Credit Loss Experience of Australasian Banks: Methodological Aspects

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Topics

- Motivation
- Literature review
- Credit loss data Australasia
- Methodological issues
  - Typology of reporting
  - Measuring credit loss experience (CLE)
  - Determinants of credit losses
- Conclusion

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Motivation

- Stability and integrity of banking systems are of utmost importance to national economies
- 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)]
- Entities in charge of prudential supervision and system stability thus need to understand drivers of credit losses in banking system

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Motivation

- Very topical research area in the context of New Basel II Capital Accord
  - Basel II will allow use of proprietary models to determine required capital but these models & parameters require validation by supervisors
  - Need to understand potential procyclical effects which could endanger system stability

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Credit Risk & Basel II

Basel on the Rhine River

Retrieved from http://www.basel.ch 21 September 2004

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Motivation

- Methodological aspects particularly with regard to obtaining good data for this research have received scant attention
- This presentation highlights some of the issues that were encountered when capturing a comprehensive credit loss history for Australian and NZ Banks (1980 – 2005)

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Motivation

Methodological issues relate to . . .

- Heterogeneity of reporting
  - Developed reporting typology to extract data along equivalent informational content
- Choice of suitable proxies to measure credit loss experience (CLE)
  - Present results of an investigation on the properties of such CLE proxies

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Motivation

Methodological issues relate to . . . (2)

- Choice of appropriate explanatory variables
  - Explored characteristics / availability of data in Australasia & predictions by earlier research
- Choice of suitable estimation models for highly unbalanced panels
  - Not covered in this presentation

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Literature review

Two main streams of research that analyse drivers of banks' credit losses (or more specifically loan losses):

1. Literature with regulatory focus looks at macro & micro factors
2. Literature looks discretionary nature of loan loss provisions and behavioural factors which affect them

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Literature review

Literature which explores macro and micro (bank specific) determinants of loan losses

- Examples macro factors:
  - GDP growth
  - indebtedness of households and firms
  - asset prices (real estate, share markets)

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Literature review

- Examples of micro (bank specific) factors:
  - exposure to certain lending, collateral
  - portfolio diversification
  - (past) credit growth
  - net interest margins
  - efficiency

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Literature review

- Behavioural hypotheses in the literature on the discretionary nature of loan loss provisions
  - Income smoothing: Greenawalt & Sinkey (1988)
  - Capital management: Moyer, 1990
  - Signalling: Akerlof, 1970, Spence, 1973
  - Taxation Management

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Literature review

- Bank data in this literature typically sourced from third parties
  - Literature using commercial data providers:
    Cavallo & Majnoni (2001), Bikker & Metzemakers (2003)
  - Literature (partially) based on confidential data reported to regulators:
    Arpa et al. (2001), Keeton (1999), Quagliarello (2004)

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Literature review

- Research based on original published financial accounts are rare (very large effort to collect data).

Examples are

- Pain (2003): 7 UK commercial banks & 4 mortgage banks 1978-2000
- Kearns (2004): 14 Irish banks, mostly early 1990s to 2003
- Salas & Saurina (2002): Spain

Credit Loss Data Australasia

- The database includes extensive financial and in particular credit loss data for
  - 23 Australian + 10 New Zealand banks
  - Time period from 1980 to 2005
  - Approximately raw 55 data elements per institution, of which 12 specifically related to the credit loss experience (CLE) of the bank

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Credit Loss Data Australasia

Sample selection criteria

- Registered banks
- Must have substantial retail and/or rural banking business
- Exclude pure wholesale and/or merchant banking institutions

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Credit Loss Data Australasia

Banks in sample

AUSTRALIA: Adelaide Bank, Advance Bank, ANZ, Bendigo Bank, Bank of Melbourne, Bank West, Bank of Queensland, Commercial Banking Company of Sydney, Challenge Bank, Colonial State Bank, Commercial Bank of Australia, Commonwealth Bank, Elders Rural Bank, NAB, Primary Industry Bank of Australia, State Bank of NSW, State Bank of SA, State Bank of VIC, St. George Bank, Suncorp-Metway, Tasmania Bank, Trust Bank

NEW ZEALAND: ANZ National Bank, ASB, BNZ, Countrywide Bank, NBNZ, Rural Bank, Trust Bank NZ, TSB Bank, United Bank, Westpac (NZ)

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Credit Loss Experience of Australasian Banks

Methodological issues

Typology of Reporting

- A methodology of typifying the credit loss reporting was motivated by the fact that there has been a great heterogeneity in reporting credit loss data by banks in Australasia
- Differing accounting / reporting formats
  - through time
  - in between institutions

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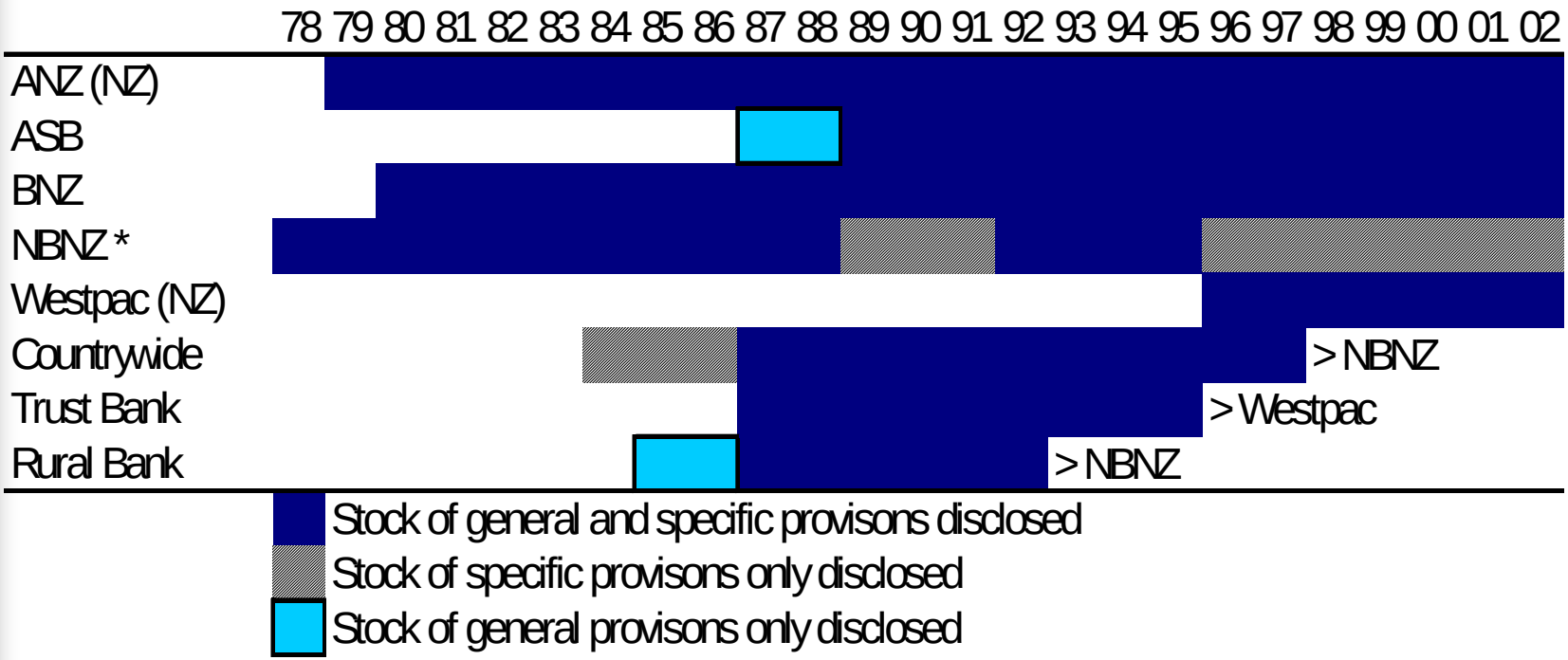
Typology of Reporting

Example heterogeneity in reporting:
stock of provisions NZ banks 1978-2002



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Typology of Reporting

- Typified the method of reporting along four separate dimensions, i.e. how banks report …
  - Stock of provisions (static levels)
  - Impaired asset expense (for period)
  - Write-offs
  - Recoveries

