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Author:
Kim, Suk-Joong; Nguyen, Tho

Publication details:
Research in International Business and Finance
v. 22
Chapter No. 3
pp. 378-395

Publication Date:
2008

Publisher DOI:
http://dx.doi.org/10.1016/j.ribaf.2008.02.001

The reaction of the Australian financial markets to the interest rate news from the Reserve Bank of Australia and the US Fed

Suk-Joong Kim[a,*], **Do Quoc Tho Nguyen**[a, b]

[a] *School of Banking and Finance, The University of New South Wales, Sydney, NSW 2052, Australia.*

[b] *State Bank of Vietnam, Vietnam.*

Abstract

This paper provides comprehensive evidence on the impacts of the Reserve Bank of Australia's (RBA) and the U.S. Fed's target interest rate announcement news on the Australian financial markets over the period 1998-2006. The RBA's news had a significant impact on the first moments of market returns/changes in line with *a priori* expectations, and the conditional volatility in most of the markets was significantly higher following the news. Asymmetric news effect is also observed for the Australian interest rates where markets tended to respond more strongly to unexpected rate rises than rate falls. While the U.S. Fed's news influenced only the USD/AUD exchange rate, the Australian market volatility was significantly lower in all market segments following the Fed's news.

JEL classification: E44; G14; G15

Keywords: Monetary surprises; Target interest rate news; Spillover effects; RBA; U.S. Fed.

Published in *Research in International Business and Finance, Vol. 22, No. 3, pp. 378-395*

DOI:10.1016/j.ribaf.2008.02.001

Acknowledgement:

We would like to thank Susan Adams, Menachem Brenner, Colm Kearney, Raghuram Rajan and an anonymous referee for valuable comments and suggestions that greatly enhanced this paper. The remaining errors, if any, are our own.

* Corresponding author. Tel: +61 2 9385 4278, Fax: +61 2 9385 6347, Email: s.kim@unsw.edu.au

1. Introduction

"Policymakers often have to act, or choose not to act, even though we may not fully understand the full range of possible outcomes, let alone each possible outcome's likelihood."

Alan Greenspan, January 3, 2004

There is a growing body of literature examining the news contents of central banks' interest rate target announcements. The investigations are aimed at ascertaining the presence and the nature of the news effects on financial markets. Recently, attention has also been directed to the spillover effects of one central bank's announcement news on another country's financial markets. Since the abandonment of monetary aggregate targeting in the mid-1980s, central banks of advanced countries have moved to targeting policy interest rates. These target interest rates are formally announced and any change thereof constitutes an adjustment in the monetary policy stance. As interest rates of longer maturities are determined by the expected levels of the target rate over the relevant time horizon, any change in the target rate has an immediate impact on other short-term interest rates.[1] Financial market participants must take positions based upon their expectations on the impending announcements of a central bank's target interest rate stance. This expected part is thus already factored into the market prices observed immediately prior to the announcement. If the actual target rate announced is different from that already priced, markets react to this surprise (or news) component accordingly. Thus, central banks influence financial markets through their control over the target interest rates and the markets' expectation on the future courses of the respective target rates.

[1] For example, the 90-day bank accepted bill rates in Australia are calculated as an average of 90 overnights expected interest rates hence.

The current literature mostly concentrates on the impacts of monetary policy news of the U.S. Federal Reserve's federal funds target rate. The Fed's interest rate news effects have been investigated on the U.S. equity market (Bonfim, 2003; Bernanke and Blinder, 1992; Bernanke and Kuttner, 2005; Lee, 2006), and on the U.S. debt markets (Cook and Hahn, 1989; Demiralp and Jorda, 2004; Gulley and Sultan, 2003; Kuttner, 2001; Roley and Sellon, 1995, 1998). Furthermore, the spillover impacts of the Fed's interest rate news have been investigated by a number of researchers. These include Bredin et al (2005) on the Irish stock market, Ehrmann and Fratzscher (2003, 2005) on the Euro area money markets, and Hausman and Wongswan (2006) on the stock, debt and foreign exchange markets of 49 countries. The Fed's interest rate news has shown to be transmitted to these markets and the spillover effects are strongly felt. However, the transmission in the opposite direction is found to be weak (Ehrmann and Fratzscher, 2005).

In Australia, the Reserve Bank of Australia (RBA) started to announce its target interest rate (the overnight cash rate) from January 1998. The RBA Board's decision on the rate (whether or not there is a change) is announced in a media release, which states the new target for the cash rate (if there is a change) together with the rationale for the decision. The literature on the RBA's cash rate announcement effect is limited to the investigation of the announcement impact on the first moments of Australian market returns (e.g., Gasbarro and Monroe, 2004; and Diggle and Brooks, 2007). The common limitation of these studies is that they only examine the overall impact of cash rate announcements rather than concentrating on the surprise or news component to which markets are responding. We aim to address this oversight by investigating the RBA's cash rate announcement news effects on both the first and second moments of daily returns/changes in the Australian debt, foreign exchange and stock markets for the period 1998 to 2006. Furthermore, the literature is missing a thorough investigation of the spillover effects of the U.S. Fed's interest rate announcement news on the

Australian financial markets. This is another oversight in the literature as the information leadership role of the U.S. in Australia is well documented. For instance, Kim and Sheen (2000) show that the Australian interest rates (90-day and 10-year rates) react strongly to the first and second moments of the corresponding U.S. rate movements. Masih and Winduss (2006) report a straightforward cointegration relationship between the Australian and the U.S. interest rates, whereas Narayan and Smyth (2004) show similar evidence for the stock markets. Kim (2005) reports a direct causal information flow from the U.S. stock market to that of Australia.

Thus, in this paper, we have the dual aim of firstly investigating the role played by the RBA's interest rate news in the Australian debt, foreign exchange and stock markets, and secondly, documenting and discussing the existence and the nature of the transmission of the U.S. Fed's interest rate news on the Australian financial markets.

The main findings of this paper are summarized as follows. First, we find evidence that the RBA's target interest rate news has statistically significant impacts on the daily returns/changes in all three financial market segments in line with prior expectations. In particular, an unexpected rise in the target rate led to a proportional increase in interest rate changes, spot and forward USD/AUD exchange rate returns and two banking stock returns. In addition, the new effects were stronger at the short-term ends of the spectrum for the interest rates and forward exchange rates. This is consistent with the general finding in the literature where the announcement news impact is observed to be weaker at the longer ends. Second, RBA's target rate news increased the volatility in most cases. This suggests that an unexpected change in the target rate creates further uncertainty regarding future rate changes and hence a higher volatility in most of the markets on the days of target rate announcements. Third, there is weak evidence for an asymmetric news effect where markets tended to have a stronger reaction to unexpected rate rises than unexpected rate falls. Fourth, the U.S. Fed's

target interest rate news significantly reduced the volatility in the Australian markets following similar volatility reducing effects in the U.S. markets (foreign exchange and stock markets). We conjecture that the Fed's interest rate news reduced the degree of uncertainty in these U.S. markets and this lower volatility environment was transmitted to the Australian markets.

The rest of the paper is organized as follows: Section 2 discusses the nature of the data used in this paper and the empirical modeling issues are discussed in detail in Section 3. Section 4 provides the analyses on the empirical investigation results, and Section 5 concludes the paper.

2. Data descriptions

2.1. Target interest rate announcement data

Both the RBA and the U.S. Fed formally announce their respective policy interest rates. The RBA has significantly improved the transparency of its monetary policy since the early 1990s. From January 1990, it started to publicly announce its monetary policy decisions, and from January 1998, the RBA Board's decision to change or leave the cash rate unchanged is announced in a media release at 9:30 am Australian EST (GMT+10) one day following the board meeting. [2] The RBA has eleven scheduled board meetings a year on the first Tuesday of every month except in January. In the case of the U.S. Fed, since 1995, the U.S. Federal Open Market Committee (FOMC) publicly announces the Fed funds target rate at 2:00 pm U.S. Eastern Standard Time (GMT-5) unless otherwise specified. The FOMC holds eight regularly

[2] The RBA maintains the target interest rate by maintaining the balance in the official money market at that target rate. It announces its dealing intentions at 9:30 am each day to maintain the balance for the day.

scheduled meetings during the year, and other unscheduled meetings as needed. The RBA and the Fed's target rate announcement data were obtained from their respective websites.[3]

Panel A of Table 1 reports the breakdown of policy announcements into rate rises, rate falls and unchanged subcomponents. From January 1998 to December 2006, the RBA and the Fed made 99 and 77 target rate announcements, respectively. Of these, the RBA had 20 announcements with rate changes (13 rate rises and 7 falls) and 79 with no changes. The Fed had 39 announcements where the target rate was changed (23 rises and 16 falls) and 38 announcements with no changes. Most of the scheduled interest rate announcements contained no change (80% for the RBA and 49% for the Fed).

