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The effect of interest rate changes on bank stock returns

Abstract

This study examines the effect of publicly announced changes in official interest rates on the stock returns of the major banks in Australia during the period from 1990 to 2005. Previous studies of such effects have reported inconclusive and mixed results. US evidence suggests that banking stocks are generally negatively (positively) impacted by increases (decreases) in official interest rates. We find, somewhat unexpectedly, that Australian bank stock returns are not negatively impacted by the announced increases in official interest rates. Furthermore, banks apparently experience net-positive abnormal returns when cash rates are increased, which is consistent with dividend valuation theory that suggests if income effects dominate, then stock returns need not be negatively impacted. We explain our findings by the fact that Australian banks, which operate in a less competitive and concentrated banking environment compared to the US, are able to advantageously manage earnings impacts when cash rate changes are announced.

Keywords: event study, interest rates, bank stock returns, monetary policy, dividend discount valuation model, optimal interest rate theory.

JEL Classification: E52, E58, G21.

Introduction

Developed country economies such as that of Australia have enjoyed a long period of relatively stable low interest rates, a growing economy and low unemployment during the period from 1993 to 2006, within the interval of our study. The banking industry in Australia has also undergone significant change during this period with the entry of foreign competition and deregulation. However, the industry is still less competitive than other developed economies such as the US. There are less than twelve banks offering a full range of services that are listed on the Australian Stock Exchange (ASX). Against this backdrop we investigate whether the effects on banking stock returns from interest rate changes are consistent with established theories of interest rate effects under competition.

The Reserve Bank of Australia (RBA)¹ uses the cash rate to affect interest rates, as its key lever for controlling inflation, in the context of ensuring economic growth and the stability of the banking system. The RBA adopted the practice of the publicized release of cash rate changes in January 1990 as part of a range of initiatives to improve financial market stability, and to increase the transparency of its monetary policy processes. Prior to this, cash rate targets were not announced but adjusted as and when needed, with limited public disclosure. This data set, available for the period under the new policy, provides an opportunity to test whether publicly

disclosed cash rate changes elicit negative or positive share price effects. We investigate the manner in which bank stock returns react to each cash rate change by the RBA, an issue that has not been studied by researchers. Interest rate changes affect operating returns and implicitly stock returns to varying degrees, this is particularly so for financial institutions such as banks.

A large number of studies, notably in the US, report that the share prices of banks are negatively affected by interest rate changes as predicted by Stone (1974). However, banks in less competitive environments with relatively greater market power may be able to benefit from interest rate changes. They do so by securing increased interest income (over and above the changes in deposit rates), and are thus likely to elicit a positive share price effect in the market. Coppel and Connolly (2003) report that inflation rate targeting (within a narrow range) became official policy in Australia in 1996, and the RBA has clearly demonstrated that it will use cash rates to manage inflation. Understanding the resultant impacts of these changes is useful as there is little reported evidence of the effects of these announced changes on bank stock returns. This is particularly true for the period following the entry of the foreign banks and the stable interest rate and good economic growth period of 1993 to 2005.

The RBA target cash rate represents the intended over-night borrowing rate that applies to banks transacting with the RBA for short-term funds. In practice, the target cash rate promulgated by the RBA, influences rates charged by banks between themselves in securing funds on a daily basis and thus affects the prevailing interest rates in the market (see Cook and Hahn, 1989; and Lowe, 1995). There have been some studies in Australia on the impacts of official interest rate changes on stock returns in general. Diggle and Brooks (2007) use the

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¹ The Reserve Bank of Australia is the independent authority responsible for managing monetary policy in Australia, with the objective of minimizing inflation, has been a key contributor to the stable economic performance of the Australian economy (RBA, 2005).

same modelling framework as Lowe (1995) on data over the period from 1990 to 2000 and find no evidence of industry effects, apart from in the Property Trusts and Tourism & Leisure sectors. Gasbarro and Monroe (2004) contrast the impact of official interest rate changes on stock returns in the period from 1986 to 1989 against the period from 1990 to 2001. Gasbarro and Monroe (2004) find no evidence of announcement date impacts on market returns, transport sector and banking sector returns in the latter period.

Kim and Nguyen (2008) consider the impacts of Australian and US monetary policy announcements over the period from 1998 to 2006 on the four largest banks and aggregate stock returns. They find evidence of policy surprise announcement day effects on both returns and volatility. Our analysis extends this previous Australian literature in the following ways. First, we have a sample period from 1990 to 2005, that covers the different periods considered by Gasbarro and Monroe (2004), Diggle and Brooks (2007) and Kim and Nguyen (2008). Second, we utilize a formal event study approach that examines an event window, in addition to the announcement day effects. Third, we consider a wider set of banking stocks. Fourth, we aim to provide a cross-sectional explanation for the differences in our results.

Stiglitz and Weiss (1981) suggest that under competition bank stocks lose value when the US Federal Reserve (Fed) increases discount rates. This has been explained as arising from sticky interest rates and increasing risks in a competitive US banking market. This implies official interest rate changes resulting in higher interest rates would attract more risky borrowers so that existing clientele would switch (if switching costs are trivial) to a bank that did not increase interest rates (a choice available if banking is competitive, since not all banks will change interest rates following the regulator's change). Thus banks have a constrained ability to effect changes in net interest margins due to competition. This suggests that as a consequence of operating impacts of changed interest rates, and thus their net interest margins, banks experience income variations thereby affecting stock returns. Ho and Saunders (1981) hypothesized the determinants of bank net interest margins on the basis that banks acted as risk-averse dealers whose main source of risk was from interest rate variability and were able to manage this by varying these margins depending on market structure.

Thus, the aim of this research is to identify any abnormal impact of cash rate announcements on banks' returns, and consider these results in the light

of those in the US. We examine the period of 1990 to 2005 and report the results using an event study following the approach in Campbell et al., (1997). We empirically examine cash rate change announcements involving adjustments to rates to measure the impact on banking stock returns. We show that the effect of these announcements is different to the US result, due to distinctive market characteristics.

This paper is organized as follows: Section 1 describes the Australian banking environment, Section 2 provides an overview of the literature, Section 3 describes the data and method employed, Section 4 discusses our findings and we conclude the paper in the last Section. Our findings are different to the US evidence and our results conform to the earnings valuation theory and the model of banks as risk averse agents. This study concludes that Australian banks operate in a different and less competitive environment than that of the US. Thus there is scope for banks to exercise greater control over income streams at the time of changes to interest rates. Therefore each change in rates, on average, provides an opportunity to benefit the earnings of banks, at least in the short term.

1. Australian banking environment

The Australian banking environment experienced significant changes both in its market structure and in regulations during the 1980s and 1990s. After deregulation from the early 1980s to the early 1990s the Australian economy experienced periods of high and volatile interest rates as well as a recession in 1991. This was in contrast to the favorable interest, inflation and unemployment rates as well as the continuous positive economic growth experienced during the subsequent period from 1993 to 2005.

The banking industry is characterized by a large concentration of market share held by four banks, whether measured by deposits, loans, or market capitalization. It was not until 1983 that financial markets were deregulated in Australia and limited competition from foreign banks was allowed thereafter. The deregulation included a raft of reforms such as the float of the Australian dollar, relaxed rules on capital retention and the introduction of more competition. Market changes in the late 1980s to early 1990s were embodied by the entry of a substantial number of foreign multinationals. In spite of this, the large domestic banks have been able to leverage their market position to minimize the impact of competition as evidenced by their significant growth in earnings and stock prices.

Panel A in Table 1 provides data to illustrate the extent of concentration in the Australian market

using the Herfindahl-Hirschman index¹ applied to 2004 data. This method is very commonly used by regulators, such as the US Commerce Department, to consider the anti-competitive implications of planned mergers and acquisitions in particular industries.

