provisions (50%)	↑ Shortfall in provisions (50%)	↓ Retained earnings ↓ Shortfall in provisions (50%)
Denominator	No impact on RWA	No impact on RWA	No impact on RWA	No impact on RWA
Net impact	↓ Tier 1 capital ratio	↓ Tier 1 capital ratio	↓ Tier 1 capital ratio	↓ Tier 1 capital ratio
Total capital ratio				
Numerator	↑ Shortfall in provisions	↓ Retained earnings ↓ Shortfall in provisions	↑ Shortfall in provisions	↓ Retained earnings ↓ Shortfall in provisions ↑ Surplus provisions (to a max. of 0.6% of credit RWA)
Denominator	No impact on RWA	No impact on RWA	No impact on RWA	No impact on RWA
Net impact	↓ Total capital ratio	None (when in shortfall)	↓ Total capital ratio	None

For Basel II IRB banks (table 1 panel B), provisioning is a two-step process that is closely aligned with the bank's credit risk assessment methodology. In the first step, the IRB bank must separately estimate the expected losses (EL) for defaulted and non-defaulted exposures before any tax effects.[17] The sum of these two amounts immediately creates a shortfall that is charged 50 per cent against tier 1 capital and 50 per cent against tier 2 capital. Therefore, the estimation of the EL effectively decreases both the tier 1 capital ratio and the total capital ratio of the bank. In the second step, the bank allocates eligible provisions (EP) on an after-tax basis against the two categories of EL.[18] This allocation process further reduces the tier 1 capital ratio, because it reduces retained earnings at the same time that it reduces the shortfall in provisions being charged in equal amounts against tier 1 and tier 2 capital. Any surplus EP above EL on non-defaulted exposures up to 0.6 per cent of RWA for credit risk is eligible to be included in tier 2 capital. Therefore, an increase in EP against EL on non-defaulted exposures decreases the tier 1 ratio, but leaves the total capital ratio unchanged until the reserving threshold is reached.

In summary, increasing provisions or reserves for anticipated credit losses always reduces the tier 1 capital ratio under the rules of the Basel Accord. It also reduces the total capital ratio, except when a standardised bank increases the GRCL or an IRB bank allocates eligible provisions against expected losses on non-defaulted exposures within the reserving thresholds in each of these cases.

[17] An IRB-approved bank uses its own credit rating system for estimating expected losses.
[18] Eligible provisions are defined as the sum of all provisions (specific provisions and GRCL, partial write-offs and discounts on defaulted assets) that are attributed to exposures treated under the IRB approach.

4. Data and sample

This study focuses on 22 banks operating in Australia with at least twelve quarters of relevant data in the period from March 2004 to December 2012. Table 2 presents the sample banks, comprising seventeen banks that use the standardised approach to credit risk across the entire sample period (in panel A) and five banks that receive approval to use the IRB approach to credit risk in the Basel II period (in panel B).[19] Quarterly data are obtained from APRA's statistical data collections on the capital base, risk-weighted assets, non-performing loans, total loans, specific provisions and GRCL, total assets, deposits, shareholders' equity and earnings for the sample banks.[20]

The analysis is restricted to licensed banks which are required to maintain capital in Australia.[21] These include domestic banks and foreign subsidiary banks. Branches of foreign banks are not required to maintain capital in Australia and these banks are excluded from the sample.[22] Building societies and credit unions apply a provisioning methodology prescribed by the regulator and these depository institutions are also excluded from the sample.[23]

[19] Macquarie Bank is accredited to use the foundation internal ratings-based (FIRB) approach to credit risk, where the bank must provide its own estimates of probability of default (PD) and maturity (M) and rely on supervisory estimates for loss given default (LGD) and exposure at default (EAD) in determining the capital requirement for a given credit exposure. ANZ Bank, Commonwealth Bank, National Australia Bank and Westpac are accredited to use the advanced internal ratings-based (AIRB) approach to credit risk, where the banks must provide their own estimates of all the credit risk components.

[20] We thank David Connolly and Meghann Garry at APRA for helping us extract the data used in this study.

[21] Fifty-two observations for banks with tier 1 capital ratios before provisions greater than 30 per cent are excluded from the sample. These banks have little incentive to adjust provisions based on considerations of capital adequacy.

[22] Foreign bank branches are not permitted to accept retail deposits from Australian residents.

[23] Thirteen observations for one bank using the prescribed provisioning methodology are discarded.

Table 2
Sample banks

Panel A: Standardised banks

Bank name	Bank type
Adelaide Bank Limited	Domestic
AMP Bank Limited	Domestic
Arab Bank Australia Limited	Foreign subsidiary
Bank of Cyprus Australia Limited	Foreign subsidiary
Bank of Queensland Limited	Domestic
Bank of Western Australia Ltd	Domestic
Beirut Hellenic Bank Ltd	Foreign subsidiary
Bendigo and Adelaide Bank Limited	Domestic
Citigroup Pty Limited	Foreign subsidiary
HSBC Bank Australia Limited	Foreign subsidiary
ING Bank (Australia) Limited	Foreign subsidiary
Investec Bank (Australia) Limited	Foreign subsidiary
Members Equity Bank Pty Limited	Domestic
Rabobank Australia Limited	Foreign subsidiary
Rural Bank Limited	Domestic
St.George Bank Limited	Domestic
Suncorp-Metway Limited	Domestic

Panel B: Internal ratings-based banks

Bank name	Bank type	IRB adoption date
Australia and New Zealand Banking Group Limited	Domestic	1 January 2008
Commonwealth Bank of Australia	Domestic	1 January 2008
Macquarie Bank Limited	Domestic	1 January 2008
National Australia Bank Limited	Domestic	1 July 2008
Westpac Banking Corporation	Domestic	1 January 2008

5. Results

5.1 Descriptive statistics

Table 3 presents descriptive statistics for standardised banks (panel A), IRB banks (panel B) and all sample banks (panel C). Figure 1 illustrates provisions as a percentage of total loans by type from December 2003 through December 2012. The average size of the loan portfolio for all sample banks is $62.3 billion (table 3). The average loan portfolio size is much larger for IRB banks ($207.4 billion) than for standardised banks ($16.0 billion). Although there is a wide range in exposure levels, standardised banks have greater exposure to corporate lending than IRB banks on average.

In this study, we use two variables to measure the credit risk associated with a bank's loan portfolio: (i) the ratio of non-performing loans to total loans;[24] and (ii) the ratio of risk-weighted assets for credit risk before provisions to total loans.[25] For all banks, the median ratio of non-performing loans to total loans is 1.06 per cent and the median ratio of credit risk-weighted assets before provisions to total loans is 86.7 per cent.

For all sample banks, the mean ratio of total provisions to total loans is 95 basis points, comprising specific provisions of 38 basis points and GRCL of 57 basis points. After decreasing over a period of four years, both specific provisions and the GRCL increase abruptly in response to the financial crisis of 2008-2009, then decline towards pre-crisis levels (see figure 1).

[24] A loan is non-performing when payments of interest and principal are 90 days or more past due or payments are less than 90 days past due, but there are other good reasons to doubt that payments will be made in full.
[25] For standardised banks, RWA for credit risk are calculated net of specific provisions but gross of GRCL. Therefore, specific provisions are added back to RWA to reflect the amount before provisions. For IRB banks, RWA for credit risk are measured gross of both specific provisions and GRCL. Therefore, no adjustment is required to reflect the amount of credit RWA before provisions for these banks.

Table 3
Descriptive statistics for sample bank-observations

This table presents the summary statistics for standardised banks (panel A), IRB banks (panel B) and all banks (panel C). The sample period is March 2004 to December 2012. The Basel II Capital Framework is implemented in Australia from 1 January 2008. The tier 1 capital ratio before provisions for standardised banks is calculated as tier 1 capital plus total provisions multiplied by one minus the corporate tax rate, divided by total risk-weighted assets plus specific provisions. The total capital ratio before provisions for standardised banks is calculated as total capital plus total provisions multiplied by one minus the corporate tax rate minus the general reserve for credit losses (to a maximum of 1.25% of total RWA), divided by total risk-weighted assets plus specific provisions. The tier 1 capital ratio before provisions for IRB banks (after Basel II implementation) is calculated as tier 1 capital plus total provisions multiplied by one minus the corporate tax rate plus the shortfall in provisions for credit losses (50%), divided by total risk-weighted assets. The total capital ratio before provisions for IRB banks (after Basel II implementation) is calculated as total capital plus total provisions multiplied by one minus the corporate tax rate plus the shortfall in provisions for credit losses minus surplus provisions on non-defaulted exposures (to a maximum of 0.6% of credit RWA), divided by total risk-weighted assets. EBPT is earnings before provisions and taxes, divided by average assets.

