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Spillover impacts of the US macroeconomic news: Australian sectoral perspective

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Abstract

We study the spillover effects of the US macroeconomic news on different sectors of the Australian stock market. We find that an indication of economic contractionary from the US raises the conditional mean, and most news elicits the associated volatility in the Australian stock markets. While the US news has been absorbed relatively quickly on the conditional mean, the volatility impact speed is unclear. More importantly, we reveal that the US GDP news has the strongest impact on both the first two moments of the Australian daily returns and help reduce volatility in the latter market.

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1. Introduction

Since the seminal work of Chen *et al.* (1986), many studies have tried to investigate the potential effect of macroeconomic forces on stock returns. It has been strongly documented that inflation and monetary policy have a negative effect on stock returns, see *inter alia* Bodie (1976), Fama (1981), Geske and Roll (1983), and Pearce and Roley (1983). On the other hand, the impact of the real economic activity variables on stock returns is still an open question that attracts numerous empirical studies. Furthermore, the extant literature provides strong evidence for the informational leadership of the US on the Asia Pacific region, see Arshanapalli *et al.* (1995), Liu and Pan (1997), Liu *et al.* (1998), Ghosh *et al.* (1999), Kim and In (2002), Kim (2003, 2005), Wongswan (2006), Kim and Nguyen (2008, 2009), amongst others. Of which, the Australian stock markets are of particular interest due to its strong link with the US through real and financial integration. Furthermore, the Australian stock markets are well established and small open financial markets relative to other Asia Pacific markets, see Kim and In (2002). However, the extant literature has mainly focused on the aggregate stock returns. This aggregate effect might mask the specific sector response as different sectors might react differently to the macroeconomic variables due to inherent characteristics. Against this background, this study is conceptually linked to two strands of the literature on the domestic and the spillover impact of macroeconomic news on stock market returns. We contribute to the literature in the following ways. Firstly, aside from the spillover effects of the US macroeconomic news on the aggregate Australian stock index, we take a step further to investigate the Australian sectoral specific responses to the US news. Secondly, by breaking down the daily return horizon into overnight and intraday horizons, we aim to investigate the speed of news absorption in the Australian markets. Finally, for policy making and trading strategies, it would also be of great interest to have a clear idea on which US news should market participants closely monitor amongst a basket of several news.

The key findings of this paper are summarized as follows. Firstly, we find that higher than expected policy interest rate, inflation and employment news from the US have a negative impact on the return of the Australian stock markets, while higher than expected US GDP growth rate leads to an increase in the Australian market returns. On the other hand, a sign of contractionary in the US economy (higher than expected interest rate, inflation and employment) has an elicit impact on the conditional volatility of the Australian market return, whereas an economic expansion (higher US GDP growth) results in a lower volatility in the Australian markets. Secondly, we find that the US news has been absorbed relatively quickly on the conditional mean of the Australian returns while the speed of adjustment on the conditional volatility is unclear. Thirdly, we show that different sectors react differently to the US news, such as the Health care is somewhat insulated while the Financial sector is very sensitive to the US news. More importantly, we show that the US GDP news has the strongest impact on both the first moments of the daily returns. This confirms prior finding that the Australian markets believe that the US targets economic activities and is consistent with the fact that the US economy is the key driving force in the world economy due to its relative size.

The rest of this paper proceeds as follows. Section 2 discusses data and empirical modeling issues. Section 3 reports and analyzes the estimation results. Section 4 discusses several robustness checks. Section 5 concludes the paper.

2. Data and modeling issues

2.1. Australian stock indices

Since the US macroeconomic announcements were made when the Australian markets were closed, the earliest reaction can be captured at market opening one calendar day after the news announcement. Hamao *et al.* (1990) suggest that information spillovers from foreign markets would be expected to show up only in the close-to-open returns as predicted by international asset pricing model. On the other hand, volatility spillovers to the conditional variances of the close-to-open and open-to-close horizons can occur. Therefore, while most of the previous studies utilize daily closing data to explore the impacts of the macroeconomic news, we employ open and close prices to disaggregate the daily investigation horizon into overnight and intraday periods. We collect daily open and close data from Reuters for the ASX/S&P 200 benchmark index (AXJO) and its Global Industry Classification Standard (GICS) sector indices including Energy (AXEJ), Industrials (AXNJ), Consumer Discretionary (AXDJ), Consumer Staples (AXSJ), Health Care (AXHJ), Information Technology (AXIJ), Telecommunications Services (AXTJ), Utilities (AXUJ), Financials (AXFJ), Property Trusts (AXPJ), and Materials (AXMJ).