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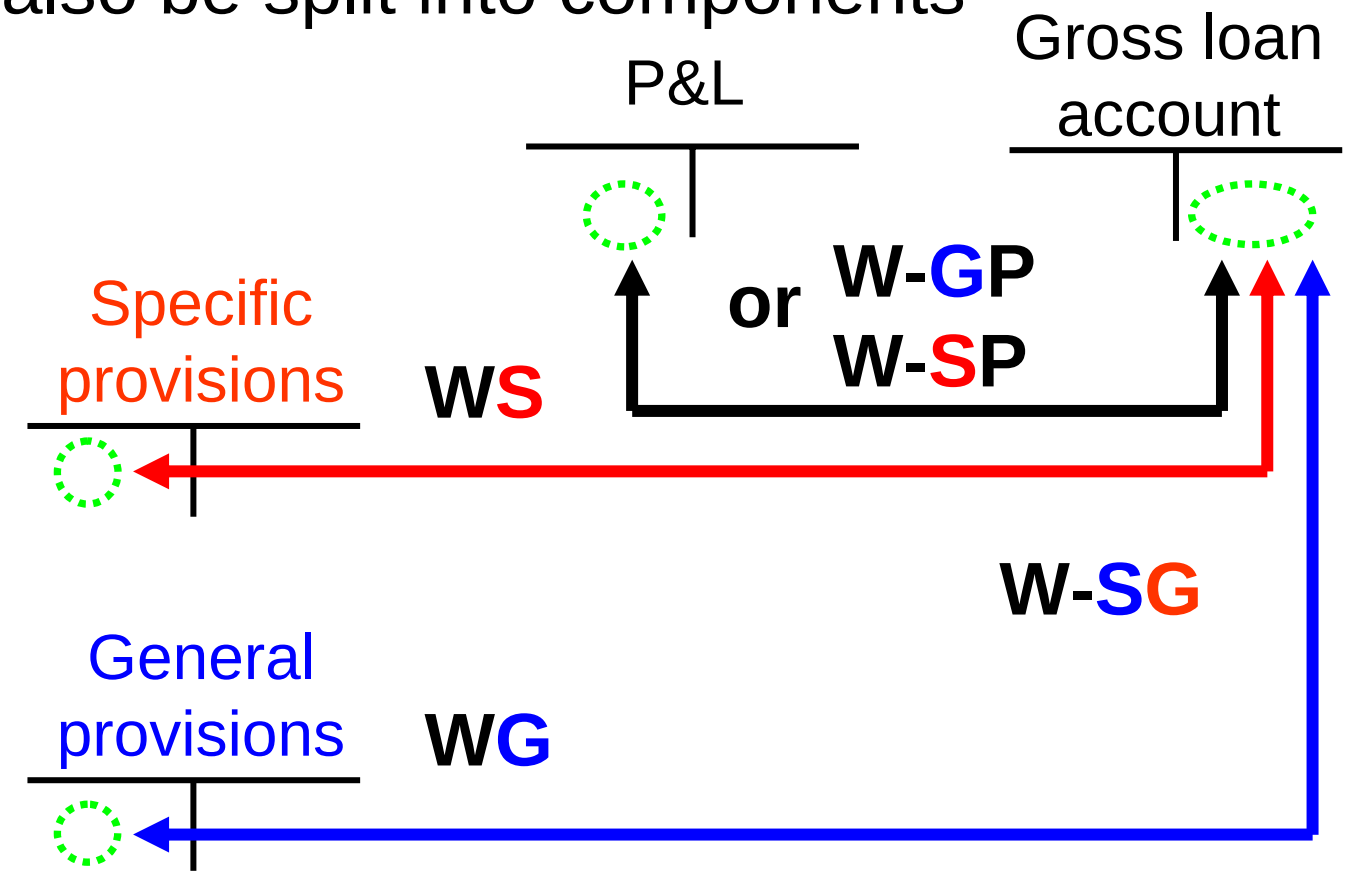
Typology example

Write-offs can be reported in many accounts and also be split into components



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Typology of Reporting

- Identified 27 different variations / combinations of reporting (see Table 2 in paper)
- Informational content differs, e.g. when direct write-offs are shown
- Reporting of recoveries is patchy, particularly for earlier periods and smaller banks

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Typology: CLE Data Template

CLE: Credit Loss Experience

Stock of provisions

Stock of provisions specific	**(1)**
Stock of provisions general	**(2)**

Movement in provisions / flow information

Starting total provision	
- Bad debt written off	**(3)**
+ Recoveries debts written off	**(4)**
+ Charge/(credit) to P&L	**(5)**
+/- Other transactions	**(6)**
Ending total provision	**(1) + (2)**

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Typology: CLE Data Template

CLE: Credit Loss Experience

Details bad debt charge to P&L

+ Specific provisions additions	**(7)**
+ General provisions additions	**(8)**
+ Direct write-offs	**(9)**
- Recoveries	**(4)**
+/- Other (plug)	**(10)**
Total charge to P&L	**(5)**

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Typology benefits

- Allows standardization of data across many reporting formats
- If we just record data as we ‘encounter’ them in the annual report, there would be, for example, no consistency in
  - Share of expense specific/general
  - Level of write-offs
  - Treatment of recoveries
- Potential application in other geographic regions

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Principal Model

$$CLE_{it} = \alpha + \beta(L)x_{it} + \sum_{s=1}^{q} \delta_s CLE_{i(t-s)} + u_{it};$$

$$i = 1,....., N; \quad t = q+1,.... T$$

CLE_{it}	credit loss experience for bank i in period t
x_{it}	observations of the potential explanatory variables
$\beta(L)$	vector of polynomial in the lag operator associated with these explanatory variables
u_{it}	random error term with distribution N(0,Σ), Σ is variance-covariance matrix of σ_{it} error terms
q	maximum lag of the dynamic component of the model

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Measuring CLE

- Many proxies for a bank's credit loss experience (CLE) are possible
  - Level of bad debt provisions, impaired assets, past due assets
  - Impaired asset expense (=provisions charge to P&L)
  - Write-offs (either gross or net of recoveries)
  - Components of above proxies, e.g. general or specific component of provisions (stock or expense)

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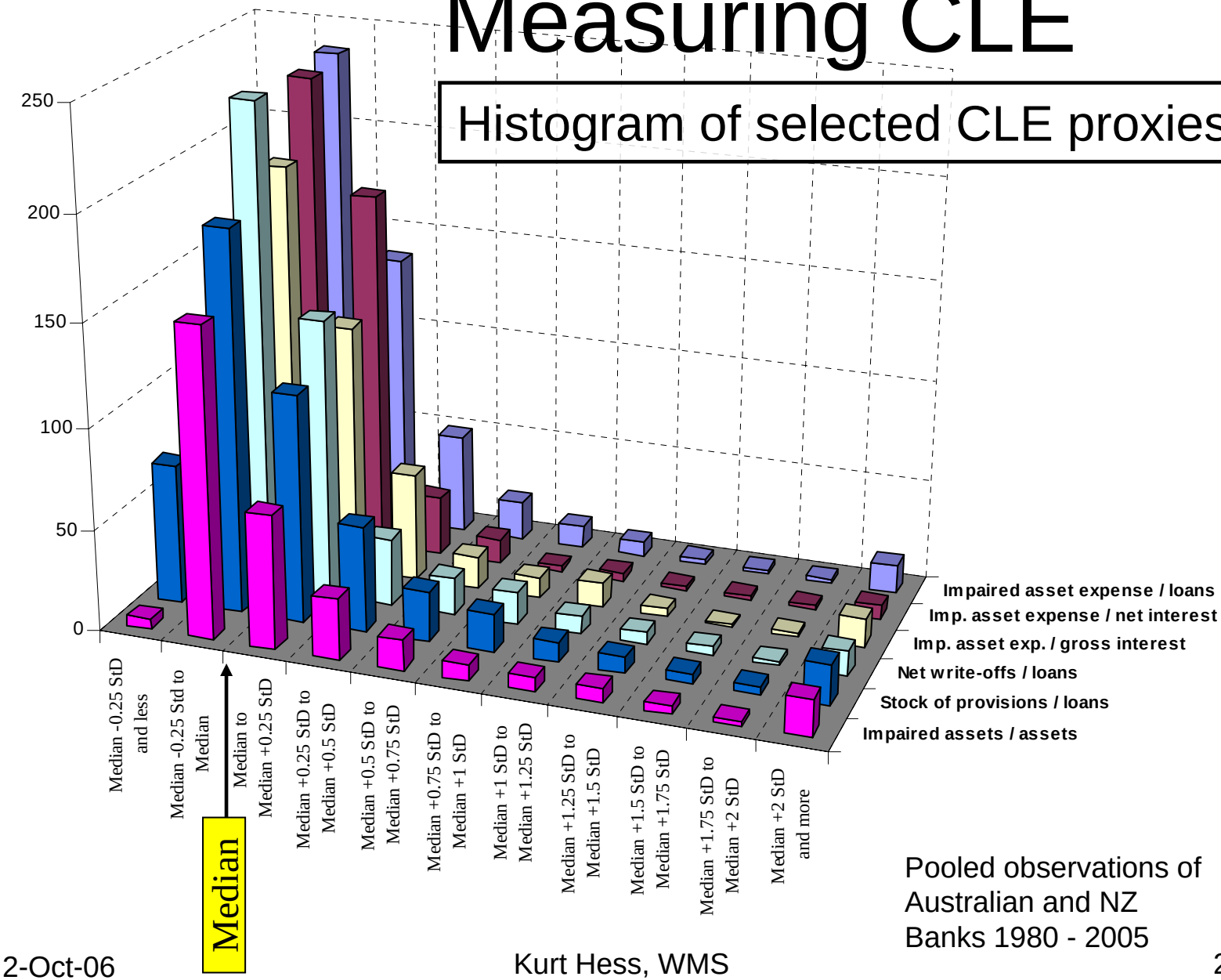
Measuring CLE