Panel A: Standardised banks, *N*=564

Data item	Mean	Standard deviation	Lower quartile	Median	Upper quartile
Total loans $mil	16,018	18,715	1,988	9,515	25,106
Loans to households %	56.0	32.9	37.7	61.0	85.6
Loans to corporates %	43.7	32.8	14.4	38.8	61.4
Loans to other %	0.3	0.7	0.0	0.0	0.2
Non-performing loans %	2.06	2.77	0.58	1.00	2.44
RWA for credit risk %	85.5	23.8	69.7	81.2	99.3
Deposits %	17.5	14.9	3.4	15.9	27.1
Specific provisions %	0.41	0.59	0.04	0.14	0.57
GRCL %	0.51	0.35	0.28	0.42	0.65
Total provisions %	0.91	0.83	0.41	0.60	1.18
Tier 1 capital ratio	11.3	4.4	8.4	9.8	12.7
Total capital ratio	13.6	3.9	11.1	12.0	14.9
EBPT % pq	0.33	0.48	0.17	0.27	0.41

Table 3 *continued*

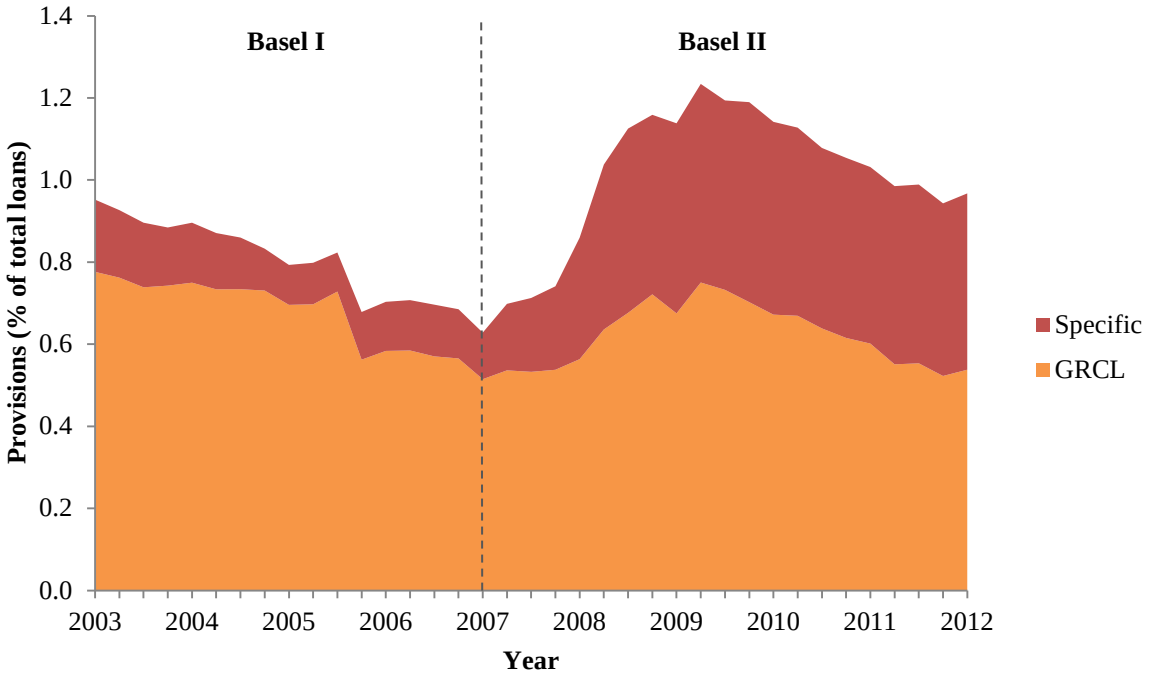
Panel B: IRB banks, *N*=180

Data item	Mean	Standard deviation	Lower quartile	Median	Upper quartile
Total loans $mil	207,428	121,102	152,206	211,672	297,121
Loans to households %	62.6	10.2	58.3	63.3	70.2
Loans to corporates %	36.6	10.3	28.3	36.5	41.3
Loans to other %	0.8	1.1	0.2	0.5	0.7
Non-performing loans %	1.82	2.17	0.69	1.22	1.91
RWA for credit risk %	125.7	77.8	73.8	101.4	124.9
Deposits %	26.8	11.4	18.1	24.8	32.4
Specific provisions %	0.30	0.23	0.12	0.26	0.41
GRCL %	0.77	0.25	0.58	0.72	0.87
Total provisions %	1.07	0.39	0.82	0.97	1.19
Tier 1 capital ratio	10.0	2.2	8.0	10.2	11.8
Total capital ratio	12.9	2.1	11.6	12.9	14.0
EBPT % pq	0.37	0.30	0.27	0.36	0.44

Panel C: All banks, *N*=744

Data item	Mean	Standard deviation	Lower quartile	Median	Upper quartile
Total loans $mil	62,327	102,602	3,375	12,953	48,581
Loans to households %	57.6	29.2	43.3	63.0	76.9
Loans to corporates %	42.0	29.1	21.7	36.7	55.3
Loans to other %	0.4	0.8	0.0	0.0	0.5
Non-performing loans %	2.00	2.64	0.61	1.06	2.10
RWA for credit risk %	95.3	46.7	70.4	86.7	103.2
Deposits %	19.8	14.7	8.8	18.9	28.7
Specific provisions %	0.38	0.53	0.06	0.17	0.47
GRCL %	0.57	0.35	0.33	0.52	0.78
Total provisions %	0.95	0.75	0.47	0.76	1.18
Tier 1 capital ratio	11.0	4.0	8.3	9.9	12.3
Total capital ratio	13.4	3.6	11.2	12.3	14.5
EBPT % pq	0.34	0.45	0.18	0.30	0.42

Figure 1
Regulatory loan-loss provisions by type



This figure plots provisions as a percentage of total loans by type from December 2003 through December 2012. The Basel II Capital Framework is implemented in Australia from 1 January 2008. Numbers in this figure are presented on an asset-weighted basis.

A bank's capital position is measured by the tier 1 capital ratio and the total capital ratio. Similar to Kim and Kross (1998), we adjust the risk-based capital ratios to eliminate the influence of loan-loss provisions.[26] The mean tier 1 and total capital ratios before provisions for all sample banks are 11.0 per cent and 13.4 per cent respectively, suggesting that on average banks have a comfortable buffer above the Basel minimum requirements. Notably, there is greater variability in the risk-based capital ratios of the standardised banks than in the capital ratios of the IRB banks.

Table 4 presents the correlations between the variables in our sample. Specific provisions are positively correlated with GRCL. Banks with greater exposure to corporate lending, more non-performing loans, higher credit risk-weighted assets, higher risk-based capital ratios and higher earnings tend to have higher provisions (both specific provisions and GRCL). Banks with greater exposure to household lending have lower provisions. Banks that fund a greater proportion of their loan books with deposits have lower specific provisions but higher GRCL.

[26] In this way, the risk-based capital ratios used in this study represent the capital ratios faced by the bank before it raises provisions to cover any potential credit losses.

Table 4
Pearson correlation coefficients for key variables of the sample bank-observations

LOGSIZE is the logarithm of total loans and advances in billions of Australian dollars. LHOUS is loans to households divided by total loans. LCORP is loans to corporations divided by total loans. NPL is non-performing loans divided by total loans. RWAC is the ratio of risk-weighted assets for credit risk to total loans minus 1. DEP is total deposits divided by total loans. SPROV is the ratio of specific provisions to total loans. GRCL is the ratio of general reserve for credit losses to total loans. LLP is the ratio of total provisions to total loans. RT1CAP is the difference between the tier 1 risk-based capital ratio before provisions and the minimum required tier 1 risk-based capital ratio of 4%. RCAPB is the difference between the total risk-based capital ratio before provisions and the minimum required total risk-based capital ratio of 8%. EBPT is earnings before provisions and taxes divided by average assets. ** indicates significance at the 5% level.

