Drivers of credit losses in Australasian banking

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Abstract

Based on a comprehensive dataset retrieved from original financial reports of 32 Australasian banks (1980 – 2005), this paper explores factors affecting the credit loss experience of these institutions. It is found that the state of economy as measured by GDP growth and unemployment rate have the expected impact. Asset markets are also important, with the performance of the equity market showing greater explanatory power than property prices. Larger banks, on average, provide more for credit losses while less efficient banks have greater asset quality problems. Strong loan growth translates into significantly higher credit losses with a lag of 2 – 3 years. Finally, the results show strong evidence of income smoothing activities by banks.

Keywords: Banking, Credit Risk, Loan Loss Provisions, Australia, New Zealand

JEL Codes: G20, G21

1 Introduction

Banks form the backbone of modern economies and instability in the banking sector can pose problems to the system as a whole. Credit losses, or more generally, asset quality problems have repeatedly been identified as the ultimate trigger of bank failures, e.g. in Graham & Horner (1988), Caprio & Klingebiel (1996). Agencies in charge of prudential supervision of the financial system thus take a keen interest into the determinants of such losses.

Research with data on the credit loss experience (CLE) of banks, in particular loan loss provisions, has traditionally focused on the discretionary aspects when a bank's management uses its discretion to set loan loss reserves. Seminal papers by Schreiner (1981) and Greenawalt & Sinkey Jr (1988) have explored income smoothing activities of US banks by means of their loan-loss provisions. The hypothesis is that banks engage in earnings management by reserving more in good times as a precaution for use in potentially leaner times ahead. Besides income smoothing, Lobo & Yang (2001) review evidence in the literature for three additional behavioural factors which influence the setting of loan loss reserves. These include signalling when a bank increases the loan loss provision to signal it is strong enough to absorb future potential losses, capital management in the context of meeting minimum capital requirements[1] and, finally, taxation aspects when loan loss provisions become a tax deductible expense.

Most of above research has focused on US banks but the development of the new Basel capital regime (Basel II) has motivated many studies for other markets which take a more macroprudential perspective on credit losses. Articles by Cavallo & Majnoni (2001), Bikker & Metzemakers (2003) use global samples and Valckx (2004) looks at loan loss provisioning in the EU. Country-specific research includes Arpa, Giulini, Ittner, & Pauer (2001) for Austria, Salas &

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[1] Basel I capital adequacy rules allowed loan loss provisions, subject to certain upper limits, to be counted as a component of regulatory capital (BCBS, 1988b, items 18-21, p. 5-6). Seminal work on this subject is by Moyer (1990, 3.1, p. 129-131) who explicitly posits capital management through loan loss provisions.

Saurina (2002) for Spain, Pain (2003) for UK commercial and mortgage banks, Kearns (2004) for the leading Irish banks and Quagliariello (2004) for a comprehensive sample of Italian banks.

This paper contributes to understanding drivers of credit losses in Australasia for which there are few prior studies. Our analysis is based on a comprehensive sample of bank specific credit loss data of 32 Australasian banks for 1980 to 2005. Unlike most other studies, these data have been retrieved from original bank financial reports and not from external data providers (e.g. Bankscope). This has the advantage of more credit loss specific data items[2] and, more importantly, it allows for extended time series covering the major crises which occurred in the Australian and New Zealand banking systems during the early 90s. Parameter estimates gained with such time series are more indicative than research studying the risk characteristics of the loan portfolio in the 'normal' course of business. In the words of Danielsson (2002), "market data are endogenous to market behaviour so statistical analysis made in times of stability does not provide much guidance in times of crisis".

The paper will proceed as follows. Section 2 defines the sample selection and provides some background information on the development of the Australasian banking system during the observation period. Section 3 introduces the methodology including the modelling approach and a discussion of the aggregate macro and bank-specific factors considered. Section 4 presents the empirical results for the overall sample as well as country-specific samples. Section 5 concludes.

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[2] The database relies on approximately 55 raw data elements per institution, of which 12 are specifically related to the CLE of the bank.

2 Background on banks in sample

Results of this paper are based on a database of financial and in particular credit loss information retrieved from original bank reports. The sample includes 23 Australian and 10 New Zealand banks (listed in Table 1 and Table 2) for the period 1980 to 2005. It essentially contains all registered banking firms operating during this time with activities in retail and/or rural banking but excludes (1) institutions that are predominantly wholesale and/or merchant banks and (2) non-bank financial institutions.

Both the Australian and New Zealand banking systems have undergone some major structural changes during this time span. The 1980s saw the initiation of major sector reforms (Campbell Inquiry, 1981 in Australia; Financial Policy Reform starting 1984 in New Zealand). The various types of financial institutions such as trading banks, savings banks, state banks, trust banks and building societies were initially subject to carefully delineated sets of legislation, but a substantial blurring between their activities had been occurring. The liberalization of the financial system saw the creation of common rules for bank registration as they are known today. The regulatory regime changed from an interventionist system inspired by a Keynesian view of the world to a more hands-off regulation of banking[3].

The observation period covers the major banking system crises in both New Zealand and Australia which occurred in 1990/1991. In New Zealand, it culminated with the 1990 near collapse and subsequent government bail-out for Bank of New Zealand, the leading bank at the time. In Australia, the state banking system was affected by the 1991 demise of both the State Bank of South Australia (later absorbed into a predecessor of St. George Bank) and State Bank of Victoria (amalgamated into Commonwealth Bank of Australia). Other Australian banking firms

[3] References for a description of this transformation process are Wallis Inquiry (1997, p. 567-597) and Davis (2004, p. 9-15) for Australia; Grimes (1998) for New Zealand.

also suffered greatly during these years, most notably market leader Westpac which paid the price for its involvement in some high profile commercial real estate projects.[4]

The fallout of the system crises led to a substantial re-shaping of the banking scene. Central and state government owned institutions were all privatized and in most cases later absorbed into other banks. Australia's banking market concentration saw the emergence of four leading banking groups (ANZ, Commonwealth Bank, NAB and Westpac). Similarly, four banking groups ANZ-National, ASB, BNZ and Westpac now hold the bulk of system assets in New Zealand, each of them controlled by one of the major Australian banks.

Table 3 provides supplemental dynamic information on the banks in the sample. The number of banks in the sample varies from 13 for 1980 to 28 banks for 1989 and 1990. The concentration in the banking system has since then led to a decline to just 16 institutions in the sample for the years 2004 and 2005. The asset size information provided in Table 3 moreover illustrates the substantial difference between the largest and smallest bank included in the sample in any particular year. In the case of Australia, for example, the smallest institution typically holds less than 1% of the largest player's assets.

[4] Westpac's cumulative write-offs from 1990 to 1993 represented about 8% of loans outstanding. See Carew (1997) and Davidson & Salisbury (2005) for an account of Westpac's crisis.