Histogram of selected CLE proxies



Pooled observations of Australian and NZ Banks 1980 - 2005

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Measuring CLE

Contemporaneous correlations between selected CLE proxies

	IAE_LN	IAE_NI	IAE_GI	NW_LN	GW_LN	RC_LN	PRV_LN	GE_LN	SP_LN	IA_A	PD_A	GEE_LN	SPE_LN
IAE_LN	1.00	**0.80**	**0.96**	0.46	0.46	0.11	0.60	0.46	0.48	0.63	0.06	0.40	**0.98**
IAE_NI	**0.80**	1.00	**0.88**	0.57	0.56	0.02	0.49	0.20	0.59	0.71	-0.02	0.32	**0.91**
IAE_GI	**0.96**	**0.88**	1.00	0.52	0.51	0.09	0.59	0.40	0.53	0.68	0.04	0.26	**0.95**
NW_LN	0.46	0.57	0.52	1.00	**1.00**	0.20	0.39	0.15	0.46	0.60	0.00	-0.07	0.37
GW_LN	0.46	0.56	0.51	**1.00**	1.00	0.24	0.38	0.15	0.46	0.59	-0.02	-0.14	0.34
RC_LN	0.11	0.02	0.09	0.20	0.24	1.00	0.40	0.30	0.33	0.30	-0.16	-0.17	0.24
PRV_LN	0.60	0.49	0.59	0.39	0.38	0.40	1.00	**0.80**	0.77	0.77	-0.01	0.00	0.64
GE_LN	0.46	0.20	0.40	0.15	0.15	0.30	**0.80**	1.00	0.24	0.38	-0.23	-0.09	0.60
SP_LN	0.48	0.59	0.53	0.46	0.46	0.33	0.77	0.24	1.00	**0.81**	0.04	0.10	0.41
IA_A	0.63	0.71	0.68	0.60	0.59	0.30	0.77	0.38	**0.81**	1.00	0.12	-0.27	0.53
PD_A	0.06	-0.02	0.04	0.00	-0.02	-0.16	-0.01	-0.23	0.04	0.12	1.00	0.02	0.13
GEE_LN	0.40	0.32	0.26	-0.07	-0.14	-0.17	0.00	-0.09	0.10	-0.27	0.02	1.00	0.18
SPE_LN	**0.98**	**0.91**	**0.95**	0.37	0.34	0.24	0.64	0.60	0.41	0.53	0.13	0.18	1.00

IAE_LN	Imp. asset exp as % of loans
IAE_NI	Impaired asset expense as % net interest income
IAE_GI	Impaired asset expense as % gross interest income
NW_LN	Net debt write-offs as % of loans
GW_LN	Gross debt write-offs as % of loans
RC_LN	Recoveries as % of loans
PRV_LN	Provisions total as % of loans
GE_LN	General provisions total as % of loans
SP_LN	Specific provisions total as % of loans
IA_A	Impaired assets as % total assets
PD_A	Past due loans as % total assets
GEE_LN	Genl. provision expense as % of loans
SPE_LN	Spec. provision expense as % of loans

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Measuring CLE

Lead / lagged correlations between selected CLE proxies

	IAE_LN (+1)	IAE_NI (+1)	IAE_GI (+1)	NW_LN (+1)	GW_LN (+1)	RC_LN (+1)	PRV_LN (+1)	GE_LN (+1)	SP_LN (+1)	IA_A (+1)	PD_A (+1)	GEE_LN (+1)	SPE_LN (+1)
IAE_LN	0.27	0.32	0.31	0.42	0.42	**0.33**	0.54	0.27	**0.59**	0.51	0.06	-0.13	0.26
IAE_NI	0.22	0.40	0.29	**0.58**	**0.58**	**0.20**	0.48	0.18	**0.59**	0.60	**-0.01**	-0.15	0.28
IAE_GI	0.26	0.36	0.34	0.49	0.49	**0.31**	0.54	0.25	**0.60**	0.57	0.04	-0.14	0.24
NW_LN	0.08	0.10	0.09	0.47	0.47	**0.43**	0.31	0.12	0.37	0.36	-0.02	-0.13	0.19
GW_LN	0.09	0.08	0.08	0.45	0.47	**0.47**	0.35	**0.18**	0.35	0.35	-0.04	-0.16	0.28
RC_LN	0.01	-0.02	0.01	0.15	0.18	0.79	0.35	**0.43**	0.13	0.25	-0.18	-0.28	0.15
PRV_LN	0.12	0.19	0.16	**0.55**	**0.56**	**0.43**	0.74	0.55	0.62	0.54	-0.03	-0.26	0.11
GE_LN	0.01	0.03	0.02	**0.21**	**0.22**	0.28	0.59	0.59	**0.33**	0.25	**-0.17**	-0.18	0.04
SP_LN	0.16	0.26	0.21	**0.66**	**0.68**	**0.40**	0.55	**0.25**	0.66	0.61	0.02	-0.22	0.15
IA_A	0.34	0.40	0.39	**0.88**	**0.89**	**0.41**	0.69	**0.38**	0.65	0.78	0.07	**-0.23**	0.34
PD_A	**0.10**	**0.03**	**0.09**	**0.02**	**0.01**	-0.16	**0.03**	**-0.22**	**0.09**	**0.14**	0.59	0.01	0.12
GEE_LN	0.00	0.00	0.02	-0.11	**-0.09**	**0.07**	**0.02**	-0.15	**0.19**	-0.32	**0.05**	-0.09	0.04
SPE_LN	0.32	0.35	0.35	**0.40**	**0.41**	**0.40**	0.58	0.42	**0.53**	0.40	0.09	-0.12	0.37

Where the lead/lag correlation exceeds the corresponding contemporaneous value, one can say that the CLE proxy in the left column leads the proxy in the top row.

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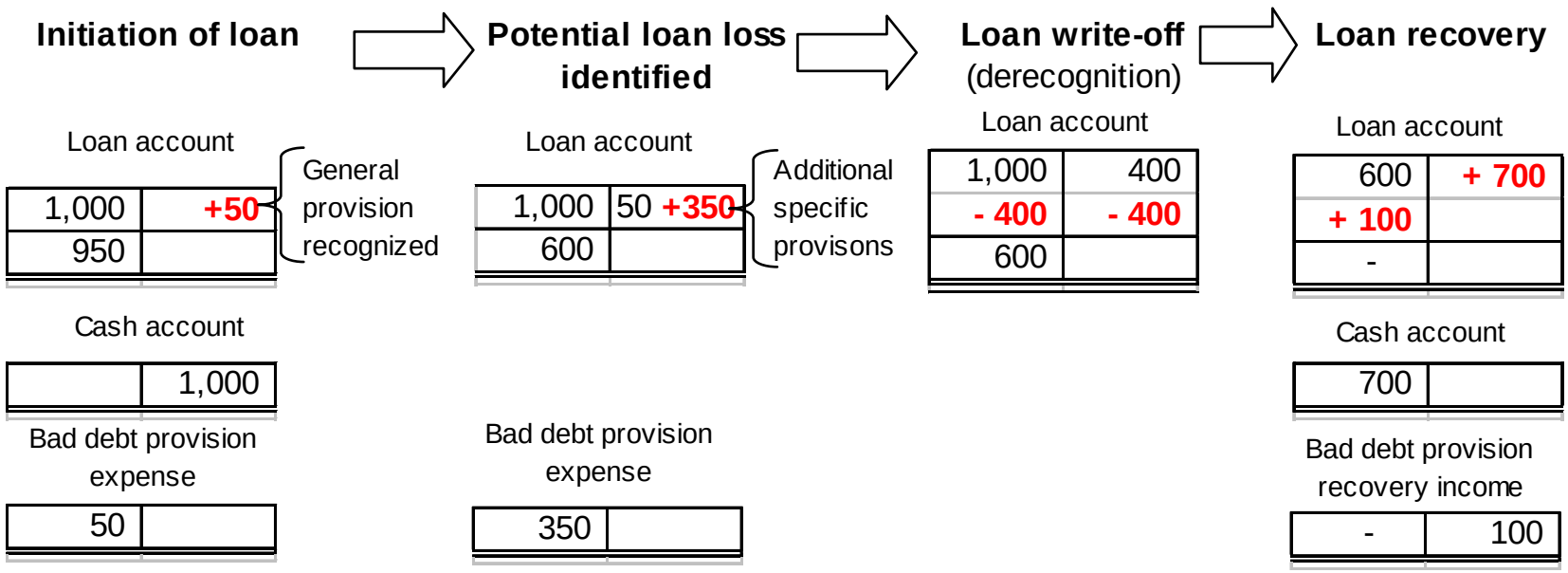
Measuring CLE