	LOGSIZE	**LHOUS**	**LCORP**	**NPL**	**RWAC**	**DEP**	**SPROV**	**GRCL**	**LLP**	**RT1CAP**	**RCAPB**	**EBPT**
LOGSIZE	1.00											
LHOUS	0.40**	1.00										
LCORP	-0.40**	-1.00**	1.00									
NPL	-0.18**	-0.35**	0.36**	1.00								
RWAC	-0.09**	-0.29**	0.29**	0.34**	1.00							
DEP	0.15**	0.05	-0.05	-0.03	0.29**	1.00						
SPROV	-0.07	-0.25**	0.26**	0.81**	0.21**	-0.14**	1.00					
GRCL	0.04	-0.33**	0.32**	0.45**	0.50**	0.17**	0.44**	1.00				
LLP	-0.03	-0.33**	0.33**	0.78**	0.38**	-0.02	0.91**	0.78**	1.00			
RT1CAP	-0.42**	-0.25**	0.24**	0.18**	0.06	-0.14**	0.23**	0.22**	0.26**	1.00		
RCAPB	-0.45**	-0.27**	0.26**	0.21**	0.15**	-0.01	0.23**	0.31**	0.31**	0.93**	1.00	
EBPT	0.07	-0.02	0.02	-0.04	0.09**	0.11**	0.06	0.09**	0.08**	0.09**	0.07	1.00

5.2 The effects of credit risk, capital adequacy and earnings on bank provisioning

5.2.1 All banks

In this subsection, a Tobit regression approach is used to examine the effects of credit risk, capital adequacy and earnings on loan-loss provisioning practices for all sample banks. Specifically, a latent variable representing the true provisioning level is regressed on various bank characteristics including measures of credit risk, risk-based capital ratios before provisions in excess of minimum regulatory levels and earnings before provisions and taxes. A conventional Tobit approach allows for the condition that provisions are lower bounded at zero.

The specification of the Tobit regression is as follows:

$$y^*_{i,t} = \alpha + \beta_1 \times NPL_{i,t} + \beta_2 \times RWAC_{i,t} + \phi \times RCAP_{i,t} + \gamma_1 EBPT_{i,t} + \gamma_2 LOGSIZE_{i,t} + \gamma_3 DEP_{i,t} + \varepsilon_{i,t} \quad (1)$$

$$PROV_{i,t} = \begin{cases} y^*_{i,t} & \text{if } y^*_{i,t} > 0 \\ 0 & \text{if } y^*_{i,t} \leq 0 \end{cases}$$

where $NPL_{i,t}$ is non-performing loans divided by total loans, $RWAC_{i,t}$ is the ratio of risk-weighted assets for credit risk before provisions to total loans minus 1, $RCAP_{i,t}$ is the difference between the risk-based capital ratio (the tier 1 capital ratio or the total capital ratio) before provisions and the minimum required risk-based capital ratio, $EBPT_{i,t}$ is earnings before provisions and taxes divided by average assets, $LOGSIZE_{i,t}$ is the logarithm of total loans and advances in billions of Australian dollars, $DEP_{i,t}$ is total deposits divided by total loans and $PROV_{i,t}$ is the ratio of provisions (specific provisions, GRCL or total provisions) to total loans. All *t*-statistics are adjusted for cross-sectional and time-series dependence in the regression residuals by clustering the standard errors at both the bank and quarter levels (as suggested by Thompson, 2011).[27]

[27] Gow, Ormazabal and Taylor (2010) find that two-way cluster-robust standard errors produce unequivocally better inferences than other common methods used to address issues of cross-sectional and time-series dependence (including Fama-MacBeth, Newey-West and standard errors clustered along a single dimension) even with as few as 10 clusters.

The regression results are presented in table 5. The coefficients on NPL and RWAC are both expected to be positive since an increase in non-performing loans or risk-weighted assets for credit risk implies an increase in default risk. Both estimated coefficients are positive and significant in the regressions for GRCL (columns 3 and 4) and for total provisions (columns 5 and 6). In the regressions for specific provisions (columns 1 and 2), the coefficient on NPL is positive and highly significant but that on RWAC is statistically insignificant. These results are consistent with the idea that banks raise specific provisions in response to existing impairments, whereas they raise the general reserve in response to the likelihood of future impairments as determined by the inherent quality of the loan portfolio.

Under the Basel rules, if banks with surplus regulatory capital use part of that surplus to boost provisions, we expect to see positive coefficients on RT1CAP and RCAPB.[28] The estimated coefficients in front of these variables are positive in all six regressions and are statistically significant in the regressions for the GRCL and for total provisions. These results are consistent with surplus capital being used to increase provisions, with the surplus mainly being directed towards funding medium to longer-term credit losses through the GRCL rather than funding short-term credit losses through specific provisions. The effect of the capital ratios on bank provisioning practices is economically significant. For example, changing from a bank at the lower quartile for the tier 1 capital ratio before provisions to a bank at the upper quartile is associated with an additional 15 basis points in total provisions.

[28] Note that, since tier 2 capital is limited to the amount of tier 1 capital, a positive coefficient on RT1CAP also implies a positive coefficient on RCAPB.

Table 5
The effects of credit risk, regulatory capital adequacy and earnings on bank provisioning practices

This table examines the effects of credit risk, regulatory capital adequacy and earnings on bank loan-loss provisions. Coefficients are estimated using Tobit regressions. The sample period is March 2004 to December 2012. *Specific provisions* is the ratio of specific provisions to total loans. *GRCL* is the ratio of general reserve for credit losses to total loans. *Total provisions* is the ratio of total provisions to total loans. *NPL* is non-performing loans divided by total loans. *RWAC* is the ratio of risk-weighted assets for credit risk to total loans minus 1. *RT1CAP* is the difference between the tier 1 risk-based capital ratio before provisions and the minimum required tier 1 risk-based capital ratio of 4%. *RCAPB* is the difference between the total risk-based capital ratio before provisions and the minimum required total risk-based capital ratio of 8%. *EBPT* is earnings before provisions and taxes divided by average assets. *Log size* is the logarithm of total loans and advances in billions of Australian dollars. *Deposits* is total deposits divided by total loans. Robust *t*-statistics in parentheses are based on standard errors clustered at both the bank and quarter levels. ** indicates significance at the 5% level.

	Specific provisions		**GRCL**		**Total provisions**	
Independent variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Intercept (α)	-0.0017	-0.0015	0.0020**	0.0018**	0.0009	0.0008
	(-1.25)	(-1.28)	(2.41)	(2.47)	(0.62)	(0.69)
NPL (β_1)	0.1701**	0.1699**	0.0430**	0.0416**	0.2089**	0.2073**
	(9.32)	(9.65)	(3.43)	(3.50)	(9.28)	(9.99)
RWAC (β_2)	-0.0004	-0.0005	0.0028**	0.0027**	0.0024**	0.0022**
	(-1.14)	(-1.24)	(4.58)	(4.36)	(2.62)	(2.39)
RT1CAP (ϕ_1)	0.0149		0.0216**		0.0371**	
	(1.00)		(4.03)		(2.33)	
RCAPB (ϕ_2)		0.0164		0.0313**		0.0493**
		(1.06)		(4.32)		(2.72)
EBPT (γ_1)	0.1079	0.1123	0.0165	0.0177	0.1196**	0.1250**
	(1.60)	(1.59)	(0.61)	(0.76)	(2.22)	(2.09)
Log size (γ_2)	0.0005**	0.0005**	0.0004	0.0005**	0.0008**	0.0009**
	(2.20)	(2.24)	(1.66)	(2.05)	(2.54)	(2.89)
Deposits (γ_3)	-0.0041	-0.0046	0.0015	0.0008	-0.0029	-0.0042
	(-1.92)	(-1.94)	(0.63)	(0.32)	(-0.85)	(-1.18)
Pseudo-R^2	0.70	0.70	0.41	0.44	0.68	0.69
Banks	22	22	22	22	22	22
Observations	744	744	744	744	744	744
Effect of LQ to UQ change (%)						
Tier 1 capital ratio	0.06		0.09		0.15	
Total capital ratio		0.06		0.11		0.17

The positive relationship between regulatory capital and provisions contrasts with the results of studies by Ahmed, Takeda and Thomas (1999) and Pérez, Salas-Fumás and Saurina (2008). Ahmed, Takeda and Thomas document a significantly negative relationship between regulatory capital and provisions for United States banks under the Basel I framework. Their finding can be explained by the different treatment of provisions under United States capital standards; where the *before-tax amount* of general loan-loss reserves counts as tier 2 capital up to the threshold of 1.25 per cent of RWA and reduces RWA in excess of the threshold. Consequently, banks concerned about falling below the Basel minimum requirement for total capital may have an incentive to increase general provisions. No such incentive exists under Australian prudential standards in the period for this study (see table 1). Pérez, Salas-Fumás and Saurina find no evidence of a relationship between regulatory capital and provisions for Spanish banks in a period spanning pre-Basel and Basel I. In Spain, loan-loss reserves are counted as neither tier 1 nor tier 2 capital. The lack of a positive relationship between regulatory capital and provisions in their study can be explained by the prescriptive rules for provisioning established by the Spanish central bank, that more strictly limit the discretion of bank managers to alter provisions than in other countries including Australia.