As the sole instrument for the RBA's monetary policy, the overnight cash rate target affects financial asset prices through conveying new information regarding the RBA's monetary policy stance. The market efficiency hypothesis implies that asset prices observable immediately prior to the RBA's cash rate announcements already incorporate the market expectations on the upcoming announcement. As such, if there is a significant market reaction to the announcement, such an effect must be due to the unexpected (i.e. news) component of the announcement. Thus, in order to gauge the extent to which unexpected changes in a direction or the extent of target rate movements affect financial markets, it is necessary to model properly the news component of the announcements. For the RBA's announcements, we utilize the financial press reports on the market consensus forecasts. Days surrounding the RBA's target rate announcements, the financial press reports what the market consensus was at the time of each announcement. We searched for these using the Factiva database of press

[3] These data are available at http://www.rba.gov.au/Statistics/cashrate_target.html for the RBA, and http://www.federalreserve.gov/FOMC/#calendars for the Fed.

reports on a few days before and after the RBA's scheduled announcements. We test for unbiasedness and efficiency of the expectation data generated this way and find that the market-based expectations are unbiased.[4] The news component of each announcement is the difference between the actual target rate change announced and the market expectation[5].

In the case of the Fed's target interest rate news, the recent literature has relied on market-based proxies to extract market expectations. Following Krueger and Kuttner (1996)'s finding that the Fed funds futures rate is an efficient predictor of the Fed funds target rate, and therefore an appropriate market-based measure of policy expectations, Kuttner (2001), in his seminal work, uses the Fed funds futures data to separate the target rate changes into anticipated and unanticipated components. He finds that the responses of the U.S. Treasury bill, note and bond yields to anticipated changes in the target rate are small, while the responses to unanticipated changes are large and significant. Similarly, Bomfim (2003) extends Kuttner (2001)'s work to volatility and finds that asset prices are more volatile following surprise announcements. In this paper, we employ Kuttner (2001)'s methodology to generate the unexpected part of the Fed funds target rate announcements. The news component of the target rate announcement on day *d* of month *m* can be derived from the implied change in the 30-day Fed fund futures price. Since the Fed fund futures settlement price is based on the monthly average of the spot Fed Funds rate, it is necessary to account for

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[4] The estimated unbiasedness test regression is $\text{ActualChange}_t = 0.023 + 1.04\ \text{Expected Change}_t$, with a p-value of the test statistic of the restriction of a zero constant and a unitary slope being 0.7723. This suggests that the market based expectations are unbiased predictors of the RBA's interest rate announcements.

[5] We also used the 90-day bank bill futures rate to extract the surprise components as in Kuttner (2001). The estimation results differ only slightly from what we report in this paper using the market expectations and the general conclusion is unaffected. Interested readers may obtain the additional estimations results upon request.

the number of days affected by the announcement in that particular month as shown in equation (1).

$$\Delta i^{u} = \frac{D}{D-d}\left(f^{0}_{m,d} - f^{0}_{m,d-1}\right) \quad (1)$$

where: Δi^{u} is the unexpected target rate changes; $f^{0}_{m,d}$ is the current month futures rate; $f^{0}_{m,d-1}$ is the futures rate as of the day prior to the announcement; D is the number of days in the month; and D-d is the number of days in the month affected by the announcement.

Panel B of Table 1 reports the summary statistics for the unexpected components of the target rates for both central banks. While 90% of the RBA's announcements contained no news, the U.S. market correctly expected 30% of the Fed's announcements. The average unexpected component (or surprise) of the RBA's announcements is 0.0135 percent, whereas the average surprise of the Fed's announcements is -0.0075 percent. The variance of the RBA's surprises is also higher than that of the Fed (0.0172 percent for the RBA compared with 0.0031 percent for the Fed).

2.2. Daily returns in financial markets

The Australian market returns data are from debt, foreign exchange and stock markets for the period January 1998 to December 2006. All were sourced from Datastream.

Debt markets data consist of short- and long-term Australian interest rates measured as the 90-day bank bill rate, and 3- and 10-year Commonwealth bond yields collected at the Australian market close (4 pm Australian EST (GMT+10)). The foreign exchange rates we investigate are mid-level spot, and 1- and 3-month USD/AUD forward exchange rates obtained at the close of London market (5pm GMT). For the stock market returns, we use the overall market index complied by Datastream. In addition, we examine the stock prices of the biggest four banks in Australia, Australia and New Zealand Banking Corporation (ANZ),

Commonwealth Bank of Australia (CBA), National Australia Bank (NAB) and Westpac (WBC). This is to investigate a disaggregated influence of the target rate surprises on the segment of the stock market that is most directly and immediately affected by the RBA's announcements. Commercial banks are one of the most important transmission channels of the RBA's monetary policy decisions. The daily closing prices are observed 4pm Australian EST.

Panel C of Table 1 reports the summary statistics of the Australian financial market returns/changes series. The series demonstrate strong evidence of positive skewness for the interest and exchange rate series and negative skewness for the stock series. In all cases, the returns/changes series exhibit leptokurtosis, non-normality and significant serial correlation in the second moment. In addition, for all return series except for the stock index and the spot exchange rate, significant serial correlation is observed at least at 10%.

3. Empirical modeling issues

3.1. Baseline EGARCH model

The literature shows that the GARCH family of models is well suited to modeling daily financial returns series, which are characterized as skewed, leptokurtic and non-normal distributions with time-varying second moments as shown in Table 1 for the variables used in this investigation. We employ the EGARCH(1,1) methodology to model these returns series, as a parsimonious specification often outperforms more profligate ones and the exponential specification allows negative coefficients in the conditional variance equation that has an important implication in this study. This methodology also enables us to measure the news and the spillover effects on both the conditional mean and variance of daily returns. In this section, we start with the baseline univariate EGARCH(1,1) model and then progress to

specific modeling of the interest rate news effects of various forms of the RBA's and the U.S. Fed's announcements on the Australian financial markets.

The baseline EGARCH(1,1) model employed in our study is described by the conditional mean and the conditional variance equations (2a) and (2b) shown below. The conditional mean equation for the returns/changes in the financial market series (y_t) is expressed as a function of past returns as well as Monday effect (*Mon*), holiday effect *(Hol*) in relevant markets. The conditional variance equation for the returns/changes in the financial market series (h_t) is expressed as a function of the past variance, Monday effect (*Mon*), and holiday effect *(Hol)*. The Monday effect variable takes the value of one for Mondays and zero otherwise. The holiday effect variable is specific to each market segment and records the number of days of market closure between two successive market prices. For example, for normal consecutive daily observations (i.e. returns calculated over two days – Monday close to Tuesday close price) the value of zero is assigned, whereas values of one or higher value will be assigned for returns observations calculated over a longer horizon due to market closure. These seasonal dummies help to control for the days of more intense information flows following a longer period of closure.

$$y_t = \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{Mon} Mon_t + \alpha_{Hol} Hol_t + \varepsilon_t \tag{2a}$$

$$\ln h_t = \beta_c + \beta_h \ln h_{t-1} + \beta_{\varepsilon 1} \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \beta_{\varepsilon 2} \frac{|\varepsilon_{t-1}|}{\sqrt{h_{t-1}}} + \beta_{Mon} Mon_t + \beta_{Hol} Hol_t \tag{2b}$$