Stock index returns have been calculated over three time horizons. The first horizon (H0) is over the close on calendar day *t-1* to the close on calendar day *t* (close-to-close); the overnight horizon (H1) is over the close of day *t-1* to the open on day *t* (close-to-open); the intraday horizon (H2) is measured over the open on day *t* to the close on day *t* (open-to-close). The overnight horizon (H1) captures the Australian stock markets' first reaction to the US news, whereas the intradaily horizon (H2) captures any delayed reactions.

2.2. The US macroeconomic news

We collect data on four key US macroeconomic announcements for the period from June 2001 to December 2008 as shown in Table 1. The dataset consists of the FOMC's target rate announcements (Fed) released after the FOMC Board meetings, quarterly Gross Domestic Product percentage level (GDP) released for the previous quarter, monthly Consumer Price Index (CPI) percentage change, and Unemployment (UE) percentage level. These are the most important economic announcements as identified by Balduzzi *et al.* (2001).

To derive the macroeconomic news component from the actual announcements, we use the median of the survey series obtained from Reuters surveys. Let M_i denote the median of the surveys and A_i is the actual announcement for macroeconomic variable i, the news component of macroeconomic news i is measured as:

$$News_i = A_i - M_i \tag{1}$$

In line with the recent developments in the target interest rate news literature, we derive the news component of the central bank's target interest rate news using Kuttner (2001)'s methodology. The news component of the Fed's target rate announcements on day *d* of month *m* can be derived from the implied change in the futures contract's price. Since the Fed funds futures settlement price is based on the monthly average of the spot Fed funds rates, the number of days affected by the announcement in that particular month is scaled as in equation (2).

$$\Delta i^u = \frac{D}{D-d}\left(f^0_{m,d} - f^0_{m,d-1}\right), \qquad (2)$$

where Δi^u is the unexpected target rate change, $f^0_{m,\,d}$ is the current-month Fed funds 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.

2.3. Empirical models

This paper dually examines the news impacts on both the conditional mean and the conditional volatility of daily returns. Furthermore, as the volatility effects of the news depend on the role of the news in resolving the heterogeneity of beliefs and expectations of market participants, it is necessary to employ a model that allows us to detect both stimulus and calming effects, i.e. higher and lower volatility impacts of the news. In the econometric literature, the parsimonious MA-EGARCH (1,1) model allowing for both positive and negative coefficients on the conditional volatility is best suited to this paper's testing purposes.

Equation (3) shows the MA-EGARCH (1,1) model used for the empirical test of the US macroeconomic news spillover effects. Following Balduzzi *et al.* (2001), we test the impact of each news separately. The conditional mean equation of the Australian stock market returns (y_t) is expressed as a function of past changes in relevant markets; the *Holiday* effect variable (Hol_t) 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.; the *Monday* dummy variable (Mon_t) is used to account for the weekend effect and takes the value of one for Mondays and zero otherwise; and the news variable ($News_t$) for each of the US macroeconomic variable discussed in Section 2.2. The conditional variance equation for the changes in the financial market series (h_t) is expressed as a function of one period lag of the variance and the residuals, the *Holiday* and *Monday* effect dummies and $News_t$ variables. The $News_t$ variable is lagged by one period to account for the trading time difference between the US and the Australian markets. The US announcements are released while the Australian markets are closed, thus the latter would respond to the news from the other two when they open for trading one calendar day after the announcements. Therefore, the spillover impacts, if any, would show up in the following day.