If banks provision more in times when earnings are higher, then we would expect a positive relation between earnings before provisions and taxes (EBPT) and loan-loss provisions. The coefficient in front of EBPT is positive and significant in the regressions for total provisions (in columns 5 and 6 of table 5), but is statistically insignificant in the regressions for specific provisions and for the GRCL considered separately (in columns 1 to 4). These results suggest that banks accumulate more provisions when earnings are higher, but with there being no clear preference for funding short-term or longer-term credit losses in this way. The significant relationship with total provisions is consistent with Hess, Grimes and Holmes (2009), who find evidence of a positive relationship between earnings before provisions and taxes and bad-debt expense for Australian banks.

In addition, larger banks maintain higher provisioning levels (as a percentage of total loans). The coefficient in front of LOGSIZE is positive and significant in all the regressions, except in the first regression for the GRCL. This result is consistent with larger banks being more closely monitored by the regulator and by their bond and stock holders. The proportion of the loan book funded by deposits does not have a significant impact on provisioning levels.

5.2.2 Standardised banks

In this subsection, a Tobit regression approach is used to examine the effects of credit risk, capital adequacy and earnings on loan-loss provisions for banks that use the standardised approach to credit risk across the entire the sample period. We also test whether standardised banks with high levels of GRCL are more capital-sensitive in their provisioning practices. To test this proposition, we examine whether the coefficients on the excess capital ratios are larger for banks that have GRCL greater than 1.25 per cent of risk-weighted assets.

For standardised banks, the specification of the Tobit regression is as follows:

$$\begin{aligned} y^*_{i,t} &= \alpha + \beta_1 \times NPL_{i,t} + \beta_2 \times RWAC_{i,t} + \phi_a \times RCAP_{i,t} + \phi_b \times RLMT_{i,t} \times RCAP_{i,t} \\ &\quad + \gamma_1 EBPT_{i,t} + \gamma_2 LOGSIZE_{i,t} + \gamma_3 DEP_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{2}$$

$$PROV_{i,t} = \begin{cases} y^*_{i,t} & \text{if } y^*_{i,t} > 0 \\ 0 & \text{if } y^*_{i,t} \leq 0 \end{cases}$$

where $RLMT_{i,t}$ is a zero-one dummy variable which equals one if the GRCL exceeds 1.25 per cent of total risk-weighted assets before provisions.[29]

Table 6 presents the regression results for standardised banks. The estimated coefficients on NPL and RWAC are positive and statistically significant in all six regressions. This suggests that the regulatory provisions maintained by standardised banks reflect meaningful assessments of the relative quality of banks' loans.

The coefficients in front of the main effects of RT1CAP and RCAPB are positive and significant in the regressions for the GRCL and for total provisions (columns 3 to 6). These results suggest that standardised banks with GRCL within the reserving threshold make use of surplus capital for increasing the GRCL. Furthermore, the coefficients in front of the interaction terms RLMT × RT1CAP and RLMT × RCAPB are positive and significant in the same regressions. This suggests that the relation between the GRCL and the excess regulatory capital ratios before provisions is stronger for banks that have general reserves exceeding the upper-bound, which is consistent with these banks facing a more clear-cut trade-off between regulatory capital adequacy and reserving for latent credit losses.

[29] There are thirteen observations for standardised banks with a GRCL exceeding 1.25 per cent of total risk-weighted assets before provisions.

Table 6

The effects of credit risk, regulatory capital adequacy and earnings on the loan-loss provisioning practices of standardised banks

This table examines the effects of credit risk, regulatory capital adequacy and earnings on loan-loss provisions for banks that use the standardised approach to credit risk across the entire the sample period. Coefficients are estimated using Tobit regressions. The sample period is March 2004 to December 2012. *Specific provisions* is the ratio of specific provisions to total loans. *GRCL* is the ratio of general reserve for credit losses to total loans. *Total provisions* is the ratio of total provisions to total loans. *NPL* is non-performing loans divided by total loans. *RWAC* is the ratio of risk-weighted assets for credit risk to total loans minus 1. *RT1CAP* is the difference between the tier 1 risk-based capital ratio before provisions and the minimum required tier 1 risk-based capital ratio of 4%. *RCAPB* is the difference between the total risk-based capital ratio before provisions and the minimum required total risk-based capital ratio of 8%. *RLMT* is a zero-one dummy variable which equals one if the general reserve for credit losses exceeds 1.25% of total RWA before provisions. *EBPT* is earnings before provisions and taxes divided by average assets. *Log size* is the logarithm of total loans and advances in billions of Australian dollars. *Deposits* is total deposits divided by total loans. Robust *t*-statistics in parentheses are based on standard errors clustered at both the bank and quarter levels. ** indicates significance at the 5% level.

	Specific provisions		**GRCL**		**Total provisions**	
Independent variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Intercept (α)	-0.0027	-0.0023	0.0027**	0.0026**	0.0010	0.0010
	(-1.34)	(-1.40)	(2.34)	(2.49)	(0.45)	(0.56)
NPL (β_1)	0.1698**	0.1676**	0.0399**	0.0371**	0.2053**	0.2002**
	(9.84)	(10.31)	(3.38)	(3.12)	(9.76)	(10.16)
RWAC (β_2)	0.0034**	0.0037**	0.0049**	0.0053**	0.0080**	0.0087**
	(2.15)	(2.39)	(2.81)	(3.10)	(3.18)	(3.50)
RT1CAP (ϕ_{a1})	0.0220		0.0190**		0.0400**	
	(1.32)		(2.91)		(2.11)	
RLMT × RT1CAP (ϕ_{b1})	0.0553**		0.1253**		0.1842**	
	(2.25)		(5.42)		(4.27)	
RCAPB (ϕ_{a2})		0.0251		0.0279**		0.0531**
		(1.43)		(3.73)		(2.59)
RLMT × RCAPB (ϕ_{b2})		0.0575		0.1352**		0.1965**
		(1.57)		(3.35)		(2.77)
EBPT (γ_1)	0.0658	0.0699	0.0039	0.0005	0.0697	0.0691
	(1.04)	(1.00)	(0.34)	(0.04)	(1.74)	(1.34)
Log size (γ_2)	0.0011**	0.0012**	0.0001	0.0003	0.0010**	0.0013**
	(2.74)	(2.70)	(0.42)	(1.08)	(2.35)	(2.80)
Deposits (γ_3)	-0.0037**	-0.0046**	0.0020	0.0011	-0.0023	-0.0040
	(-2.28)	(-2.62)	(0.97)	(0.58)	(-0.88)	(-1.57)
Pseudo-R^2	0.77	0.77	0.54	0.54	0.78	0.78
Banks	17	17	17	17	17	17
Observations	564	564	564	564	564	564
Effect of LQ to UQ change (%)						
Tier 1 capital ratio	0.09		0.08		0.17	
Total capital ratio		0.10		0.11		0.21

Among the standardised banks in our sample, there is no significant relationship between earnings before provisions and taxes and provisioning levels (based on the estimated coefficients in front of EBPT in table 6). Larger banks in this group have significantly higher specific provisions. Standardised banks that fund a greater proportion of their loan books with deposits have significantly lower specific provisions, suggesting that these banks may receive slightly less scrutiny of their specific provisions from the market.

5.2.3 Internal ratings-based banks

This section examines the effect of the Basel II capital framework on provisioning practices for the five Australian banks that receive approval to use the internal ratings-based approach to credit risk.[30] In particular, we test whether the greater alignment of regulatory provisioning requirements with banks' internal risk assessments has reduced the incentives for IRB banks to set aside surplus capital to cover future credit losses. To test this issue, we investigate whether the coefficients on the excess capital ratios are smaller for these banks after they adopt the IRB approach to credit risk.