Lead-lag characteristic rooted in life cycle of bad debt provisioning



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Measuring CLE

Modelling lag characteristic of write-offs: net write-off as a linear function of previous year impaired asset expense

$$\text{NW\_LN}_{it} = \alpha + \sum_{s=1}^{4} \beta_s \ \text{IAE\_LN}_{i(t-s)} + u_{it};$$

i : bank cross sections 1,....., N; t : year

NW_LN_{it}: Net debt write-offs as % of average loans of bank i in year t

IAE_LN_{it}: Impaired asset expense as % of average loans of bank i in year t

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Measuring CLE

Modelling lag characteristic of write-offs: results

	Full sample	Australia all banks	Australia 4 major banks	New Zealand all banks	New Zealand 5 major banks
Dependent variable	Net debt write-offs as % of average loans (NW_LN)				
Constant	0.000235	-0.000524	-9.49E-05	0.000787	***0.001520**
(t-statistics)	(0.327377)	(-0.777075)	(-0.268449)	(1.032898)	(2.454055)
IAE_LN(-1)	****0.248538**	****0.507196**	****0.568898**	0.097696	0.060910
(t-statistics)	(3.094785)	(4.157299)	(5.551430)	(1.943121)	(0.812854)
IAE_LN(-2)	***0.307172**	****0.666997**	0.292586	****0.126465**	0.052727
(t-statistics)	(2.471981)	(5.522455)	(1.648128)	(3.369025)	(0.778485)
IAE_LN(-3)	0.067921	-0.135374	-0.052761	0.137665	0.139875
(t-statistics)	(0.585167)	(-1.808127)	(-0.803062)	(1.499259)	(0.677921)
IAE_LN(-4)	****0.195659**	-0.077473	0.040547	****0.167858**	****0.282831**
(t-statistics)	(2.928499)	(-0.837329)	(1.209100)	(3.652307)	(8.320548)
R-squared	0.44815	0.63869	0.855668	0.39366	0.39297
Cross sections	29	20	4	9	5
Observations	362	249	88	113	91

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Measuring CLE

Modelling lag characteristic of write-offs: Interpretation of results

- On average 1 Dollar in provisions expense is written down as follows:
  - Subsequent year 25 cts.
  - Year 2 30 cts.
  - Year 3 6 cts.
  - Year 4 14 cts.
- **This means only 75% of a year's impaired asset expense is truly written off in the subsequent four years**
- Similar write-down patterns were found by Pain (2003)

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Measuring CLE

Modelling lag characteristic of recoveries: Similar as previous results for write-offs

- In theory, write-offs should mean losses with high degree of certainty
- In practice, banks appear to interpret this differently
- Across the sample cumulative bad debt recoveries as % of cumulative write-offs are 13.9%
- These values vary significantly among banks (see following chart)

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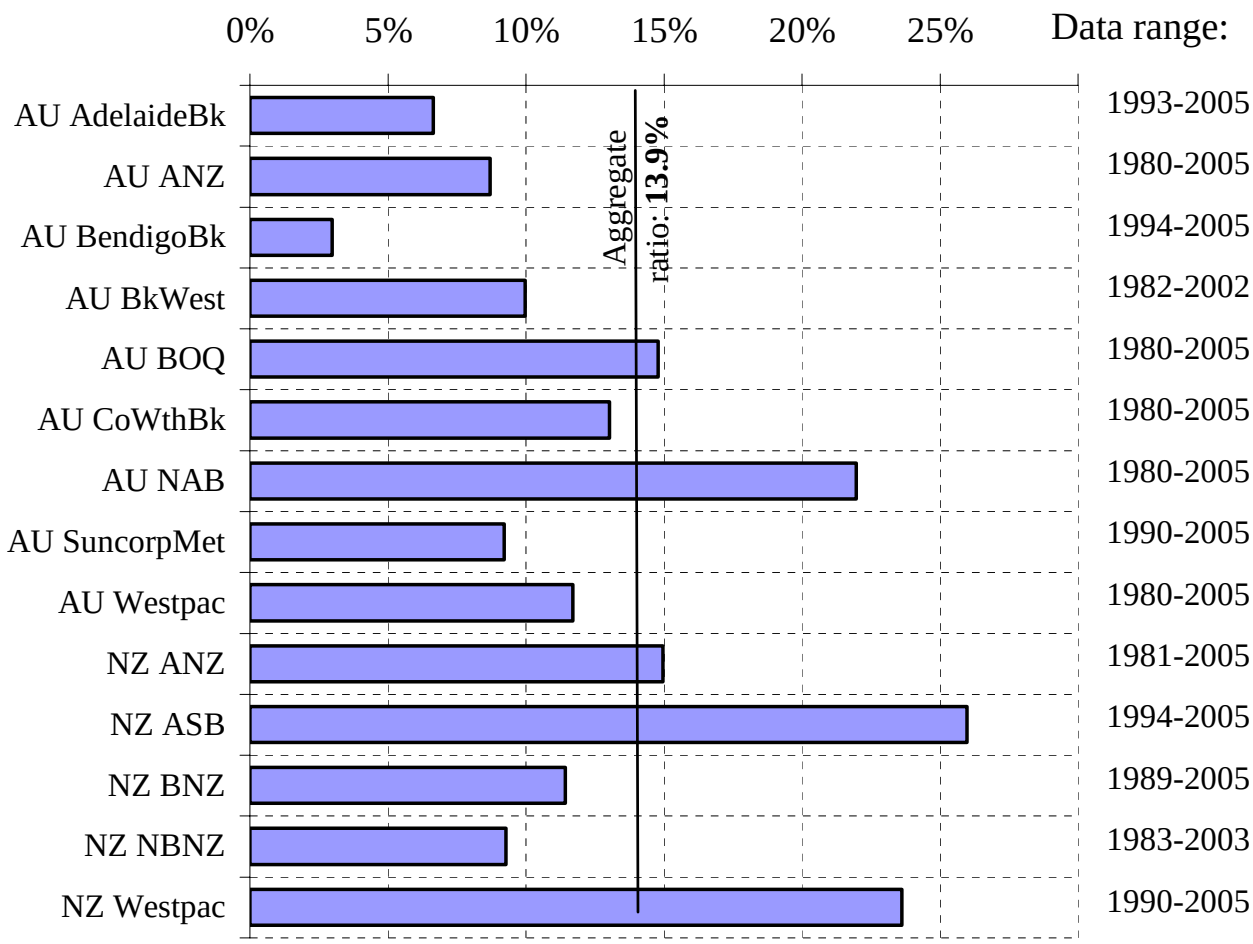
Measuring CLE

Cumulative debt recoveries as % of write-offs



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Measuring CLE

- Reference levels to measure CLE
  - Literature typically uses levels of assets or loans (average of beginning and ending balance)
  - Can also consider income items like gross interest income, net interest income, total operating income
- It is found that balance sheet items have more desirable properties as reference levels
- Main reasons are their magnitude & stability so CLE in numerator becomes major driver in derived ratio.

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Determinants of Credit Losses

Issues related to

- Choice of suitable proxies
- Data quality with regard to
  - Availability
  - Comparability due to inconsistent statistics or reporting.

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Determinants of Credit Losses

Choice of suitable proxies

- What are the drivers of CLE?
  - Literature has used numerous proxies and results are often conflicting
- What lags for these proxies?
- Proposed approaches
  - Maximize log likelihood function
  - Information criteria

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Determinants of Credit Losses

Data quality issues

- Macro level statistics
  - Differing formats between NZ and Australia e.g. indebtedness of households / firms
  - House price series back to 1986 only for Australia
  - Balance sheets of M3 institutions only back to 1988 for New Zealand

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Determinants of Credit Losses

Data quality issues (2)

- Micro / bank specific data
  - Lack of reporting limits choice of proxies (particularly through the very important crisis time early 1990)
  - Comparability due to inconsistent reporting (e.g. segment credit exposures)

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Determinants of Credit Losses

Macro Factors (1)

Real GDP growth	-ve	Ability of borrowers to service debt determined by the economic cycle.
Unemployment rate	+ve	Unemployment rate not only reflects the business cycle (like GDP growth) but also longer term and structural imbalances in economy.
Liabilities of households/firms as % of disp. income	+ve	The more households and firms in the system are indebted, the more financially vulnerable they will be.

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Determinants of Credit Losses

Macro Factors (2)

Asset prices / interest rates		Disturbances in the asset markets can impair the value of banks' assets both directly and indirectly (i.e. through reduced collateral values). Experience shows that especially the property sector and the share markets may play a critical role in triggering losses in the banking system. Similar effects are expected in a volatile interest rate environment.
Housing price index (changes)	-ve	
Return leading share indices	-ve	
Change real/nominal interest rates	+ve	

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Determinants of Credit Losses

Bank Specific Factors (1)

Past credit expansion	+ve or -ve	Fast growth of the loan portfolio is often associated with subsequent loan losses. Alternatively, a slow growing loan portfolio may be caused by a weak economy and thus increase CLE.

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Determinants of Credit Losses

Bank Specific Factors (2)

Pricing of risks (net interest margins)	+ve/ (-ve)	A bank's deliberate choice to lend to more risky borrowers is likely reflected in higher interest margins. Lower past margins might induce greater risk-taking by bank
Characteristic of lending portfolio (share of housing loans)	-ve	The share of comparably lower risk housing loans as % of loans proxies the risk characteristic of the bank's loan portfolio.

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Determinants of Credit Losses

Bank Specific Factors (3)

Diversification (asset size)	-ve	A bank's assets in proportion to the overall banking system asset provides a crude proxy for loan portfolio diversification.
Cost efficiency (cost-income ratio)	+ve/ (-ve)	Inefficient banks can be expected to suffer greater credit losses. Alternatively, such banks could maintain an expensive credit monitoring procedure and will thus exhibit lower credit losses.

Determinants of Credit Losses

Bank Specific Factors (4)

Market power (% share of system assets)	+ve/ (-ve)	Monopolistic markets structures promotes lending to young firms which then leads to higher credit losses (Petersen & Rajan, 1995). Conversely, increased competition may induce banks to take greater risks.