$$\begin{aligned}
y_{i,t} &= \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} News_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k} \\
\ln h_{i,t} &= \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{|\varepsilon_{i,t-1}|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} \\
&\quad + \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} |News_{i,t-1}| \\
\varepsilon_{i,t} &= z_{i,t} \sqrt{h_{i,t}} \sim (0,\ h_{i,t}),\ z_{i,t} \sim iid\ (0,1)
\end{aligned} \qquad (3)$$

In general, in line with the extant literature, we expect to find a negative impact of the US inflation and monetary policy on the Australian stock returns. The impact of other real variables (GDP and Unemployment) needs to be empirically tested. The volatility effect depends on whether the news adds to or resolves uncertainty in the markets. If the news leads to further speculations in the market, this increased heterogeneity would be shown in a rise in the volatility. Furthermore, depending on the value added of the information injected by the US news to Australian market participants, a market calming effect could be observed if the US news resolves uncertainty in the Australian markets.

3. Empirical results

3.1. Baseline model's results

Table 2 shows the estimations for the spillover of the US's macroeconomic news on the Australian stock markets. In general, all four key US macroeconomic news have significant impacts on both the first two moments of the Australian stock markets' returns. Consistent with the literature on domestic impacts of the US macroeconomic news and *a priori* expectation, we find that higher than expected interest, inflation and unemployment rates from the US have a negative impact, whereas higher than expected US GDP growth rates have a positive impact on the Australian stock markets' returns. This suggests that a contractionary in the US economy has a negative impact on its own stock markets, and this has a contagious effect on the Australian markets as well. This finding is also consistent with Kim and Nguyen (2009) where they find that higher than expected target rate news from the Fed results in lower returns for most of Asia Pacific stock markets including the Australia.

On the conditional volatility, in general, higher than expected news on the US Fed's target interest rate, inflation and unemployment elicit volatility in the Australian stock markets. This is consistent with Kim and In (2002) where the authors also show a positive volatility influence from the US macroeconomic news on the Australian stock markets. On the other hand, higher than expected US GDP tends to lower volatility in the Australian markets. This is consistent with the finding of Flannery and Protopapadakis (2002), where they find that real GDP/GNP surprises are associated with significantly lower conditional return volatility in the US stock market. Therefore, along with Andritzky *et al.* (2007)'s finding that the US's macroeconomic news reduce uncertainty in emerging markets, this domestic influence from the US markets would also possibly transmitted to the Australian markets due to the leadership of the US on the latter.

Overall, the GDP news has the strongest impact on both moments of the daily return of the Australian stock markets. This suggests the relative important of the US GDP news for the Australian investors and confirms the finding that the Australian market participants believe that the US targets economic activity as found in Kim and Sheen (2000). We argue that as the US economy is the most important driver for the global economy growth, higher than expected GDP news in the US economy would be considered as good news for the other economies which have the US as a key trading partner like Australia.

3.2. Sectoral effects

In this section, we go deeper into analyzing the impact of the US macroeconomic news on different sectors of the ASX/S&P 200 index. While the conditional mean of the ASX/S&P 200 reacts to the Fed news during the daily horizon only, the sub-indices react relatively strongly. While the US news has no significant impact on Health care sector's conditional mean, all four US news has significant impacts on the conditional mean of the Financials (AXFJ) and Consumer Discretionary (AXDJ) sectors mostly overnight. Furthermore, while higher than expected Fed news has a negative impact on the Consumer Discretionary sector's return as consumers would cut spending during a contractionary period, it has a positive impact on the conditional mean of the Financials sector. The latter is also consistent with the finding of Kim and Nguyen (2008) where the authors find that due to the balance sheet structure of most Australian banks where they have more US dollar denominated interest rate sensitive assets than liabilities, thus unexpected increase in the US target rate would ultimately result in a positive effect on the banks' income and these unexpected windfall would have been shown up in their stock prices.