Table 1 Overview of banks in database (Australia)

Bank identifier	Bank full name	Insitution earlier name	Successor	Registered	Data range
AU AdelaideBk	Adelaide Bank	Co-operative Building Society of South Australia		1994 to present	1988-2005
AU AdvanceBk	Advance Bank	NSW Building Society	AU StGeorge	1985 to 1998	1986-1996
AU ANZ	ANZ Banking Group (AUS)			whole period	1979-2005
AU BendigoBk	Bendigo Bank			1995 to present	1991-2005
AU BkMelbourne	Bank of Melbourne	RESI Statewide Building Society	AU Westpac	1989-1998	1998-1996
AU BkWest	Bank West / HBOS Australia	Rural & Industries Bank of Western Australia	HBOS Australia	whole period	1983-2005
AU BoQ	Bank of Queensland			whole period	1980-2005
AU CBC Sydney	Commercial Banking Company of Sydney Limited		AU NAB	to 1982	1979-1981
AU ChallengeBk	Challenge Bank	Hotham Permanent Building Society (Vic)/ Perth Building	AU Westpac	1987 to 1996	1987-1995
AU Colonial	Colonial / Colonial State Bank	Colonial Mutual Life Assurance Society	AU CoWthBk	1996 to 2001	1996-1999
AU CommBk	Commercial Bank of Australia		AU Westpac	to 1982	1979-1981
AU CoWthBk	Commonwealth Bank			whole period	1979-2005
AU EldersRural	Elders Rural Bank Limited			2000 to present	1999-2005
AU NAB	National Australia Bank	National Bank of Australasia		whole period	1979-2005
AU PIBA	Primary Industry Bank of Australia		Rabobank Australia	1987 to 2003	1979-1993
AU SBNSW	State Bank of New South Wales	Rural Bank of New South Wales	AU Colonial	to 1995	1980-1995
AU SBSA	State Bank of South Australia	The State Bank of South Australia	AU Advance Bk	to 1994	1980-1994
AU SBVictoria	State Bank of Victoria		AU CoWthBk	to 1991	1979-1990
AU StGeorge	St.George Bank	St.George Building Society		1993 to present	1989-2005
AU SuncorpMet	Suncorp-Metway, Suncorp after 2002	Metway Bank	renamed Suncorp in 2002	1988 to present	1991-2005
AU TasmaniaBk	Tasmania Bank	Statewide Bank (Launceston Bank for Savings), The Tasmanian Permanent Building Society	AU Trustbk TAS	to 1991	1984-1990
AU Trustbk TAS	Trust Bank Tasmania	SBT Bank (The Savings Bank of Tasmania), Hobart Savings Bank	AU CoWthBk	to 1999	1983-1999
AU Westpac	Westpac (AUS)	Bank of New South Wales		whole period	1979-2005

Table 2 Overview of banks in database (New Zealand)

Bank identifier	**Bank full name**	**Insitution earlier name**	**Successor**	**Registered**	**Data range**
NZ ANZ	ANZ National Bank	ANZ Banking Group (New Zealand) until 2004		whole period	1980-2005
NZ ASB	ASB Ltd.	Auckland Savings Bank		1989 to present	1983-2005
NZ BNZ	Bank of New Zealand			whole period	1979-2005
NZ Countrywide	Countrywide Bank	Countrywide Building Society	NZ NBNZ	1987 to 1998	1983-1998
NZ NBNZ	National Bank of New Zealand		NZ ANZ	to 2004	1979-2003
NZ Rural Bank	Rural Bank	Rural Banking and Finance Corporation of New Zealand	NZ NBNZ	1990 to 1994	1984-1992
NZ Trust Bank	Trust Bank NZ	Trustee Bank Group	NZ Westpac	1989 to 1996	1988-1996
NZ TSB Bank	TSB Bank	Taranaki Savings Bank		1989 to present	1987-2005
NZ UnitedBK	United Bank	United Building Society	NZ Countrywide	1990 to 1994	1983-1992
NZ Westpac	Westpac Banking Corp. (NZ)	Bank of New South Wales		whole period	1987-2005

Table 3 Summary asset size information on banks in sample

Australian banks

Year:	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total banks	10	11	10	11	13	15	16	17	17	18	18	17	17	17	16	16	13	12	12	13	11	11	11	11	11	11
Total assets of banks in sample (AUD bil)	75	89	107	122	158	194	245	286	346	420	469	467	488	508	513	571	607	687	786	808	1013	1103	1138	1246	1412	1525
Average assets per bank (AUD bil)	7.5	8.1	10.7	11.1	12.1	12.9	15.3	16.8	20.4	23.3	26.1	27.4	28.7	29.9	32.1	35.7	46.7	57.2	65.5	62.1	92.1	100.3	103.4	113.2	128.4	138.6
Assets smallest bank (AUD bil)	0.07	0.09	0.10	0.11	0.21	0.29	0.31	0.35	0.46	0.60	0.71	0.72	1.17	1.33	1.55	1.68	1.80	1.95	2.11	0.40	0.74	1.05	1.31	1.81	2.08	2.62
Assets largest bank (AUD bil)	17.9	20.1	31.3	34.5	40.4	49.1	60.7	70.3	84.6	108.6	107.0	106.0	110.9	118.0	130.4	148.1	173.7	202.0	251.7	254.1	343.7	374.7	377.4	397.5	411.3	419.6

New Zealand banks

Year:	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Total banks	3	3	6	8	8	10	10	10	10	10	10	10	10	8	8	8	7	7	6	6	6	6	6	6	5	5
Total assets of banks in sample (NZD bil)	8.3	9.8	12.9	18.6	23.5	32.9	41.2	49.4	49.2	56.2	62.0	66.9	73.7	78.1	83.8	94.0	104.3	112.1	125.0	131.3	147.4	161.3	165.7	178.9	191.4	215.7
Average assets per bank (NZD bil)	2.8	3.3	2.2	2.3	2.9	3.3	4.1	4.9	4.9	5.6	6.2	6.7	7.4	9.8	10.5	11.8	14.9	16.0	20.8	21.9	24.6	26.9	27.6	29.8	38.3	43.1
Assets smallest bank (NZD bil)	1.81	2.23	0.28	0.33	0.42	0.22	0.23	0.27	0.30	0.34	0.38	0.41	0.45	0.51	0.55	0.61	0.74	0.88	1.10	1.21	1.42	1.63	1.83	2.06	2.34	2.60
Assets largest bank (NZD bil)	4.6	5.3	6.3	6.7	8.6	11.2	13.5	16.7	15.4	18.0	19.6	20.7	19.8	19.0	19.3	22.0	26.4	27.5	29.3	31.0	35.3	38.2	38.9	42.3	74.2	85.3

3 Methodology

3.1 The model

In line with comparable macro-prudential literature, we propose the pooled regression model of Equation 1 which represents a reduced form approach to explaining banks' credit losses. Thus we examine of credit losses without modelling the precise mechanism by which these proxies affect credit losses. The advantage is the possibility to include a range of explanatory variables whose actions on the dependent variable are often complex and indirect.