Table 1. Industry concentration.
Panel A

	No	%	Herfindahl-Hirschman Index
Four firm industry concentration	4	68	1,179
Event sample banks	10	82	1,231
All banks	51	100	1,251

Source: APRA (2005).

Panel B

Category	% of market	Sample banks (\$M)	All banks (\$M)
Assets	82%	1,040,768	1,264,697
Mortgage loans	91%	447,854	491,856
Other loans	81%	290,510	359,578
Total loans	87%	738,363	851,434
All mortgages as % of loans	58%		
Category (Big 4 banks)	% of market	Big 4 banks (\$M)	
Assets	68%	863,515	
Mortgage loans	76%	371,840	
Other loans	67%	242,710	
Total loans	72%	614,550	

Note: This table illustrates the relative concentration in the Australian Banking Industry. Panel A shows the Herfindahl Index for the top 4 banks. Panel B illustrates the market shares in loans and assets for banks in our sample as a percentage of the banking market. It also shows the relative value of those categories for the Big 4 banks

Despite deregulation, the “four pillars” policy, introduced to maintain viable banks and effective competition, has had the effect of limiting competition and promoting the safety of the top four banks. The Australian banking market with an index of 1251 in 2005 is moderately concentrated. However, this only provides a limited perspective and does not

indicate the extent of market power enjoyed by the larger participants. The 4 largest banks, namely the ANZ, Commonwealth, National Australia and Westpac banks hold a very large share of the market. Panel B of Table 1 provides basic information about the Australian banking market including assets, loans and advances and mortgages to give a better insight into the concentration in the market (APRA, 2005).

From Panel B of Table 1 it is clear that the largest 4 banks account for close to 76 percent of the mortgage market and the sample banks altogether account for 91 percent of all mortgages and 68 percent of assets. This may be contrasted with the US where 93 of 1,593 of the larger banks account for 68 percent of assets (Fed, 2006). Bank mortgages in the Australian market have a broader effect due to “lock-in” practices. Mortgager banks often require mortgagees to hold accounts with them and also offer bundled discount credit cards and other services. Refinancing charges are also relatively high so that mortgagees would incur non-trivial switching costs which along with other factors make these clients more ‘sticky’ to mortgager banks. In an interesting contrast, we find that the banks’ share of the business lending market is more consistent with their assets as they are not able to give effect to the same market power. Claessens and Laeven (2004) found that the Australian market, based on the H test, was characterized as one of monopolistic competitors with an index that suggested much less competition compared to most of the developed markets in their study.

In such an environment, banking clients incur non-trivial costs to switch from one bank to another, which are less likely in a more competitive environment. Domestic banks, have by virtue of their market power, are able to increase their non-interest income in the consumer market whilst reducing their share of such income in the business market due to greater competition.

2. Literature relevant to interest rate effects

Sharpe (1964) and Lintner (1965) in the Capital Asset Pricing Model (CAPM) provided us with a method for understanding returns and a firm’s systematic risk as measured by its relative sensitivity to market factors.

$$R_i = R_f + \beta_i(R_m - R_f), \quad (1)$$

where R_i represents the expected return on a security, R_f is the risk-free rate, β_i is the risk of the asset where $(R_m - R_f)$ is the market risk premium and R_m the market rate of return. In practice the interest rate on secure debt securities, such as government bonds

¹ The index is calculated by weighting each bank’s assets as a percent of the total market to indicate market share and is then squared, weighting the market share by the asset proportion. An index of less than 1000 implies low concentration whereas an index above 1000 but less than 2000 implies moderate concentration. An index above 2000 implies very high concentration such as an oligopoly and possibly approaching monopoly status.

is often used as the surrogate for the risk-free rate. Stone (1974) explained that there were variations in the cross sectional returns of securities that the CAPM was unable to explain using a single factor sensitivity. He introduced a second factor, in addition to a stock's beta, the interest rate sensitivity; and thus provided a model that allowed for the inclusion of interest rate impacted securities such as bonds and banking stocks to be better understood.

$$R_i = +\beta_i R_m + \theta_i R_d, \quad (2)$$

where θ_i represents the sensitivity of a security to the market debt index and R_d represents the return on the market debt index.

Stone's adaptation of the CAPM suggests that interest rate impacts on returns may be positive or negative depending on the nature of the interest rate sensitivity. Stone's work was built on and further enhanced by Lyngne and Zumwalt (1980) who found that interest rate sensitivity varied depending on the term of interest rates, namely short versus longer term interest rates. They found that stock returns of banks were more sensitive than non-financial stock returns; however, there were still significant extra-market and extra-interest rate effects that are unexplained. In addition, they also found that the sensitivity of bank stock returns had changed over time. Later work done by Ross (1976) in developing Arbitrage Pricing Theory (APT), provided for multifactor dependencies that included interest rates although it was not specifically targeted at considering bank stock returns.

We draw on three theories, in the CAPM context, to examine the expected impacts on banks stock returns in the face of announced interest rate changes: Stiglitz and Weiss (1981) Optimal Interest Rate Theory and Gordon (1962) Dividend Valuation Theory as well as Ho and Saunders (1981) theory of banks as risk averse dealers in the market for deposits and loans. Stiglitz and Weiss suggested that interest rates are sticky in a competitive credit environment, as bank profitability might not grow with increases in interest rates. This theory is based on the proposition that there are optimal interest rates that banks can charge where their profits are maximized, hence banks will ration funds and charge lower interest rates in accordance with that principle, rather than increase lending rates and capture the higher demand arising from the suggested market equilibrium. In other words, disequilibrium exists between the market-clearing rate and the actual rate charged on funds that is applicable if the banking system is competitive and not concentrated.

They postulated that a risk neutral borrower firm would be willing to undertake projects with a higher

probability of failure when interest rates increased. Banks typically endure asymmetric information about the nature of a borrowing firm's behavior and thus experience increased moral hazard problems brought about by higher interest rates, hence they prefer to ration their capital. They proposed that banks would rather ration lending, charging lower interest rates than the market would be willing to pay. Increasing interest rates causes existing, less risky clients, to switch banks but is likely to attract more risky, albeit higher interest rate business. In these circumstances, the additional risk inherent in such loans negatively offsets any gains from increased income from higher interest rates; this in turn reduces income and thus the value of bank stocks.

Interest rates are a primary input factor for investors expected returns in the context of alternative uses of their capital. We discuss the Dividend Valuation Model and the CAPM to show how interest rates taken together with investor risk perceptions, expected future earnings and growth rates, affect the valuation of banking stocks. Williams (1956) from his early work in the 1930s provided the linkage between earnings growth and valuations of stock returns, later simplified by Gordon in 1962 (Sorensen and Williamson, 1985). Gordon's Dividend Valuation Theory sometimes is criticized for its simplicity, but is often used for that very reason. The theory as explained by Hurley and Johnson (1994) in its simplest manifestation, suggests that the current value of a stock is determined according to the equation below:

$$V_{i0} = \frac{D_{i1}}{k_i - g_i}, \quad (3)$$

where V_{i0} is the value of the firm in the current period, D_{i1} is the dividend paid by the firm in the subsequent period, k_i is the firm's expected future return and g_i is its expected future growth.