For IRB banks, the Tobit regression is specified as follows:[31]

$$\begin{aligned} y^*_{i,t} &= \alpha_i + \beta_1 \times NPL_{i,t} + \beta_2 \times RWAC_{i,t} + \phi_c \times RCAP_{i,t} + \phi_d \times IRB_{i,t} \times RCAP_{i,t} \\ &\quad + \phi_e \times IRB_{i,t} + \gamma_1 EBPT_{i,t} + \gamma_2 LOGSIZE_{i,t} + \gamma_3 DEP_{i,t} + \varepsilon_{i,t} \end{aligned} \tag{3}$$

$$PROV_{i,t} = \begin{cases} y^*_{i,t} & \text{if } y^*_{i,t} > 0 \\ 0 & \text{if } y^*_{i,t} \leq 0 \end{cases}$$

where $IRB_{i,t}$ is a zero-one dummy variable which equals one if the bank has received approval to use the internal ratings-based approach to credit risk. Bank-specific intercepts capture any unobserved bank effects not included in the model.[32] All *t*-statistics are adjusted for

[30] In this study, we cannot test whether IRB banks exceeding the reserving threshold are more capital-sensitive in their provisioning practices, because there are no observations in our sample for which an IRB bank has surplus provisions on non-defaulted exposures greater than the limit of 0.6 per cent of credit RWA. In fact, there is only one observation for which an IRB bank allocates any surplus EP above EL on non-defaulted exposures.
[31] There is a potential endogeneity issue with this specification, because banks that have received IRB approval may use their internal models to estimate credit RWA together with loan-loss provisions. To address this issue, we try removing RWAC and replacing the excess risk-based capital ratio before provisions (RCAP) with the ratio of capital to total assets before provisions. The results are similar.
[32] These effects may arise from differences between IRB banks in the way that they measure credit risk.

correlation of the regression residuals between banks in each quarter by clustering the standard errors at the quarter level.[33]

Table 7 presents the regression results for IRB banks. Consistent with the results for standardised banks, the estimated coefficients on NPL and RWAC are positive and statistically significant in all six regressions, suggesting that provisioning practices are based on sensible assessments of the default risk associated with banks' lending activities.

The coefficients on RT1CAP and RCAPB are significantly positive, except in the regression for the impact of the total capital ratio before provisions on the GRCL (column 4).[34] These results suggest that, in the period before they adopt the IRB approach to credit risk, the five sample banks use surplus regulatory capital for funding both specific provisions and the GRCL. With respect to the impact of IRB adoption, the coefficients in front of the interaction terms IRB × RT1CAP and IRB × RCAPB are not significantly negative in any of the regressions. Moreover, the coefficients on the excess capital ratios after IRB adoption (that is, the sum of the coefficients on RT1CAP and IRB × RT1CAP and the sum of the coefficients on RCAPB and IRB × RCAPB) are significantly positive, except in the regression for the impact of the total capital ratio on the GRCL. These results suggest that banks that receive approval to use the IRB approach to credit risk continue to allocate surplus regulatory capital to both specific provisions and the GRCL after they adopt the IRB approach.

Based on the regression results for IRB banks, there is no evidence that these banks accumulate more regulatory provisions when their earnings are higher.

[33] For the analysis in this subsection, we do not cluster the standard errors at the bank level for the five IRB banks in the sample. Thompson (2011: 6) demonstrates that double-clustering is likely to do more harm than good when there are too few clusters along one dimension, because the double-clustered standard error estimates will be excessively noisy.

[34] The insignificance of the coefficient on RCAPB in table 7, column 4 is consistent with all banks being allowed to count GRCL within the reserving threshold towards total capital in the Basel I period.

Table 7
The effect of the revised Basel capital framework on the loan-loss provisioning practices of IRB banks

This table examines the effect of the revised capital rules on the relation between bank capital adequacy and loan-loss provisions for banks that receive approval to use the IRB approach to credit risk. Coefficients are estimated using Tobit regressions. The sample period is March 2004 to December 2012. The Basel II Capital Framework is implemented in Australia from 1 January 2008. *NPL* is non-performing loans divided by total loans. *RWAC* is the ratio of risk-weighted assets for credit risk to total loans minus 1. *RT1CAP* is the difference between the tier 1 risk-based capital ratio before provisions and the minimum required tier 1 risk-based capital ratio of 4%. *RCAPB* is the difference between the total risk-based capital ratio before provisions and the minimum required total risk-based capital ratio of 8%. *IRB* is a zero-one dummy variable which equals one if the bank has received approval to use the IRB approach to credit risk. Robust *t*-statistics in parentheses are based on standard errors clustered at the quarter level. ** indicates significance at the 5% level.

	Specific provisions		**GRCL**		**Total provisions**	
Independent variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
NPL (β_1)	0.0439**	0.0509**	0.0284**	0.0289**	0.0724**	0.0798**
	(5.57)	(5.95)	(2.34)	(2.57)	(5.47)	(6.33)
RWAC (β_2)	0.0017**	0.0024**	0.0023**	0.0023**	0.0040**	0.0047**
	(3.57)	(3.70)	(2.62)	(2.36)	(5.35)	(5.10)
RT1CAP (ϕ_{c1})	0.0315**		0.0497**		0.0814**	
	(2.48)		(2.02)		(5.03)	
IRB × RT1CAP (ϕ_{d1})	0.0201		-0.0275		-0.0076	
	(1.47)		(-1.05)		(-0.43)	
$\phi_{c1} + \phi_{d1}$	0.0516**		0.0222**		0.0738**	
	(9.19)		(2.37)		(8.81)	
RCAPB (ϕ_{c2})		0.0302**		0.0190		0.0494**
		(2.92)		(1.00)		(3.36)
IRB × RCAPB (ϕ_{d2})		0.0284**		-0.0084		0.0198
		(2.51)		(-0.44)		(1.46)
$\phi_{c2} + \phi_{d2}$		0.0586**		0.0105		0.0692**
		(5.91)		(0.68)		(4.15)
IRB (ϕ_e)	0.0002	0.0002	0.0007	0.0002	0.0009	0.0004
	(0.36)	(0.49)	(0.67)	(0.25)	(1.01)	(0.47)
EBPT (γ_1)	-0.0353	-0.0419	-0.0416	-0.0208	-0.0764	-0.0623
	(-1.35)	(-1.52)	(-0.72)	(-0.38)	(-1.56)	(-1.38)
Log size (γ_2)	-0.0003	0.0007	-0.0021**	-0.0015	-0.0024**	-0.0008
	(-0.80)	(1.53)	(-2.79)	(-1.97)	(-3.34)	(-1.06)
Deposits (γ_3)	-0.0014	-0.0020**	0.0007	0.0003	-0.0008	-0.0017
	(-1.61)	(-2.05)	(0.47)	(0.18)	(-0.69)	(-1.16)
Bank intercepts	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.90	0.89	0.70	0.69	0.90	0.89
Banks	5	5	5	5	5	5
Observations	180	180	180	180	180	180
Effect of LQ to UQ change (%)						
Tier 1 capital ratio						
Before IRB approval	0.12		0.19		0.31	
After IRB approval	0.20		0.08		0.28	
Total capital ratio						
Before IRB approval		0.07		0.05		0.12
After IRB approval		0.14		0.03		0.16

5.2.4 Further analysis for internal ratings-based banks

To better understand the incentives facing IRB banks under the revised Basel Accord, we investigate whether either the expected losses (EL) or eligible provisions (EP) reported by an IRB bank may be influenced by the strength of the bank's capital base.

Table 8 reports descriptive statistics for EP and EL reported by IRB banks (panel A), together with the results of Tobit regressions to examine the impact of capital before provisions on the ratio of EL to total loans (panel B), the ratio of EP to EL (panel C) and the ratio of EP to total loans (panel D). In addition to total exposures, the table presents results for defaulted and non-defaulted exposures. Figure 2 illustrates the progression of EL as a percentage of total loans by type (panel A) and EP as a percentage of EL and the risk-based capital ratios (panel B) for the five sample IRB banks through the Basel II period. Numbers in the figure are presented on an asset-weighted basis.

For the IRB banks, the mean ratio of EL to total loans in the Basel II period is 201 basis points (table 8, panel A). In comparison, the mean ratio of EP to total loans is 137 basis points (representing 68.0 per cent of EL).[35] Expected losses (especially those on defaulted exposures) increase in response to the financial crisis of 2008-2009 (figure 2, panel A). As a percentage of EL, the EP allocated by IRB banks shows a slight upward trend over the Basel II period (figure 2, panel B). In the same period, IRB banks increased their tier 1 capital ratios (with a main emphasis on common equity tier 1 capital), in preparation for the more stringent capital adequacy requirements forthcoming under the Basel III framework.