The US news has strongest impacts on the conditional variance of the Industrials (AXNJ) and Property Trusts (AXPJ) which 10 significant responses each. Moreover, while the US news has a stimulus impact on volatility of most of indices, we observe that the conditional variance of Telecommunications Services (AXTJ) and Property Trusts (AXPJ) indices was lower following the US news, especially the good news of higher than unexpected GDP growth rate over all three time horizons.

3.3. Speed of response

On the conditional mean, we find that the US macroeconomic news has the most significant effect overnight only where 20 out of 26 significant responses are observed during the overnight horizon. This suggests that the Australian stock markets absorb the US news relatively quickly. However, there is an unclear pattern on the reaction speed on the conditional variance of the Australian markets' returns. The US inflation and unemployment news has been absorbed relatively quickly, where 19 out of 41 significant responses are shown during the overnight horizon. On the other hand, the volatility elicit impact of the US Fed news are persistent where most of significant responses from the Australian stock markets are shown during the intradaily and the daily horizons while a calming effect is observed overnight only. The reverse pattern has been shown for the US GDP news where the calming effect is persistent while the elicit effect is shown during the overnight horizon only.

4. Robustness checks

4.1. Controlling for the Australian domestic news

During the course of a trading day, other macroeconomic announcements made by the Australian Bureau of Statistics (ABS) at 11.30 AM Australian EST (GMT+10) might hit the Australian stock markets. Thus, we include a dummy variable ($MacroAnn_{i,t}$) for each of the Australian macroeconomic announcements in the conditional variance equation to isolate the influence of the US news from the Australian domestic news on the days of multiple information arrivals.[1] In particular, we control for the announcements of Australian inflation, employment, international accounts and retail sales as in equation (4).

$$
\begin{aligned}
y_{i,t} &= \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} News_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k} \\
\ln h_{i,t} &= \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{|\varepsilon_{i,t-1}|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} \\
&\quad + \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} |News_{i,t-1}| + \beta_{MacroAnn} MacroAnn_t
\end{aligned}
\tag{4}
$$

Table 3 shows that controlling for the Australian domestic news, the results are qualitatively similar to what was reported in Section 3 where on the mean, an expansion in the US economy (higher GDP) leads to an increase in the Australian stock market return, while a contractionary (higher interest rate, inflation and employment) results in a negative return for the Australian markets. On the conditional variance, the impacts other way around where higher than expected US GDP helps reduce volatility in the Australian markets and the other news elicit volatility. We further consistently observe that the US GDP news is the most important news for the Australian stock markets.

4.2. Standardized effects

Since measurement units differ across news, to facilitate comparability we standardize the news by dividing it by the standard deviation across all observations following Balduzzi *et al.* (2001). Let $SNews_i$ denotes standardized news and σ_i is the standard deviation of macroeconomic news i, the standardized news ($SNews_i$) is measured as:

$$SNews_i = News_i \,/\, \sigma_i \tag{5}$$

We then estimate equation (3) with $SNews_i$ instead of $News_i$ as shown in equation (6)

$$
\begin{aligned}
y_{i,t} &= \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} SNews_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k} \\
\ln h_{i,t} &= \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{|\varepsilon_{i,t-1}|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} \\
&\quad + \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} |SNews_{i,t-1}|
\end{aligned}
\tag{6}
$$

The regression coefficient is to be interpreted as the response to a one-standard deviation change in the news variable, $SNews_i$. Table 4 shows evidence consistent with the findings reported in Section 3. Specifically, all the US news have expected effects on the conditional mean of the Australian stock markets where higher than expected news on the

[1] We do not include the macro announcement dummies in the conditional mean equations because they represent an average impact of positive and negative macro news (e.g. higher or lower than expected announcements which would have opposite impacts on stock returns). However, macroeconomic announcements, irrespective of the types of news contents, could influence market volatility in a similar fashion depending on the value added content and the role in resolving different in belief of the news.

Fed target interest rates, inflation and unemployment rate lead to lower returns in the Australian markets, while higher than expected GDP growth rate has a positive effect. On the conditional volatility, while the US GDP news injects some market calming effects to the Australian stock markets, the other news has an opposite impact. In terms of sectoral specific effects, the US news has strongest impacts on the Industrials (AXNJ) and Property Trusts (AXPJ) sectors. However, the US news has no significant impact on Health care sector's conditional mean. More importantly, we consistently find that the US GDP still has the strongest impact on both the first moments of the Australian stock markets' returns.

