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Abstract

This paper empirically examines key factors that may affect mortgage yield spreads of banks and mortgage corporations in Australia, and analyses changes of lender credit policy. Literature and the recent sub-prime crisis suggest that three key factor (lender criteria, funding channel and housing price) are relevant to yield spreads. Using a large unique dataset, this paper is the first to examine these three variables together and relaxation of lender credit criteria. Regression findings suggest that credit criteria, funding channels and housing price changes are significantly associated with yield spreads. The analysis also indicates that lenders considerably relaxed their credit policy for the research period. The findings are consistent with the literature related to each variable and add new evidence to existing research.

JEL classification: G21; E43

Keywords: Credit policy; Mortgage yield spreads; Market default risk; Funding channel

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1 Introduction

How mortgages are financed in a cost efficient way has increasingly concerned banking regulators and policymakers as mortgage costs have played a very important role in improving a national economy, quality of living and in particular housing affordability. According to the statistics of Reserve Bank of Australia (2008), mortgage outstanding by December 2007 reached $916 billion (2008). That means that a 20-basis point reduction (0.20%) should lead to nearly $2 billion mortgage cost savings for the borrower per year. In addition, mortgage is the single largest asset of Australian major banks. Therefore, without understanding precisely what factors affect mortgage costs or pricing may cost multi billion dollars for borrowers and lenders, and lead to inappropriate decisions made by banking regulators and policymakers. This is significant as is the impact of home lending on borrowers, lenders and the economy as a whole. Therefore, any analysis that provides insights into mortgage costs in this paper is of wider economic relevance.

Particularly, in the wake of the recent sub-prime crisis in the U.S., this issue has attracted a widespread attention by banking regulators, lenders, borrowers, the public and academic alike. As the Australian market in some ways mirrors U.S. and the crisis is an accumulative result for a few decades, findings in this paper should shed new light for banking regulators and policymakers on understanding lender risk taking behaviour for the research period.

There are at least three key issues that emerge from the recent sub-prime crunch and affect mortgage costs: lender credit policy; securitization; and housing price. This paper examines the three factors together that may affect mortgage costs in terms of yield spreads in an Australian context. This research should yield a significant implication for and considerably interest banking regulators, borrowers, lenders and the general public by understanding the three key factors' effects on mortgage costs. From the three perspectives, we review key literature that is mostly linked to the issue contained in this paper.

Lender credit criteria are traditionally regarded as the most important factor in assessing the loan application. A large number of studies (mostly theoretical in nature) address the importance of the design of lending contract due to information asymmetry between the lender and the borrower. Literature that examines the relation between loan spreads and risk characteristics of loans and borrowers generally follows two paradigms with different assumptions about a lender's ability to access the information of borrower's individual risk. The first paradigm assumes that borrower's risk can be observed, referred to as the "sorting-by-observed risk paradigm" discussed by Berger and Udell (1990) when they test the relation between collateral and credit risk in commercial and industry loans. Observably risky borrowers are required to pledge collateral while observably safe borrowers are not. In contrast, if borrowers' risk is not observable, several theoretical studies focus on private information about credit risk and prepayment risk known only to the borrower. A contract has to be designed in a way by which credit sorting with interest rate and/or non interest rate would be

effective, referred to as "the sorting-by-private information paradigm". A number of studies on the relationship between collateral and borrower quality find that safer borrowers are more likely to pledge collateral (e.g., Chan and Kanatas, 1985; Bester, 1985; Besanko and Thakor, 1987; Jiméneza et al, 2006). Chan and Kanatas (1985) and Bester (1985) find that collateral can play a sorting role across borrower types when collateralization is expensive. Under this paradigm, Stiglitz and Weiss (1981), Bester (1985) and Ben-Shahar (2006) predict that both the loan spread and other non-rate terms could be important screening devices for both credit sorting and credit rationing. Besanko and Thakor (1987) note that loan size, collateral and interest rates would be used in combination if the wealth constraints of debtors become binding. Empirical studies on mortgage yield spreads (e.g., Hendershott and Shilling, 1989; Ambrose et al., 2004 and 2005; Kau, 2005; Liu and Skully, 2005) use loan-to-value ratio (LTV) and loan size in testing models for credit risk. Also LTV and loan size in the U.S. are considered as two key factors in defining whether a loan is a conforming or a jumbo.

For the research period Australian banks[1] funded themselves mainly through the deposit-taking channel while mortgage corporations securitize nearly 100% of their assets in capital markets. Since the mid-1990s, securitization has allowed mortgage corporations to establish in Australia and to securitize their loans for raising cheaper funds and then lending them to borrowers. The whole recycling process enables them to grow quickly by providing new products (currently about 2,000 products in the market). A number of studies discuss potential benefits (or advantages) associated with the securitization funding channel from various perspectives (e.g., Berger and Udell, 1993; Schwarcz, 1994; Hill, 1997; Gorton and Pennacchi, 1995; Iacobucci and Winter, 2005; DeMarzo, 2005). Liquidity-based theory suggests: (1) Overall mortgage marketability and liquidity are improved through securitization (e.g., Black et al., 1981; Gorton and, Pennacchi, 1995); (2) The process of securitization changes the nature of assets (e.g., Schwarcz, 1994; Hill, 1997), transforming illiquid assets (e.g., mortgages) into marketable securities; (3) Security designs with pooling and tranching enhance asset liquidity (e.g., DeMarzo, 2005), reallocating cash flows, risks and information; and (4) Banks' liquidity positions are strengthened (e.g. Berger and Udell, 1993). Funding cost studies (e.g., Hill, 1997; Schwarcz, 1994; Iacobucci and Winter, 2005; Gorton and Souleles, 2005) indicate that securitization's purpose is to low funding costs for the firm by separating the originator's receivables via securitization from its associated risks. Moreover, researchers (e.g., Greenbaum and Thakor, 1987) support the view that securitization banks can reduce their reserve, capital requirements and deposit insurance premium, known as "regulatory tax".

The above mentioned cost effects in theory are reflected in mortgage costs. Empirical work of securitization on yield spreads follows two broad approaches. The first approach (e.g., Black et al., 1980; Naranjo and Toevs, 2002) uses time series data to test effects of securitization over time. The

1 For this research period banks just started their securitization programs and securitized their loans at a very small scale (less than 5% of their total assets).

second approach uses lenders or loans level data to investigate securitization's effects on originator pricing behavior (e.g., Hendershott and Shilling, 1989; Ambrose et al, 2004). Using different U.S. datasets they consistently find that mortgage banks that securitize their assets have lower mortgage rates or spreads than depository institutions. However, empirical research exclusively focuses on U.S. markets and mainly examines the effects of government sponsored enterprises on mortgage costs except for Liu and Skully (2005) who use 2001Australian lender data only.

This paper also considers the housing price in model test that proxies for the market condition. According to option-based default models, several researchers use housing price to estimate the probability of defaults or explain the default behaviour (e.g., Quercia and Stegman 1992; Capozza et al, 1997; Hayre, 2008). When the value of collateral increases the bank reassesses the risk of loss on the loan and accordingly adjusts the loss and risk component in the lending margin. A rise in housing pricing means that the value of bank collateral has increased (see Kau et al, 1994). In effect, reduction in lending margin may reflect the increase of the collateral value. Empirical studies on the relation between default risk and housing prices are very well documented in Quercia and Stegman (1992). They (p. 375) review 29 empirical studies over a 30-year period and conclude: "Consistently, home equity, or the related measure of loan-to-value ratio, has been to influence the default decision…". Similarly, Kau et al (1994, p. 287) conclude: "There exists a significant literature examining causes of default…considerable empirical evidence exists showing that it is the house versus the mortgage value, rather than such personal characteristics as the home borrower's liquidity position, that explains default.". Capozza et al (1997), Ambrose et al (2004) and Kau (2005) use housing price as a key variable in testing mortgage yield spreads.