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Determinants of Credit Losses

Bank Specific Factors (5)

Income smoothing (Earnings before provisions & taxes as % of assets)	+ve	Some literature finds evidence of banks using discretionary provisions to smooth earnings for a variety of motivations.
Capital management (Capital measured as tier 1 or tier 1+2 capital as % of risk weighted assets)	-ve	General provisions count towards Basel I minimum capital and weaker banks might thus be tempted to engage in capital management through provisioning.

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Conclusions

- Methodological issues related to modelling credit loss experience (CLE) may not be underestimated

Main issues relate to

- Heterogeneous financial reporting through time and amongst banks for which we have proposed a typology here

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Conclusions (2)

Main issues relate to (2)

- Choice of CLE proxy.
  - None seems 100% ideal but impaired asset expense still most preferable with best availability
  - Write-offs, while more certain, are too much delayed
  - Use assets or loans as a reference level

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Conclusions (3)

Main issues relate to (3)

- Choice of appropriate determinants of credit losses with conflicting results in earlier literature
- Data quality issues related to these determinants with regard to
  - Availability
  - Comparability due to inconsistent statistics or reporting by banks

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Credit Loss Experience of Australasian Banks

Back-up Slides

Basel II Pillars

- Pillar 1:
  - Minimum capital requirements
- Pillar 2:
  - A supervisory review process
- Pillar 3:
  - Market discipline (risk disclosure)

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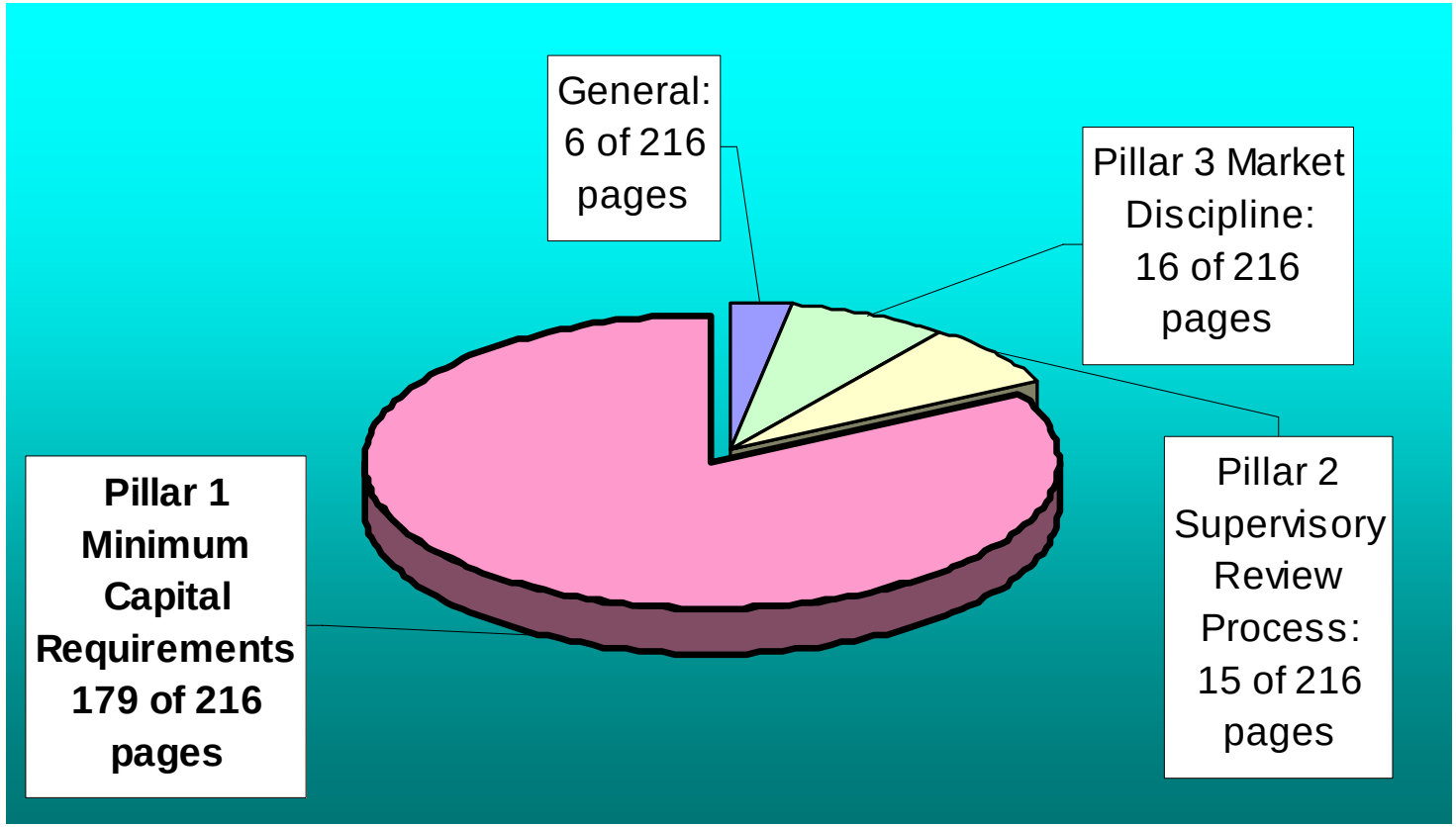
Basel II Pillars

Pages in New Basel Capital Accord (issued June 2004)



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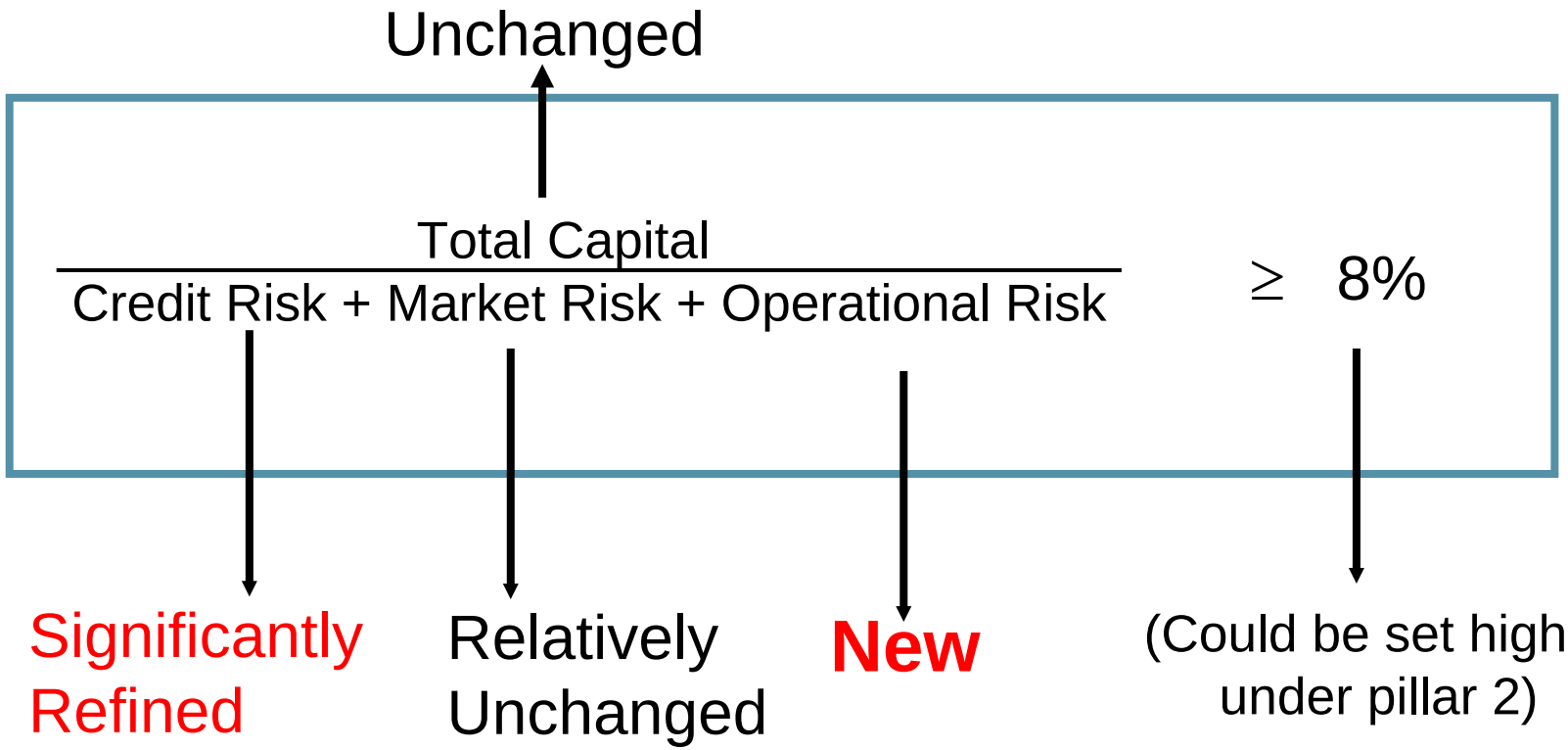
Pro Memoria: Calculation Capital Requirements under Basel II



Source: slide inspired by PWC presentation slide retrieved 27/7/2005 from http://asp.amcham.org.sg/downloads/Basel%20II%20Update%20-%20ACC.ppt ,