3.2. Overall news effects of the RBA's target interest rate announcement news

The base model shown in (2a) and (2b) is augmented with various forms of interest rate news variables. The first model includes an overall RBA news variable, $RBANews_t$, as described in equations (3a) and (3b) below to investigate the overall news effects of the RBA's target news on the first and second moments of returns. In addition, on forty-two out

of the ninety-nine RBA announcement days, there was at least one scheduled macroeconomic announcement made by the Australian Bureau of Statistics (ABS) on the same day[6]. The RBA's announcements were made at 9.30 am and the ABS's announcements at 11.30 am Australian EST. Thus, it is necessary to control for these announcements to isolate the RBA's interest rate news effect on the daily returns of the Australian financial markets on these days. We include a dummy variable, $MacroAnn_t$, in both the conditional mean and the variance equations that take the value of one for those RBA's announcements that coincided with the release of other macroeconomic variables on the same day, and zero otherwise.

$$y_t = [\text{RHS of (2a)}] + \alpha_{RBANews}\, RBANews_t + \alpha_{MacroAnn}\, MacroAnn_t \quad (3a)$$

$$\ln h_t = [\text{RHS of (2b)}] + \beta_{RBANews} \left| RBANews_t \right| + \beta_{MacroAnn}\, MacroAnn_t \quad (3b)$$

In general, we expect that the sign of the news coefficient in the mean equation to be positive for the debt and the foreign exchange markets. An unexpected rise in the target rate would have the expected stimulus on the short- and longer-term interest rates. However, the extent to which the shorter- and longer-term rates are affected differently needs to be empirically determined. The USD/AUD exchange rate is expected to respond in the same direction to an unexpected rise in the RBA target rate, as this would represent a rise in real interest rates with corresponding adjustments in the foreign exchange market. The sign of the news coefficient for the stock index returns is expected to be negative, in general, as Bernanke and Kuttner (2005) show such a relationship in the U.S. market. As for the banking stocks, depending on their balance sheet exposure to interest rate changes, we may observe either

[6] Four different types of macroeconomic variables were announced in a total of forty-two days when the RBA's cash rate announcements were made. These are CPI inflation, employment, international accounts and retail sales. The details on the release dates are shown in Appendix.

positive or negative coefficient. The news effect on the volatilities would depend on whether the news adds to or resolves uncertainties in the market. If an unexpected change in the rate leads to further speculation in the market regarding the future direction of the target rate, this increased heterogeneity would be shown as a positive news coefficient in the variance equation, i.e. a rise in the volatility. On the other hand, a market calming effect could be observed if an unexpected change resolves uncertainty and this is shown as a negative news coefficient.

3.3. Asymmetric news effects of the RBA's target interest rate news

There is a potential for unexpected interest rate rises and falls having different impact. The announcement news literature reports that bad news usually have larger impact. For example, Connolly and Wang (1998) report that volatility spillovers amongst the U.S., the UK and Japanese stock markets depend on whether the announcement was good or bad news. In particular, bad news from the UK and the U.S. lead to significant increases in volatility in Japan. For monetary policy announcements, Bonfim (2003) finds that unanticipated rises in the Fed Funds target rate tend to have a larger effect on the U.S. stock market volatility than unanticipated falls. Gulley and Sultan (2003) find that U.S. monetary policy shocks had an asymmetric effect on the stock market, but a symmetric effect on the bond market.

We investigate the potentials of asymmetric influences of unexpected rises and unexpected falls of the RBA's target rate announcements. The overall news variable is disaggregated into two types of news, unexpected rises and unexpected falls. As suggested in the literature, we expect that the Australian market would react more strongly to unexpected interest rate increases than falls. We model this by partitioning the $RBANews_t$ variable into a rate rise component, $RBANews\_R_t$, and a rate fall, $RBANews\_F_t$, and add these to equations

(2a) and (2b) as below. The potential for an asymmetric effect is ascertained by examining the difference between the two coefficients in terms of their signs and magnitudes.

$$y_t = [\text{RHS of (2a)}] + \alpha_{RBANews\_R} RBANews\_R_t + \alpha_{RBANews\_F} RBANews\_F_t + \alpha_{MacroAnn} MacroAnn_t \quad (4a)$$

$$\ln h_t = [\text{RHS of (2b)}] + \beta_{RBANews\_R} \left|RBANews\_R_t\right| + \beta_{RBANews\_F} \left|RBANews\_F_t\right| + \beta_{MacroAnn} MacroAnn \quad (4b)$$

3.4. Spillover effects of the U.S. Fed's target interest rate news on the Australian markets

We further expand the base model to examine the spillover effects of the U.S. Fed's target rate news on the Australian financial markets. Both direct and indirect transmission channels of the U.S. news are reported in the literature. To the extent that the U.S. stock markets respond to the Fed's interest rate surprises (e.g. Bernanke and Kuttner, 2005) and they lead other markets such as Australia, the Fed's interest rate news can have an indirect influence on other markets. For example, the Australian stock markets would take a lead from the overnight U.S. market movements that incorporate the U.S. markets' responses to the Fed's news. There is strong evidence of the U.S. stock market leading the Australian market (Narayan and Smyth, 2004; Kim, 2005) and similar evidence is shown for the Australian interest rate movements (Kim and Sheen, 2000). A first step in investigating a direct influence of the U.S. Fed's interest rate announcements on other countries is shown in Hausman and Wongswan (2006). We aim to provide more detailed analyses on the direct channel of influence by investigating the extent of the Australian markets' responses to the Fed's news announcements.

We model this spillover effect explicitly in both the conditional mean and volatility of the daily Australian market returns/changes. We introduce an overall Fed's surprise variable (*FedNews*) into the model (3a) and (3b). We lag this news variable by one period to account

for the time difference between the U.S. and Australia. The overall Fed's news effects are detected via the following system of conditional mean and variance equations.

$$y_t = [\text{RHS of (3a)}] + \alpha_{FedNews} FedNews_{t-1} \tag{5a}$$

$$\ln h_t = [\text{RHS of (3b)}] + \beta_{FedNews} \left| FedNews_{t-1} \right| \tag{5b}$$

We expect that the unexpected rise in the U.S. Fed's target rate would move the Australian interest rates in the same direction, but the stock index and the Australian dollar are expected to fall. As for the conditional volatilities, the response would depend on the informational role the Fed news plays in the Australian markets.

The literature reports that worse than expected monetary policy shocks tended to have bigger impacts in the U.S. markets (Bonfim, 2003; Gulley and Sultan, 2003; Connolly and Wang, 2003). This, along with the findings of the U.S. spillover impact on the Australian markets, motivates us to extend the base model to investigate the potential for asymmetric Fed news spillover effects on the Australian financial markets. We disaggregate the Fed news series into two sub-components: unexpected rise (*FedNews_R*) and unexpected fall (*FedNews_F).*. The following system presents the conditional mean and conditional variance equations used to detect such asymmetric effects.[7]

$$y_t = [\text{RHS of (4a)}] + \alpha_{FedNews\_R} FedNews\_R_{t-1} + \alpha_{FedSur\_F} FedNews\_F_{t-1} \tag{6a}$$

$$\ln h_t = [\text{RHS of (4b)}] + \beta_{FedNews\_R} \left| FedNews\_R_{t-1} \right| + \beta_{FedSur\_F} \left| FedNews\_F_{t-1} \right| \tag{6b}$$

[7] As a robustness check, we added the two components of the Fed news variables to (2a) and (2b) instead, and the resulting Fed surprise coefficients are essentially the same as what we report here.

4. Empirical results

4.1. The RBA's target interest rate announcement news

The quasi-maximum likelihood estimations of the baseline EGARCH(1,1) model are reported in Table 2. We elect to include two lags of the dependant variable and this addresses the residual serial correlations in most cases.[8]

In the conditional mean equation for the interest rate changes, we find the coefficient for the first and the second lags are significant and negative. However, only the first lag coefficient is significant and it is positive for the stock returns of CBA, NAB and WBC. The Monday dummy is significantly negative for the 10-year rate changes, spot and 1-month forward USD/AUD exchange rate returns. The holiday dummy is positive and significant for the CBA stock return and 3- and 10-year bond rate changes.