This paper contributes to the literature and distinguishes itself from previous research in several dimensions as almost all existing research used U.S. data and concentrated in the U.S. markets. It is the first examination of the three factors in an Australian context. It uses such a unique and large monthly mortgage dataset of all the banks and mortgage corporations that operated in Australia for the research period from 1997 to 2000. It is also the first to bring together the three factors in the same model in Australia where no government agency is directly involved in the secondary mortgage market. In addition, it is the first to analyse the changes of lender credit criteria-a factor that has been blamed for the recent sub-prime default in the U.S. in terms of relaxing credit standards.

We identify three key research questions based on the above mentioned literature: (1) Are lender credit criteria are relevant to mortgage yield spreads? (2) Do funding channels (banks heavily rely on deposit-based model while mortgage corporations virtually depends on securitization) affect yield spreads significantly? (3) Does the change in housing price affect lender pricing policy? To answer these three questions, we develop regression models to test monthly standard mortgage rates and all types of fee data with 2508 observations of all the banks and mortgage corporations and analyze distributions of lender credit criteria as well. The empirical results confirm our hypotheses. Namely,

this paper evidences the significance for the three key factors (credit criteria, funding channel and housing price) relevant to yield spreads.

The rest of this paper is organized as follows. In Section 2 we report data and methodology. Section 3 analyzes distributions of lender criteria of all banks and mortgage corporations. In section 4 we conduct empirical tests and discuss the results. The conclusions are drawn in Section 5.

2 Data and Methodology

2.1 Data

The data for mortgage price and credit criteria contains 2504 observations of standard adjustable mortgages (owner-occupied home loans) from January 1997 to December in 2000 for all the banks and mortgage corporations in Australia. Reasons to select the dataset for this period include: (1) Mortgage data of lenders is available; (2) There was no big market-wide event for this period and thus, this will allow us to test the data more accurately; (3) For this research period banks just started their securitization programs and securitized their loans at a very small scale (less than 5% of their total assets) and so this allows us to compare these two types of lenders more effectively; (4) No prior research using such data can be found and so this provides a opportunity for us to conduct the research.

The monthly dataset is gathered from Cannex's monthly survey of Australian lenders. To make data comparable across lenders only standard products of residential mortgages (see details in Table 1), excluding other purpose loans, are used. The dataset includes nominal interest rates and annualized average percentage rate (AAPR)[2] that considers all kinds of fees and uses standard calculations required under Australian Uniform Consumer Credit Code (UCCC)[3]. The AAPR is regarded as a benchmark for comparing mortgage products in Australia. In addition we use mortgage yield spreads, rather than interest rates, following the prior literature (e.g., Black et al., 1981; Ambrose et al, 2004 and 2005; 1998; Liu et al 2005 and 2008) as this can overcome the impact of inflation and adjustments of monetary policy over time. Data of yields of 90-day bank-accepted bills are collected from Statistics of the Reserve Bank of Australia (RBA), and national housing price index data from Australian Bureau of Statistics (ABS).

2.2 Variables and Models Determination

2More information is available at CANNEX website at www.cannex.com.au. The calculations of the AAPR consider all the kinds of upfront fees (e.g., documentation fees, valuation fees, application fees) and ongoing service fees. Other parameters in the AAPR include loan amount and maturity into its calculations.

3 More detailed information about the UCCC can be found at an Australian government website:

http://www.creditcode.gov.au.

The dependent variables that are both the nominal and effective yield spreads of banks and mortgage corporations are calculated from the differences between standard ARMs' nominal and AAPR rates and 90-day bank bill rates at time *t*. The approach is often used by the RBA, the banking industry, most mortgage pricing research and Australian authors (e.g., Kumar and Ralston, 1999; Liu et al, 2005 and 2008) that take the 90-day bank bill rates as the industry benchmark to measure relative or margin costs. Table 1 defines all the variables used for regression model tests. This paper uses similar methodologies that can be found in literature (e.g., Hendershott and Shilling, 1989; Ambrose et al., 2004 and 2005; and Liu et al, 2005). In addition, this paper examines adjustable rate mortgages only as majority of home loans (about 80%) are originated with a variable rate.

We test the relation of both nominal and effective mortgage yield spreads to lender credit criteria, funding channel and the market condition variable respectively as these perspective variables are regarded as mostly relevant to yield spreads in literature. Cross-sectional regression model (hereafter called Model 1) of the following form is estimated:

$$\begin{aligned} YSPi = {} & \alpha_0 + \alpha_1 BANK_i + \alpha_2 \mathbf{MCORP}_i + \alpha_3 \mathbf{NomaxL}_i + \alpha_4 \mathbf{MaxL1m}_i + \alpha_5 MaxL1m75_i + \alpha_6 MaxL7550_i \\ & + \alpha_7 MaxL50_i + MinL60_i + \alpha_8 MinL6050_i + \alpha_9 MinL5040_i + \alpha_{10} MinL4030_i + \alpha_{11} MinL3020_i \\ & + \alpha_{12} \mathbf{MinL2010}_i + \alpha_{13} \mathbf{MinL10}_i + \alpha_{14} \mathbf{LVR80}_i + \alpha_{15} LVR8078_i + \alpha_{16} LVR7775_i + \alpha_{17} LVR75_i \\ & + \alpha_{18} Term_i + \alpha_{19} \Delta house_i + e_i \qquad (1) \end{aligned}$$

YSP (the dependent variable) is the bank monthly yield spreads over the benchmark, including nominal and effective yield spreads of all banks and most mortgage corporations for the research periods with a total observation of 2504 (see details in Table 1). The independent variables are: lender types for funding channels; maximum loan sizes, minimum loan sizes and loan to value ratios at which borrowers are required to buy mortgage insurance from a private mortgage insurer, loan terms; the change in housing price index proxing for the market condition. We control the variables in bold that are NomaxL and MaxL1m in maximum loan, $MinL2010_i$ and MinL10 in minimum loan, and LVR80 in loan to value ratio.

Lender credit criteria are traditionally regarded as the most important factor in assessing the loan applications. A large number of literature (mostly theoretical in nature) addresses the importance of the design of lending contract due to information asymmetry between the lender and borrower. Literature on the relation between loan spreads and risk characteristics of loans and borrowers generally follow two paradigms with different assumptions about a lender's ability to access the information of borrower's individual risk. The first paradigm assumes that borrower's risk can be observed, referred to as "sorting-by-observed risk paradigm" by Berger and Udell[4] (1990). In contrast, much theoretical studies focus on private information about credit risk and prepayment risk known only to the borrowers (e.g., Besanko and Thakor, 1987; Stiglitz and Weiss, 1981; 1990; Ben-Shahar,

4 They test the relation between collateral and credit risk in C&I loans. .

2006). They predict that both the loan spread and other non-rate terms could be important screening devices for both credit sorting and credit rationing. Besanko and Thakor (1987) note that loan size, collateral and interest rates would be used in combination if the wealth constraints of debtors become binding.

Empirical studies (e.g., Hendershott and Shilling, 1989; Ambrose et al., 2004 and 2005; Kau, 2005) use loan-to-value ratio (LTV) and loan size in testing models for credit risk. LTV and loan size in the U.S. are considered as two key factors in defining whether a loan is conforming or jumbo. We employ the approach by dividing maximum loan size into five groups (see Table 2) in which a positive relationship between yield spreads and larger loans is expected. In addition, the loan to value ratio (LVR) at which a borrower is required to purchase mortgage insurance is also considered. We divide LVR into four groups. Most of lenders in the dataset require borrowers to purchase mortgage insurance if LTV exceeds 80% (see distributions in Table 3).