Equation 1 Basic model form

$$
\begin{aligned}
& IAE\_LN_{i,t} = Const \\
& \left.\begin{aligned}
& + \beta_{1.0} GDPGRW_{i,t} + \beta_{1.1} GDPGRW_{i,t-1} + \beta_{1.2} GDPGRW_{i,t-2} \\
& + \beta_{2.0} \Delta UNEMP_{i,t} + \beta_{2.1} \Delta UNEMP_{i,t-1} + \beta_{2.2} \Delta UNEMP_{i,t-2} \\
& + \beta_{3.0} UNEMP_{i,t} + \beta_{3.1} UNEMP_{i,t-1} + \beta_{3.2} UNEMP_{i,t-2}
\end{aligned}\right\} \text{Alternative macro factors} \\
& \left.\begin{aligned}
& + \beta_{4.0} RET\_SHINDX_{i,t} + \beta_{4.1} RET\_SHINDX_{i,t-1} + \beta_{4.2} RET\_SHINDX_{i,t-2} \\
& + \beta_{5.0} HPGRW_{i,t} + \beta_{5.1} HPGRW_{i,t-1} + \beta_{5.2} HPGRW_{i,t-2}
\end{aligned}\right\} \text{Alternative asset shock proxies} \\
& \left.\begin{aligned}
& + \beta_{6.0} CPIGRW_{i,t} + \beta_{6.1} CPIGRW_{i,t-1} + \beta_{6.2} CPIGRW_{i,t-2}
\end{aligned}\right\} \text{Macro/finance factor} \\
& \left.\begin{aligned}
& + \beta_{7} SH\_SYSLNS_{i,t} \\
& + \beta_{8.0} NIM_{i,t} + \beta_{8.1} NIM_{i,t-1} + \beta_{8.2} NIM_{i,t-2} \\
& + \beta_{9.0} CIR_{i,t} + \beta_{9.1} CIR_{i,t-1} + \beta_{9.2} CIR_{i,t-2} \\
& + \beta_{10.0} EBTP\_AS_{i,t} + \beta_{10.1} EBTP\_AS_{i,t-1} + \beta_{10.2} EBTP\_AS_{i,t-2}
\end{aligned}\right\} \text{Misc. bank-specific proxies} \\
& \left.\begin{aligned}
& + \beta_{11.0} ASGRW_{i,t} + \beta_{11.1} ASGRW_{i,t-1} + \beta_{11.2} ASGRW_{i,t-2} \\
& \qquad + \beta_{11.3} ASGRW_{i,t-3} + \beta_{11.4} ASGRW_{i,t-4} \\
& + \beta_{12.0} DVLNGRW_{i,t} + \beta_{12.1} DVLNGRW_{i,t-1} + \beta_{12.2} DVLNGRW_{i,t-2} \\
& \qquad + \beta_{12.3} DVLNGRW_{i,t-3} + \beta_{12.4} DVLNGRW_{i,t-4}
\end{aligned}\right\} \text{Alternative growth proxies (bank-specific)} \\
& + u_{i,t}
\end{aligned}
$$

Where
$IAE\_LN_{i,t}$ is the CLE variable impaired asset expense as % of loans for bank i in year t; the explanatory variables on the right hand side of the equation are explained in Table 4 and Table 5.

We choose impaired asset expense as % of loans (IAE_LN) as a dependent variable which is the proxy most widely used in literature[5] and is available for most banks throughout the observation period. IAE_LN may not precisely reflect actual credit losses in an ex-post analysis, i.e. in view of subsequent write-offs and recoveries. It gives, however, a timely indication of credit events without the delays observed for definite asset derecognitions (write-offs).

The drivers of a bank's CLE presented in the following two sections can be broken down into two categories. The first includes aggregate macro variables explained in Table 4, the second bank-specific factors in Table 5. The summary statistics for both categories of factors are shown in Table 6, respectively Table 7.

3.2 Aggregate macro factors

A first group of aggregate variables in Equation 1 comprises state of the economy factors such as GDP growth (GDPGRW) and the rate of unemployment (UNEMP) which are likely to affect the asset quality in the banking system. While GDPGRW and changes in unemployment (ΔUNEMP) are proxies for economic cycles, UNEMP can provide an indication for the presence of structural problems. GDPGRW and ΔUNEMP are highly negatively correlated for both the Australian and New Zealand series and thus measure similar effects.[6] They will thus not be included jointly in the same regression.

There are a number of factors which can be subsumed as 'asset price shock proxies'. Sudden price changes in key asset classes such as property and shares may weaken borrowers and reduce the value of collateral held by banks. Moreover, Pain (2003, p. 21) argues that sharp changes in asset prices may be associated with increased fragility of borrowers through more

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[5] Impaired asset expense represents management's estimate for the period's credit losses. Because most impaired assets will be related to lending, impaired asset expense will typically be very close to loan loss provision expense, a term used in most literature.

[6] The correlation is -81% for the Australian series and -61% for the New Zealand series.

traditional macroeconomic channels. For example, swift increases in interest rates can lead to cash-flow problems in both the corporate and household sectors, which in turn can lead to borrower default.

The basic model formulation of Equation 1 includes the return on the national share index (RET_SHINDX) and the changes in the housing price index (HPGRW) as asset shock variables. Point changes in nominal 3 month interest rates (NOMINTGRW) show some explanatory power but nominal interest rates are a linear combination of real interest rates and the change in CPI inflation (CPIGRW). While point changes in real interest rate (REALINTGRW) are found to possess no explanatory power (and were thus omitted)[7], we have considered the effect of CPI inflation as an additional proxy. CPIGRW may have ambiguous effects on a bank's CLE since a rise in CPIGRW raises nominal interest rates, placing greater strains on debt servicing, while increasing asset values (but not liability values) so improving solvency of borrowers.