Basel II – IRB Approach

Two approaches developed for calculating capital minimums for credit risk:

- Standardized Approach (essentially a slightly modified version of the current Accord)
- Internal Ratings-Based Approach (IRB)
  - foundation IRB - supervisors provide some inputs
  - advanced IRB (A-IRB) - institution provides inputs

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Basel II – IRB Approach

- Internal Ratings-Based Approach (IRB)
  - Under both the foundation and advanced IRB banks are required to provide estimates for probability of default (PD)
  - It is commonly known that macro factor are the main determinants of PD

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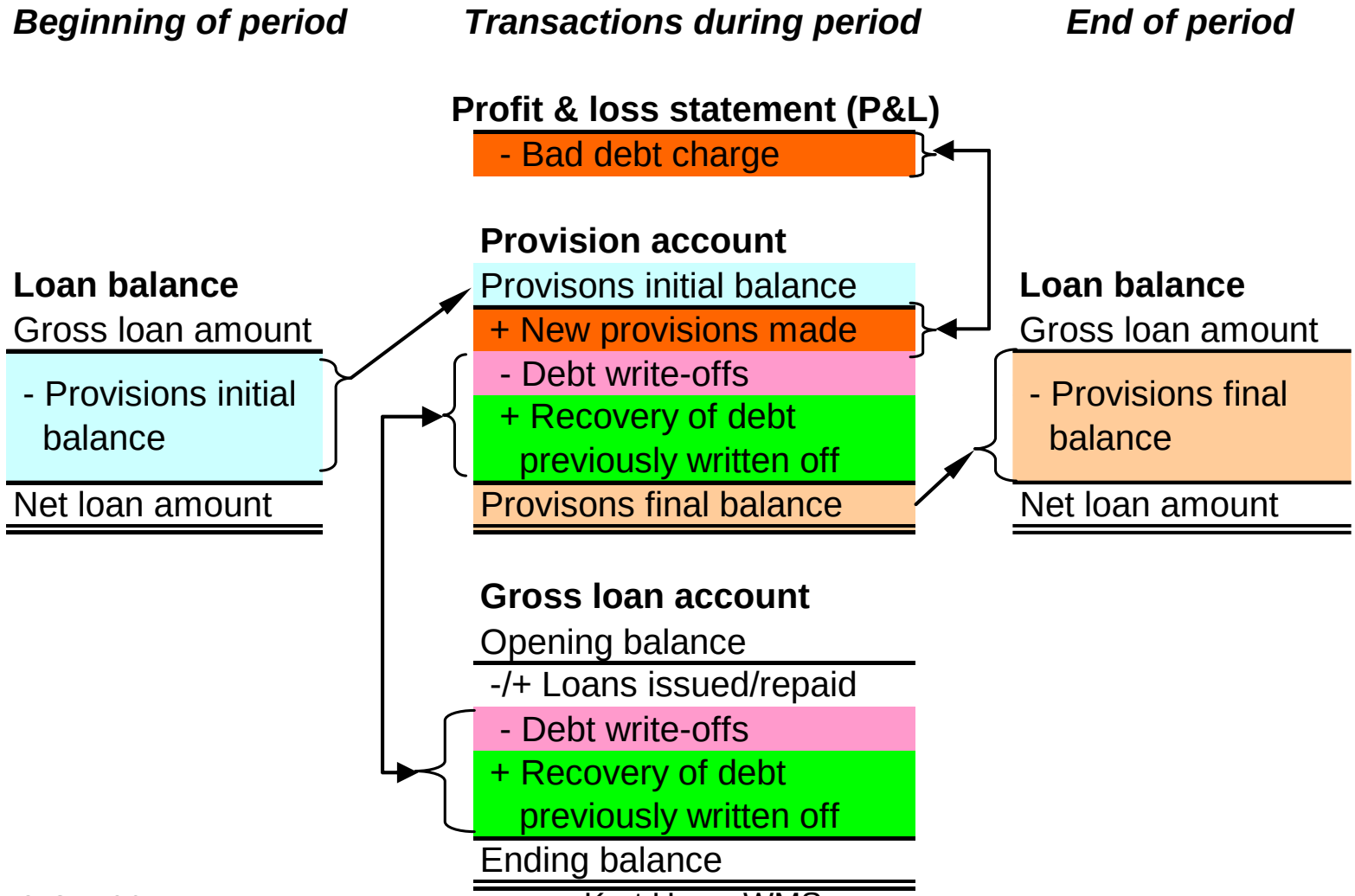
Primer Loan Loss Accounting



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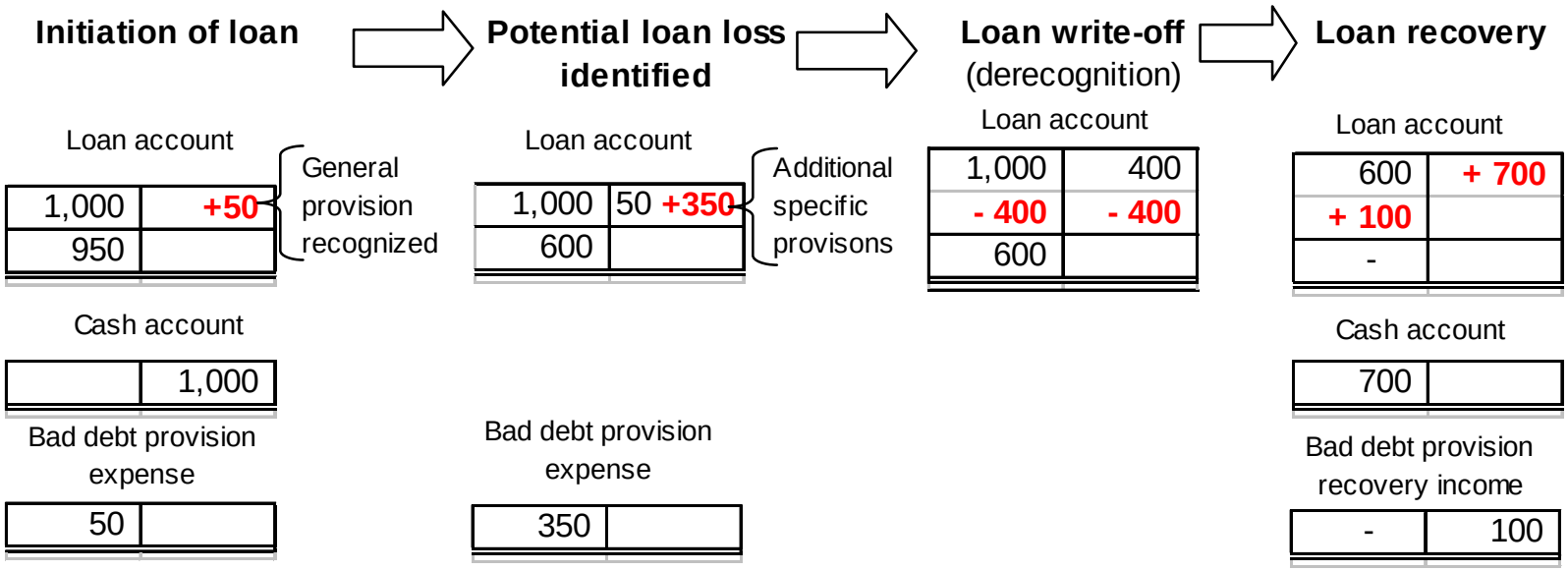
Primer Loan Loss Accounting



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Typology: Stock of Provisions

- Stock of provisions
  - Not shown STK-O
  - General STK-G
  - Specific STK-S
  - Both STK-SG
  - Combined STK-C

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Typology: Provisions Expense

- Charges to P&L from …
  - Not shown O
  - Specific provisions account S
  - General provisions account G
  - Both provision accounts SG
  - Combined provision account C