We also expect that minimum loans of credit criteria will incur additional costs to the lender because such loans do not have economies of scales or have higher transaction costs (see discussions in Benston, 1992; Hill, 1997; Liu et al, 2005). Benston (1992)

Table 1

Definitions of variables used for regression models and credit criteria comparisons between banks and mortgage corporations

Short form	Definition
NYSP	Standard monthly adjustable interest rates over 90-day bill rates
EYSP	Effective monthly adjustable interest rates over 90-day bill rates
BANK	All banks operated in Australia from 1997 to 2000
MCORP	Major mortgage corporations operated from 1997 to 2000
LVR80	Purchase mortgage insurance required LVR>80%
LVR8078	Purchase mortgage insurance required d 80%≤LVR≥78%
LVR7775	Purchase mortgage insurance required 77%≤LVR≥75%
LVR75	Purchase mortgage insurance required LVR<75%
MaxLTV90	Maximum LTV> 90%
MaxLTV9085	90%≤ maximum LTV ≥85%
MaxLTV80	Maximum LTV<85%
MinL60	Minimum loan ≥ $60,000
MinL6050	$60,000 < minimum loan ≥ $50,000
MinL5040	$50,000 < minimum loan ≥ $40,000
MinL4030	$40,000 < minimum loan ≥ $30,000
MinL3020	$30,000 < minimum loan ≥ $20,000
MinL2010	$20,000 < minimum loan ≥ $10,000
MinL10	Minimum loan <$$10,000
NomaxL	No maximum loan required by the lender
MaxL1m	Maximum loans ≥ $1,000,000
MaxL1m75	$1,000,000<maximum loans ≥$750,000
MaxL7550	$750,000<maximum loans ≥$500,000
MaxL50	Maximum loans < $500,000
Term3029	Loan terms from 29 to 30 years
Term2827	Loan terms from 27 to 28 years

Term2625	Loan terms from 25 to 26 years
Term25	Loan terms from < 25 years
Term	Loan terms from 20 to 30 years
Δhouse	Housing price index changes (first difference)
Mon*i*	Seasonal effect proxied by month from January to December

notes the costs of loan standardization that borrowers with less standardizable financing needs will have to pay a premium for loans tailored for their needs and borrowers who whish flexibility during the loan term also will have to pay more (see more discussions in Liu et al, 2005). We divide minimum loans into seven categories (see Table 1) to test whether lenders price them differently.

Based on liquidity premium theory, longer term to maturity requires a liquidity premium to compensate for holding a loan that has a longer team to maturity. A positive relationship is expected between loan term and the yield spreads (e.g., Hendershott and Shilling, 1989; Ambrose et al., 2005). Therefore, Model 1 also considers the relation of contracted term to maturity to yield spreads.

Funding channels for banks and mortgage corporations in Australia are very different for the research period. Since 1990, mortgage corporations were established and securitised their loans (nearly 100%) in both the domestic and global capital markets for raising cheaper funds and then lending them to borrowers. The whole recycling process allows them to grow quickly and compete with banks (see Kumar and Ralston, 1999; Liu et al, 2008). In contrast, banks heavily relied on deposit-taking mode. Some studies empirically examine the effects of securitization on mortgage yield spreads (Black et al., 1981; Hendershott and Shilling, 1989; Sirmans and Benjamin, 1994; Ambrose et al. 2004; Liu et al, 2005). They consistently find that mortgage banks that securitize their assets have lower mortgage rates or spreads than those of depository institutions. Based on the literature (e.g., Hendershott and Shilling, 1989; Ambrose et al. 2004; Liu et al, 2005) Model 1 tests funding channels by lender type dummy.

In addition, according to option-based default models, several researchers use housing price to estimate the probability of defaults (Quercia and Stegman 1992; Capozza et al, 1997; Hayre, 2008). A rise in housing pricing means that the value of bank collateral has increased (see Kau et al, 1994). In effect, reduction in lending margin may reflect the increase of the collateral value. Empirical studies on the relationship between default risk and housing prices are very well documented in Quercia and Stegman (1992). They (p. 375) review 29 empirical studies over a 30-year period and conclude: "Consistently, home equity, or the related measure of loan-to-value ratio, has been to influence the default decision…". Similarly, Kau et al (1994, p. 287) conclude: "There exists a significant literature examining causes of default…considerable empirical evidence exists showing that it is the house versus the mortgage value, rather than such personal characteristics as the homeborrower's liquidity position, that explain default.". Capozza et al (1997), Ambrose et al (2004) and Kau (2005) use the

housing price as a key variable in testing mortgage yield spreads. We consider the change of national housing price index (first difference) in Model 1 proxing for the market condition.

Several authors in the literature use months or quarters for testing seasonal effects on mortgage yield spreads (e.g., Hendershott and Shilling, 1989; Naranjo and Toevs, 2002; Ambrose et al., 2004 and 2005). Replacing the housing price variable in Model 1 with seasonal variables (months)[5], we utilise the following regression (called Model 2) for testing pooled data for all the four years and an individual year respectively:

$$\begin{aligned} YSP_i = {} & \beta_0 + \beta_1 BANK_i + \beta_2 \mathbf{MCORP}_i + \beta_3 \mathbf{NomaxL}_i + \beta_4 \mathbf{MaxL1m}_i + \beta_5 MaxL1m75_i + \beta_6 MaxL7550_i \\ & + \beta_7 MaxL50_i + \beta_8 MinL60_i + \beta_9 MinL6050_i + \beta_{10} MinL5040_i + \beta_{11} MinL4030_i + \alpha_{12} MinL3020_i \\ & + \beta_{13} \mathbf{MinL2010}_i + \beta_{14} \mathbf{MinL10}_i + \beta_{15} \mathbf{LVR80}_i + \beta_{16} LVR8078_i + \beta_{17} LVR7775_i + \beta_{18} LVR75_i \\ & + \beta_{19} Term_i + \beta_i \sum mon_{ji} + e_i \end{aligned} \quad (2)$$

YSP (yield spreads, the dependent variable) is the bank monthly yield spreads over the benchmark, including nominal and effective yield spreads of all banks and most mortgage corporations for the research periods with a total observation of 2504 (see details in Table 1). The independent variables are: lender types for funding channels; maximum loan sizes, minimum loan sizes and loan to value ratios at which borrowers are required to buy mortgage insurance from a private mortgage insurer, loan terms; months as seasonal effects. We control the variables in bold that are NomaxL and MaxL1m in maximum loan, $MinL2010_i$ and MinL10 in minimum loan, and LVR80 in loan to value ratio; and February in seasons.

2.3 Correlations of Variables in Model 1 and Model 2

In order to make estimated results more reliable and robust, the potential multicollinearity among the independent variables is examined. The initial step is to test the degree of correlations between independent variables in Model 1 and Model 2. Almost all the variables in these two models have very low correlation coefficients (most are below 0.100). We further test the variance inflationary factors (VIFs) to detect collinear variables. All VIFs for Model 1 and Model 2 are very low (almost all are below 2), far below 5, so that the multicollinearity problem is further proved not to be substantial. Because the correlation tables and VIFs tables cover over four pages long they are excluded from this paper due to space constraints.