Table 4 Grouping of drivers of a bank's CLE into functional groups: **macro variables**

Functional group	Regressor	Acronym	Expected sign
State of the economy (cycles, structural)	Real GDP growth	GDPGRW	-ve
	Unemployment rate (level, change)	UNEMP, ΔUNEMP	+ve
Asset price shock proxies	Effects of asset prices / interest rates		
	Return on leading share indices	RET_SHINDX	-ve
	Housing price index (changes)	HPGRW	-ve
	Point change nominal / real interest rates	NOMINTGRW / REALINTGRW	+ve
Other	Change in consumer price index	CPIGRW	+ve/-ve

[7] Note that REALINTGRW was also omitted because of its elevated correlation with the economic state variable GDPGRW (Australia: +50%*, NZ: +37%; *significant at 5% level)

3.3 Bank-specific factors

The first group of bank-specific proxies in Table 5 mainly controls for institution specific characteristics in this heterogeneous sample of banks ranging from small regional mortgage lenders to multi-line internationally diversified institutions. SH_SYSLNS, defined as the bank's share of total private sector credit, is the primary size proxy, gauging both risk diversification and market power of banks. Its expected sign is uncertain since better diversified banks might face lower credit losses but at the same time be tempted into higher risk lines of business. There is moreover the market power hypothesis which postulates that monopolistic market structure promotes lending by larger banks to young firms which then leads to higher credit losses (Petersen & Rajan, 1995).

The net interest margin is a further measure of a bank's operational characteristics. Wider margins are typically associated with a strong retail focus and reliance on balance sheet business. In particular, gross funding costs of retail deposits (before operating expenses required to originate them) are lower. Such institutions often focus on residential lending for which one expects comparably lower credit losses (negative coefficient). Alternatively, a high interest margin may reflect a bank's deliberate choice to lend to more risky borrowers (positive coefficient). Pain (2003, Table 5, p. 24) has moreover argued that there is a potential for lower past margins to induce greater risk-taking by banks.

Ideally, our model should also include a proxy directly measuring the risk characteristic of the loan portfolio, i.e. the exposure to certain lending categories. Unfortunately such information is not consistently disclosed by all banks throughout the observation period and some standardization of risk classes was only brought about by the Basel I Capital Accord (BCBS, 1988a). It allowed the creation of HS_LN, defined as the share of residential mortgage loans (50% risk weight) in the bank's loan portfolio. HS_LN can thus only be employed for empirical modeling with data after 1990 and has not been considered in Equation 1.

Bank-specific factors in Table 5 include proxies for a bank's growth. There is anecdotal evidence confirmed by some empirical studies (e.g. Clair, 1992) that banks expanding (too) rapidly, are faced with elevated credit losses in subsequent years. In order to gain market share, such institutions loosen lending criteria but are not able to accurately appraise required provision at the time. On the one hand, one can measure absolute bank asset growth using the proxy ASGRW. Alternatively, it can be argued that relative growth differentials are more relevant because strong growth in times of economic expansion might be in line with the general economy. Accordingly, we define a second growth proxy DVLNGRW as the point difference of a bank's loan growth rate from the growth rate of the overall system (growth in total private sector credit PSC). ASGRW and DVLNGRW correlate very closely (92%) and can thus not be used jointly in the same regression. Up to 4 lags of these growth parameters are included in the regression because the implications of 'reckless' lending in times of strong expansion might not become apparent for some time.

Monitoring of borrowers is a key element of an effective credit policy. Berger & De Young (1997) employ Granger-causality techniques to test effects of cost efficiencies on subsequent loan losses. They find that measured cost efficiency precedes reductions in problem loans and thus conclude that 'cost efficiency may be an important indicator of future problem loans and problem banks'. Accordingly, inefficient banks would be expected to suffer greater credit losses. Alternatively, one can argue such banks could maintain an extensive credit evaluation procedure and will thus exhibit lower credit losses. The cost-income ratio (CIR)[8] is chosen as the cost efficiency proxy. It is widely used by practitioners and also in comparable CLE driver studies such as Pain (2003) and Salas & Saurina (2002).[9]

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[8] CIR is defined as non-interest expense (essentially operational expense) over total operating income consisting of net interest income and other operating income.

[9] Note, however, that CIR is quite contentious for efficiency studies in banking. See for example the discussion on this subject in Hess & Francis (2004).

Smoothing reported income by means of discretionary provisions was explored as one of the very first topics in research on bad debt provisions (Greenawalt & Sinkey Jr., 1988). Based on analytical results by Fudenberg & Tirole (1995), one would predict that for banks with good (poor) current performance and expected poor (good) future performance, managers will save income for (borrow income from) the future by reducing (increasing) current income through loan loss provisions (Kanagaretnam, Lobo, & Mathieu, 2003). This hypothesis would thus call for positive coefficients of an earnings proxy. We include earnings before taxes and loan loss provisions over average total assets (EBTP_AS) as an explanatory variable to control for this behavioural influence on provisioning levels.[10]

Table 5 Grouping of drivers of a bank's CLE into functional groups: **bank specific variables**

Functional group	Regressor	Acronym	Expected sign
Bank characteristics (systemic importance, market power, risk profile)	Share of system loans	SH_SYSLNS	+ve/-ve
	Pricing of risks as measured by net interest margins	NIM	+ve/(-ve)
	Housing loans (Basel I definition) as % of total loans	HS_LN	-ve
Past credit expansion proxies	Growth rate bank assets	ASGRW	+ve
	Point deviation of a bank's loan growth from total system loans growth	DVLNGRW	+ve
Other variables	Cost efficiency: Cost-income ratio (level)	CIR	+ve/(-ve)
	Income smoothing:		
	Earnings before taxes and provisions as % of assets / as % of equity	EBTP_AS	+ve

[10] This approach to earnings proxy modelling (using average assets) is widely used in the relevant literature, e.g. in Ahmed, Takeda, & Thomas (1999) and, more recently, Kearns (2004).

Table 6 Descriptive statistics aggregate macro factors (1980 to 2005)

Acronym	Mean	Median	Maximum	Minimum	Std. Dev.	Skewness	Kurtosis	Obs
CPIGRW_AU	5.0%	4.2%	11.2%	0.2%	3.4%	0.412	1.809	26
CPIGRW_NZ	6.0%	2.9%	17.1%	-0.1%	5.7%	0.977	2.377	26
GDPGRW_AU	3.3%	3.8%	6.6%	-0.7%	1.8%	-0.667	3.074	26
GDPGRW_NZ	2.8%	2.8%	8.5%	-1.9%	2.2%	0.277	3.287	26
HPGRW_AU	8.7%	8.4%	38.8%	-4.2%	8.6%	1.508	6.757	26
HPGRW_NZ	10.1%	8.7%	31.6%	-2.5%	8.5%	0.703	3.100	26
PSC_AU (AUD bil) *	433.0	346.5	1,141.4	69.7	299.7	0.774	2.709	26
PSC_NZ (NZD bil) *	77.2	62.0	201.9	10.9	54.0	0.656	2.463	26
PSCGRW_AU (1)	12.2%	11.3%	23.9%	-1.2%	6.2%	-0.120	2.955	26
PSCGRW_NZ (1)	12.8%	10.9%	31.0%	4.9%	6.9%	1.182	3.664	26
RET_SHINDX_AU	9.0%	8.8%	41.5%	-26.6%	14.8%	-0.019	3.354	26
RET_SHINDX_NZ	7.5%	6.3%	57.1%	-49.5%	20.9%	-0.239	4.291	26
UNEMP_AU	7.6%	7.7%	11.1%	5.1%	1.7%	0.371	2.272	26
UNEMP_NZ	5.7%	5.5%	10.4%	1.9%	2.3%	0.480	2.556	26

Notes:
Series suffices: AU - Australia; NZ -New Zealand
* PSC, PSCGRW are auxiliary series for private sector credit, respectively private sector credit growth, used to derive bank-specific series SH_SYSLNS and DVLNGRW.