Gordon (1962) suggests a formal relationship between a firm's value today (V_{i0}) with its dividends in the following period (D_{i1}), income growth rate (g_i) and interest rates which are reflected in the cost of capital (k_i). When interest rates increase, if expected returns on stocks are perceived to be negatively affected, then we may see capital flows to bond markets and other classes of securities. This is implied by the Dividend Model: depending on the timeframe *ceteris paribus*, the denominator " k " will increase when the interest rate increases, hence the impact of equation (3) is to have a negative effect on returns. However, why should that be negative if the interest rate changes are capable of creating higher earnings (thus more dividends) when the bank is a price setter under a less competitive banking environment?

Stone's adaptation of the CAPM in (2) suggests that, when interest rates change, markets will perceive changes as good or bad depending on the net effect on expected returns. If the risk-free rate of return is altered upward by interest rates and related sensitivities of bank stocks suggest a positive earnings impact; should the impact on expected returns be lower? In a less competitive market, an increase in interest rates may enable banks to pass on these costs leading to higher income, which as predicted by Gordon's Dividend Valuation Theory, should lead to an increase in stock returns. Furthermore, an increase in interest rates may have positive effects if future income is likely to increase by more than the cost of securing the funds, namely higher net interest margins which, as predicted by the same theory, should increase returns.

Ho and Saunders (1981) investigated the determinants of net interest margins of banks and proposed a model of banks as risk-averse dealers facilitating deposits and loans. In attempting to minimize the impact of the major source of risk, namely risk arising from interest volatility, they showed that banks managed net interest margins in the context of their market structure and management's aversion to risk. The idea is that banks are able to manage net interest margins to their advantage in the face of interest rate changes, when they have market power, namely when the banking industry lacks adequate competition. A study of the Australian market following the model of Ho and Saunders by Williams (2007), confirms that Australian banks are able to increase net interest margins and thus profitability as a consequence of increased market power.

Flannery and James examined, in more detail, the underlying factors for the sensitivity of stock returns to interest rates to understand the characteristics of banks that gave rise to this sensitivity (Flannery and James, 1984a). They confirmed the negative relationship of stock returns to interest rates whether short-term or long. They asserted that the mix of assets and liabilities with respect to maturity was a key factor in explaining sensitivity of stock returns to unexpected interest rate changes (Flannery and James, 1984a, b).

In Fama's seminal paper on efficient markets hypothesis (Fama, 1970), it is posited that stock prices reflect relevant information that is known about the stock in the market. So whilst economic indicators such as inflation or unemployment that signal problems in the economy, may influence the RBA to adjust interest rates; the market knowing this, is likely to have absorbed this information into stock prices; if the market is semi-strong form efficient. Kuttner (2001) examined the impact of surprise rate

changes and found that they have a significant measurable effect on the stock returns of banks. Using interest rate futures to proxy expectations, he showed that in the absence of surprises, changes in interest rates had limited effects, to the extent that information conveyed was similar to that already contained in other economic indicators or data. He also showed that the markets did not totally rely on the discount rate as an indicator of future expectations but also looked to other economic indicators. Accordingly, if there is no information value in the rate change announced by the RBA, we expect this will be evidenced by the lack of any measurable abnormal effects on the bank stock price. This implies that the target cash rate changes may have no significant direct impact on returns if there is limited "news" or surprise value. Bernanke and Kuttner (2005) examined the broader stock market and concluded that unexpected monetary policy actions prompted relatively strong and consistent responses by the stock market but only accounted for a small proportion of the overall variability in stock returns. In addition, they showed that responses to monetary policy differ across industry portfolios and are consistent with the predictions arising from the CAPM.

Coppel and Connolly (2003) show that, as a result of the RBA's open communication policy there has been a reduction in the volatility of interest rates and investors show a better anticipation of policy changes. They suggest that financial markets have become relatively efficient in interpreting economic data and policy announcements. A later study by Connolly and Kohler (2004) found that cash rate change announcements whilst important to markets, were always weighed in the context of other economic indicators in determining expectations of future interest rates. Macro-economic information was often seen as a better longer-term indicator, so that any RBA announcements were considered in the context of other pre-existing economic information. Additionally, the market paid attention, in a qualitative sense, to the commentary that came with the announcements and not just the quantitative value of the announced data. The impact of such events was even stronger when Australian economic news was augmented by US economic news.

Madura and Schnusenberg (2000) examined the interaction between the bank stock returns and the US Federal Reserve discount rate and found they were negatively related. Using a comprehensive methodology, the research showed that there was an asymmetric response in bank stock returns to changes in target rate. More specifically, increases in the target rate evoked a disproportionate response to decreases. Further, Madura demonstrated that the Fed rate change effect varied significantly depend-

ing on the size of banks concerned. A further important finding was that rate change impacts on stock returns were inversely related to the capital ratios of the banks studied.

Berger et al. (2004) and Beck et al. (2003) showed that market concentration and regulation are amongst the key variables that determine the stability and profitability of banks. A later study by Thorsten et al. (2006) confirmed that banks in countries with higher market concentration experienced lower likelihood of crisis and risks as well as better profitability. During the 1990s and early 2000s there has been considerable consolidation of banks globally, suggesting banks are able to manage risk better than in the past. Australia experienced some of this consolidation with the acquisition of smaller banks by the four larger banks. The government has employed the "four pillars" policy that has since discouraged further consolidation of the larger banks to encourage competition. This has however, strongly entrenched national distribution of the older established participants giving them strong market power in the retail market but less power in the business or corporate market.

Berg and Kim (1998) have observed significant differences in bank operating practices due to asymmetries in market power between retail and corporate banking activities. Differences in the power of consumers and "stickiness" of retail customers in Australia compared to the US may explain differences in the sensitivity of bank stock returns. This has also impacted the ability of new entrant foreign firms to advance into the retail segment. Consequently, the "four pillar" banks are able to achieve favorable rate spreads in these segments, with positive impacts on their profitability.

Bikker and Haaf (2002) showed that banking concentration impaired competitiveness and a few large, cartel like banks, were able to limit the competitive impact of smaller fringe players and new entrants. Their study although focused on Europe, included Australia for limited comparative purposes. Williams (2002) examined the relative profitability and competitive participation of foreign banks in Australia and found that they faced reduced profits in retail banking, effectively experiencing an entry barrier. As a result, foreign banks did not compete in all segments, with competition being greatest in the wholesale and corporate sectors. Dennis and Jeffrey (2002), using data from the period from 1981 to 1993, report that in Australia bank returns are not adversely affected by rising interest rates.

Berg and Kim (1998) found that banks are more accommodating to competition in corporate markets than retail markets. This is a similar situation in

Australia due to the limited power of consumers to negotiate and may be a point of difference with the US. This suggests that banks may be able to increase returns as per Gordon's Dividend Valuation Theory contrasting US studies. If, based on Gordon's model, bank stock returns do not decrease with interest rate increases; it contrasts Stiglitz-Weiss theory which suggests the opposite. Prima facie, we expect different effects on banking stock returns due to fundamental differences in industry competitiveness between the Australian and US markets.

Since the RBA was officially sanctioned with the specific objective of managing the inflation rate in a target range of 2-3 percent it has actively practiced a philosophy of transparency on its policy mechanisms and motivations. Fama (1970) in his Efficient Markets Hypothesis suggests that stock prices should reflect all available information known to impact a stock. This means that in an environment of transparent monetary policy, the market anticipates potential rate changes returns and impute their altered valuation perspectives in stock prices, so that announcements produce few surprises.

We expect that as a result of market power enjoyed by the sampled local banks arising from Australian market conditions, bank stocks would not be adversely affected by cash rate increases (decreases) in interest rates in the short term. Due to the established practices arising from this market power, customers that try to switch banks experience non-trivial costs and thus sticky deposits and loans (Bikker and Haaf, 2002). This in turn enables banks to pass on the adverse affects of interest rate changes to customers and minimize the negative effects on their margins due to competition. Thus we would not expect to observe sustained negative impacts from cash-rate change announcements as measured by abnormal bank stock returns. Additionally we expect limited effects to be measurable on the announcement day consistent with the view that the rate change itself would be anticipated by a semi-strong form efficient market (Fama, 1970).