4.3. Common-sized effects

As news measured in absolute term might mask the relative importance of the news to its actual announcement, e.g. a shock of 50 basis points will have different impacts if the actual announcement is 1 percents instead of 2 percents, another way to facilitate a direct comparison is to normalize all news relative to their actual announcements. That is, let $CNews_i$ denotes common-sized news and A_i is the actual announcement for macroeconomic variable i, the common-sized news $CNews_i$ is measured as:

$$CNews_i = News_i \ / A_i \qquad (7)$$

We then estimate equation (3) with $CNews_i$ instead of $News_i$ as shown in equation (8)

$$\begin{aligned} y_{i,t} &= \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} CNews_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k} \\ \ln h_{i,t} &= \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{\left|\varepsilon_{i,t-1}\right|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} \\ &\quad + \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} \left| CNews_{i,t-1} \right| \end{aligned} \qquad (8)$$

Table 5 shows that in terms of significant responses and the reaction magnitude, the US news' common-sized effects on the conditional mean and conditional volatility of the Australian stock markets are similar to what was reported in Section 3.

5. Conclusion

We empirically investigate the impacts of the US macroeconomic news on both the conditional mean and volatility of daily changes in the returns of the Australian stock market indices. We find that higher than expected interest rate, inflation and employment news from the US have a negative impact on the return of the Australian stock markets, while higher than expected US GDP growth rate leads to an increase in the Australian market returns. On the other hand, a sign of contractionary in the US economy (higher than expected interest rate, inflation and employment) has a elicit impact on the conditional volatility of the Australian market return, whereas an expansion (higher US GDP growth) results in a lower volatility in the Australian markets. Secondly, we find that the US news has been absorbed relatively quickly on the conditional mean of the Australian return while the speed of adjustment on the conditional volatility is unclear. Thirdly, we show that different sectors react differently to the US news, such as the Health care is somewhat insulated while the Financial sector is very sensitive to the US news. More importantly, we show that the US

GDP news has the strongest impact on both the first moments of the daily returns. This confirms prior finding that the Australian markets believe that the US targets economic activities and is consistent with the notion that the US economy is the key driving force in the world economy due to its relative size. Therefore, direct news on the underlying health of the US economy would shake not only its domestic markets but also foreign markets. However, further research is needed to further explore different channels that transmit the US news to the Australian stock markets such as the financial and real integration channels.

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Table 1 – Macroeconomic announcements

This table reports number of announcements, release times and reporting sources of the US macroeconomic variables.

Releases	Observations	Release Time (EST)	Reporting authority
Target interest rates (Fed)	64	14.15	Federal Reserve Board
Gross Domestic Product (GDP)	30	8.30	Bureau of Economic Analysis
Consumer Price Index (CPI)	90	8.30	Bureau of Labor Statistics
Unemployment (EU)	90	8.30	Bureau of Labor Statistics
Total	**274**		

Table 2 – The news spillover effects

This table reports the estimation results of the MA-EGARCH models described in equation (3) for the spillover effect of the US news on daily changes of the Australian stock markets. Fed is the FOMC's target rate announcement, GDP is the Gross Domestic Product, CPI is the Consumer Price Index, and UE is the Unemployment rate. P-values are in parentheses. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

$$
\begin{aligned}
y_{i,t} &= \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} News_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k} \\
\ln h_{i,t} &= \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{\left|\varepsilon_{i,t-1}\right|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} + \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} \left| News_{i,t-1} \right|
\end{aligned}
\tag{3}
$$