Table 7 Descriptive statistics of bank specific series (including auxiliary series)

	Mean	Median	Maximum	Minimum	Std.Dev.	Skewness	Kurtosis	Obs.	Cross sect.
ASGRW	17.0%	14.1%	180.6%	-40.1%	19.1%	3.06	21.91	517	32
CIR	65.0%	65.6%	131.7%	18.0%	12.3%	0.12	5.61	519	31
DVLNGRW	7.1%	3.3%	147.8%	-39.5%	20.7%	2.87	17.20	513	32
EBTP_AS	1.7%	1.6%	17.0%	-1.5%	1.1%	7.14	88.87	477	32
HS_LN	52.7%	54.1%	96.2%	0.0%	21.9%	-0.40	2.65	323	27
LNGRW	19.0%	15.4%	160.4%	-28.3%	20.6%	2.97	17.99	513	32
NIM	3.34%	3.06%	11.07%	0.51%	1.43%	1.97	9.18	510	31
SH_SYSLNS	8.0%	3.4%	34.4%	0.0%	8.3%	0.90	2.79	536	32

4 Empirical results

This section estimates Equation 1 for the combined Australasian sample as well as the Australian and New Zealand sub-samples with results shown in Table 8, respectively Table 9 (Australia) and Table 10 (New Zealand). The tables do not show all potential formulations of Equation 1. For instance, they omit presentation of estimates with the alternative bank growth parameters DVLNGRW, given the high correlation with ASGRW (the results are very similar).

All equations are estimated with cross-section fixed effects to account for unobserved individual bank characteristics. Such an estimation methodology has, for example been applied by Kearns (2004). As a robustness test, an alternative set of estimates has been run using a random-effects model which assumes that the distribution of individual unobserved bank-specific effects does not vary over time and can be separately identified in the overall regression (as done by Pain, 2003, p. 20, footnote 8). The results of the random effects model are not shown but available on request. They are very similar to the ones for the fixed effects specification.

All t-statistics use White diagonal standard errors (degree of freedom corrected) to correct for the presence of heteroskedasticity of unknown form (White, 1980).

4.1 Discussion of results for aggregate macro factors

As shown in Table 8, GDP growth (GDPPGRW) and both the change and level of the unemployment rate (UNEMP, ΔUNEMP) have the expected effects on a bank's annual loan loss provisions with a lag of one year. Based on the Schwarz and Akaike information criteria, the unemployment rate based model shows greater explanatory power. This corresponds to results found by Kearns (2004, p. 118) for a smaller and shorter sample of Irish banks. He concludes that the unemployment rate is the most significant macroeconomic factor affecting the rate of provisioning.

Other research generally finds similar qualitative results (e.g. signs of coefficients) but the concrete sensitivities of impaired asset expense to GDP growth and changes in unemployment often remain unreported (e.g. in Kearns, 2004 above). In our study, a one percentage point increase in the two year cumulative GDP growth rate results in an (annualised) decline in IAE_LN of 8-9%; alternatively, a one percentage point increase in the unemployment rate (cumulative over the preceding two year period) results in a 21% rise in IAE_LN. It is difficult to compare these sensitivities to results of other studies due to differences in model design (e.g. alternative dependent CLE variables and different variable transformations). The sensitivities in Australasia seem nonetheless lower with regard to GDP growth compared with the international studies of Bikker & Hu (2001, Table 3, p. 12) for banks from 29 countries from 1979-1999 and Valckx (2004, Table 1, p. 7) with data drawn from OECD bank profitability statistics for all 15 EU countries from 1979 to 2001.

As to country-specific differences between Australia and New Zealand, Australia's estimation results show much greater sensitivities to GDP growth (see Table 9). Conversely, the New Zealand results are less significant and effects of GDP, ΔUNEMP and UNEMP seem more delayed as none of the contemporaneous proxies shows the expected sign of the coefficient (see Table 10). These results mean that, while the basic effects can be observed in both systems, we have to be careful generalising parameter results since transmission mechanisms from the economic cycle to CLE in the banking system do not appear uniform.

The return on the national share index (RET_SHINDX) is one of the asset shock proxies included in Equation 1. The contemporaneous term is found significantly negative for the overall sample and for Australian banks. It is slightly less significant for New Zealand banks but shows the expected negative sign. Overall it appears to have greater explanatory power than the growth of the housing price index (HPGRW), the alternative asset market proxy. HPGRW also shows the negative coefficients for the overall sample but only the contemporaneous term of HPGRW shows some significance for the Australian sub-sample.

The formulation of Equation 1 also considers impacts of the growth of CPI (CPIGRW). The results in Table 8 show coefficients with mostly positive signs but limited significance.

Contemporaneous coefficients are much smaller (and negative in the regression with GDPGRW) but higher for longer lags. This pattern is more pronounced for the Australian sub-sample (Table 9) with negative and sometimes significant contemporaneous coefficients and positive one-year lagged terms. This means inflationary pressure apparently leads to just a temporary improvement of borrower quality. Such short-term gains, brought about by increased consumption when consumers reduce their savings rates, has been documented before, e.g. in Tommasi (1994). Our results are consistent with research which generally postulates welfare costs of inflation in the long-run (e.g. Lucas, 2000).

4.2 Discussion of results for bank-specific factors[11]

The size proxy, SH_SYSLNS, defined as the bank's share of system loans, is consistently positive for all estimates indicating higher levels of provisioning for larger banks. The coefficient values are not significant at conventional levels, however. We see this result as a reflection of structural heterogeneity of the sample as smaller banks are predominantly housing lenders with comparably lower levels of provisioning requirements. However, we cannot rule out the market power hypothesis which postulates that monopolistic market structure promotes lending by larger banks to young firms which then leads to higher credit losses (Petersen & Rajan, 1995). Note that a size proxy has also been used by Pain (2003, Table 7, p. 28) who finds no significance for contemporaneous but some positive significance for one year lagged size for a more homogenous and smaller balanced sample of seven UK commercial banks.

The coefficients for the net interest margin (NIM) generally turn out negative and mostly significant for the contemporaneous and twice-lagged term. This is consistent with our initial

[11] The discussion excludes the HS_LN proxy (share of residential mortgage loans in a bank's portfolio) which can only be employed for empirical modeling with data after 1990. It has thus not been considered in Equation 1.

expectation that larger banks tend to exhibit lower interest rate margins (as indicated by a negative and significant correlation of -22% between SH_SYSLNS and NIM). Larger banks derive a higher portion of their profit through off-balance sheet business while smaller players rely more on their lending income.