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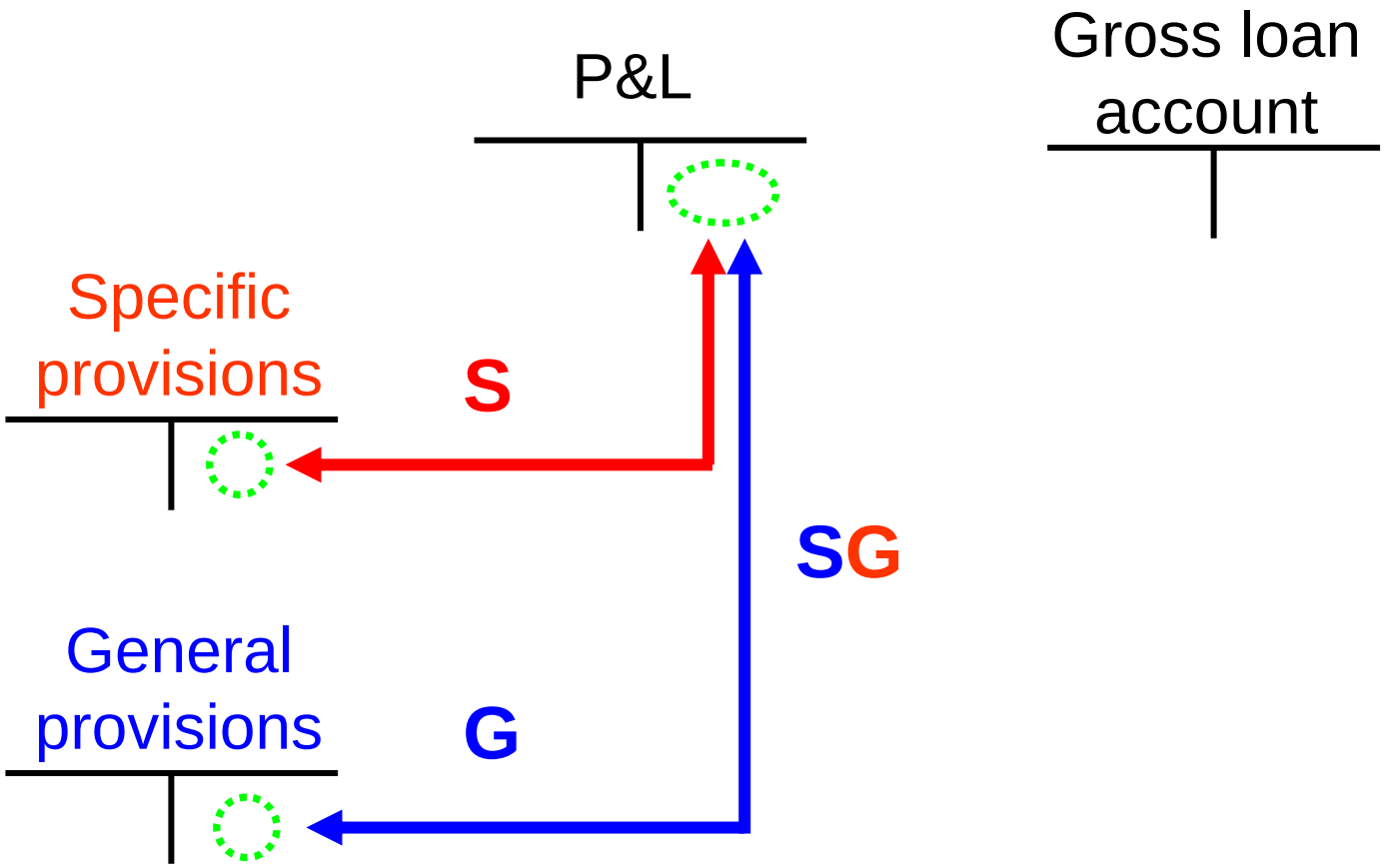
Typology: Provisions Expense



Note: only more frequent types shown on this slide

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Typology: Write-offs

- Write-offs shown in …
  - Not shown — WO
  - Specific provisions account — WS
  - General provisions account — WG
  - Combined provisions acc. — WC
  - Both provision accounts — W-SG
  - Specific and direct in P&L — W-SP

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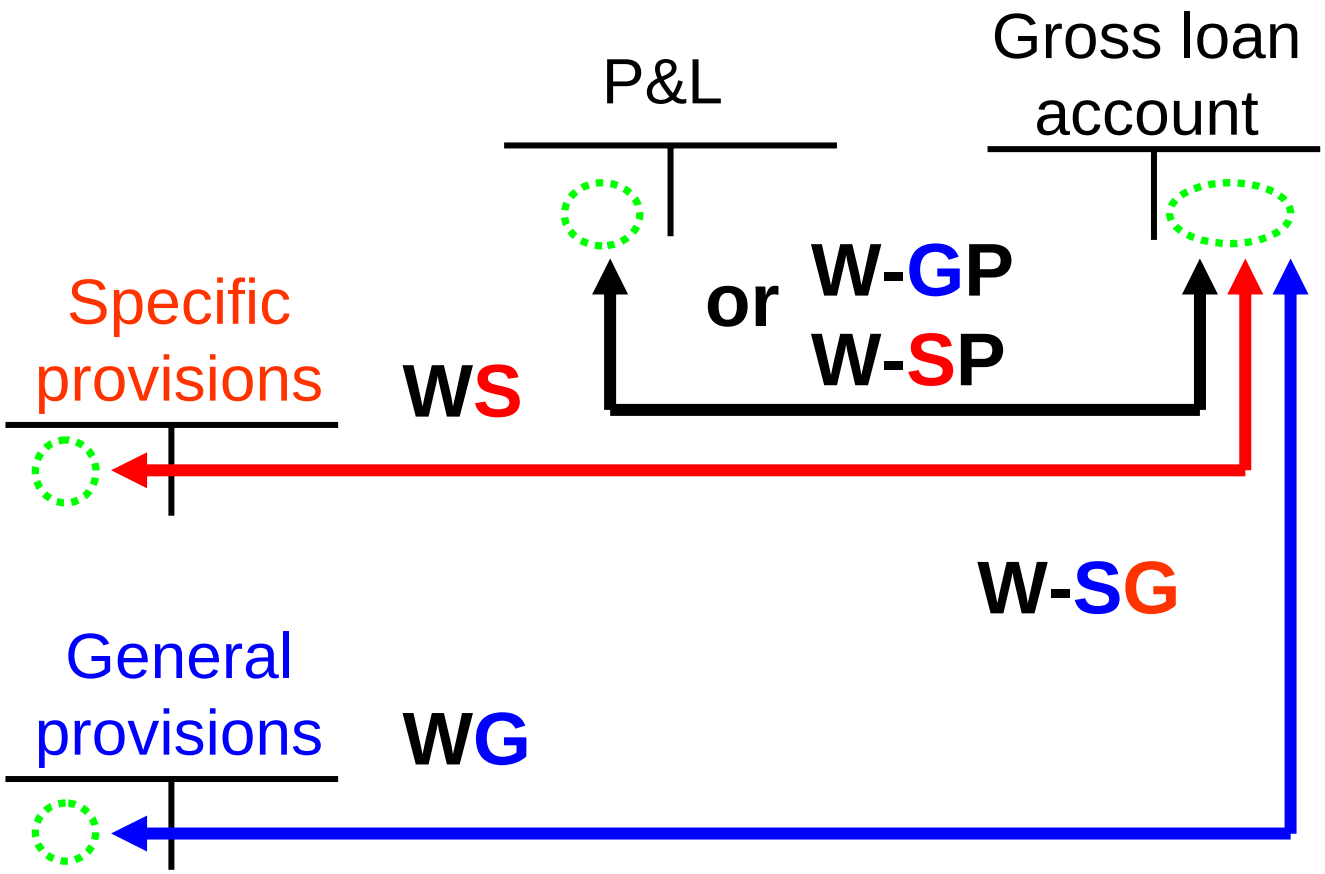
Typology: Write-offs



Note: only more frequent types shown on this slide

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Typology: Recoveries

- Recoveries shown in …
  - Not shown RO
  - Specific provisions account RS
  - General provisions account RG
  - Combined provisions acct. RC
  - P&L account RP
  - Both provision accounts R-SG

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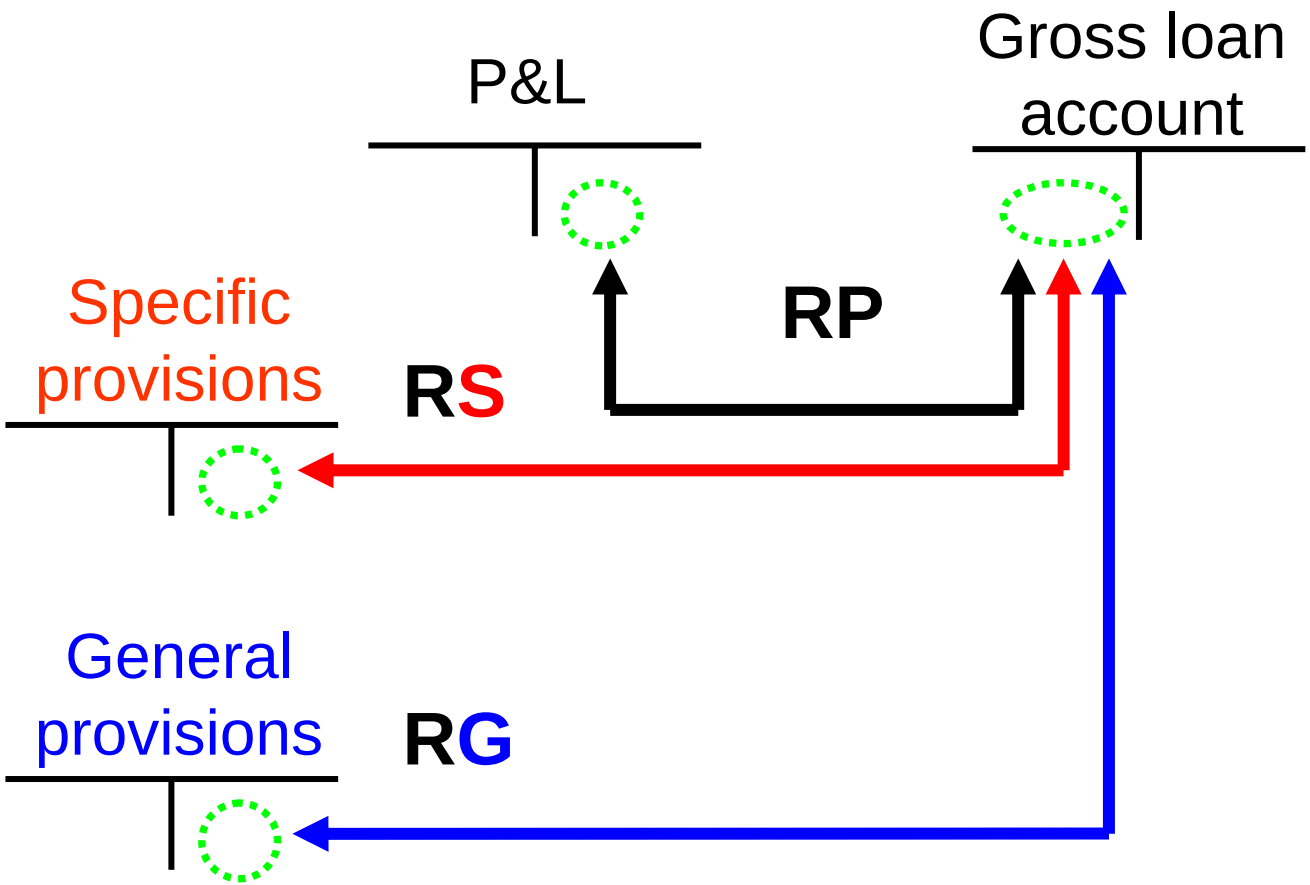
Typology: Recoveries