In the conditional variance equations, the lagged variance term (β_h) is close to one in all cases except for the 10-year rate where it is negative, suggesting volatility persistence as found in the literature. We report the volume effects of innovations, that is, unexpected changes, regardless of the direction, in the mean has a significant impact of raising the conditional volatility (positive $\beta_{\varepsilon 2}$). There is also some evidence for an asymmetric effect of the innovations. A negative influence ($\beta_{\varepsilon 1}<0$) is found for the NAB, stock index returns, 3-year bond rate changes, and 3-month forward exchange rate returns. This suggests that an unexpected fall in the conditional mean in these cases leads to even higher conditional

[8] For the remaining serial correlations in the first and second moments of the standardized residuals, varying the lags of the dependant variables and EGARCH lags addressed the remaining correlations. However, this did not have material impact on the estimation results of the interest rate news variables. Thus, for consistency across the models, we chose to concentrate on the same modeling specification.

variances. On the other hand, a positive impact ($\beta_{\varepsilon 1}>0$) is shown for the 90-day and the 10-year interest rate changes. The conditional variances are lower, in general, on Mondays, while they are generally higher on the days immediately following market closure due to holidays.

The quasi-maximum likelihood estimates of the EGARCH model for the overall effect of the RBA's target rate news as modeled in (3a) and (3b) are reported in Table 3. Significant news effects on the interest rates and the USD/AUD exchange rates are detected. As the 90-day rate is based on the target cash rate, we expect an immediate change in this rate in the same direction as the target cash rate changes. For the longer-term rates, we expect a change in the same direction as the news effect is expected to be transmitted from the short ends to the long ends. As the target rate change represents a change in the real interest rate in the economy, we expect an appreciation (a depreciation) of the AUD in response to an unexpected increase (fall) in the target rate. Thus, we expect a positive sign for the news coefficient for both the interest rate and the exchange rate estimations. Indeed, this is what we find. A significant and positive news coefficient is found in the conditional mean equations of the 90-day and the 3-year rate estimations. In response to a one-percentage point (25 basis points) unexpected rise in the target rate, the 90-day bank bill rate rose by 0.3601 percent (0.0900 percent) while the 3-year bond rate was increased by 0.1570 percent (0.0393 percent). The AUD appreciated when the RBA announced an unexpected rate rise. In response to a one-percentage point (25 basis points) unexpected rise in the target rate, the spot rate appreciated by 2.7074 percent (0.6769 percent) while the 1- and 3-month forward rates appreciated by 1.8744 (0.4686 percent) and 1.7157 percent (0.4289 percent), respectively.

It is noticeable that the impact of the RBA's news on the first moments of interest rate and exchange rate changes are larger in magnitude at the short-term spectrum. This finding is consistent with previous research, such as Cook and Hahn (1989) who report an increase of 50 to 55 basis points in the short-term T-bill rates in response to a one basis point increase in

the Fed funds target rate, but only a 10 basis point increase in the 20-year bond yield is observed.

The interest rate news also has a significant impact on the conditional volatility in nearly all cases. Unexpected announcements led to a higher volatility on the announcement days in most cases. This result is similar to Ehrmann and Fratzscher (2003) who report that the Bundesbank's interest rate announcement increased the volatility of the German money markets prior to 1999. We argue that in approaching an impending RBA's target rate announcement, market participants might correctly guess the direction of the possible target rate change but are unsure about the magnitude of such an action. Therefore, when there is a surprise in the RBA's announcement the homogeneity evaporates and instead would lead to heterogeneity of beliefs among market participants. This then leads to a higher volatility in most markets on the announcement day.

For the stock market series, the stock prices of NAB and WBC significantly rose in response to the news. In response to a one-percentage point (25 basis points) unexpected rise in the target rate, the NAB's stock rose by 1.9621 percent (0.4905 percent) and the WBC's by 1.9372 percent (0.4843 percent). We conjecture that this might be due to both NAB and WBC having more interest rate sensitive assets than liabilities denominated in the same currency for most of the period under investigation. As a result, an unexpected rise in the target rate would be expected to have a positive influence on these banks' incomes and this would be shown as a current rise in their stock prices.[9] There is also evidence for a significant volatility effect in

[9] For example, the net interest rate sensitive asset positions of the NAB at balance sheet dates for the period 2002 to 2006 were such that it would have experienced a net income rise by 21, 67, 39, 50 and 42 million AUD, respectively, in response to a one percent parallel rise in interest rates across the whole Australian yield curve. For WBC, for the same period, it would have experienced an income rise of 17, 29, 30 and 26 billion for the

some cases. The interest rate news raised the conditional volatility of the returns of ANZ, WBC and the stock index.

The macroeconomic announcement dummy is shown to be ineffective in explaining the mean equations. However, it is contributing to the conditional variance equations. In three out of the five cases where a significant coefficient is detected, the macroeconomic announcements significantly reduced the conditional volatility.[10]

4.2. Asymmetric impacts of the RBA's target interest rate news

The second panel of Table 3 shows the disaggregated news coefficients of the conditional mean and variance equations of (4a) and (4b). For the debt market, the two long-term interest rates responded only to unexpected rises whereas the 90-day rate responded to both types of news. In all cases, interest rates rose significantly to the news. In the case of the exchange rates, the spot rate does not show an asymmetric response, however, the 1-month

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period 2002-2005, respectively, and an income deterioration by 32 billion AUD in 2006. Although ANZ also had a similar risk position for a number of years, the RBA's news did not have a noticeable impact.

[10] In addition to the macroeconomics dummy, we also considered a dummy variable for those RBA announcements that had no news content. Even if the RBA's announcements contained no surprise element, the confirmation of the markets' beliefs could still have a material impact on the conditional volatility of market returns as this might either resolve or create market uncertainty. We included a no news dummy that takes the value of one for those RBA announcements that were fully expected by the market (i.e. no news) and zero otherwise in the conditional volatilities in the models reported in Tables 3 and 4. Although this did not have any impact on the estimations reported in this paper, we find significantly higher conditional volatilities of all three interest rates, the NAB's stock returns and the stock index returns on these days. However, we find the opposite result, in general, for the exchange rates. Detailed results of this investigation are available upon request from the corresponding author.

forward responded only to unexpected falls whereas the 3-month forward responded only to unexpected rises. There is no asymmetric response shown in the stock market.

The evidence on the asymmetric impacts on the conditional volatility is less uniform. In general, only unexpected target rate falls raised the interest rate volatilities, whereas the reverse is true for the exchange rates. For the stock market, all the significant coefficients have a positive sign, suggesting a volatility increase. Unexpected rises led to a higher volatility, in general, although unexpected falls also increased the volatility for the CBA and the stock index returns. Furthermore, in most cases, the hypothesis that the magnitudes of the two different types of news coefficients are equal in the variance equation is rejected. Thus, there is a complex array of volatility responses to each type of news.

4.3. Spillover effects of the U.S. Fed's target interest rate news on the Australian markets

In this section, we investigate the impact of unexpected U.S. Fed funds target rate movements on the Australian financial markets. [11] The investigation results are reported in Table 4.[12]

There is no evidence of the spillover effect on the daily Australian interest rate changes, however, the USD/AUD exchange rate responded as per prior expectations. Both spot and one-month forward rates depreciated (appreciated) in response to an unexpected U.S.

[11] We find a weak evidence (at 10%) that the U.S. Fed target rate changes Granger cause the RBA's cash rate changes with two lags included in the test equations, but the causality does not run in the other direction.

[12] We also conducted investigations to ascertain the nature of the U.S. Fed's target interest rate news on the U.S. markets. The short term interest rate (90-day T-Bill) moved in the same direction as the unexpected target rate movement and the volatilities of the USD exchange rates and stock indices were significantly reduced. The details of the estimations are shown in Appendix B.

Fed target rate rise (fall). In addition, the Australian stock index significantly fell following the U.S. interest rate news. We suggest that an interest rate rise in the U.S. would eventually dampen the U.S. and the world demand for commodities and resources, and hence a negative influence on the Australian stock markets where resource stocks are influential.