Few researchers have included net interest margin proxies into their formulations. Pain (2003) finds consistently positive and in some regressions[12] significant coefficients for the lagged level of net interest margins. In his view, this would reflect the timing between the pricing of past loans and subsequently realized credit losses. Other researchers have faced conflicting results for the NIM coefficients. Salas & Saurina (2002, Table 2, p. 218) report positive but insignificant values for lagged NIM terms of Spanish commercial banks but a significant negative value for the sub-sample of savings banks. Given such inconclusive results, the effect of net interest margins will require further exploration.

Highly significant contemporaneous coefficients of the cost-income ratio proxies (CIR) and generally negative coefficients for lagged terms indicate that high and increasing cost-income ratios (lower operational efficiencies) are associated with higher levels of impaired assets. The results lend support to the hypothesis that operational problems at banks (high CIR) go hand in hand with poor credit risk management and thus higher loan losses. Conversely, they appear to reject the alternative theory which postulates that extensive costly monitoring (high CIR) leads to better asset quality (i.e. negative coefficient for CIR).

Our results for CIR support Berger & De Young (1997) who found 'cost efficiencies to precede reductions in problem loans'. The results are also generally in line with Salas & Saurina (2002, Table 2, p. 218) who find positive, but not always significant coefficients. Mixed results were, however, reported by Pain (2003, Table 7 & 8, p. 28,30) with positive coefficients for UK commercial banks but negative and significant coefficients for mortgage banks.

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[12] For a sub-sample of 5 UK mortgage banks Pain (2003, Table 8, p. 30) finds highly significant coefficients for one-year lagged NIM.

Estimates in Table 8 show consistently positive relationships between the level of provisioning (IAE_LN) and the banks' contemporaneous pre-provision earnings (EBTP_AS), confirming previous results for other markets supportive of an income smoothing pattern (e.g. Arpa, Giulini, Ittner, & Pauer, 2001, p. 107 for Austria; Bikker & Hu, 2001 for 26 OECD countries; Bikker & Metzemakers, 2003 for US, EU; Cavallo & Majnoni, 2001 for G10 countries; Greenawalt & Sinkey Jr., 1988 for US; Kearns, 2004 for Ireland). Lagged terms of EBTP_AS show negative and often significant coefficients which support the theory that necessary provisions are postponed into the following year if earnings are low in that particular time period. These results are consistent across the Australian and New Zealand sub-samples even though Australian institutions seem to postpone required provisions for shorter periods (the first lag of EBTP_AS is significant in Table 9) while New Zealand banks smooth over longer cycles (the first and second lag is often significant in Table 10). One could hypothesize that Australian banks, which are mostly exchange listed, have less discretion in smoothing income compared to their (mostly) non-listed New Zealand counterparts.

An interesting result emerges for the asset growth parameter ASGRW as signs and significance of the coefficients are affected by the lags considered. Contemporaneous growth appears to be associated with lower credit losses (negative coefficients) but this effect is very weak. On the other hand, terms lagged beyond 2 years have the expected unfavourable effect (positive coefficient). These positive coefficients are moreover generally highly significant. Both these results support the notion that at the time of the expansion, management has a too optimistic judgment of the risks associated with their strategy, an assessment which has to be corrected in subsequent years.

These findings appear to explain some of the controversy in the literature regarding the effect of past credit growth as these studies typically look at one or just two lags of the growth parameter. Pain (2003, p. 29), for instance, discovered negative and in some cases significant coefficients for his one-period lagged growth proxy even though he notes that the coefficients are ‘very small’. Likewise Cavallo & Majnoni (2001, p. 20) state that “the loan growth rate has a negative sign implying that provisions tend to decrease as a share of total assets when the increase of new lending and the decrease of monitoring tend to reinforce the risk exposure of banks portfolios.” Note that Cavallo & Majnoni (2001) use contemporaneous loan growth as their proxy. This means both authors have apparently measured effects of current lending growth as opposed to the impact of banks ‘buying market share’ at the expense of subsequent asset quality as studied in work of Clair (1992).

All in all, our results are similar to Salas & Saurina (2002, Table 2, p. 218) who also study lags up to 4 years and generally find negative coefficients for shorter lags but positive coefficients for longer lags of asset and branch network growth. While partially significant, their results are less clear-cut since they use an alternative CLE proxy in the form of a level variable ‘problem loan ratio’, which would roughly correspond to the level of impaired assets in Australasian accounting terminology. This level variable is likely to provide a blurred picture of the credit events in a particular period since the level of impaired assets will be the consequence of loan defaults and debt workouts possibly many years back.

Table 8 Estimation results for alternative forms of basic model Equation 1 **(full sample)**