3 Comparative Analysis of Lender Credit Criteria

Table 2 reports minimum and maximum loan distributions in banks and mortgage corporations' credit policies from 1997 to 2000. To compare changes of loan size for the four years, their values are adjusted for quarterly inflations. In the maximum loan distribution, on average for the four years,

5 Because seasonal variables and the housing price variable have a high degree of correlation, we consider them in separate models (Model 1 and Model 2).

mortgage corporations have 29.27% of no maximum loan required (NomaxL) and 14% of larger than $1 million dollar (MaxL1m). Most of their loans concentrate in between $1 million and 0.5 million dollars (22.62% and 25.31% respectively). In contrast, banks have 74.16% of no maximum loan required (NomaxL) and 4.72% % of larger than $1 million dollar

Table 2

Minimum Loan and Maximum Loan Distributions in Credit Policy of All Banks and Most Mortgage Corporations

This table reports minimum and maximum loan distributions in banks and mortgage corporations' credit policies from 1997 to 2000. The sample includes all the banks and mortgage corporations that operated in Australia for the research period. Minimum loans (MinL) are divided into seven categories while maximum loans (MaxL) are classified into five groups (see their definitions in Table 1). The classifications are mainly based on existing research (e.g., Hendershott and Shilling, 1989; Ambrose et al, 2004; Liu and Skully, 2005). Minimum loans represent lender transaction costs whereas maximum loans proxy for a perspective of credit risk that are considered in lender credit policy.

Lender Type/Year	MinL60	Min6050	MinL5040	MinL4030	MinL3020	MinL2010	MinL10	No of Obs.
Mortgage Corp.1997	12.30%	55.74%	15.98%	0.00%	4.51%	11.48%	0.00%	244
Mortgage Corp.1998	10.98%	51.22%	17.99%	4.57%	1.83%	11.89%	1.52%	329
Mortgage Corp.1999	14.10%	43.08%	14.87%	11.28%	0.00%	9.49%	7.18%	390
Mortgage Corp.2000	9.82%	39.96%	16.96%	12.05%	0.89%	9.82%	10.49%	448
Average	11.80%	47.50%	16.45%	6.98%	1.81%	10.67%	4.80%	353
Bank 1997	6.30%	13.70%	8.89%	0.00%	8.89%	22.96%	39.26%	269
Bank 1998	5.56%	16.67%	10.37%	0.00%	8.89%	27.41%	31.11%	270
Bank 1999	8.63%	16.19%	12.95%	0.00%	9.71%	33.81%	18.71%	278
Bank 2000	5.23%	19.16%	12.89%	0.00%	10.80%	32.40%	19.51%	287
Average	6.43%	16.43%	11.28%	0.00%	9.57%	29.15%	27.15%	276
Lender Type/Year	**NomaxL**	**MaxL1m**	**MaxL1m75**	**MaxL7550**	**MaxL50**			**No of Obs.**
Mortgage Corp.1997	13.11%	11.89%	17.62%	39.34%	18.03%	~	~	329
Mortgage Corp.1998	22.19%	14.89%	25.23%	29.48%	8.21%	~	~	390
Mortgage Corp.1999	35.13%	16.15%	26.41%	17.69%	4.62%	~	~	448
Mortgage Corp.2000	46.65%	16.07%	21.21%	14.73%	1.34%	~	~	353
Average	29.27%	14.75%	22.62%	25.31%	8.05%	~	~	269
Bank 1997	69.52%	5.95%	8.55%	11.52%	4.46%	~	~	269
Bank 1998	76.67%	4.44%	8.89%	7.04%	2.96%	~	~	270
Bank 1999	75.18%	4.32%	8.27%	12.23%	0.00%	~	~	278
Bank 2000	75.26%	4.18%	11.15%	9.41%	0.00%	~	~	287
Average	74.16%	4.72%	9.22%	10.05%	1.86%	~	~	276

Table 3

Distributions of Loan to Value Ratio, Maximum Loan to Value Ratio, and Terms in Credit Policy of All Banks and Most Mortgage Corporations

This table reports distributions of loan to value ratio (LVR) and maximum loan to value ratio (MaxLTV) in banks and mortgage corporations' credit policies from 1997 to 2000. The sample includes all the banks and mortgage corporations that operated in Australia for the research period. The LVRs at which borrowers are required to buy mortgage insurance from a private mortgage insurer are divided into four categories while MaxLTVs are classified into three groups (see their definitions in Table 1). The classifications are mainly based on existing research (e.g., Hendershott and Shilling, 1989; Ambrose et al, 2004; Liu and Skully, 2005). Both of them may affect mortgage pricing as a part of credit risk considered in lender credit policy. In addition, according to the liquidity premium theory, the term of loan may impact on yield spreads (see Hendershott and Shilling, 1989).

Lender Type/Year	**LVR80**	**LVR8078**	**LVR7775**	**LVR75**	**No of Obs.**
Mortgage Corp.1997	9.02%	25.41%	53.28%	12.30%	329
Mortgage Corp.1998	10.98%	42.99%	43.29%	2.74%	390
Mortgage Corp.1999	9.49%	52.05%	35.64%	2.82%	448
Mortgage Corp.2000	7.90%	71.78%	16.25%	4.06%	353
Average	9.34%	48.06%	37.12%	5.48%	269
Bank 1997	16.73%	56.51%	20.07%	6.69%	269
Bank 1998	12.96%	67.41%	15.19%	4.44%	270
Bank 1999	12.95%	72.30%	12.95%	1.80%	278
Bank 2000	13.94%	79.44%	6.62%	0.00%	287
Average	14.14%	68.91%	13.71%	3.23%	276
	MaxLTV90	MaxLTV9085	MaxLTV85		No of Obs.
Mortgage Corp.1997	20.90%	79.10%	0.00%	~	329
Mortgage Corp.1998	34.35%	65.65%	0.00%	~	390
Mortgage Corp.1999	55.38%	44.62%	0.00%	~	448
Mortgage Corp.2000	67.19%	32.37%	0.45%	~	353
Average	44.46%	55.43%	0.11%	~	269
Bank 1997	71.85%	21.85%	6.30%	~	269
Bank 1998	65.19%	28.52%	6.30%	~	270
Bank 1999	60.07%	35.61%	4.32%	~	278
Bank 2000	67.60%	25.09%	7.32%	~	287
Average	66.18%	27.77%	6.06%	~	276
	Term3029	Term2827	Term2625	Term25	No of Obs.
Mortgage Corp.1997	27.05%	4.92%	63.11%	4.92%	329
Mortgage Corp.1998	38.72%	3.66%	53.96%	3.66%	390
Mortgage Corp.1999	41.79%	5.38%	49.74%	3.08%	448
Mortgage Corp.2000	45.54%	5.36%	47.99%	1.12%	353
Average	38.27%	4.83%	53.70%	3.19%	269
Bank 1997	43.07%	0.75%	53.93%	2.25%	269
Bank 1998	52.06%	0.75%	47.19%	0.00%	270
Bank 1999	49.64%	3.24%	46.40%	0.72%	278
Bank 2000	49.83%	4.53%	45.30%	0.35%	287
Average	48.65%	2.32%	48.21%	0.83%	276

(MaxL1m). This should indicate that banks design much more flexible credit policy and make riskier loans than mortgage corporations. The difference may be because the mortgage corporations securitize their loans and must meet rating agency requirements (see discussions in Hill, 1997;

Ambrose. 2004; and Liu et al, 2005). In addition, both types of the lenders over the period increased the proportion of no maximum loan required (NomaxL), from 13.11% to 46.65% for mortgage corporations, and from 69.52% to 75.26% for banks. This indicates that both of them, particularly the former, take more risk and relaxed their credit standards over the period.