The following is a formal statement of hypotheses to be tested:

H1: The cumulative abnormal returns of the selected banks' stock returns will be negatively (positively) affected by RBA announced increases (decreases) in cash rates.

This implies that Australian banks operate in a competitive industry and behave in a manner expected under Stiglitz-Weiss theory, namely that banks will be adversely impacted by increases and positively affected by decreases (Stiglitz and Weiss, 1981). If this is not the case, it provides evidence of a less competitive market that enables banks to manage earnings to compensate for risks arising from up-

ward movements in interest rates and vice versa. Consistent with Gordon's theory, the market perceives that banks are able to improve their returns allowing for cost of funds, and shield themselves from adverse effects when cash rates increases are announced by the RBA.

We expect to observe significant abnormal returns for bank stocks in the days prior to the announcement due to reported views in the media and anticipation effects arising from the availability of other economic data as well as previously communicated monetary policy statements of the RBA so that there will be limited surprises. Therefore, the rate change itself may only be a surprise if it is contrary or in excess of pent-up expectations of change, albeit with some adjustment to the initial anticipated effects on returns, once the announcement information content is absorbed.

H2: The market will exhibit strong anticipatory effects and significant abnormal returns will be measured in the days leading to the event with little or no significance in the post event period.

Madura showed that there is an asymmetric response to changes in the Federal Reserve target rate (Madura and Schnusenberg, 2000). Do bank stock returns in Australia exhibit asymmetric impacts; namely do increases in the target rate elicit a disproportionate response to decreases?

H3: Bank stock returns have asymmetric responses to changes in interest rates affected by the RBA's policy.

Lynge and Zumwalt (1980) found that stock returns of banks were more sensitive than non-financial stocks but there were still significant extra-market and extra-interest rate effects that were unexplained. In addition, they also found that the sensitivity of bank stock returns had changed over time.

H4: The stock returns of non-financial stocks will not be significantly impacted by RBA announcements.

We expect to measure the impact of these cash rate changes, by examining the average abnormal and the cumulative abnormal returns of the common stock prices of non-financial stocks using an index of their daily returns. As for bank stocks, abnormal returns are examined in the days preceding and following the announcement of a rate change by the RBA.

3. Data and method

The source for stock and index data was Thomson DataStream whilst the cash rate data were sourced from the RBA website (RBA, 2005). There were approximately 51 banks in Australia in the study

period, 11 of which are listed on the Australian Stock Exchange (ASX). Banks that were merged, de-listed or wound up during the period of our study, January 1990 to June 2005, have not been examined as they are not useful for comparisons over this period. New banks that had started operations after 2000, such as the AMP bank, were also excluded; additionally, specialist merchant banks and small mortgage lenders were excluded. We also left out foreign banks as their operations in Australia represent too small a proportion of their total business to have a material impact on their stock returns in their home country stock market.

Furthermore, we also undertook an analysis of the stock market index of non-financial firms to provide a contrast for our banking stock results. We obtained daily index data, for the same period as the banks, on the following non-financial industry sectors, namely: Food, Health, Insurance, Industrial, Media, Mining, Retail and Staples. Daily data are used for the event study to ensure the abnormal return wealth effect is measurable on a day by day basis, so that the timing of the response to the cash rate change can be observed. In addition it allows us to examine identified movements in our results, in the context of other events that may overlap following (Campbell et al. (1997)).

We obtained RBA cash-rate change announcements, identified the dates of rate target announcements, and also examined them to ascertain the direction of changes in these rates. Table 2 lists the event dates used for our study. The Australian market underwent a total of 27 downward rate changes and 13 upward rate changes during the sample period. Events were grouped into increase or decrease events and overlapping event windows were removed from the sample. The end result was that our cross-section size comprised 33 events partitioned into decreases (23) and increases (10) impacting on 10 banks: this provides a satisfactory number of observations for inference purposes. Our study was able to examine the period of 1990 to 2005 with observations in our sub-samples exceeding 95 observations.

Table 2. RBA cash rate change event dates (event calendar)

Date	Rate change	Rate	Type
23/01/1990	-1.00%	17.50%	Decrease
4/04/1990	-1.50%	15.00%	Decrease
2/08/1990	-1.00%	14.00%	Decrease
15/10/1990	-1.00%	13.00%	Decrease
18/12/1990	-1.00%	12.00%	Decrease
4/04/1991	-0.50%	11.50%	Decrease

Table 2 (cont.). RBA cash rate change event dates (event calendar)

Date	Rate change	Rate	Type
16/05/1991	-1.00%	10.50%	Decrease
3/09/1991	-1.00%	9.50%	Decrease
6/11/1991	-1.00%	8.50%	Decrease
8/01/1992	-1.00%	7.50%	Decrease
6/05/1992	-1.00%	6.50%	Decrease
8/07/1992	-0.75%	5.75%	Decrease
23/03/1993	-0.50%	5.25%	Decrease
30/07/1993	-0.50%	4.75%	Decrease
17/08/1994	0.75%	5.50%	Increase
24/10/1994	1.00%	6.50%	Increase
14/12/1994	1.00%	7.50%	Increase
31/07/1996	-0.50%	7.00%	Decrease
11/12/1996	-0.50%	6.00%	Decrease
23/05/1997	-0.50%	5.50%	Decrease
30/07/1997	-0.50%	5.00%	Decrease
2/12/1998	-0.25%	4.75%	Decrease
3/11/1999	0.25%	5.00%	Increase
2/02/2000	0.50%	5.50%	Increase
3/05/2000	0.25%	6.00%	Increase
2/08/2000	0.25%	6.25%	Increase
7/02/2001	-0.50%	5.75%	Decrease
4/04/2001	-0.50%	5.00%	Decrease
3/10/2001	-0.25%	4.50%	Decrease
5/12/2001	-0.25%	4.25%	Decrease
8/05/2002	0.25%	4.50%	Increase
5/11/2003	0.25%	5.00%	Increase
2/03/2005	0.25%	5.50%	Increase

Note: The data in this table are the announcement dates of the RBA cash rate changes when this practice commenced in January 1990 and constitutes our event calendar. We have excluded 7 announcements due to overlapping event windows leaving a total of 33 events, 10 increases and 23 decreases in the target cash rate.

To ensure the validity of our measured responses to RBA rate change events, we needed to consider the impact of other common or clustered events contemporaneous to these rate changes. These announcements also signal expectations about inflation and so need to be considered with other macro-economic announcements, as suggested by Connolly and Kohler (2004), thus they may substitute for the information value of cash rate change announcements. We examined the CPI and other announcements made regularly by the Australian Bureau of Statistics, only two of the announcements occurred on the same day as the RBA's announcements, namely on the May 6th, 2002 and November 13th,

2003. These two events were checked for their impact on our results by excluding them initially and as they did not alter the significance of our findings the events were included.

Coincident "shock" events such as September 11th, 2001 or announcements of other economic indicators may also cause innovations in returns. We investigated all stocks in our sample for event contamination by checking coincident announcements and other shock inducing events in the press. We considered the significance or otherwise of regular announcements such as annual reports, profit warnings and other reports and announcements to the market. Additionally, we examined all firm specific announcements for our sampled firms, potentially impacting the event window, using the Dow Jones Factiva database. This included non-financial and financial announcements. We found that most of these announcements made by the companies were not price sensitive to the extent they would cause shocks. Most announcements were anticipated such as earnings reports that are required under continuous disclosure rules of the stock exchange. There were no surprise or shock announcements as such, in our judgement, sufficiently major to eliminate them from a particular event in our sample.