Equation 1 - Full Sample	1	Signif.	t-Stat	2	Signif.	t-Stat	3	Signif.	t-Stat
Independent	IAE_LN			IAE_LN			IAE_LN		
Sample Group	ALL			ALL			ALL		
Start Year	1980			1980			1980		
End Year	2005			2005			2005		
Constant	**-0.0241**	**	-3.33	**-0.0256**	**	-3.71	**-0.0289**	**	-4.27
GDPGRW	-0.0345		-0.84						
GDPGRW(-1)	-0.0572		-1.49						
GDPGRW(-2)	-0.0178		-0.47						
UNEMP-UNEMP(-1)				-0.0376		-0.43			
UNEMP(-1)-UNEMP(-2)				**0.2442**	**	3.76			
UNEMP(-2)-UNEMP(-3)				0.0519		1.04			
UNEMP							-0.0052		-0.05
UNEMP(-1)							**0.3128**	**	2.69
UNEMP(-2)							**-0.2277**	**	-3.34
RET_SHINDX	**-0.0122**	*	-2.05	**-0.0144**	*	-2.34	**-0.0151**	*	-2.37
RET_SHINDX(-1)	-0.0023		-0.49	-0.0017		-0.33	-0.0006		-0.12
RET_SHINDX(-2)	0.0054		0.83	0.0085		1.23	0.0072		1.10
HPGRW	-0.0146		-1.27	-0.0190		-1.86	-0.0188		-1.80
HPGRW(-1)	-0.0021		-0.31	-0.0045		-0.61	-0.0003		-0.04
HPGRW(-2)	-0.0031		-0.42	0.0056		0.79	0.0084		1.03
CPIGRW	-0.0126		-0.31	0.0005		0.01	0.0022		0.05
CPIGRW(-1)	0.0391		0.61	0.0641		1.22	0.0690		1.33
CPIGRW(-2)	**0.0549**	*	2.04	0.0167		0.63	0.0251		0.90
SH_SYSLNS	**0.0512**	*	2.19	**0.0511**	*	2.28	**0.0552**	*	2.46
NIM	-0.1819		-1.40	-0.1619		-1.24	-0.2150		-1.50
NIM(-1)	0.0864		0.65	0.0764		0.57	0.0898		0.66
NIM(-2)	**-0.2285**	*	-2.14	**-0.2233**	*	-2.14	**-0.2286**	*	-2.18
CIR	**0.0635**	**	4.69	**0.0635**	**	4.65	**0.0597**	**	4.14
CIR(-1)	-0.0063		-0.45	-0.0080		-0.57	-0.0085		-0.59
CIR(-2)	-0.0184		-1.93	**-0.0193**	*	-2.02	**-0.0202**	*	-2.17
EBTP_AS	**1.0493**	**	9.79	**1.0481**	**	10.16	**1.0619**	**	10.18
EBTP_AS(-1)	**-0.2112**	*	-2.12	**-0.2148**	*	-2.19	**-0.2042**	*	-2.11
EBTP_AS(-2)	-0.1604		-1.64	-0.1719		-1.73	-0.1646		-1.65
ASGRW	-0.0027		-1.09	-0.0028		-1.10	-0.0030		-1.18
ASGRW(-1)	-0.0009		-0.44	-0.0015		-0.73	-0.0016		-0.74
ASGRW(-2)	0.0036		1.48	0.0034		1.45	0.0033		1.43
ASGRW(-3)	**0.0046**	*	2.38	**0.0042**	*	2.17	**0.0040**	*	2.12
ASGRW(-4)	**0.0069**	**	2.93	**0.0068**	**	2.75	**0.0067**	**	2.62
Cross-sections included	28			28			28		
Observations	362			362			362		
Adjusted R^2	0.740			0.748			0.749		
F-Statistics	**20.021**	**		**20.831**	**		**20.900**	**	
Schwarz criterion	-6.057			-6.088			-6.091		
Akaike info criterion	-6.649			-6.680			-6.682		
Durbin-Watson stat	2.102			2.119			2.136		

Notes: ** significant at 1% level, * at 5% level

Estimation for full observation period 1980 to 2005 for common sample of Australian and New Zealand banks.

Dependent variable is impaired asset expense as % of loans (IAE_LN). Explanatory variables as defined in Table 4 and Table 5. All equations estimated with cross-section fixed effects. All t-statistics use White diagonal standard errors & covariance (d.f. corrected)

Table 9 Estimation results for alternative forms of basic model Equation 1 **(Australian banks)**

Equation 1 - Australia	1	Signif.	t-Stat	2	Signif.	t-Stat	3	Signif.	t-Stat
Independent	IAE_LN			IAE_LN			IAE_LN		
Sample Group	AU			AU			AU		
Start Year	1980			1980			1980		
End Year	2005			2005			2005		
Constant	**-0.0196**	*	-2.50	**-0.0259**	**	-3.32	**-0.0337**	**	-3.83
GDPGRW	**-0.2227**	**	-3.52						
GDPGRW(-1)	**-0.1242**	*	-2.41						
GDPGRW(-2)	-0.0749		-1.78						
UNEMP-UNEMP(-1)				0.1300		1.02			
UNEMP(-1)-UNEMP(-2)				**0.2623**	**	2.82			
UNEMP(-2)-UNEMP(-3)				**0.1525**	*	2.11			
UNEMP							0.1199		0.60
UNEMP(-1)							0.2666		1.40
UNEMP(-2)							**-0.2763**	*	-2.37
RET_SHINDX	**-0.0181**	**	-3.52	**-0.0221**	**	-3.83	**-0.0224**	**	-3.49
RET_SHINDX(-1)	**0.0168**	*	2.14	0.0113		1.27	0.0098		0.97
RET_SHINDX(-2)	**0.0296**	**	3.37	**0.0274**	**	3.39	**0.0181**	*	2.39
HPGRW	**-0.0378**	**	-3.03	**-0.0449**	**	-4.33	**-0.0371**	**	-3.51
HPGRW(-1)	0.0165		1.71	0.0046		0.34	0.0107		0.52
HPGRW(-2)	0.0134		1.64	0.0081		0.95	0.0133		1.29
CPIGRW	**-0.1519**	**	-2.78	-0.0740		-1.70	-0.0544		-1.36
CPIGRW(-1)	0.1062		1.62	**0.1280**	**	2.93	**0.0953**	*	2.36
CPIGRW(-2)	-0.0314		-0.87	-0.0541		-1.72	-0.0303		-0.96
SH_SYSLNS	0.0289		1.44	0.0352		1.76	**0.0397**	*	1.99
NIM	-0.1128		-0.58	-0.1390		-0.73	-0.1509		-0.76
NIM(-1)	0.1059		0.45	0.0792		0.31	0.0848		0.33
NIM(-2)	-0.2163		-1.21	-0.2420		-1.26	-0.2595		-1.31
CIR	**0.0755**	**	6.01	**0.0712**	**	5.74	**0.0680**	**	5.15
CIR(-1)	-0.0053		-0.48	-0.0093		-0.83	-0.0079		-0.66
CIR(-2)	-0.0183		-1.75	-0.0187		-1.89	**-0.0197**	*	-2.01
EBTP_AS	**1.0186**	**	7.31	**1.0479**	**	7.66	**1.0569**	**	7.29
EBTP_AS(-1)	**-0.4578**	**	-3.53	**-0.4206**	**	-3.21	**-0.4098**	**	-3.05
EBTP_AS(-2)	0.0745		0.69	0.0742		0.66	0.0643		0.57
ASGRW	-0.0006		-0.23	-0.0007		-0.28	-0.0015		-0.56
ASGRW(-1)	-0.0017		-0.56	-0.0031		-1.08	-0.0027		-0.97
ASGRW(-2)	**0.0071**	**	2.91	**0.0059**	*	2.38	**0.0059**	*	2.42
ASGRW(-3)	**0.0058**	**	2.73	**0.0045**	*	2.10	**0.0044**	*	2.05
ASGRW(-4)	**0.0084**	**	3.04	**0.0080**	*	2.59	**0.0081**	*	2.35
Cross-sections included	19			19			19		
Observations	236			236			236		
Adjusted R^2	0.722			0.723			0.721		
F-Statistics	**14.581**	**		**14.624**	**		**14.496**	**	
Schwarz criterion	-6.159			-6.162			-6.155		
Akaike info criterion	-6.834			-6.837			-6.830		
Durbin-Watson stat	2.170			2.195			2.185		

Notes: ** significant at 1% level, * at 5% level
Estimation for full observation period 1980 to 2005 for Australian banks.
Dependent variable is impaired asset expense as % of loans (IAE_LN). Explanatory variables as defined in Table 4 and Table 5. All equations estimated with cross-section fixed effects. All t-statistics use White diagonal standard errors & covariance (d.f. corrected)