As shown in Table 2 for the minimum loan, MinL60 and MinL6050 constitute 11.80% and 47.50%, totaling 59.30% for mortgage corporations, while 6.43% and 16.43%, totaling just 22.86% for banks. However, banks concentrated their loans in below $20,000 with a total of 56.30%. This suggests that banks designed more flexible credit policy and would be costly as smaller loans in credit criteria will add additional costs to the lender because such loans do not have economies of scales or have high transaction costs. Benston (1992) notes the costs of loan standardization that borrowers with less standardizable financing needs will have to pay a premium for loans tailored for their needs and borrowers who whish flexibility during the loan term also will have to pay more (see more discussions in Hill, 1997; Liu et al, 2005). Mortgage corporations that wish to securitize their mortgage loans must satisfy standardized origination procedures designed by rating agencies. This means that they may do not have a high degree of small loans and so have lower costs.

As shown in Table 3 for the loan to value ratio distribution, banks required higher LVR to purchase mortgage insurance, with 14.14% of LTV80 and 68.91% of LTV8078 on average, than mortgage corporations with 9.34% and 48.06%. This again suggests that banks designed riskier credit policy than the later group. More interestingly, both types of lenders dramatically lift the ratios, from 56.51% of LVR8078 to 79.44% for banks, and from 25.41% to 71.78% for mortgage corporations. As securitized their loans that are originated by mortgage corporations must satisfied credit rating standards of credit ratings agencies, the results also suggest that rating agencies relaxed their rating criteria over the time.

In addition (see Table 3), similarly, banks originated loans with higher MaxLTV90 (66.18% on average) than mortgage corporations (44.46%). Both groups concentrate their maximum LTVs on MaxLTV90 and Max LTV9085. Surprisingly, mortgage corporations considerably increased MaxLTV90 from 20.90% to 67.19% to catch up with those of banks for this period. It can be interpreted that mortgage corporations take more credit risk by modifying their maximum LTV policy. In Table 3, we also consider variations of term to maturity for the two group lenders. Bank loans have longer terms (48.65% of Term3029) than mortgage corporations (38.27%). For this research period, both groups' loans increased their term to maturity, from 27.05% to 45.54% of Term3029 for mortgage corporations and from 43.07% to 49.83% for banks.

4 Empirical Results and Discussions

In this section we report and discuss empirical results to answer the three questions. As shown in Panels A and B of Table 4 for Model 1, when controlling NomaxL (No maximum loan required) and

MaxL1m (Maximum loans ≥ $1,000,000), all other three groups (MaxL1m75, MaxL7550 and MaxL50) are negatively related to both nominal and effective yield spreads respectively with the 1% level of significance. MaxL50 (Maximum loans < $500,000) has 14.5 basis points in Panel A and 17.9 basis points in Panel B cheaper than the reference. The 3.4 basis point difference is due to fees charged by the lender. MaxL1m75 ($1,000,000<maximum loans ≥$750,000) and MaxL7550 ($750,000<maximum loans ≥$500,000) require 8.5 and 8.6 basis points in Panel A and 9.1 and 11.0 basis points in Panel B cheaper than the control variable. These results suggest that lenders require credit risk premium for making larger loans because of a perceived higher credit risk. In addition, as shown in Table 2, both mortgage corporations and banks designed a credit policy of no loan cap requirement with a cost as found above.

In the same Model 1, when controlling LVR80 (insurance required LVR>80%), LVR8078 (insurance required 80%≤LVR≥78%) are negatively associated with both spreads in Panels A and B at the 1% level of significance. As loan to value ratio (LVR) represents another perspective of credit risk in addition to loan size, the lender requires additional costs to the borrower due to higher potential credit risk. As shown in Table 3, majority of mortgage corporations and banks (48.06% and 79.44% on average respectively) set their LVRs at LVR8078 and considerably increased them to 71.78% and 79.44% from below the two categories (LVR7775 and LVR75) for the research period. However, even though LVR7775 and LVR75 should be safer than the reference (LVR80), they are not significant to the spreads. The results above may

Table 4

Regression Relating Yield Spreads to Credit Criteria, Funding Channel and Housing Price

This table reports the regression result of the relation of both nominal and effective mortgage yield spreads to lender credit criteria, funding channel and the market condition variable respectively. Cross-sectional regression of the following form (Model 1) is estimated:

$$YSP_i = \alpha_0 + \alpha_1 BANK_i + \alpha_2 \mathbf{MCORP}_i + \alpha_3 \mathbf{NomaxL}_i + \alpha_4 \mathbf{MaxL1m}_i + \alpha_5 MaxL1m75_i + \alpha_6 MaxL7550_i + \alpha_7 MaxL50_i + MinL60_i + \alpha_8 MinL6050_i + \alpha_9 MinL5040_i + \alpha_{10} MinL4030_i + \alpha_{11} MinL3020_i + \alpha_{12} \mathbf{MinL2010}_i + \alpha_{13} \mathbf{MinL10}_i + \alpha_{14} \mathbf{LVR80}_i + \alpha_{15} LVR8078_i + \alpha_{16} LVR7775_i + \alpha_{17} LVR75_i + \alpha_{18} Term_i + \alpha_{19} \Delta house_i + e_i$$

YSP (the dependent variable) is the bank monthly yield spreads over the benchmark, including nominal and effective yield spreads of all banks and most mortgage corporations for the research periods with a total observation of 2504 (see details in Table 1). The independent variables are: lender types for funding channels; maximum loan sizes, minimum loan sizes and loan to value ratios at which borrowers are required to buy mortgage insurance from a private mortgage insurer, loan terms; the change in housing price index proxing for the market condition. We control the variables in bold that are NomaxL and MaxL1m in maximum loan, $MinL2010_i$ and MinL10 in minimum loan, and LVR80 in loan to value ratio.

	Panel A: Nominal Yield Spreads		Panel B: Effective Yield Spreads	
Exp.Variables	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	1.490	18.953[a]	1.527	19.226[a]
BANK	0.242	15.771[a]	0.250	16.152[a]
MaxL1m75	-0.085	-3.880[a]	-0.091	-4.073[a]
MaxL7550	-0.086	-4.107[a]	-0.110	-5.182[a]
MaxL50	-0.145	-4.110[a]	-0.179	-5.000[a]
MinL60	-0.150	-5.553[a]	-0.129	-4.728[a]
MinL6050	-0.070	-3.434[a]	-0.079	-3.845[a]
MinL5040	-0.052	-2.212[b]	-0.066	-2.794[b]
MinL4030	-0.304	-8.222[a]	-0.302	-8.083[a]
MinL3020	-0.002	-0.064	0.045	1.412
LVR8078	-0.100	-4.703[a]	-0.090	-4.191[a]
LVR7775	-0.012	-0.457	0.011	0.445
LVR75	0.016	0.420	0.050	1.273
TERM	0.005	1.820[c]	0.008	2.909[a]
Δhouse	-0.056	-10.621[a]	-0.061	-11.402[a]
No. of obs.	2504		2504	
Adj. R-sqd.	0.264		0.285	
F-statistic	65.169		72.197	
p-value	0.000		0.000	

a, b, c denote the 1%, 5% and 10% levels of significance respectively.

be interpreted as to that: (1) as housing price in Australia steadily increased for the period, lenders perceived that loans with below 80% LVR are safer enough for credit risk[6]; (2) as rating agencies traditionally set 80% of LVR as a cut-off in deciding credit ratings (conforming or no-conforming) in securitization, lenders have incentives to lift LVR to LVR8078; and (3) the findings also imply that the lenders used pricing advantages associated with LVR8078 to encourage borrowers for taking riskier loans or punish for a safer loan with LVR7775 or LVR75. The above findings are consistent with literature (e.g., Stiglitz et al, 1981; Chan et al, 1985; Bester, 1985; Ambrose et al., 2004; Liu et al, 2005; Kau, 2005) with our additional findings.