More importantly, we find that the Fed's interest rate news injected market-calming influence on all three segments of the Australian markets, while the RBA's news resulted in higher levels of volatility as reported above. This is contrary to what Bredin, et al. (2005)'s finding where the U.S. Fed's announcements generally increased the Irish equity market volatility on the days of announcement. In particular, they report that an unexpected increase of the Fed's target rate increased the volatility. We put forward two explanations for this market calming effects of the U.S. Fed's news on the Australian markets. First, we report in Appendix B that the U.S. Fed's target interest rate announcement news significantly reduced the daily return volatilities of spot and forward USD exchange rates and stock indices. Given the established pattern of information leadership of the U.S., the momentum of the trading environment in the U.S. following the Fed's news announcement was transferred to the Australian markets leading to lower market volatilities. Second, the Australian markets might be at an information disadvantage regarding forming expectations on the U.S. Fed's interest rate decisions compared to the U.S. market participants. Thus, a relatively larger proportion of under-informed traders in Australia would have caused a higher diversity of opinions on the impending U.S. announcements compared to the RBA's announcements where they would have a relatively clearer position. However, since the Australian markets open for trading after the U.S. markets close on a calendar day, the market participants in Australia observe any heterogeneity of opinions dissolve over the course of the U.S. trading day after the Fed's interest rate news announcements. By the time the Australian market opens a clear U.S. market movement would have been established and the implications of the Fed's news on the

Australian markets would have been well understood. Thus, the Fed's news would have injected market-calming influences leading to significant reductions in the conditional volatilities of market returns/changes in the Australian financial markets.

In general, we find no strong evidence for asymmetric influences of the Fed's news on the Australian markets. Nonetheless, we observe that, the USD/AUD exchange rates tended to depreciate more in response to unexpected U.S. rate falls, and the volatility reducing effect is bigger with unexpected U.S. rate rises on the Australian interest rates.

5. Conclusion

This paper provides comprehensive evidence on the impacts of the RBA's and the U.S. Fed's target interest rate news on the various segments of the Australian financial markets. We report a number of important findings. First, we find that the RBA's target interest rate news has statistically significant impacts on the conditional means of the daily returns/changes in the Australian debt, foreign exchange and stock markets. Unexpected rate rise announcements significantly raised the 90-day bank bill and the 3-year government bond interest rates, appreciated the USD/AUD exchange rate in the spot and 1- and 3-month forward markets, and stimulated two bank stock returns (NAB and WBC). In addition, we find that the news effect is stronger at the short-term ends of the interest rates and forward exchange rates. Second, we find that the news raised the level of volatility in most cases. Apparently, when markets were caught by surprise the implications of the changes were interpreted differently in the markets. The resulting heterogeneity of opinions would have led to an increased volume of trade and hence higher volatilities on the days of the announcements with an unexpected target rate change. Third, we find some evidence for asymmetric effects of policy surprises. Markets tend to response more strongly to unexpected rate rises than rate falls, in general. Fourth, the U.S. Fed's target rate news significantly

reduced the volatility in the Australian markets. We argue that this is due to (i) the market momentum in the U.S. of the volatility reducing effect of the Fed's news was spilt over to the Australian market leading to similar reductions in volatility, (ii) and to the Fed's news resolving the level of uncertainly in Australia regarding the U.S. economy which has a direct bearing on that of the Australia's.

These findings have important implications for policy makers and market participants alike. By providing comprehensive evidence on not only the RBA's target interest rate announcement news effects but also on the spillover effects of the U.S. Fed's target interest rate news on various segments of the Australian financial markets, this research provides an enhanced understanding of the short-term transmission mechanism of the interest rate news. An interesting extension would be to examine higher frequency responses to the interest rate announcement news in Australia. We leave this avenue for future studies.

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Table 1 - Descriptive statistics target rate announcements and financial market returns

This table reports descriptive statistics for the RBA's and the U.S. Fed's target interest rate announcements (Panel A), the news components (Panel B), and the Australian financial market returns/changes series (Panel C) for the period from January 1998 to December 2006.

Panel A. Target interest rate announcements

	RBA cash rate announcements				Fed fund target rate announcements			
	Total	**Rate rise**	**Rate fall**	**No change**	**Total**	**Rate rise**	**Rate fall**	**No change**
No. of announcements	99	13	7	79	77	23	16	38
Proportions	(100%)	(13%)	(7%)	(80%)	(100%)	(30%)	(21%)	(49%)

Panel B. Target interest rate surprises

	RBA				Fed			
	Total	**Unexpected rise**	**Unexpected fall**	**No surprise**	**Total**	**Unexpected rise**	**Unexpected fall**	**No surprise**
No. of announcements	99	6	4	89	77	28	26	23
(Proportion)	(100%)	(6%)	(4%)	(90%)	(100%)	(36%)	(34%)	(30%)
Summary statistics								
Mean	0.0135	0.2500	-0.2500		-0.0075	0.0957	-0.2934	
Variance	0.0172	0.0000	0.0000		0.0031	0.0070	0.1911	
Skewness	0.0763				5.1583	0.8946	-2.2423	
Excess Kurtosis	3.6837				44.4570	2.3690	8.3325	
Min	-0.2500	0.2500	-0.2500		-1.9140	0.0055	-1.9140	
Max	0.2500	0.2500	-0.2500		0.2760	0.2760	-0.0050	

Table 1 – Continued

Panel C. Australian financial market returns

	Debt market			USD/AUD exchange rate			Stock market				
	90-Day Bank Bill	3-Year Bond	10-Year Bond	Spot	1-Month Forward	3-Month Forward	ANZ	CBA	NAB	WBC	Stock Index
No. of observations	2370	2370	2370	2370	2370	2370	2370	2370	2370	2370	2370
Mean	0.0006	0.0002	-0.0001	-0.0063	-0.0062	-0.0061	0.0450	0.0441	0.0303	0.0399	0.0355
Std. deviation	0.0315	0.0665	0.0945	0.6888	0.6920	0.7273	1.2727	1.1165	1.2582	1.2013	0.7562
Skewness	0.4665	0.0102	0.0268	0.1591	0.1936	0.0434	-0.1054	-0.2545	-0.8623	-0.1127	-0.3006
Kurtosis	39.1209	5.2996	47.0594	2.6521	2.6814	7.0423	1.3716	1.9232	8.5894	1.1252	3.6918
Jarque-Bera	151154	2772	218598	704	725	4896	190	391	7576	130	1381
Ljung-Box Q test											
Return	77.7867 ***	42.8172 ***	233.2497 ***	26.9036	31.9287 **	30.9100 *	31.1432 *	32.1658 **	50.1271 ***	32.1544 **	12.8212
P-Value	{0.0000}	{0.0022}	{0.0000}	{0.1380}	{0.0441}	{0.0564}	{0.0533}	{0.0416}	{0.0002}	{0.0417}	{0.8849}
Volatility	302.2633 ***	230.8850 ***	572.0751 ***	77.8947 ***	89.4621 ***	213.7224 ***	668.9714 ***	228.9215 ***	251.4905 ***	470.6277 ***	239.8054 ***
P-Value	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}

Note: *, **, *** denotes significance at 10%, 5%, and 1%, respectively

Table 2 – EGARCH(1,1) estimations of daily returns

This table reports the quasi-maximum likelihood estimates of the EGARCH (1,1) model as described in equations (2a) and (2b) of daily Australian interest rate changes, USD/AUD exchange rate returns and stock market returns. P-values are in braces.

$$y_t = \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{Mon} Mon_t + \alpha_{Hol} Hol_t + \varepsilon_t \qquad (2a)$$

$$\ln h_t = \beta_c + \beta_h \ln h_{t-1} + \beta_{\varepsilon 1} \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \beta_{\varepsilon 2} \frac{|\varepsilon_{t-1}|}{\sqrt{h_{t-1}}} + \beta_{Mon} Mon_t + \beta_{Hol} Hol_t \qquad (2b)$$