Table 10 Estimation results for alternative forms of basic model Equation 1 **(New Zealand banks)**

Equation 1 - New Zealand	1	Signif.	t-Stat	2	Signif.	t-Stat	3	Signif.	t-Stat
Independent	IAE_LN			IAE_LN			IAE_LN		
Sample Group	NZ			NZ			NZ		
Start Year	1980			1980			1980		
End Year	2005			2005			2005		
Constant	-0.0128		-1.22	-0.0149		-1.51	-0.0173		-1.86
GDPGRW	0.0583		0.84						
GDPGRW(-1)	-0.0204		-0.40						
GDPGRW(-2)	-0.0932		-1.48						
UNEMP-UNEMP(-1)				-0.2209		-1.13			
UNEMP(-1)-UNEMP(-2)				0.0926		0.87			
UNEMP(-2)-UNEMP(-3)				0.1316		1.42			
UNEMP							-0.1741		-0.96
UNEMP(-1)							0.3806		1.69
UNEMP(-2)							-0.0776		-0.64
RET_SHINDX	-0.0162		-1.77	-0.0180		-1.86	-0.0193		-1.86
RET_SHINDX(-1)	-0.0077		-1.50	-0.0050		-0.88	-0.0045		-0.80
RET_SHINDX(-2)	-0.0019		-0.30	0.0004		0.06	-0.0017		-0.27
HPGRW	-0.0121		-0.68	-0.0059		-0.39	-0.0091		-0.56
HPGRW(-1)	0.0150		0.90	0.0080		0.56	0.0154		0.86
HPGRW(-2)	-0.0010		-0.07	-0.0036		-0.26	-0.0019		-0.12
CPIGRW	0.0105		0.18	-0.0585		-0.60	-0.0408		-0.43
CPIGRW(-1)	0.1183		1.18	0.1392		1.40	0.1518		1.39
CPIGRW(-2)	0.0617		1.33	0.1039		1.35	0.1079		1.37
SH_SYSLNS	0.0468		1.19	0.0483		1.24	0.0472		1.21
NIM	-0.1971		-0.63	-0.2637		-0.93	-0.3209		-1.21
NIM(-1)	-0.0889		-0.53	-0.0521		-0.33	-0.0001		0.00
NIM(-2)	-0.2016		-1.45	-0.2175		-1.50	-0.2391		-1.53
CIR	**0.0742**	**	4.45	**0.0753**	**	4.40	**0.0642**	**	3.06
CIR(-1)	-0.0453		-1.55	-0.0435		-1.57	-0.0439		-1.57
CIR(-2)	-0.0043		-0.25	-0.0066		-0.39	-0.0084		-0.51
EBTP_AS	**0.9044**	**	3.75	**0.9304**	**	4.19	**0.9460**	**	4.28
EBTP_AS(-1)	**-0.2540**	*	-2.04	-0.2286		-1.96	-0.2296		-1.95
EBTP_AS(-2)	**-0.3027**	*	-2.39	**-0.2869**	*	-2.40	**-0.2927**	*	-2.38
ASGRW	-0.0016		-0.26	-0.0023		-0.38	-0.0012		-0.21
ASGRW(-1)	0.0048		1.00	0.0048		0.97	0.0061		1.14
ASGRW(-2)	-0.0012		-0.28	0.0003		0.08	0.0007		0.16
ASGRW(-3)	0.0045		0.86	0.0014		0.26	0.0022		0.44
ASGRW(-4)	0.0017		0.44	0.0037		0.85	0.0062		1.20
Cross-sections included	9			9			9		
Observations	126			126			126		
Adjusted R^2	0.795			0.799			0.798		
F-Statistics	**14.874**	**		**15.162**	**		**15.069**	**	
Schwarz criterion	-5.601			-5.617			-5.612		
Akaike info criterion	-6.411			-6.428			-6.423		
Durbin-Watson stat	2.090			2.042			2.052		

Notes: ** significant at 1% level, * at 5% level
Estimation for full observation period 1980 to 2005 for New Zealand banks.
Dependent variable is impaired asset expense as % of loans (IAE_LN). Explanatory variables as defined in Table 4 and Table 5. All equations estimated with cross-section fixed effects. All t-statistics use White diagonal standard errors & covariance (d.f. corrected)

5 Summary and conclusions

This study identifies the major drivers of credit losses in the Australasian banking system. No such research for this particular geographic region has been conducted previously. The analysis is based on a hand-compiled data set of financial and credit loss data for 32 Australasian banks over a period of 1980 to 2005. We choose impaired asset expense as % of loans as the dependent variable in a pooled regression model, a variable that has been widely used in comparable studies and is available consistently throughout the observation period.

Explanatory variables include aggregate macro factors including state of the economy variables like GDP growth and unemployment rate as well as asset price shock proxies for share and housing market performance. While the impact of these macro variables (signs of coefficients) is as expected, the rate of unemployment is the macro variable with the best explanatory power; with respect to asset prices, the return on the share index has a more significant effect on credit losses than property prices. This result reflects the major banking crisis in Australasia around 1990 which was not triggered by asset shocks emanating from the housing market but rather by asset quality problems in the corporate and commercial property sector.

Bank-specific variables are included to control for institution-specific characteristics. We find that larger banks and banks with wider net interest margins have, on average, reported lower levels of credit losses. In the particular case of net interest margins, wide margins are typically associated with retail focused, smaller housing lenders. Experience shows comparably lower levels of loan losses for such residential home lending.

Interesting results are found with respect to the effect of past bank expansion where we find significantly greater asset quality problems for fast expanding banks with a lag of 2 to 3 years. Our findings provide strong evidence that managers opting for quick growth are unable to accurately gauge the provisioning requirements associated with their strategy.

Bank inefficiency as measured by the cost-income ratio is generally associated with greater credit losses. This means inefficient institutions do not spend their resource on extensive credit monitoring but rather their high cost-income ratios are a reflection of poor management and control.

Finally, the coefficients for the contemporaneous pre-tax & provision earnings proxy are consistently positive and significant for all samples considered. Managers of Australasian banks have thus apparently employed discretionary elements of impaired asset expense for the purpose of achieving certain target earnings. In particular, they seem to increase provisions in good years 'to store' earnings for potentially more adverse years to come.

Overall, our results are very similar for both the Australian and New Zealand sub-samples. Likewise they are broadly consistent with findings for other geographic areas. In detail, however, there are differences; for example, with regard to the timing of the effects. This means that, while the general impact might be the same, the actual transmission mechanism is subject to specific local influences. Continued research on drivers of credit losses in Australasia may usefully consider structural modelling approaches to further understand the influence and timing of particular factors.

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