Thus we feel that our sampling and data analysis approach mitigated contamination effects having examined over 33 events (after elimination of problem events) for 10 banks. Due to the length of our estimation windows and the number of events and stocks used, no significant distorting effects of other individual events were found with the exception of the September 11th, 2001 terrorist attack. Whilst that particular event was controlled for and had an impact, it did not alter the overall significance of our results.

To determine the impact of cash rate changes on bank stock returns, we employed the market model, event study methodology following Brown and Warner (1985), Boehmer et al. (1991) as well as Campbell et al. (1997). The method involves calculating expected returns from a period just prior to the event (the estimation period) and comparing this to the actual returns observed at the time of the announcements (the event period) to determine abnormal returns.

Event windows were chosen after an examination of the literature to consider the efficiency by which the market absorbs news regarding cash rate changes (Coppel and Connolly, 2003). We also examined the financial press for chatter regarding interest rates in the weeks preceding rate change events. The foregoing suggested that a window of 26 days, namely 15 days prior and 10 days after the event would be ade-

quate due to the manner in which the market is conditioned by the communication process and from the RBA, Government and media sources. This was also confirmed by testing different event window sizes to observe the effects. The estimation period used to compute the beta that in turn is utilized to calculate expected returns was 200 days, known as T_0 (-215 days) to T_1 (-16 days) prior to the event day (date of announcement). The estimation period is much longer than the event window as it is important to minimize any short-term volatility effects in the expected return calculations as we approach the event.

We first calculate returns for the stocks and indices themselves. Returns were calculated using end of day or week prices without dividends. Daily or weekly returns are best calculated by taking the log of the price on day t (week w) divided by the price lagged by 1 period (day or week) as depicted in the equation 4 below (Strong, 1992):

$$R = Ln(P_t / P_{t-1}) \tag{4}$$

To calculate abnormal returns we use the data in our estimation period to regress the individual security returns against the returns on the market in accordance with the equation (5) below to derive estimated β and α for the security.

$$R_{it} = \alpha_i + \beta_i R_{mt} + u_{it} \tag{5}$$

A β is also calculated using weekly returns. To compute a daily alpha value from weekly data used in regression, we carry out a 2 step procedure to minimize the volatility on the intercept. First, we calculate a weekly α and then convert it to a daily α in accordance with equation (6) below.

$$\hat{\alpha}_i = (1 + \alpha_{i,week})^{\frac{1}{5}} - 1 \tag{6}$$

The coefficients (α_i) and (β_i) are then used as estimates in equation (4) to calculate the abnormal returns (AR) for the event period.

$$AR_{it} = R_{it} - (\hat{\alpha}_i + \hat{\beta}_i R_{mt}) \tag{7}$$

Clustering problems caused by a common event across stocks require special attention to the t-test for significance. We discuss this standardized cross sectional t-test later. For a particular day in event time the t statistic is given by the standardized return

$$\frac{AR_{it}}{\sigma_{it}} \tag{8}$$

Following Boehmer et al. (1991) the standard error is determined by equation (9) which uses the estimation period residuals to compute the standard deviation for the event period. This is done to adjust for the clustering effect as variance increases in this period may be

caused by the event itself. The second term with the square root is to correct for sampling error.

$$\sigma_{it} = est \sigma_i * \sqrt{1 + \frac{1}{L} + \frac{(R_{mt} - \bar{R}_m)^2}{\sum_{-215}^{-16} (R_{mt} - \bar{R}_m)^2}} \tag{9}$$

The numerator term under the square root in equation (9) is the event period market abnormal return; the denominator term is the market return, squared residual from the estimation period. Equation (10) uses estimation period residuals to calculate the variance due to the expected impact of the event itself on the variance

$$est \sigma_i = \hat{S}(A_i) = \sqrt{\frac{\left(\sum_{t=-215}^{t=-16} (A_{it} - \sum_{t=-215}^{t=-16} A_{it}) \right)^2}{199}} \tag{10}$$

To calculate the daily cross-sectional average abnormal return (AAR_t or \bar{A}_t) we use the following formula:

$$AAR_t = \bar{A}_t = \frac{\sum_{i=1}^N AR_{it}}{N} \tag{11}$$

To determine the significance of the cross-sectional average abnormal returns on a particular event day, we follow Brown and Warner (1985), Boehmer et al. (1991) and calculate t (or z in this case) as in the equation below.

$$Z = \frac{\frac{\sum_{i=1}^N SAR}{N}}{\sigma_i} \tag{12}$$

The cross-sectional standard deviation as suggested by Boehmer using the standardized abnormal return (SAR) is computed in equation (13). This allows stocks to bring forward individual variances, from the estimation period providing more power to our test (Brown and Warner, 1985; Boehmer et al., 1991).

$$\sigma_{SAR_t} = \sqrt{\frac{\left(\sum_{i=1}^N (SAR_{it} - \sum_{i=1}^N SAR_{it} / N) \right)^2}{N(N-1)}} \tag{13}$$

Returns are accumulated over the event period in accordance with equation (14) as the test statistic for significance. Returns are accumulated across events, within the event window, cumulated through the pre-event, on-event and post-event sub-periods.

$$\sum_{t=-15}^{+10} \bar{SAR}_t / \left(\sum_{t=-15}^{+10} \sigma_{SAR_t}^2 \right)^{\frac{1}{2}} \tag{14}$$

It should be noted that the average *SAR* in (14) is accumulated both as a cross section of securities and across increase or decrease events, thus it can represent the number of events and/or the number of securities. The formula for the average *SAR* is:

$$\overline{SAR}_t = \frac{\sum_{i=1}^N SAR}{N} \tag{15}$$

In order to validate our results, we also utilize non-parametric tests, because our parametric methods assume assumptions of normality and therefore expose the specification of our significance tests to these assumptions per MacKinlay (1997). We use a generalized sign test following Cowan and Sergeant (1996), a measure that examines the sign of the abnormal returns. The test provides more power than other non-parametric tests such as the rank test which is likely to reject the null in events with longer event windows. In addition, it is well specified in a variety of circumstances, as it is more powerful in detecting abnormal returns and relatively robust to increases in the variance as we approach the event window. The test statistic is:

$$Z = \frac{(W - n\hat{p})}{[n\hat{p}(1 - \hat{p})]^{1/2}} \tag{16}$$

In equation (16) *W* represents the number of positive abnormal returns on the event day or event sub-period in our sample, *n* is the sample size and *p* represents the proportion of positive returns measured during the estimation period. \hat{p} is calculated by the following equation:

$$\hat{p} = \frac{1}{N} \sum_{j=1}^N \frac{1}{T} \sum_{t=1}^{T_j} \phi_{jt} \tag{17}$$

4. Results

4.1. Banking stocks. The results of our event study are now presented; we separately report the results for banks and non-financial stocks (using indices) and within this we examine the rate increase events and decrease events for each sample group. There were 33 events collated into 23 increase and 10 decrease rate events: consider that these 33 events were analyzed across 10 bank stock prices over 26 observation dates. A cross sectional average is taken across banks and indices (grouped as banks and non-financial firms) and across all rate change events (as increases or decreases) as sub-groups for each day in the event window on a day by day basis over 26 days. These abnormal returns are then accumulated progressively into cumulative abnormal returns (CARs) for each of the sub-periods in the event window.