	Debt market			USD/AUD exchange rates			Stock Market				
	90-day	3 Year	10 year	Spot	1-M forward	3-M forward	ANZ	CBA	NAB	WBC	Index
Conditional mean equation (Eq. 2a)											
α_c	0.0006 ***	0.0020 ***	0.0013	0.0201	0.0212	0.0150	0.0376 *	0.0736 ***	0.0388 *	0.0547 **	0.0208 ***
	{0.0048}	{0.0096}	{0.1211}	{0.1106}	{0.1042}	{0.3277}	{0.0552}	{0.0000}	{0.0823}	{0.0437}	{0.0051}
$\alpha_{Lag,\ 1}$	-0.0593 ***	-0.0406 **	-0.0445 **	0.0031	0.0048	-0.0179	0.0490	0.1150 ***	0.0890 ***	0.0756 ***	0.0105
	{0.0000}	{0.0348}	{0.0158}	{0.8821}	{0.8166}	{0.2775}	{0.1219}	{0.0000}	{0.0000}	{0.0002}	{0.5827}
$\alpha_{Lag,\ 2}$	0.0516 ***	-0.0422 **	-0.0387 ***	-0.0011	-0.0068	-0.0050	-0.0075	-0.0139	0.0039	-0.0040	-0.0052
	{0.0018}	{0.0355}	{0.0027}	{0.9584}	{0.7458}	{0.8066}	{0.7264}	{0.4840}	{0.8536}	{0.8448}	{0.7811}
α_{Mon}	0.0001	-0.0029	-0.0116 ***	-0.0525 *	-0.0545 *	-0.0594	-0.0036	0.0432	0.0334	-0.0285	0.0323
	{0.8073}	{0.2593}	{0.0014}	{0.0752}	{0.0715}	{0.1220}	{0.9309}	{0.2459}	{0.4294}	{0.5032}	{0.3228}
α_{Hol}	-0.0001	0.0146 **	0.0199 **	-0.0205	-0.0341	-0.0450	0.0081	0.1087 *	-0.0860	0.0919	0.0840
	{0.9830}	{0.0407}	{0.0235}	{0.7841}	{0.6684}	{0.5474}	{0.9115}	{0.0773}	{0.2356}	{0.2773}	{0.2048}
Conditional variance equation (Eq. 2b)											
β_c	-0.3846 ***	-0.2318 ***	-6.7607 ***	-0.0368 ***	-0.0222 ***	-0.0859 ***	-0.0976 ***	-0.0996 ***	-0.0949 ***	-0.1171 ***	-0.1528 ***
	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}
β_h	0.9720 ***	0.9781 ***	-0.2168 ***	0.9937 ***	0.9971 ***	0.9933 ***	0.9698 ***	0.9727 ***	0.9772 ***	0.9650 ***	0.9804 ***
	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}
$\beta_{\varepsilon 1}$	0.0494 ***	-0.0189 ***	0.0550 ***	-0.0040	0.0024	-0.0053 **	-0.0050	0.0095	-0.0168 *	0.0157	-0.0918 ***
	{0.0000}	{0.0000}	{0.0000}	{0.3810}	{0.5653}	{0.0210}	{0.6755}	{0.2944}	{0.0527}	{0.1430}	{0.0000}
$\beta_{\varepsilon 2}$	0.2973 ***	0.1477 ***	0.6303 ***	0.0633 ***	0.0586 ***	0.0819 ***	0.1758 ***	0.1630 ***	0.1538 ***	0.1834 ***	0.1029 ***
	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}
β_{Mon}	-0.1522 ***	-0.0060	0.4962 ***	-0.1012 ***	-0.1414 ***	0.0896 ***	-0.1842 ***	-0.1502 ***	-0.1404 ***	-0.1426 ***	0.2813 ***
	{0.0000}	{0.3533}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}
β_{Hol}	0.6296 ***	0.2153 ***	0.5565 ***	0.2269 ***	0.2223 ***	0.1690 ***	0.0171	-0.0357	0.0791 **	0.1056 ***	0.0916 ***
	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.6291}	{0.4047}	{0.0104}	{0.0087}	{0.0077}
Estimation diagnostics											
LogL	5575	3178	2696	-2401	-2406	-2505	-3434	-3196	-3272	-3353	-2493
Q(20)	34.6662 **	27.7139	33.5644 **	24.4674	29.4178 *	28.6472 *	16.3243	23.5822	19.9796	24.0919	11.1004
	{0.0220}	{0.1163}	{0.0292}	{0.2226}	{0.0799}	{0.0949}	{0.6963}	{0.2611}	{0.4592}	{0.2384}	{0.9436}
Q2(20)	18.0505	90.7487 ***	5.4240	18.4343	23.8941	87.3449 ***	16.6027	16.9941	27.2085	14.6040	18.0531
	{0.5841}	{0.0000}	{0.9995}	{0.5588}	{0.2470}	{0.0000}	{0.6786}	{0.6534}	{0.1295}	{0.7986}	{0.5839}

Note: *, **, *** denote significance at 10%, 5%, and 1%, respectively

Table 3 –RBA's surprises effects on the Australian financial markets

This table reports the quasi-maximum likelihood estimates of the EGARCH model as described in equations (3a), (3b), (4a), and (4b) of daily Australian stock market returns, interest rate changes, and USDAUD exchange rates. P-values are in braces.

$$y_t = [\text{RHSof (2a)}] + \alpha_{RBANews} RBANews_t + \alpha_{MacroAnn} MacroAnn_t \quad (3a)$$

$$\ln h_t = [\text{RHSof (2b)}] + \beta_{RBANews} |RBANews_t| + \beta_{MacroAnn} MacroAnn_t \quad (3b)$$

$$y_t = [\text{RHS of (2a)}] + \alpha_{RBANews\_R} RBANews\_R_t + \alpha_{RBANews\_F} RBANews\_F_t + \alpha_{MacroAnn} MacroAnn_t \quad (4a)$$

$$\ln h_t = [\text{RHS of (2b)}] + \beta_{RBANews\_R} |RBANews\_R_t| + \beta_{RBANews\_F} |RBANews\_F_t| + \beta_{MacroAnn} MacroAnn_t \quad (4b)$$