Table 5

Regression Relating Yield Spreads to Credit Criteria, Funding Channels and Seasonal Effects

This table reports the regression result of the relation of both nominal and effective mortgage yield spreads to lender credit criteria, funding channel and the seasonal variable respectively. Cross-sectional regression of the following form (Model 2) is estimated:

$$YSP_i = \beta_0 + \beta_1 BANK_i + \beta_2 \mathbf{MCORP}_i + \beta_3 \mathbf{NomaxL}_i + \beta_4 \mathbf{MaxL1m}_i + \beta_5 MaxL1m75_i + \beta_6 MaxL7550_i + \beta_7 MaxL50_i + \beta_8 MinL60_i + \beta_9 MinL6050_i + \beta_{10} MinL5040_i + \beta_{11} MinL4030_i + \alpha_{12} MinL3020_i + \beta_{13} \mathbf{MinL2010}_i + \beta_{14} \mathbf{MinL10}_i + \beta_{15} \mathbf{LVR80}_i + \beta_{16} LVR8078_i + \beta_{17} LVR7775_i + \beta_{18} LVR75_i + \beta_{19} Term_i + \beta_i \sum mon_{ji} + e_i$$

6 The recent sub-prime mortgage crisis in the U.S. indicates that the 80% of LVR is not enough for absorbing default risk due to considerable drops in housing price.

YSP (the dependent variable) is the bank monthly yield spreads over the benchmark, including nominal and effective yield spreads of all banks and most mortgage corporations for the research periods with a total observation of 2504 (see details in Table 1). The independent variables are: lender types for funding channels; maximum loan sizes, minimum loan sizes and loan to value ratios at which borrowers are required to buy mortgage insurance from a private mortgage insurer, loan terms; months or quarters seasonal effects. We control the variables in bold that are NomaxL and MaxL1m in maximum loan, MinL2010_i and MinL10 in minimum loan, and LVR80 in loan to value ratio; and February in seasons.

	Panel C: Nominal Yield Spreads		Panel D: Effective Yield Spreads	
Exp. Variables	Coefficient	*t*-statistic	Coefficient	*t*-statistic
Intercept	1.472	18.003[a]	1.502	18.137[a]
BANK	0.244	15.627[a]	0.252	15.941[a]
MaxL1m75	-0.084	-3.741[a]	-0.088	-3.901[a]
MaxL7550	-0.082	-3.843[a]	-0.105	-4.882[a]
MaxL50	-0.128	-3.564[a]	-0.161	-4.422[a]
MinL60	-0.161	-5.860[a]	-0.140	-5.042[a]
MinL6050	-0.069	-3.329[a]	-0.078	-3.723[a]
MinL5040	-0.052	-2.210[b]	-0.066	-2.760[a]
MinL4030	-0.322	-8.569[a]	-0.321	-8.426[a]
MinL3020	0.006	0.196	0.053	1.633
LVR8078	-0.107	-4.939[a]	-0.096	-4.392[a]
LVR7775	-0.014	-0.536	0.009	0.359
LVR75	0.027	0.676	0.061	1.528
TERM	0.004	1.626	0.007	2.699[a]
mon1	-0.080	-2.515[b]	-0.078	-2.398[b]
mon3	-0.123	-3.765[a]	-0.126	-3.785[a]
mon4	-0.130	-4.109[a]	-0.133	-4.132[a]
mon5	-0.138	-4.345[a]	-0.141	-4.381[a]
mon6	-0.127	-4.040[a]	-0.128	-4.024[a]
mon7	-0.054	-1.714[c]	-0.055	-1.733[c]
mon8	-0.140	-4.599[a]	-0.137	-4.450[a]
mon9	-0.078	-2.401[b]	-0.079	-2.379[b]
mon10	-0.083	-2.636[b]	-0.105	-3.284[a]
mon11	-0.130	-4.150[a]	-0.152	-4.766[a]
mon12	-0.083	-2.636[b]	-0.102	-3.195[a]
No. of obs.	2504		2504	
Adj. R-sqd.	0.240		0.257	
F-statistic	33.903		37.049	
p-value	0.000		0.000	

a, b, c denote the 1%, 5% and 10% levels of significance respectively.

When controlling MinL2010 ($20,000 <minimum loan ≥ $10,000) and MinL10 (Minimum loan <$$10,000), the four groups (MinL60, MinL6050, MinL5040 and MinL4030) in Panels A and B of Table 4 are negatively significant to the spreads at the 1% level except for MinL5040 at the 5% level of significance. The results suggest that smaller loans require prices for additional costs. For example, MinL60 charged 15.15 and 12.9 basis points cheaper than the reference in Panels A and B. The findings are consistent with research (e.g., Benston, 1992; Hill, 1997; Liu et al, 2005). This has at least

two implications. Firstly, small dollar loans incur additional operational costs for lenders in terms of reduced economies of scale or having higher transactions costs. As borrowers may pay off such loans more quickly they may also increase prepayment risk. In either case additional costs mean that the lender prices the loan higher accordingly. In addition (in Model 1) we also find that the loan term (TERM) is positive to both spreads at the 10% and 5% levels respectively, consistent with research (e.g., Hendershott and Shilling, 1989). These results above answer our first research question on the relation between credit criteria and yield spreads.

Regarding the funding channels, in Panels A and B of Table 4, when controlling for mortgage corporations as the reference, banks are positively related to both yield spreads (nominal and effective) at the 1% level of significance. Banks charge 24.2 and 25.0 basis points respectively more than the reference. This result supports literature of securitization cost effects (e.g., Black et al., 1981; Schwarcz, 1994; Hill, 1997; Iacobucci and Winter, 2003). These are also consistent with empirical findings (e.g., Benjamin et al., 1994; Ambrose et al., 2004 and 2005; Liu et al, 2005). In addition, Hill (1997), and Iacobucci andWinter (2003) suggest that a securitization institution will develop more standardized products (e.g. terms, documentation and underwritings criteria) that are easier for the investors to assess. Therefore, securitization funding may help mortgage corporations standardize their credit criteria and thus save costs. As shown in Table 2, banks focus minimum loans below $20,000 (MinL2010 and MinL10) with over 55% while mortgage corporations center on over $50,000 with over 55%. The difference may contribute to bank costs. The regression results provide an answer to our second question and provide evidence of cost differentials due to lender funding channels.

To answer to our third research question on the relation between housing price (proxing for the market condition) and yield spreads, in Panels A and B of Table 4, we find that the changes of housing prices (Δhouse) are negatively associated with the two yield spreads at the 1% level of significance. This finding suggests that lender take into account housing prices to their prices for the market condition, consistent with a range of research (e.g., Quercia and Stegman, 1992, Capozza et al, 1997; Ambrose et al, 2004; Kau, 2005; Hayre, 2008). The finding suggests that a 10 increase (or decrease) in the quarterly housing price index could alone lead to 56 and 61 basis points reductions (or additions) of nominal and effective yield spreads respectively. The 5 basis points difference between the two spreads is the fee charge.