The event sub-periods are defined as: the *pre*-event sub period (event day -15 to event day -2), the *on*-event sub-period (event day -1 to event day +1) and the *post*-event sub-period (event day +2 to event day +10). In addition, we also accumulate the returns over the entire event window. We also report the tests of significance for all these CAR values. We then present graphs that plot the CARs on a day by day basis for the overall event window (event day -15 to event day +10) to visualize the progressive anticipatory aspects pre-event through to the event day itself.

The bank stock CARs measured during rate increase events are reported in Panel A, Table 3. We note that there are CARs of +1.14 percent at end of the pre-event period with significance at the 1 percent level. This suggests early anticipation in the market of a change in interest rates with the result reflecting a positive abnormal impact on bank stock returns. In the subsequent on-event period, we see that once the market has received the information from the announcement there is a negative CAR suggesting some correction to the anticipated effect on the abnormal returns during the pre-event period. The CAR in the on-event period is significant at the 5 percent level but does not reduce the overall anticipation effect in the abnormal returns accumulated in the pre-event period, suggesting that the event maintains abnormal positive gains made in the pre-event period. As we enter the post-event period the CAR values fail significance tests although they remain negative, albeit with CARs that are much smaller in absolute value than those accumulated pre-event and on-event.

Table 3. Banking firm CARs.
Panel A. Bank stocks – rate increases

Window	CAR	Z (CAR)
-15 to -2 Pre-event	1.144%	2.599***
-1 to +1 On-event	-0.545%	-2.486 **
+2 to +10 Post-event	-0.083%	-0.362
-15 to 10 Total event	0.517%	0.828

Panel B. Bank stocks – rate decreases

Window	CAR	Z(CAR)
-15 to -2 Pre-event	0.671%	2.231**
-1 to +1 On-event	0.393%	2.439**
+2 to +10 Post-event	-0.075%	-0.443
-15 to +10 Total event	0.990%	2.152**

Table 3 (cont.). Banking firm CARs.
Panel C. Bank stock – rate increases

	Pos CAR	% Positive	Big 4 %
No. Positive CARs pre-event	52	54%	70%
No. Positive CARs on-event	42	44%	45%
No. Positive CARs post-event	43	45%	38%
No. Positive CARs pre + on-event	51	53%	60%
No. Positive CARs event window	49	51%	63%

Panel D. Bank stock – rate decreases

	Pos CAR	% Positive
No. Positive CARs pre-event	93	60%
No. Positive CARs on-event	91	59%
No. Positive CARs post-event	67	43%
No. Positive CARs pre + on-event	92	59%
No. Positive CARs event window	99	64%

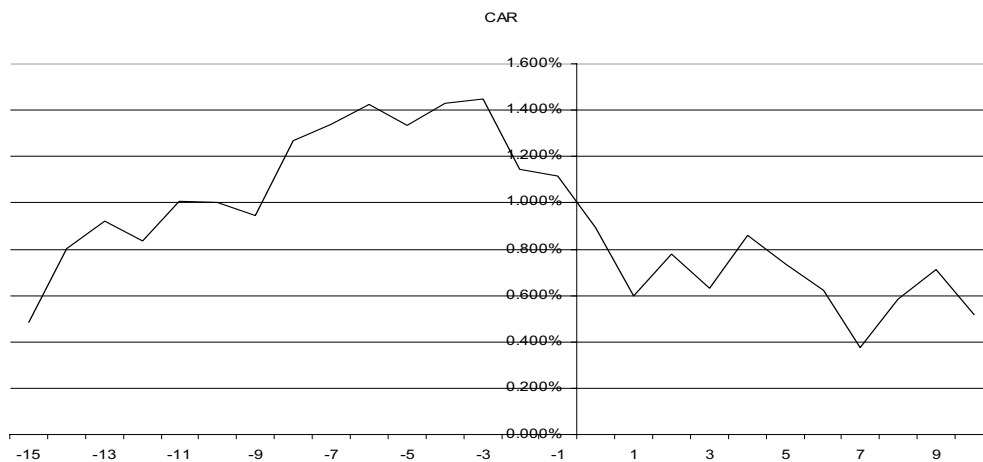
Note: * significant at 10%, ** significant at 5%, *** significant at 1%. Panel A contains the cumulative CARs during rate increase events for our sample banks. The CARs are calculated by accumulating the cross sectional average abnormal returns during each event sub-period on a day by day basis into pre-event, on-event and post-event sub-periods together with the associated Z scores. The cross sectional abnormal returns are calculated by taking an average for each event day across all sampled banks and across all rate increase events on a day by day basis for each of the days in the event window. Panel B contains bank CAR data during rate decreases calculated as for Panel A. Panel C and Panel D contain the count of the number of positive returns measured for each bank rate change event, in the case of rate increases.

Remembering that we are measuring cumulative abnormal returns, we note that the net effects of the measured CARs during the pre-event and on-event periods are significant and positive. There is no significant evidence of a correction to CARs in the post event period. The market made some corrections once the rate change is announced however; the gains in returns are not reversed following the pre-event

period. Taking the pre-event returns and the on-event returns together suggests a net positive effect of a 0.6 percent increase to banking stock returns.

Panel C of Table 3 reports the number of positive CARs reported for each rate increase event for each bank. It can be observed that the overall proportion of positive returns during the pre-event period, collectively the pre- plus on-event period, and the overall event window is in excess of 50%. In the on-event period and the post-event period the proportion of banks experiencing positive event related CARs is less than 50% of events, however this was expected as the market anticipates the effects with the news value of the information being absorbed in the pre-event period with residual effects in the on-event period. We also examined the proportion of positive responses to the rate increase events amongst the "four pillar" banks and found a larger proportion of positive CARs in the pre-event and collectively the pre- and on-event periods as well as the overall event window. This reinforces the view that the "four pillar" banks are able to benefit from rate increases. Thus we are able to reject H1, lending support to the view that the stock returns of Australian banks are not adversely impacted by announced increases in the cash rate.

The graph in Figure 1 shows the CARs of the sampled banks aggregated through all increase events, plotted from day -15 to day 10 in our event window, a duration of 26 days. It can be seen that as the market anticipates the change, this affects the value of the cumulative abnormal returns. This may also reflect other contemporaneous announcements and information such as economic data supporting current expectations. The early rise of the graph suggests that the market is anticipating a positive impact from the cash rate announcement but corrects the magnitude of the return once the actual announcement occurs.



Note: Shown above is the graph of financial firms abnormal returns graphed during event time on a day by day basis. The vertical axis is the abnormal return in percentages and the horizontal axis days relative to the event day, 0 being event day.

Fig. 1. Banking firms' CARs during RBA increase events

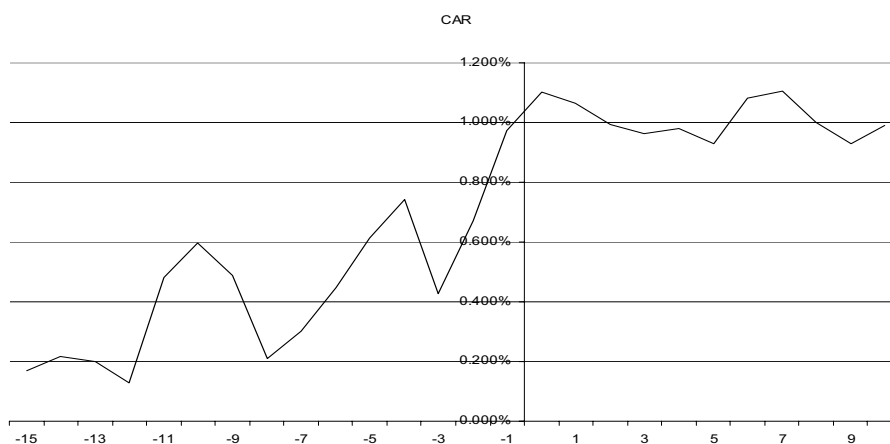
We observe, consistent with Connolly and Kohler (2004), that as a result of anticipation in the market, there was an apparent increase in the cumulative abnormal returns up to 2 days prior to the event. However, once the rate is announced the market adjusts for this information and the abnormal returns reduce to reflect the value of information inherent in the announcement. In the days subsequent to the event, the graph shows cumulative returns eased, losing any gains made in abnormal return levels prior to the announcement; however, this net effect is not statistically significant. CARs are however significant in the pre-event period and the on-event period. The net positive effect of at least 0.5 percent to 0.6 percent observed during this period suggests a market value impact, using the March 2005 event data, of \$1.0 billion to \$1.2 billion for the banks studied. The overall impact, looking at the full event window suggests no net-negative impact on banking stock returns but rather a net-positive short-term impact. We conclude that for cash rate increases, contrary to the theory, we find that cash rate increase announcements do not negatively affect Australian bank stock returns in the short term and reject H1 for rate increases.