	Debt markets			USDAUD exchange rates			Stock Market				
	90-day	3-Year	10-year	Spot	1-Month Forward	3-Month Forward	ANZ	CBA	NAB	WBC	Index
Overall news coefficients (Eq. 3a and 3b)											
$\alpha_{RBANews}$	0.3601 ***	0.1570 *	0.0124	2.7074 **	1.8744 *	1.7157 **	1.5636	0.9286	1.9621 ***	1.9372 **	-0.6784
	{0.0000}	{0.0571}	{0.9161}	{0.0414}	{0.0658}	{0.0124}	{0.2434}	{0.3891}	{0.0057}	{0.0207}	{0.5860}
$\alpha_{MacroAnn}$	-0.0034	0.0003	0.0126	0.0238	0.0175	0.0652	-0.0026	-0.0374	-0.1421	-0.0590	-0.0818
	{0.0520}	{0.9735}	{0.0111}	{0.8054}	{0.8694}	{0.5099}	{0.9845}	{0.7841}	{0.2814}	{0.6332}	{0.3433}
$\beta_{RBANews}$	1.2396 ***	2.5810 ***	0.7065	1.1078 ***	0.9516 ***	-2.4968	1.4728 ***	0.5816	0.8685	1.6610 ***	1.4323 ***
	{0.0049}	{0.0000}	{0.7199}	{0.0000}	{0.0000}	{0.1943}	{0.0015}	{0.4549}	{0.1368}	{0.0017}	{0.0000}
$\beta_{MacroAnn}$	-0.2143 ***	0.2016 ***	-0.5544 ***	-0.0656 **	-0.0020	-0.1440	-0.1042	0.0086	-0.0413	-0.0499	0.3432 ***
	{0.0000}	{0.0000}	{0.0006}	{0.0441}	{0.9037}	{0.5657}	{0.1296}	{0.9121}	{0.5974}	{0.4315}	{0.0000}
News coefficients for unexpected rate rise (RBANews_R) and rate fall (RBANews_F) (Eq. 4a and 4b)											
$\alpha_{RBANews\ R}$	0.3883 ***	0.2807 **	0.1360 **	3.5535	3.1317	2.7929 ***	-0.5100	0.0796	2.2871	0.6335	-1.0126
	{0.0000}	{0.0107}	{0.0219}	{0.1404}	{0.1202}	{0.0000}	{0.7281}	{0.9635}	{0.5120}	{0.6129}	{0.4616}
$\alpha_{RBANews\_F}$	0.3386 ***	-0.0831	-0.1602	0.2998	0.2693 ***	0.2179	3.6330	3.1339	-0.1443	2.6617	2.1456
	{0.0000}	{0.6210}	{0.4973}	{0.9031}	{0.0019}	{0.8251}	{0.3084}	{0.4256}	{0.9450}	{0.3897}	{0.3847}
$\alpha_{MacroAnn}$	-0.0029 *	-0.0037	-0.0030	0.0106	0.0103	0.0294	0.0066	-0.0047	-0.1822	-0.0630	-0.0816
	{0.0955}	{0.7155}	{0.7416}	{0.9125}	{0.9023}	{0.7539}	{0.9615}	{0.9759}	{0.1566}	{0.6053}	{0.3594}
$\beta_{RBANews\_R}$	-0.5235	-0.2360	-4.6372 **	1.5304 ***	1.5960 ***	-4.5705	1.5898 ***	-0.9814	0.8330	2.5964 ***	0.0932
	{0.4646}	{0.6119}	{0.0209}	{0.0000}	{0.0000}	{0.2405}	{0.0097}	{0.3423}	{0.3092}	{0.0000}	{0.9072}
$\beta_{RBANews\_F}$	4.0801 ***	5.8815 ***	2.5300	0.3235	-0.0445	-3.2599	0.9574	2.4105 ***	0.8072	-0.0614	2.5837 ***
	{0.0000}	{0.0000}	{0.3545}	{0.4311}	{0.8925}	{0.3107}	{0.4662}	{0.0016}	{0.3884}	{0.9705}	{0.0000}
$\beta_{MacroAnn}$	-0.1720 ***	0.1527 ***	-0.5665 ***	-0.0819 **	-0.0281 **	-0.1737	-0.1217 **	0.0487	-0.0416	-0.0767	-0.2995 ***
	{0.0011}	{0.0000}	{0.0000}	{0.0103}	{0.0296}	{0.4674}	{0.0433}	{0.5395}	{0.5294}	{0.2047}	{0.0000}
Tests of equality between RBANews_R and RBANews_F											
Mean Eq	0.5747	3.2937 *	1.3912	0.8772	1.9316	5.1548 **	1.1532	0.4991	0.3870	0.3414	1.2494
	{0.4484}	{0.0695}	{0.2382}	{0.3490}	{0.1646}	{0.0232}	{0.2829}	{0.4799}	{0.5339}	{0.5590}	{0.2637}
Var Eq	24.3623 ***	104.3811 ***	4.7967 **	6.4158 **	17.0581 ***	0.0623	0.1764	7.0601 ***	0.0005	2.2775	7.6813 ***
	{0.0000}	{0.0000}	{0.0285}	{0.0113}	{0.0000}	{0.8028}	{0.6745}	{0.0079}	{0.9831}	{0.1313}	{0.0056}

Note: *, **, *** denote significance at 10%, 5%, and 1%, respectively

Table 4. Spillover effects of U.S. Fed's target rate news in the Australian financial markets

This table reports the quasi-maximum likelihood estimates of the EGARCH model as described in equations (5a), (5b), (6a), and (6b) of daily Australian stock market returns, interest rate changes, and USDAUD exchange rates. P-values are in braces.

$$y_t = [\text{RHS of (3a)}] + \alpha_{FedNews} FedNews_{t-1} \quad (5a)$$

$$\ln h_t = [\text{RHS of (3b)}] + \beta_{FedNews} \left| FedNews_{t-1} \right| \quad (5b)$$

$$y_t = [\text{RHS of (4a)}] + \alpha_{FedNews\_R} FedNews\_R_{t-1} + \alpha_{FedNews\_F} FedNews\_F_{t-1} \quad (6a)$$

$$\ln h_t = [\text{RHS of (4b)}] + \beta_{FedNews\_R} \left| FedNews\_R_{t-1} \right| + \beta_{FedNews\_F} \left| FedNews\_F_{t-1} \right| \quad (6b)$$

	Debt markets			USDAUD exchange rates			Stock Market				
	90-day	3-Year	10-year	Spot	1-Month Forward	3-Month Forward	ANZ	CBA	NAB	WBC	Index
Overall newsw coefficients (Eq. 5a and 5b)											
$\alpha_{FedNews}$	0.0008	-0.0022	-0.0047	-0.1886 **	-0.1893 **	-0.5017	-0.1285	0.0621	-0.1995	-0.1045	-0.1630 **
	{0.7668}	{0.8659}	{0.8122}	{0.0243}	{0.0426}	{0.2320}	{0.3736}	{0.3465}	{0.2282}	{0.4355}	{0.0189}
$\beta_{FedNews}$	-0.2006 ***	-0.1384 *	-0.2271	-0.1878 ***	-0.1567 ***	1.0363 ***	-0.1425 ***	-0.1044 *	-0.1726	-0.1493	-0.2026 ***
	{0.0049}	{0.0644}	{0.5041}	{0.0000}	{0.0000}	{0.0002}	{0.0021}	{0.0638}	{0.1314}	{0.1802}	{0.0004}
News coefficients for unexpected rate rise (FedNews_R) and rate fall (FedNews_F) (Eq. 6a and 6b)											
$\alpha_{FedNews\ R}$	0.0006	-0.0031	-0.0049 **	-0.1289	-0.1277	-0.1332 ***	-0.2532	-0.0603	-0.2507	-0.2616 ***	-0.0510
	{0.1672}	{0.2483}	{0.0379}	{0.6849}	{0.6795}	{0.0000}	{0.3468}	{0.7406}	{0.5528}	{0.0000}	{0.8495}
$\alpha_{FedNews\ F}$	0.0338 ***	0.0230	0.0194	-0.6761 *	-0.6381 ***	-0.5899 ***	0.6309	0.8849 **	0.4826	0.5063	-0.6630 ***
	{0.0016}	{0.1566}	{0.5150}	{0.0723}	{0.0013}	{0.0000}	{0.3329}	{0.0453}	{0.3330}	{0.1648}	{0.0002}
$\beta_{FedNews\ R}$	-0.4199 ***	-0.2183 **	-1.0555 ***	-0.1162 ***	-0.0942 **	-0.1083 **	-0.0980 **	-0.0866 ***	-0.1004	-0.0859	-0.1441 ***
	{0.0055}	{0.0131}	{0.0014}	{0.0069}	{0.0222}	{0.0108}	{0.0363}	{0.0000}	{0.4588}	{0.3777}	{0.0000}
$\beta_{FedNews\_F}$	0.1128	-0.3371	0.0427	-0.3786 ***	-0.2898 ***	-0.3617 ***	-0.3395	-0.3228	-0.3865 *	-0.4120 *	-0.5334 ***
	{0.6594}	{0.1231}	{0.9548}	{0.0000}	{0.0000}	{0.0013}	{0.3513}	{0.2472}	{0.0855}	{0.0845}	{0.0001}
Tests of equality between FedNews_R and FedNews_F											
Mean Eq	9.7175 ***	2.6698	0.6720	1.2328	1.9224	0.0056	1.4984	3.9053 **	1.2573	4.3215 **	2.5981
	{0.0018}	{0.1023}	{0.4124}	{0.2669}	{0.1656}	{0.9403}	{0.2209}	{0.0481}	{0.2622}	{0.0376}	{0.1070}
Var Eq	13.0673 ***	0.5413	1.7840	9.5106 ***	6.7588 ***	30.1031 ***	0.4218	0.7320	1.1986	1.7903	9.1530 ***
	{0.0003}	{0.4619}	{0.1817}	{0.0020}	{0.0093}	{0.0000}	{0.5160}	{0.3922}	{0.2736}	{0.1809}	{0.0025}

Note: *, **, *** denote significance at 10%, 5%, and 1%, respectively

Appendix A: Macroeconomic announcements made on the same date as the RBA's target rate announcements

Macroeconomic announcement	Announcement date
CPI Inflation (Cat. No. 6403)	08-Aug-01
	07-Nov-01
	06-Feb-02
	08-May-02
	03-Jul-02
	07-Aug-02
	06-Nov-02
	07-May-03
	05-Nov-03
	02-Sep-04
	02-Feb-05
	04-May-05
	03-Aug-05
	02-Nov-05
	03-May-06
	02-Aug-06
Employment/Unemployment	07-Apr-99
(Cat. No. 6202.2)	05-Apr-00
	05-Jul-00
	04-Oct-00
	02-Oct-02
International Accounts	03-May-00
(Cat. No. 5368)	03-Apr-02
	08-Jun-05
	08-Feb-06
	08-Mar-06
	04-Oct-06
	08-Nov-06
Retail sales (Cat no. 8501)	04-Feb-98
	06-May-98
	04-Aug-99
	03-Nov-99
	02-Aug-00
	03-Oct-01
	02-Apr-03
	02-Jul-03
	06-Aug-03
	03-Sep-03
	04-Feb-04
	03-Nov-04
	04-May-05
	02-Aug-06

Note: The Australian Bureau of Statistics' publications (i.e. announcements) are released to general public at 11:30 am Australian EST on the day of announcement and are embargoed until the official release.