In Table 5 (Model 2), regarding the relation between credit criteria, funding channel and the two yield spreads, we derive very similar findings as those in Model 1. The results further answer our first two research questions. In Panels C and D of Table 5, when controlling February as seasonal effect reference, the months (mon 3, mon4, mon5, mon6, mon8 and mon11) are negatively significant to the two spreads at the 1%, level and all other months (mon1, mon9, mon10, mon12) at the 5 % level except for mon 7 at the 10% level. This suggests the summer month in Australia, February, is the most

expensive one. The result is consistent with some studies (e.g., Hendershott and Shilling, 1989; Naranjo and Toevs, 2002; Ambrose et al., 2004).

In addition to the pooled regression above, we test monthly lender data each year separately for the four years. Continuing the sorting-by-private information paradigm, we further interpret lender behavior to use credit criteria and interest rates as screening devices in assessing mortgages. Table 6 presents the results for 1997 and 1998 and Table 7 for 1999 and 2000. As shown in Panels E1 and E2 of Table 6, lenders consider maximum loan size as an important credit risk measure and charged higher prices for larger loans. Compared to the reference (controlling NomaxL and MaxL1m), all other three groups (MaxL1m75, MaxL7550 and MaxL50) are negatively significant to the two spreads at the 1% level, having 20.8, 26.3 and 34.8 basis points cheaper. For 1997, as shown in Table 2, the three groups (MaxL1m75,

Table 6
Regression Relating Yield Spreads to Credit Criteria and Funding Channels for 1997 and 1998

This table reports the regression result of the relation of both nominal and effective mortgage yield spreads to lender credit criteria, funding channel and the seasonal variable respectively. Cross-sectional regression of the following form (Model 2) is estimated:

$$YSP_i = \gamma_0 + \gamma_1 BANK_i + \gamma_2 \mathbf{MCORP}_i + \gamma_3 \mathbf{NomaxL}_i + \gamma_4 \mathbf{MaxL1m}_i + \gamma_5 MaxL1m75_i + \gamma_6 MaxL7550_i + \gamma_7 MaxL50_i + \gamma_8 MinL60_i + \gamma_9 MinL6050_i + \gamma_{10} MinL5040_i + \gamma_{11} MinL4030_i + \gamma_{12} MinL3020_i + \gamma_{13} \mathbf{MinL2010}_i + \gamma_{14} \mathbf{MinL10}_i + \gamma_{15} LVR80_i + \gamma_{16} \mathbf{LVR8078}_i + \gamma_{17} \mathbf{LVR7775}_i + \gamma_{18} \mathbf{LVR75}_i + \gamma_{19} Term_i + \gamma_i \sum mon_{ji} + e_i$$

YSP (the dependent variable) is the bank monthly yield spreads over the benchmark, including nominal and effective yield spreads of all banks and most mortgage corporations (see details in Table 1). The independent variables are: lender types for funding channels; maximum loan sizes, minimum loan sizes and loan to value ratios at which borrowers are required to buy mortgage insurance from a private mortgage insurer, loan terms; months or quarters seasonal effects. We control the variables in bold that are NomaxL and MaxL1m in maximum loan, $MinL2010_i$ and MinL10 in minimum loan; LVR below 80%; and February in seasons.

	1997				1998			
	Panel E1: NYSP		Panel E2: EYSP		Panel F1: NYSP		Panel F2: EYSP	
Exp. Variables	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept	1.817	14.271[a]	1.996	15.018[a]	1.511	18.759[a]	1.495	17.449[a]
BANK	0.150	5.859[a]	0.139	5.207[a]	0.208	12.800[a]	0.214	12.406[a]
MaxL1m75	-0.208	-4.658[a]	-0.242	-5.179[a]	-0.014	-0.671	-0.012	-0.531
MaxL7550	-0.263	-6.760[a]	-0.288	-7.103[a]	-0.120	-5.862[a]	-0.128	-5.853[a]
MaxL50	-0.348	-8.010[a]	-0.382	-8.407[a]	-0.164	-5.176[a]	-0.180	-5.354[a]
MinL60	-0.117	-2.407[b]	-0.159	-3.143[a]	-0.108	-3.657[a]	-0.086	-2.748[a]
MinL6050	-0.035	-0.858	-0.058	-1.355	-0.093	-4.613[a]	-0.116	-5.387[a]
MinL5040	0.040	0.881	0.042	0.890	-0.057	-2.370[b]	-0.074	-2.890[a]
MinL4030	-0.017	-0.382	-0.005	-0.104	-0.128	-2.767[b]	-0.135	-2.753[b]
MinL3020	0.014	0.447	0.021	0.621	-0.088	-2.712[b]	-0.052	-1.490
LVR80	0.006	1.372	0.004	0.768	0.094	4.441[a]	0.093	4.132[a]
TERM	0.123	2.409[b]	0.126	2.358[b]	0.002	0.787	0.007	2.568[b]
mon1	-0.490	-9.608[b]	-0.485	-9.100[a]	-0.022	-0.656	-0.019	-0.534
mon3	-0.477	-9.412[b]	-0.471	-8.894[a]	0.018	0.559	0.017	0.475
mon4	-0.335	-6.598[b]	-0.331	-6.255[a]	0.051	1.546	0.048	1.364
mon5	-0.152	-3.008[a]	-0.148	-2.811[b]	0.002	0.054	0.000	-0.007
mon6	-0.116	-2.304[b]	-0.115	-2.179[b]	-0.360	-11.015[a]	-0.365	-10.481[a]
mon7	-0.054	-1.095	-0.050	-0.971	-0.210	-6.445[a]	-0.213	-6.144[a]
mon8	-0.146	-2.854[a]	-0.139	-2.597[b]	-0.243	-7.511[a]	-0.247	-7.158[a]
mon9	-0.211	-4.206[a]	-0.203	-3.876[a]	-0.089	-2.730[a]	-0.082	-2.376[b]
mon10	-0.347	-6.931[a]	-0.332	-6.355[a]	-0.125	-3.861[a]	-0.130	-3.775[a]
mon11	-0.469	-9.432[a]	-0.448	-8.637[a]	-0.075	-2.312[b]	-0.076	-2.194[b]
mon12	-0.469	-9.432[a]	-0.448	-8.637[a]	-0.146	-4.498[a]	-0.149	-4.316[a]
No. of obs.	506		506		594		594	
Adj. R-sqd.	0.559		0.533		0.664		0.660	
F-statistic	31.52		26.551		54.373		53.462	
p-value	0.000		0.000		0.000		0.000	

a, b, c denote the 1%, 5% and 10% levels of significance respectively.

Table 7
Regression Relating Yield Spreads to Credit Criteria and Funding Channels for 1999 and 2000

This table reports the regression result of the relation of both nominal and effective mortgage yield spreads to lender credit criteria, funding channel and the seasonal variable respectively. Cross-sectional regression of the following form (Model 2) is estimated:

$$YSP_i = \omega_0 + \omega_1 BANK_i + \omega_2 \mathbf{MCORP}_i + \omega_3 \mathbf{NomaxL}_i + \omega_4 \mathbf{MaxL1m}_i + \omega_5 MaxL1m75_i + \omega_6 MaxL7550_i + \omega_7 MaxL50_i + \omega_8 MinL60_i + \omega_9 MinL6050_i + \omega_{10} MinL5040_i + \omega_{11} MinL4030_i + \omega_{12} MinL3020_i + \omega_{13} \mathbf{MinL2010}_i + \omega_{14} \mathbf{MinL10}_i + \omega_{15} LVR80_i + \omega_{16} \mathbf{LVR8078}_i + \omega_{17} \mathbf{LVR7775}_i + \omega_{18} \mathbf{LVR75}_i + \omega_{19} Term_i + \omega_i \sum mon_{ji} + e_i$$

YSP (the dependent variable) is monthly yield spreads over the benchmark, including nominal and effective yield spreads of all banks and most mortgage corporations (see details in Table 1). The independent variables are: lender types for funding channels; maximum loan sizes, minimum loan sizes and loan to value ratios at which borrowers are required to buy mortgage insurance from a private mortgage insurer, loan terms; months or quarters seasonal effects. We control the variables in bold that are NomaxL and MaxL1m in maximum loan, $MinL2010_i$ and MinL10 in minimum loan; LVR below 80%; and February in seasons.