We now examine the results for rate decrease events reported in Panel B. The results for banking stocks, as before, are summarized across all events which represent rate decrease or cash rate decreases events. A summary of the CARs and related Z values accumulated over event sub-periods is presented as before. We can see that the CARs of banking stocks in the pre-event period are significant at the 5 percent level and prices react generally positively, as measured by the abnormal returns to anticipated announced decreases in the cash rate. This result is a positive abnormal return of +0.67 percent; namely strong pre-event anticipation by the market. Positive returns are continued

through the on-event period where we find an additional significant positive return of +0.39 percent. In the post-event period returns reverse to marginally negative but there is no significance in the Z value and the magnitude is relatively small¹. However, the CARs for the total event period show a significant positive effect on bank stock returns so we report a net positive increase in the CARs of 0.99 percent.

Panel D of Table 3 reports the number of positive CARs reported for each rate decrease event for each bank. It can be observed that the overall proportion of positive returns during the pre-event period, collectively the pre-plus on-event period, the post-event period and the overall event window is in excess of 50%. In the on-event period this falls to less than 50% of events, however this was expected as the market anticipates the effects given the transparent policy environment, with information being absorbed in the pre-event period and reflected in the price. So that it is only unexpected changes that will result in large on-event movements.

The graph in Figure 2 plots the CARs of the sampled banks during rate decrease events for each day in the event window. In a similar manner to rate increases, there is an upward trend in the CARs very early in the event period, albeit with some fluctuation, which stabilizes as we approach the event. Again, it can be seen that as the market anticipates the change, it has increased the value of the cumulative abnormal returns in anticipation of cash rate decreases. The early rises of the CARs in the graph continue all the way past the event day when it approaches +1.1 percent and then oscillates at the levels reached on event day of about 1 percent and do not decline. This suggests the market has expected cash rate decreases and, on confirmation, the positive effect in abnormal returns is sustained after the event day.



Note: This graph presents financial firms cumulative average abnormal returns graphed during event time on a day by day basis. The vertical axis is the abnormal return in percentages and the horizontal axis days relative to the event day, 0 being event day.

Fig. 2. Banking firms' CARs during RBA decrease events

¹ During the period from 1990 to 1993 there was consecutive interest rate reduction that followed an extremely volatile and high interest period when interest rates reached record levels and the cash rate was in excess of 17.5 percent. The conclusions drawn in our analysis were not altered by the exclusion of these events.

Although the graph illustrates continuity of the positive CARs after the event day they are not significant in the post event period. Interest rate reductions create a favorable environment for the banking market, as evident from the graph, supporting well established theory and the experience of other markets that bank stocks experience positive effects when cash rates are decreased¹. This represents a cumulative benefit of approximately 0.9 percent for the overall event period or 1.1 percent for the pre-event and post-event periods. This reflects a market value impact, based on March 2005 data, of \$1.6 billion to \$2 billion.

We also undertook cross sectional regressions for each of the pre-event, on-event and post-event periods to examine whether CARs reported varied due to other effects such as size of firm. This was done for rate increases and decreases. We have not reported these regressions here as there was no significance found in relation to the size of banking firm as measured by total assets.

To enhance the robustness of our findings, given the relatively small number of firms in our sample, we have conducted the non-parametric generalized sign test. The generalized sign test is of benefit to our study as it does not require us to assume normality in our data, although it does assume independence between observations (Cowan and Sergeant, 1996). The results are summarized in Table 4 below.

Table 4. Generalized sign test for positive abnormal returns

Generalized sign test for positive cumulative abnormal returns				
		Est. period	Event day	Event per.
	Positive returns	9682	39	51
Increases	No.	19,200	96	96
	Proportion	50.4%	40.6%	53.1%
	Z value		(1.92)*	0.53
Decreases	Positive returns	15157	89	98
	No. ARs	31,000	155	155
	Proportion	48.9%	57.4%	63.2%
	Z value		2.12**	3.57***

Notes: * significant at 10% level, ** significant at 5% level, *** significant at 1% level. Reported above are the results of our generalized sign test. The table shows a count of the observations used during each of the increase and decrease estimation periods for cumulative returns to determine the expected proportion of positive returns. This is then used as a bench mark to test the count of the positive returns during the event period for rate increase and decrease events.

¹ During our testing of events, we noted that there were three situations that were tested to ensure they did not distort our results. We refer to the September 11, 2001 and the period of 1990 to 1993 when there were 15 consecutive decreases and two coincident CPI announcements. These circumstances were examined to see if our results were altered by their exclusion. There was no change in the conclusions drawn due to these circumstances.

In our test we look at the incidence of positive abnormal returns, and we can see from Table 4 that our event period ARs for both increases and decreases indicate that our results are statistically significant at the 10 percent and the 5 percent level. However, we also report no significant support for negative effects on stock returns in the overall event period for increase events supporting our rejection of H1 for increases but also providing strong evidence to support the results for the decrease events.

We conclude the analysis of our results for banking firms by observing that our first hypothesis H1 is supported for rate decreases but not for increases. We have demonstrated significant abnormal returns during the pre-event period supporting our hypothesis H2, that there will be significant abnormal returns in the pre-event period, as markets anticipate the impact of cash rate changes on banks stocks. We also find sufficient evidence to empirically support hypothesis H3 regarding asymmetrical effects. Increases and decreases have similar responses in the pre-event period, symmetric responses in the on-event period and inconclusive results in the post-event sub-period.

4.2. Non financial firms. In Panel A of Table 5 we report the impacts of rate increase events for non-financial firms and again we present the cumulative average abnormal returns and the corresponding Z values, grouped by event sub-period and the event period overall. We see that the reported CAR value is -0.61 percent during the pre-event period. This suggests a negative relationship with the rate change however, the Z value fails to achieve significance at the 10 percent level. In the on-event period however, we report a positive return of 0.13 percent once again with no significance. In the post-event period, we report a negative return of -0.53 percent also with no significance. Therefore, we find no significance in the CARs in any of the sub periods, namely the pre-event, on-event and post-event periods somewhat consistent with the literature which suggests non-financial firms are not impacted by monetary policy, rate change announcements, in the short term.