Appendix B: The U.S. market responses to the U.S. Fed's target interest rate news

This paper has demonstrated the existence of a direct influence of the U.S. Fed's target interest rate announcement news on the Australian financial markets. In this Appendix, we provide a comprehensive empirical evidence of the extent to which the Fed's news has an impact on the U.S. financial markets. Our coverage of the U.S. markets includes debt, foreign exchange and stock markets.

Panel A of Table B shows the daily U.S. market returns data which consist of short- and long-term interest rates (90-day Treasury bills, 3- and 10-year Treasury bonds); spot and 1- and 3-month forward exchange rates of the U.S. dollar against the Euro (EUR), Japanese yen (JPY) and British pound (GBP); and two largest stock indices, the S&P Composite and the Dow Jones Industrial Average (DJIA). These are all sourced from Datastream. In most cases, we observe significant negative skewness and serial correlation in returns. In addition, we observe leptokurtosis, non-normality and significant serial correlation in the second moments in all cases.

Panel B of Table B reports the estimation results of the Fed's news effects on the U.S. financial markets. For the debt market, we find evidence that the short-term interest rate responded stronger to the news than the longer-term rates where the 90-day rate increased by 0.0562 percentage point in response to a one percentage point unexpected rise in the Fed's target rate, while the 10-year rate fell by 0.0125 percent. For the foreign exchange market, only the 1-month forward rate responded. The USD/JPY 1-month forward rate depreciated by 0.0838 percent and the USD/EUR appreciated by 0.0272 percent in response to a one percentage point unexpected rise in the Fed's target rate.

The news effect on the conditional volatility is a lower level of volatility, in general. The conditional volatilities of the USD/EUR, the USD/GBP exchange rate returns and stock

index returns are significantly lower in response to the news. However, the target interest rate news significantly increased the conditional volatility of the daily changes of the 90-day Treasury bill rate. This suggests that the new information contained in the Fed's target interest rate announcements helped to reduce the level of heterogeneity in belief among market participants regarding the future course of the U.S. economy.

Table B: The U.S. financial market returns and the U.S. Fed's target interest rate news effects

This table reports descriptive statistics for the U.S. financial market returns/changes series (Panel A), and the estimation results for the impacts of the U.S.'s Fed news on the U.S. financial markets (Panel B),

Panel A reports the summary statistics of daily changes of short-and long-term interest rates, daily returns of spot and 1-month and 3-month forward USD exchange rates against the Euro, Yen and Pound Sterling, and daily returns of two stock market indices (S&P composite and Dow Jones Industrial Average)

Panel B reports the news coefficients in the conditional mean and variance of the EGARCH(1,1) equations employed to examine the Fed's news effects on the U.S. financial markets as shown below. The dependant variable, y_t, is the daily U.S. financial market variables shown in Panel A. P-values are in braces.

$$y_t = \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{Mon} Mon_t + \alpha_{Hol} Hol_t + \alpha_{FedNews} FedNews_t + \varepsilon_t$$

$$\ln h_t = \beta_c + \beta_h \ln h_{t-1} + \beta_{\varepsilon 1} \frac{\varepsilon_{t-1}}{\sqrt{h_{t-1}}} + \beta_{\varepsilon 2} \frac{|\varepsilon_{t-1}|}{\sqrt{h_{t-1}}} + \beta_{Mon} Mon_t + \beta_{Hol} Hol_t + \beta_{FedNews} |FedNews_t|$$

Panel A. The US financial market returns

	Debt market			Exchange rates									Stock Market	
				USD/EUR			USD/JPY			USD/GBP				
	90-Day T-bill	3-Year T-bond	10-Year T-bond	Spot	1-Month Forward	3-Month Forward	Spot	1-Month Forward	3-Month Forward	Spot	1-Month Forward	3-Month Forward	S&P Composite	DJIA
No. of observations	2370	2370	2370	2087	2087	2087	2370	2370	2370	2370	2370	2370	2370	2370
Mean	-0.0002	-0.0004	-0.0005	-0.0056	-0.0056	-0.0055	-0.0034	-0.0033	-0.0032	-0.0063	-0.0064	-0.0065	0.0158	0.0186
Std. deviation	0.0443	0.0607	0.0512	0.6017	0.6005	0.5998	0.6880	0.7326	0.7335	0.4925	0.4921	0.5372	1.1258	1.0875
Skewness	-1.7206	0.0959	0.2889	-0.2110	-0.2005	-0.1965	-0.7392	-0.733938	-0.7399	-0.1080	-0.1016	-0.2723	-0.0016	-0.1252
Kurtosis	28.2719	3.0337	1.1118	0.9802	0.9568	0.9449	6.0666	9.884944	7.6520	0.7649	0.7521	6.4683	2.9089	3.9307
Jarque-Bera	80066	912	155	99	94	91	3849	9858	5996	62	60	4159	835	1531
Ljung-Box Q test														
Return	120.6239 ***	39.0931 ***	23.8262	10.2505	10.0663	10.0669	28.5205 *	24.9247	33.8427 **	31.1707 *	33.7111 **	31.0644 *	32.6041 **	26.3564
P-Value	{0.0000}	{0.0065}	{0.2501}	{0.9634}	{0.9670}	{0.9669}	{0.0976}	0.204327	{0.0272}	{0.0530}	{0.0281}	{0.0543}	{0.0373}	{0.1544}
Volatility	181.2865 ***	162.3160 ***	161.7333 ***	51.3407 ***	53.6618 ***	55.0158 ***	464.2989 ***	183.7811 ***	199.2567 ***	117.4211 ***	118.5834 ***	303.9345 ***	989.3466 ***	839.8300 ***
P-Value	{0.0000}	{0.0000}	{0.0000}	{0.0001}	{0.0001}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}	{0.0000}

Panel B. Coefficients for U.S. Fed's target rate news

				Overall news coefficients										
$\alpha_{FedNews}$	0.0562 ***	0.0042	-0.0125 *	-0.0245	-0.0272 *	-0.0251	0.0710	0.0838 **	0.0812	0.1076	0.1079	-0.0756	-0.1540	-0.1157
	{0.0000}	{0.7449}	{0.0661}	{0.1458}	{0.0627}	{0.1198}	{0.2606}	{0.0475}	{0.1185}	{0.1149}	{0.1096}	{0.5406}	{0.1771}	{0.3376}
$\beta_{FedNews}$	0.4505 ***	-0.0255	0.1246	-1.4407 ***	-1.4436 ***	-1.4294 ***	-0.0469	-0.0827	-0.0332	-0.7318 ***	-0.7488 ***	0.1594	-0.2126 ***	-0.2808 ***
	{0.0000}	{0.7864}	{0.1288}	{0.0000}	{0.0000}	{0.0000}	{0.2880}	{0.2023}	{0.3092}	{0.0000}	{0.0000}	{0.7855}	{0.0010}	{0.0006}

Note: *, **, *** denote significance at 10%, 5%, and 1%, respectively