Note: only more frequent types shown on this slide

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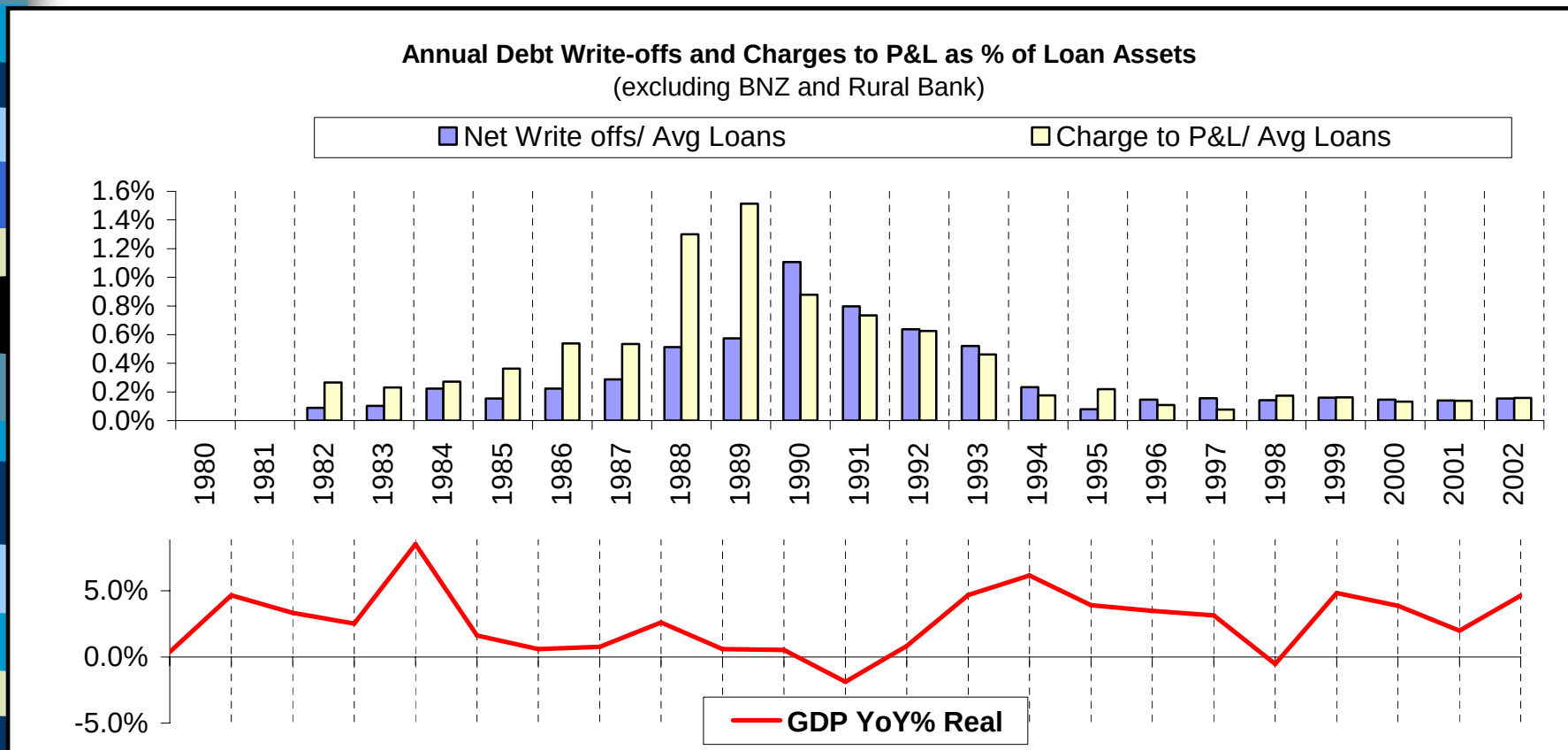
Credit Losses and GDP Growth

(New Zealand Banks)

Provisioning/write-off behaviour correlated to macro factors



Note: chart for NZ Bank sub-sample only

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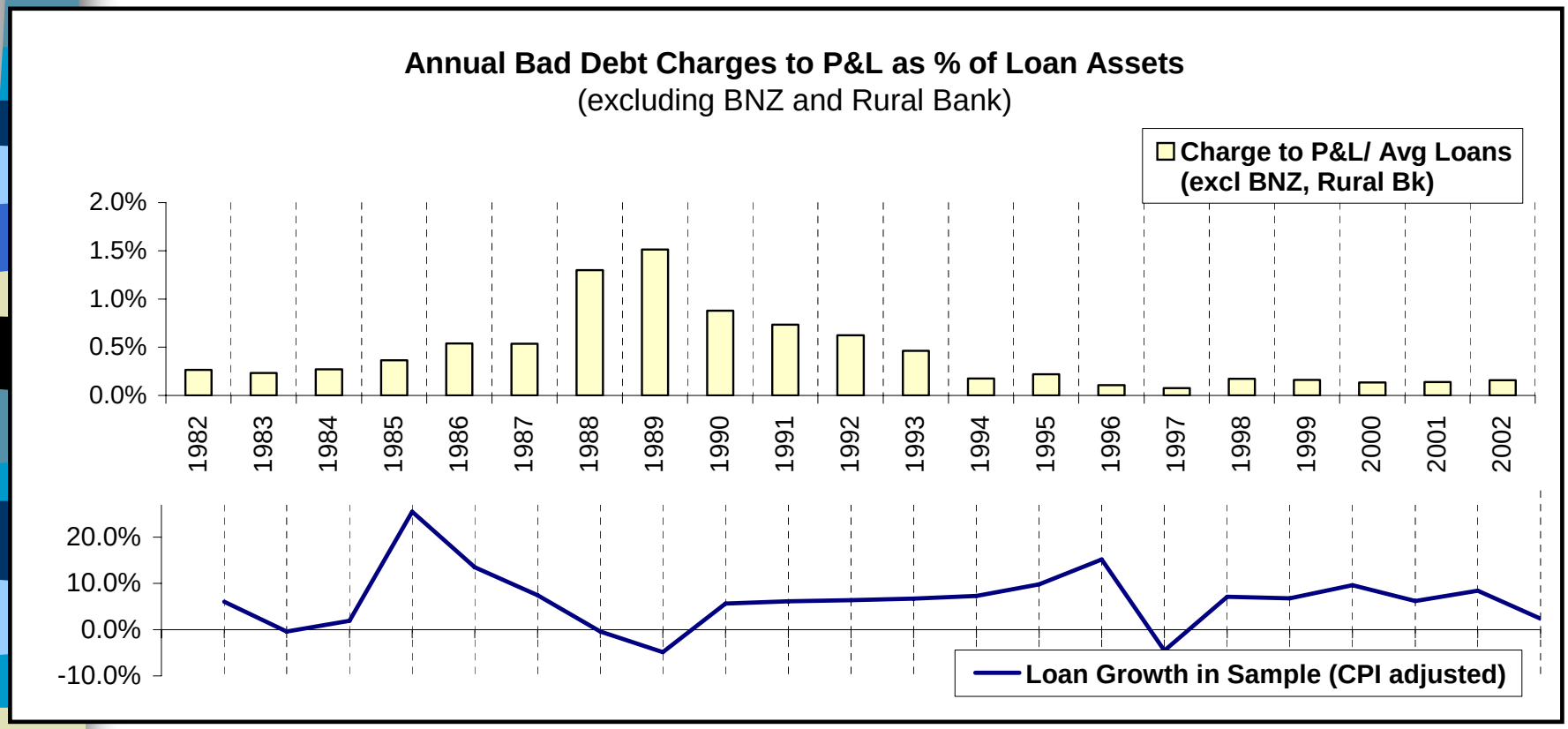
Credit Losses and Past Loan Growth (New Zealand Banks)

Loan growth is the seed for later credit losses (Keeton 1999)



Note: chart for NZ Bank sub-sample only

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Credit Loss Experience of Australasian Banks

Selected References

Selected References

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