[35] This figure is close to 100 minus the Australian company tax rate of 30 per cent, suggesting that on average IRB banks allocate provisions on a before-tax basis close to total EL. Whereas EL are reported on a before-tax basis, EP are required to be reported on an after-tax basis in the Basel II period.

Table 8
The effect of bank capital ratios on eligible provisions under the IRB approach

This table examines the relation between bank capital adequacy and eligible provisions under the internal ratings-based approach to credit risk. The sample period is March 2008 to December 2012. Eligible provisions are reported on an after-tax basis and net of any associated deferred tax assets. Panel A reports summary statistics of eligible provisions and expected losses. Panel B reports the results of regressing the ratio of expected losses to total loans on bank capital ratios before provisions. Panel C reports the results of regressing the ratio of eligible provisions to expected losses on bank capital ratios before provisions. Panel D reports the results of regressing the ratio of eligible provisions to total loans on bank capital ratios before provisions. EP^{def} is eligible provisions on defaulted exposures. $EP^{non\text{-}def}$ is eligible provisions on non-defaulted exposures. EP^{tot} is total eligible provisions. EL^{def} is expected losses on defaulted exposures. $EL^{non\text{-}def}$ is expected losses on non-defaulted exposures. EL^{tot} is total expected losses. *TL* is total loans. *NPL* is non-performing loans divided by total loans. *T1CAPTA* is tier 1 capital divided by total assets before provisions. *CAPBTA* is total capital divided by total assets before provisions. *RT1CAP* is the difference between the tier 1 risk-based capital ratio before provisions and the minimum required tier 1 risk-based capital ratio of 4%. *RCAPB* is the difference between the total risk-based capital ratio before provisions and the minimum required total risk-based capital ratio of 8%. *EBPT* is earnings before provisions and taxes divided by average assets. Robust *t*-statistics in parentheses are based on standard errors clustered at the quarter level. ** indicates significance at the 5% level.

Panel A: Descriptive statistics, *N*=98

Data item	Defaulted exposures	Non-defaulted exposures	Total
Eligible provisions			
Mean %	0.83	0.53	1.37
Median %	0.46	0.47	0.90
Standard deviation %	0.80	0.23	0.98
Expected losses			
Mean %	1.13	0.88	2.01
Median %	0.53	0.72	1.28
Standard deviation %	1.30	0.45	1.68

Panel B: Regression of expected losses relative to total loans on bank capital ratios

	EL^{def} / TL		$EL^{non\text{-}def}$ / TL		EL^{tot} / TL	
Independent variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
NPL	0.4325**	0.4415**	0.0189	0.0273	0.4514**	0.4688**
	(12.86)	(13.78)	(0.87)	(1.10)	(12.94)	(11.77)
T1CAPTA	0.1832**		0.1388**		0.3220**	
	(3.13)		(6.14)		(6.13)	
CAPBTA		0.1421**		0.1718**		0.3140**
		(2.25)		(5.73)		(4.24)
EBPT	0.1184	0.0944	-0.2075	-0.2333	-0.0891	-0.1389
	(0.69)	(0.55)	(-1.82)	(-1.79)	(-0.54)	(-0.71)
Bank intercepts	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.97	0.96	0.85	0.86	0.97	0.97
Banks	5	5	5	5	5	5
Observations	98	98	98	98	98	98
Effect of LQ to UQ change (%)						
Tier 1 capital / TA	0.27		0.20		0.47	
Total capital / TA		0.25		0.31		0.56

Table 8 *continued*

Panel C: Regression of eligible provisions relative to expected losses on bank capital ratios

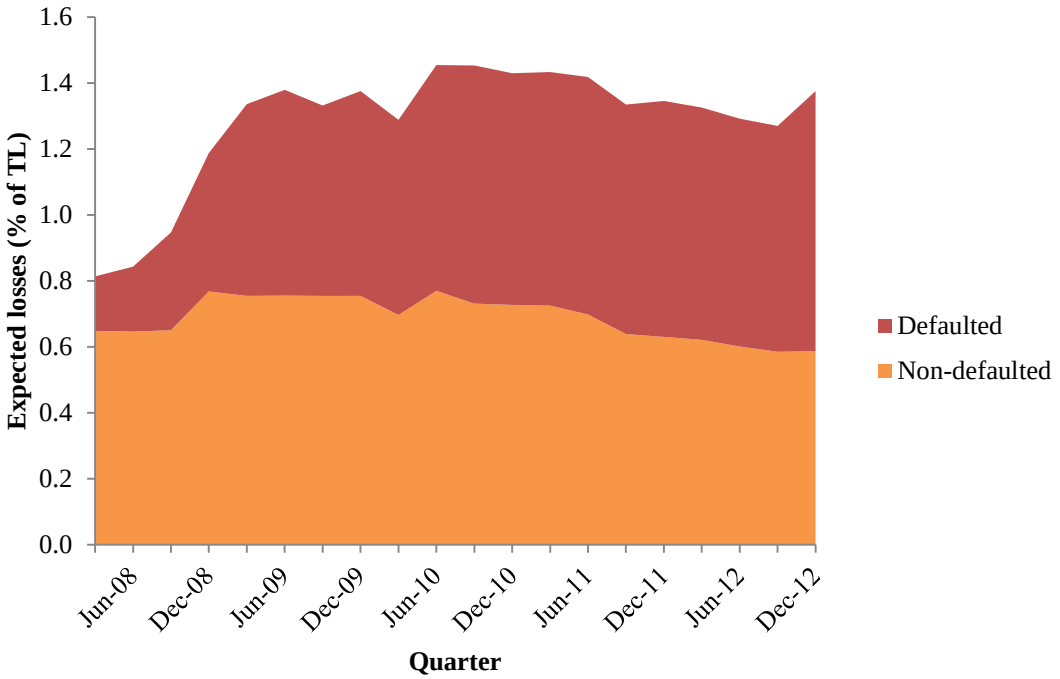
	EP^{def} / EL^{def}		$EP^{non\text{-}def} / EL^{non\text{-}def}$		EP^{tot} / EL^{tot}	
Independent variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
RT1CAP	-0.2407		2.9209**		2.0879**	
	(-0.27)		(3.15)		(3.14)	
RCAPB		-0.5793		1.6667		0.9361
		(-0.38)		(1.34)		(1.06)
EBPT	-1.9831	-1.5461	0.1321	0.0231	-3.8090	-3.6396
	(-0.23)	(-0.17)	(0.03)	(0.00)	(-0.70)	(-0.63)
Bank intercepts	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.46	0.46	0.53	0.48	0.55	0.51
Banks	5	5	5	5	5	5
Observations	98	98	98	98	98	98
Effect of LQ to UQ change (%)						
Tier 1 capital ratio	-0.4		5.2		3.7	
Total capital ratio		-0.7		2.1		1.2

Panel D: Regression of eligible provisions relative to total loans on bank capital ratios