	1999				2000			
	Panel G1: NYSP		Panel G1: EYSP		Panel H1: NYSP		Panel H2: EYSP	
Exp. Variables	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.	Coeff.	*t*-stat.
Intercept	1.335	14.368[a]	1.369	14.036[a]	0.810	7.908[a]	0.878	8.084[a]
BANK	0.203	10.860[a]	0.209	10.682[a]	0.242	12.308[a]	0.265	12.703[a]
MaxL1m75	-0.112	-4.880[a]	-0.099	-4.084[a]	-0.124	-4.606[a]	-0.128	-4.485[a]
MaxL7550	-0.194	-7.772[a]	-0.233	-8.866[a]	-0.147	-4.902[a]	-0.193	-6.089[a]
MaxL50	-0.257	-5.147[a]	-0.293	-5.598[a]	-0.808	-8.553[a]	-0.809	-8.090[a]
MinL60	-0.175	-6.040[a]	-0.164	-5.391[a]	-0.071	-2.017[b]	-0.050	-1.359
MinL6050	-0.122	-5.269[a]	-0.143	-5.901[a]	-0.058	-2.237[b]	-0.048	-1.740
MinL5040	-0.043	-1.589	-0.062	-2.173[b]	0.043	1.511	0.031	1.023
MinL4030	-0.211	-5.490[a]	-0.207	-5.141[a]	0.026	0.618	0.057	1.270
MinL3020	-0.007	-0.160	0.079	1.809	0.021	0.511	0.075	1.708
LVR80	0.081	3.180[a]	0.070	2.624[a]	0.069	2.444[b]	0.035	1.172
TERM	0.008	2.517[b]	0.012	3.529[a]	0.014	4.239[a]	0.017	4.589[a]
mon1	-0.005	-0.146	-0.005	-0.139	-0.327	-7.921[a]	-0.319	-7.303[a]
mon3	-0.006	-0.140	-0.009	-0.194	-0.053	-1.297	-0.056	-1.299
mon4	0.022	0.619	0.012	0.333	-0.177	-4.308[b]	-0.175	-4.012[a]
mon5	-0.087	-2.484[b]	-0.097	-2.655[b]	-0.180	-4.422[b]	-0.178	-4.119[a]
mon6	-0.168	-4.823[a]	-0.176	-4.815[a]	0.078	1.921	0.081	1.878
mon7	-0.117	-3.364[a]	-0.126	-3.429[a]	0.133	3.239[b]	0.137	3.147[a]
mon8	-0.144	-4.106[a]	-0.150	-4.068[a]	-0.097	-2.553[b]	-0.088	-2.177[b]
mon9	-0.231	-6.610[a]	-0.238	-6.492[a]	0.000	-0.005	-0.002	-0.043
mon10	-0.522	-15.026[a]	-0.532	-14.582[a]	0.176	4.282[a]	0.099	2.264[b]
mon11	-0.643	-18.530[a]	-0.654	-17.948[a]	0.261	6.394[a]	0.186	4.296[a]
mon12	-0.588	-16.900[a]	-0.598	-16.381[a]	0.396	9.653[a]	0.322	7.411[a]
No. of obs.	667		667		734		734	
Adj. R-sqd .	0.706		0.705		0.554		0.511	
F-statistic	73.841		73.490		42.368		35.82	
p-value	0.000		0.000		0.000		0.000	

a, b, c denote the 1%, 5% and 10% levels of significance respectively.

MaxL7550 and MaxL50) take 75% for mortgage corporations, but just 25% for banks. This further indicates that banks design more flexible and risk-induced credit policy than mortgage corporations. Therefore, banks charged 15 basis points more than the reference in 1997. For 1998, 1999 and 2000, there are very similar findings in Panels F1 and F2 of Table 6, Panels G1, G2, H1 and H2 of Table 7. In relation to LVR, for the four years in Tables 6 and 7, when controlling three smaller LVRs (LVR8078, LVR7775 and LVR75), LVR80 is positively significant to the two types of spreads except for 1997. As the loan size and LVR are regarded as two key credit risk measures, the results further crystallize that lenders charge higher price for larger size and higher LRV loans.

As shown in Tables 6 and 7, TREM are fund to be positively significant to the two spreads for these four years except for nominal spreads in 1998. This further supports the view that longer term loan are charged with a higher price. The findings are further consistent with existing research (e.g., Hendershott and Shilling, 1989). In the minimum loan policy, as shown in Panels F1 and F2 of Table 6, and Panels E1 and E2 of Table 7, the results for 1998 and 1999 suggest that larger minimum loans are negatively significant to the two yield spreads. This again indicates that smaller minimum loans are costly. This generally supports the view that smaller loans in lender minimum loan policy requires higher prices to compensate for such loans that have higher transaction cost.

Again, the results above are consistent with various literatures on the sorting-by-private information paradigm (e.g., Stiglitz et al, 1981; Chan et al, 1985; Bester, 1985) and empirical studies (e.g., Ambrose et al., 2004; Liu et al, 2005; Kau, 2005). The findings further answer our first research question on lender credit policy and yield spreads.

Regarding the funding channel question, Table 6 and Table 7 show that banks are consistently and positively related to the two yield spreads at the 1% level of significance each year for the four years. Compared to mortgage corporations banks charged over 20 basis points more except for 1997 (about 15 basis points). The findings are again consistent with literature (e.g., Schwarcz, 1994; Iacobucci and Winter, 2003; Benjamin et al., 1994; Ambrose et al., 2004).

5 Conclusion

We empirically examine, in the context of Australia, the effect on mortgage yields of three key factors that have played an important role in the recent sub-prime loans crisis in the US – lending criteria, funding channel, and housing prices. We undertake the investigation using a comprehensive data set, which comprises of 2,504 observations of standard adjustable mortgages from January 1997 to December 2000 for all banks and mortgage corporations in Australia. The study is the first of its kind, which analyses the impact on mortgage yields of the three factors together or simultaneously.

We find that all three variables significantly determine mortgage yields. Our results show that both banks and mortgage corporations significantly relaxed their lending criteria (in terms of higher loan valuation ratios, bigger loan sizes and longer term loans) over the years, most especially in the case of the latter. This has implications for rating agencies. As rating agencies evaluate the riskiness of securities issued by mortgage corporations, this finding implies that rating agencies may have also relaxed their rating criteria. We also find that mortgage corporations have significantly lower mortgage yields than banks, which implies that securitisation has led to lower costs of mortgages. Finally, our findings confirm that the value of collateral (housing prices) affect mortgage yields in an opposite way. Banks and mortgage corporations in Australia are therefore exposed to the risk of a downturn in the housing market.

Australian banks and mortgage corporations, most especially the latter, have significantly increased their risk exposure in housing mortgages over the years in terms of relaxing their lending criteria. Mortgage corporations, through securitisation, have been able to provide cheaper mortgages. Our findings reveal that banks and mortgage corporations are susceptible to a negative movement in the market. Thus, the lessons from the sub-prime crisis in the U.S. are applicable to the Australian market and should therefore be taken seriously by Australian regulators.

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