Table 5. Non-financial firms' event period CARs

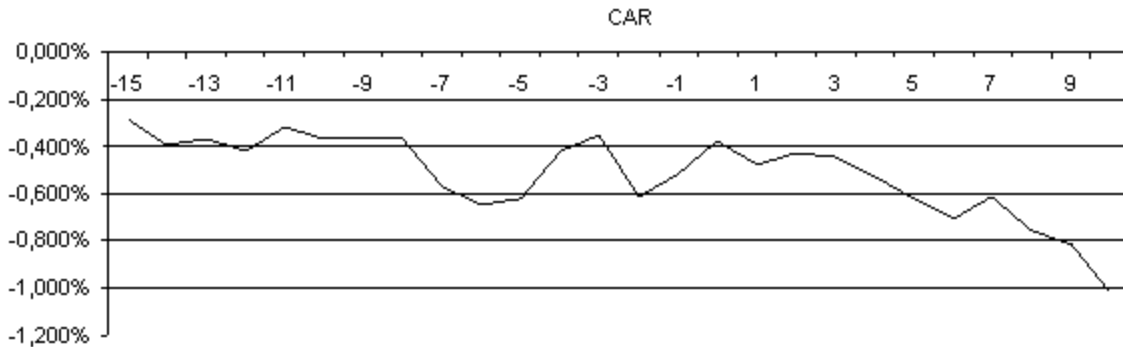
Panel A. Non-financial firms – rate increases		
Window	CAR	Z(CAR)
-15 to -2 Pre-event	-0.610%	-1.596
-1 to +1 On-event	0.128%	0.317
+2 to +10 Post-event	-0.532%	-1.433
-15 to 10 All event	-1.015%	-1.820*

Table 5 (cont.). Non-financial firms' event period CARs

Panel B. Non-financial firms – rate decreases		
Window	CAR	T (CAAR)
-15 to -2 Pre-event	-0.280%	-1.218
-1 to +1 On-event	-0.015%	-0.230
+2 to +10 Post-event	0.267%	1.182
-15 to 10 Total event	-0.028%	-0.415

Notes: * significant at 10%, ** significant at 5%, *** significant at 1%. Panel A contains the cumulative CARs during rate increase events for our sample non financial indices. The CARs are calculated by accumulating the cross sectional average abnormal returns during each event sub-period on a day by day basis into pre-event, on-event and post-event sub-periods together with the associated Z scores. The cross sectional abnormal returns are calculated by taking an average for each event day across all sampled non-financial indices and across all rate increase events on a day by day basis for each of the days in the event window. Panel B contains non financial indices CAR data during rate decreases calculated as for Panel A.

The graph in Figure 3 plots the cumulative average abnormal returns as before for non-financial firms for rate increase events. We observe that the results are not clear with respect to movement through the event period. The graph starts with negative returns and does not indicate a trend and neither does it indicate possible anticipatory effects of the event. There are large movements of the CAR line with oscillation at negative levels of abnormal returns all the way through to the event period. The CARs become increasingly negative post-event, remain at around -0.4 percent and then fall 3 days after the event. It is possible that non-financial firms have a more significant lag effect that is not observable in the event window. However, there is no reason to pursue this based on the literature. Contrasting the results observed for bank stocks, we find no significance in the abnormal returns of non-financial stock returns in the on-event period due to RBA rate increase announcements.

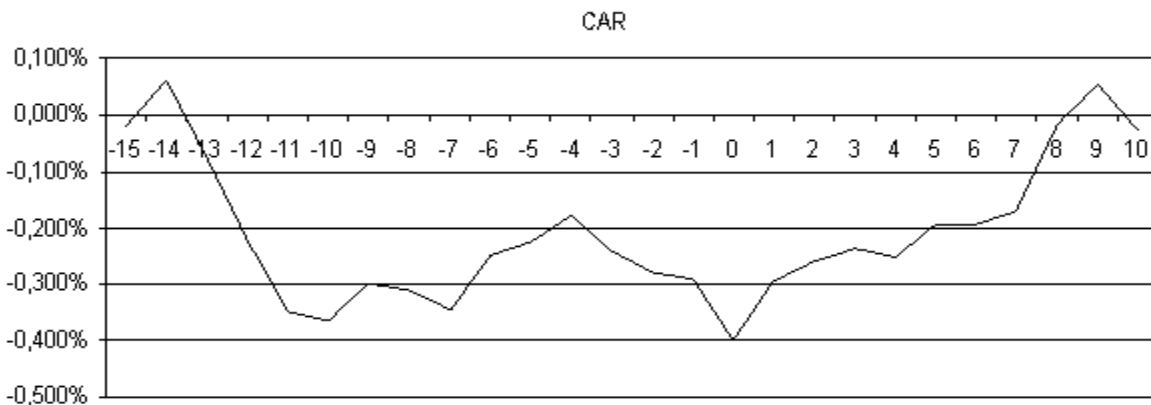


Note: Shown above is the graph of non-financial firms abnormal returns graphed during event time on a day by day basis. The vertical axis is the abnormal return in percentages and the horizontal axis days relative to the event day, 0 being event day.

Fig. 3. Non-financial firm CARs during RBA increase events

We now consider the impact of rate decrease events for non-financial firms in Panel B of Table 5. We find that decrease events show spurious results with negative CARs in the pre-event and on-event periods and positive CARs on-event. In all cases the Z values are not significant, and do not allow any con-

clusions to be drawn. Contrasting the pre- and on-event sub-periods, the CARs for the post-event period are positive but, again are not significant. Figure 4 below illustrates the movement of the cumulative abnormal returns of the non-financial stocks over the event days.



Note: This graph presents non-financial firms abnormal returns graphed during event time on a day by day basis. The vertical axis is the abnormal return in percentages and the horizontal axis days relative to the event day, 0 being event day.

Fig. 4. Non-financial firms' CARs during RBA decrease events

We can see that the CARs start and finish at approximately the same point on the graph vertical axis with enormous variations that in between, with the CARs remaining negative throughout the event window. There is an initial negative abnormal return that increases as it approaches day 12, oscillates between -0.2 and -0.4 percent, and gradually returns back to its starting level. There are no anticipatory effects evident as we approach the event day. The graph suggests a negative CAR that eventually returns back to original levels found at entry into the event window, however as we have seen from Table 5 this is not statistically significant. We therefore find that there is no significant impact on the stock returns of non-financial firms in the event window arising from RBA rate decrease announcements. We therefore find support for hypothesis H4.

Conclusion

We undertook this study to examine the reaction of bank stock returns to changes in the cash rate, as measured by their abnormal and cumulative returns. The results were obtained by examining the stock returns of selected listed Australian banks, studied as a group, representing in excess of 80 percent of the market. We contrasted the response of these stocks to those of non-financial firms using a selection of industry indices. These returns were examined for 10 rate increase events and 23 rate decrease events affecting 10 banks using the well established event study methodology. We find that, for rate increase events, contrary to one well established

theory which suggests a negative relationship, bank stocks report significant net-positive CARs in total during the pre-event and on-event periods. We find no significance in CARs for returns of the post-event sub-period and therefore conclude that bank stock returns in Australia are *not negatively* impacted in the short term, by cash rate increases. Cash rate increases have a small positive short-term effect. This finding is inconsistent with the US literature. In the case of rate decreases, we found that CARs for bank stocks are positive and significant in both the pre-event and the on-event sub-periods. RBA decreases in the cash rate target have a significant and positive effect on bank stock returns consistent with the established theory. We also analyzed the effects of these returns on non-financial firms. In the case of increases and decreases, there was no significance in the abnormal returns of non-financial firms for rate increases or decreases.

The positive impact on bank stock returns due to rate increases needs to be considered in the context of two perspectives: the market power of the dominant banks and the economic environment. The Australian economy has benefited from relatively low inflation and interest rates. The majority of the interest rate increases initiated by the RBA were to control overheating of sectors in the economy to prevent a boom bust cycle. Sectors such as housing have boomed during the late 1990s and early 2000s and the RBA tried to discourage what it regards as the formation of large asset bubbles on the back of strong demand for consumer debt.

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