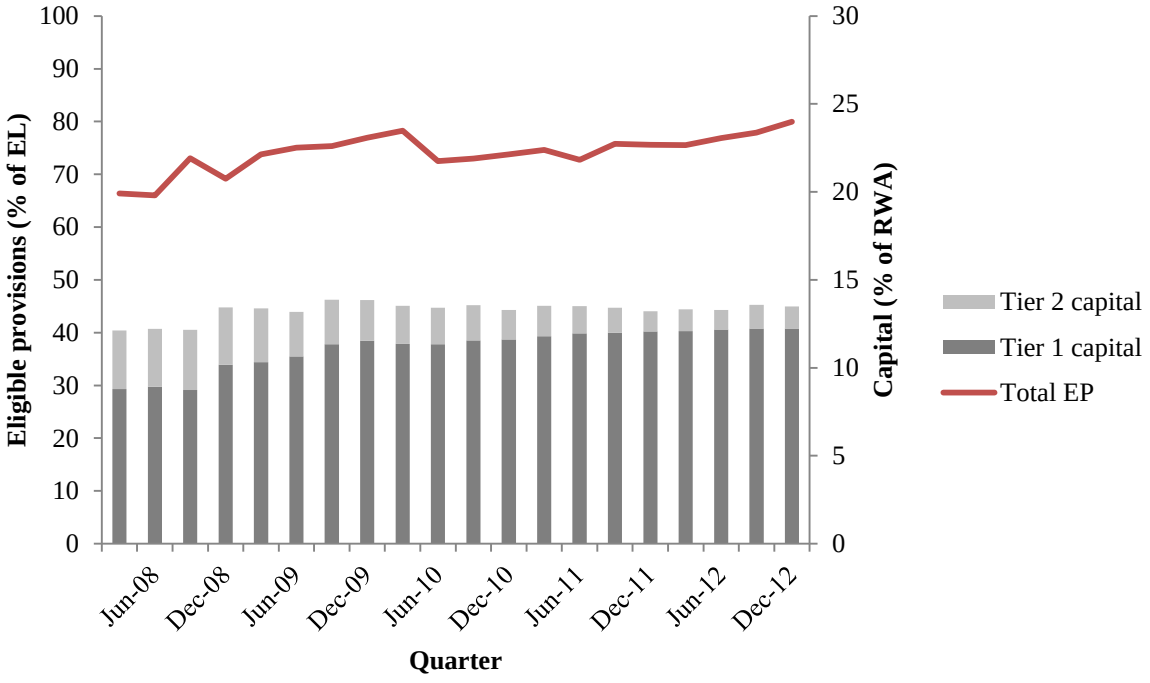
	EP^{def} / TL		$EP^{non\text{-}def} / TL$		EP^{tot} / TL	
Independent variables	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
NPL	0.1367**	0.1488**	-0.0204	-0.0111	0.1163**	0.1378**
	(3.52)	(3.28)	(-1.46)	(-0.69)	(2.45)	(2.41)
T1CAPTA	0.2529**		0.1640**		0.4169**	
	(4.60)		(6.04)		(6.08)	
CAPBTA		0.1872**		0.1790**		0.3662**
		(2.99)		(5.06)		(4.26)
EBPT	-0.1849	-0.2169	-0.0538	-0.0814	-0.2387	-0.2983
	(-1.09)	(-1.10)	(-0.53)	(-0.70)	(-1.02)	(-1.05)
Bank intercepts	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.91	0.88	0.66	0.65	0.89	0.86
Banks	5	5	5	5	5	5
Observations	98	98	98	98	98	98
Effect of LQ to UQ change (%)						
Tier 1 capital / TA	0.37		0.24		0.61	
Total capital / TA		0.33		0.32		0.65

Figure 2
Provisioning inputs and capital ratios of Basel II IRB-approved banks

Panel A: Expected losses



Panel B: Eligible provisions and capital ratios before provisions



This figure illustrates the progression of provisioning inputs and capital adequacy for the IRB banks, under the Basel II capital framework from March 2008 through December 2012. Panel A plots IRB-expected losses as a percentage of total loans by type. Panel B plots IRB-eligible provisions as a percentage of total expected losses and tier 1 and tier 2 risk-based capital ratios before provisions. Numbers in this figure are presented on an asset-weighted basis.

In the regressions to explain the ratio of expected losses to total loans (table 8, panel B), credit risk is captured by the ratio of non-performing loans to total loans (NPL) together with bank-specific fixed effects. Because IRB banks use their internal models for estimating both RWA and EL for credit risk, we deflate capital before provisions by total assets instead of risk-weighted assets (to avoid using the endogenously determined risk-based capital ratio in the regressions). The results show that the coefficients on the total asset-based capital ratios (T1CAPTA and CAPBTA) are positive and significant in all six regressions. In interpreting these results, we note that all of the Australian IRB banks raised significant amounts of new capital as a response to severe funding pressures in offshore wholesale markets over 2008 and 2009.[36] Over this period, the banks in our sample mostly relied on private placements, dividend reinvestment plans and, to a lesser extent, share purchase plans. However, the expected losses of IRB banks did not peak until June 2010 (see figure 2, panel A). In these circumstances, the regression results suggest that IRB banks did not consider the likelihood of more adverse conditions until they had rebuilt their capital base. That is, banks may not have fully revised their estimates for the probability of default (PD) and loss given default (LGD) associated with credit exposures until they had a sufficient capital buffer to cope with the stressed conditions and meet the requirements of the Basel III framework.[37]

In the regressions to explain the ratio of eligible provisions to expected losses (table 8, panel C), the excess risk-based capital ratios before provisions (RT1CAP and RCAPB) are used as explanatory variables on the basis that the banks allocate EP against EL independently of the process for estimating total RWA.[38] Noticeably, the estimated coefficient in front of RT1CAP is positive and statistically significant in the regression for the ratio of EP to EL on non-defaulted exposures (column 3), implying that banks allocate higher EP against EL on these exposures when their tier 1 capital ratios are stronger. In economic terms, changing from an IRB bank at the lower quartile for the tier 1 capital ratio before provisions to an IRB bank at the upper quartile is associated with an increase in the ratio of EP to EL on non-

[36] For example, market statistics show that the four major banks, ANZ Bank, Commonwealth Bank, National Australia Bank and Westpac were among the top five Australian companies for secondary capital raisings over 2008 and 2009, raising a total of $37.8 billion (see the Australian Securities Exchange report, *Capital Raising in Australia: Experiences and Lessons from the Global Financial Crisis*, ASX Information Paper, 29 January 2010).

[37] An alternative explanation is that banks were monitoring developments in the United States subprime lending market, but did not have sufficient evidence to revise loss expectations until the spill-over effects on economic activity were felt in their key lending markets in Australia and abroad. This explanation seems less plausible, given that business confidence as measured by the National Australia Bank decreased at a rapid pace in 2008 and bottomed in early 2009.

[38] This assumption is consistent with the two distinct steps by which IRB banks determine their provisioning levels, depicted in table 1, panel B.

defaulted exposures of 5.2 per cent. In contrast, the coefficient in front of RCAPB is statistically insignificant in the regression for non-defaulted exposures (column 4). These findings are consistent with the allocation of EP against EL reducing the tier 1 capital ratio, but having no impact on the total capital ratio (see table 1, panel B).

Table 8, panel D examines the combined effect of capital before provisions on the ratio of eligible provisions to total loans. Following the approach used in panel B, credit risk is measured by the NPL variable and bank-specific fixed effects and the impact of capital before provisions is measured by the variables T1CAPTA and CAPBTA, to avoid relying on endogenous risk estimates. The coefficients in front of T1CAPTA and CAPBTA are positive and significant in all six regressions, suggesting that IRB banks use surplus regulatory capital to increase EP on both defaulted and non-defaulted exposures under the Basel II framework.

6. Conclusion

Based on confidential regulatory data collected by APRA, this study examines the loan-loss provisioning practices of 22 banks operating in Australia in the period from March 2004 to December 2012. In a departure from accounting standards, APRA administers a forward-looking provisioning model for the prudential supervision of banks. The model distinguishes between specific provisions to cover credit losses expected to be realised in the next 12-18 months and a general reserve to cover losses that are expected but not certain to arise over the full life of all the loans in a bank's portfolio. The forward-looking model is consistent with the expected loss approach to provisioning advocated by the Basel Committee on Banking Supervision in its Basel III reforms.

Analysing provisioning behaviour across the whole sample, we find evidence that: (i) regulatory provisions reflect meaningful information about the default risk associated with banks' loan portfolios, (ii) banks allocate part of surplus capital above Basel minimum requirements to pre-fund future credit losses through provisions, and (iii) banks accumulate additional provisions when their earnings are higher. These findings imply that bank provisioning behaviour has both pro-cyclical and counter-cyclical characteristics: Provisions are sensitive to cyclical fluctuations in default risk; however, banks adjust provisions to cushion the impact of cyclical fluctuations in capital adequacy and earnings. We also find that larger banks maintain higher provisioning levels than smaller banks, suggesting that larger banks are more closely monitored by regulators and investors.

In Australia, most small to medium-sized banks use the standardised approach to credit risk across the entire sample period. Results of our study suggest that standardised banks with GRCL within the reserving threshold make use of surplus capital for increasing the GRCL. Furthermore, a positive relationship between the GRCL and regulatory capital ratios before provisions is stronger for banks that have general reserves exceeding the upper-bound of 1.25 per cent of RWA, consistent with these banks facing a stricter trade-off between capital adequacy and reserving for future credit losses. In addition, standardised banks that fund a greater proportion of their loan books with deposits maintain significantly lower specific provisions, suggesting that these banks may be less closely monitored by wholesale funding markets.

Four major banks and one medium-sized bank, Macquarie Bank, received approval to use the internal ratings-based approach to credit risk with the implementation of the Basel II capital framework. A feature of Basel II is the greater use of IRB banks' internal credit risk assessments as inputs to capital calculations. Our results suggest that these banks continue to use surplus regulatory capital for replenishing both specific provisions and the GRCL after they adopt the IRB approach. Thus, there is no evidence that the greater alignment of regulatory provisioning requirements with banks' internal risk assessments has discouraged IRB banks from using surplus capital in this way. Interestingly, an analysis of IRB banks' expected losses suggests that these banks did not factor in the likelihood of more adverse conditions during the financial crisis of 2008-2009 until they had reinforced their capital base. Furthermore, the IRB banks allocated more provisions against expected losses on non-defaulted exposures when their tier 1 capital ratios before provisions were stronger. These findings suggest that improving the quality of their capital base in preparation for the more stringent requirements under Basel III was a greater priority for banks in this period than bolstering loan-loss provisions.

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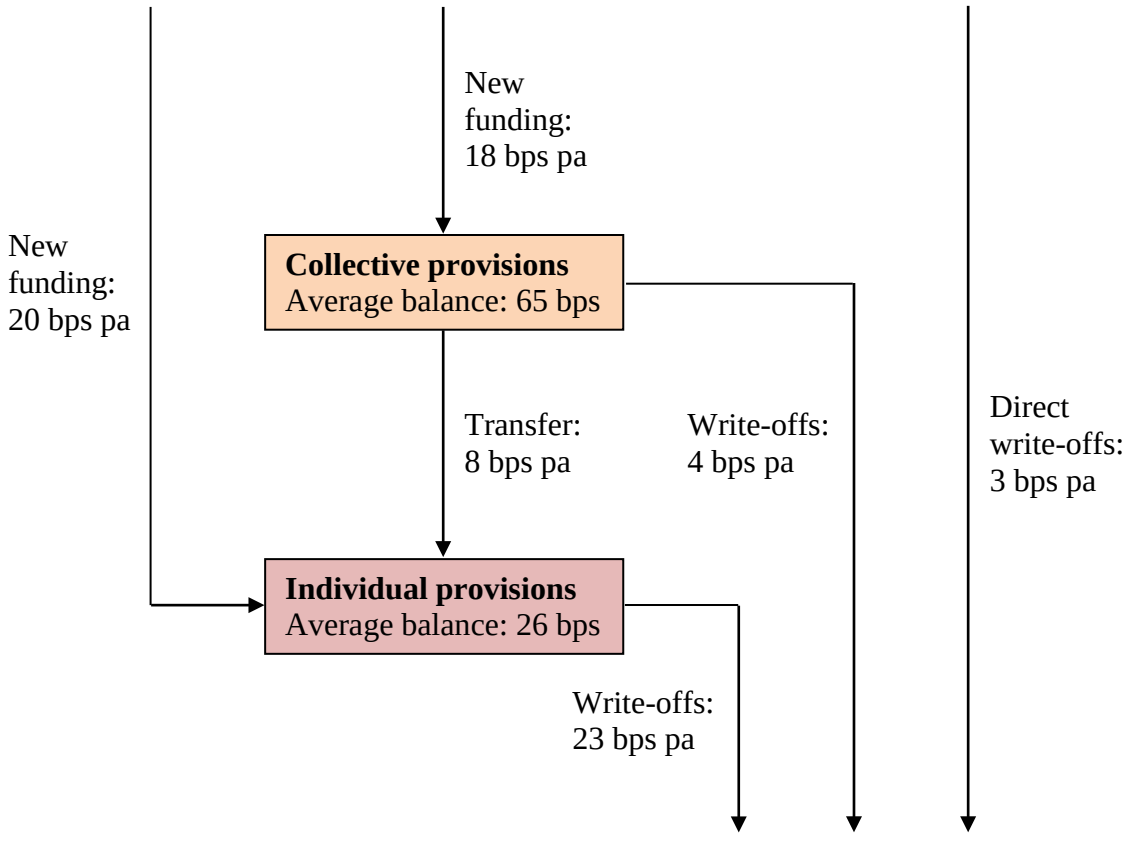
Appendix A1

Provisioning waterfall for Australian banks

Figure A1.1 illustrates movements in provisions under Australian accounting standards. Australian accounting standards have been harmonised with International Financial Reporting Standards (IFRS) from January 2005. The figure shows movements for provisions assessed on an individual loan basis and for those assessed on a portfolio (collective) basis. For each data item (for example, new funding for collective provisions), first the asset-weighted average across all banks for each quarter from March 2004 to December 2012 is calculated; and then a simple time-series average of the cross-sectional averages is reported. Numbers in this figure are presented in annual terms.

Figure A1.1
Movements in provisions for impairment



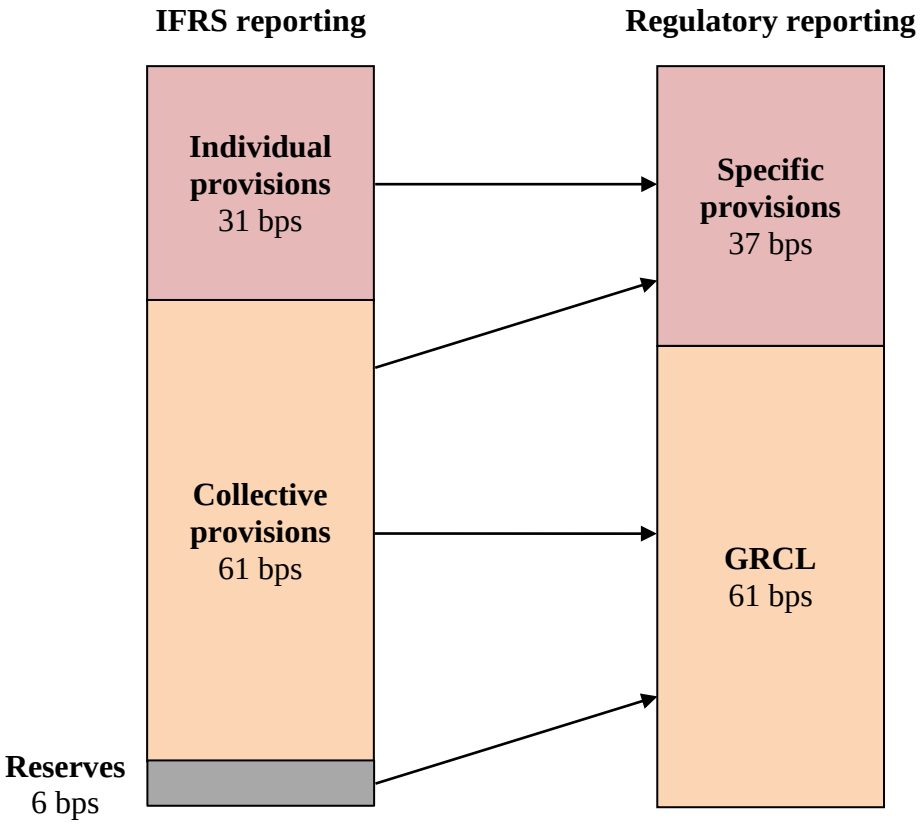
This figure illustrates movements in Australian accounting standards provisions for all sample banks. The sample period is March 2004 to December 2012. Australian accounting standards have been harmonised with International Financial Reporting Standards (IFRS) from January 2005.

Appendix A2
Comparison of the provisioning models used by Australian banks

Figure A2.1 illustrates the relationship between the two provisioning models used by Australian banks: the forward-looking model specified by APRA and the incurred loss model for reporting to the market. For each data item, first the asset-weighted average across all banks for each quarter from September 2006 to December 2012 is calculated; and then a simple time-series average of the cross-sectional averages is reported.

Requirements for reclassifying accounting provisions as two types of regulatory provisions are specified in APRA's Prudential Standard APS 220 *Credit Quality*, May 2006. All provisions assessed by a bank on an individual basis under Australian accounting standards (31 basis points) and a portion of provisions assessed on a collective basis for which losses are expected to materialise in the short term (6 basis points) are treated as specific provisions for regulatory purposes. Collective provisions for losses that are expected but not certain to arise are included in the GRCL (55 basis points). Where the bank does not maintain sufficient GRCL made up of collective provisions, it is required to establish a reserve against retained earnings for the additional amount (6 basis points).

Figure A2.1
Relationship between accounting provisions and regulatory provisions



This figure illustrates the allocation of Australian accounting standards provisions to specific provisions and general reserve for credit losses for regulatory purposes for all sample banks. The sample period is September 2006 to December 2012.