	AXJO			AXEJ			AXNJ			AXDJ		
	H0	H1	H2	H0	H1	H2	H0	H1	H2	H0	H1	H2
Conditional mean equation												
α_{Fed}	-0.1376 **	-0.2591	-0.2286	0.3787	0.5967 ***	0.2380	0.8563	0.1389	0.5435	-0.4243	-0.6821 *	-0.4267
	(0.0121)	(0.3713)	(0.5700)	(0.1144)	(0.0000)	(0.1725)	(0.2748)	(0.7781)	(0.5323)	(0.6146)	(0.0511)	(0.5517)
α_{GDP}	0.0271	0.0166	0.0334	-0.2374	-0.0513 ***	-0.1827	0.1256	-0.0382	0.1466	-0.0995	0.0577 ***	-0.1177
	(0.8077)	(0.7889)	(0.8413)	(0.2792)	(0.0000)	(0.3214)	(0.2473)	(0.4111)	(0.4002)	(0.6681)	(0.0025)	(0.2347)
α_{CPI}	0.0036	-0.0107	0.0033	-0.0312	0.0216	-0.0290	0.0635 ***	0.0173 ***	0.0417 *	-0.0047	-0.0196 ***	-0.0137
	(0.8810)	(0.3141)	(0.8910)	(0.4623)	(0.1797)	(0.4882)	(0.0099)	(0.0049)	(0.0953)	(0.8535)	(0.0000)	(0.6231)
α_{UE}	0.1393	-0.1259	0.3866	0.2451	-0.0415 ***	0.0599	0.4525	0.2363	0.1168	0.5184	-0.1433 *	0.5492
	(0.7728)	(0.4964)	(0.5262)	(0.8040)	(0.0000)	(0.9564)	(0.4945)	(0.1271)	(0.8631)	(0.5021)	(0.0817)	(0.4914)
Conditional variance equation												
β_{Fed}	0.9071 *	0.6848 ***	0.3460 **	0.2051 **	0.2553	0.2036	0.2335 ***	0.3754 ***	0.3926 ***	0.5859 **	0.6711	0.2758
	(0.0517)	(0.0000)	(0.0190)	(0.0176)	(0.8129)	(0.6853)	(0.0000)	(0.0004)	(0.0020)	(0.0148)	(0.7055)	(0.4826)
β_{GDP}	-0.3647 ***	0.0565	-0.2950 ***	-0.3758 ***	0.7244 ***	-0.1455 **	-0.5570 ***	0.6969 ***	-0.3657 ***	-0.1158	-0.7877 ***	-0.1283 *
	(0.0014)	(0.4681)	(0.0085)	(0.0005)	(0.0000)	(0.0257)	(0.0000)	(0.0000)	(0.0058)	(0.1519)	(0.0037)	(0.0948)
β_{CPI}	0.0507 *	0.0696 ***	0.0359	-0.0553	0.0060	-0.0732	-0.0423 ***	-0.0566 ***	-0.0542 **	0.0676 ***	0.2925 ***	0.0735 ***
	(0.0530)	(0.0004)	(0.1973)	(0.2620)	(0.9777)	(0.1967)	(0.0003)	(0.0003)	(0.0236)	(0.0000)	(0.0000)	(0.0036)
β_{UE}	0.1182	0.7544 ***	0.9363 *	-0.3176	0.9523	-0.0777	-0.2758	0.5369 ***	0.6581	0.7431 **	0.1347 ***	0.5204
	(0.7632)	(0.0000)	(0.0925)	(0.3424)	(0.2421)	(0.8305)	(0.4080)	(0.0000)	(0.1606)	(0.0197)	(0.0000)	(0.2597)

Table 2 – Continued

	AXSJ			AXHJ			AXIJ			AXTJ		
	H0	H1	H2	H0	H1	H2	H0	H1	H2	H0	H1	H2
Conditional mean equation												
α_{Fed}	-0.6733*	-0.0079***	-0.7709	0.8336	0.1529	0.6229	0.6234	0.7200	0.0274	0.7190	0.2681	0.0259
	(0.0699)	(0.0000)	(0.1759)	(0.2210)	(0.6347)	(0.3688)	(0.4330)	(0.2208)	(0.9639)	(0.6257)	(0.7091)	(0.9520)
α_{GDP}	0.0408	-0.0267	0.0854	0.0625	0.0507	-0.0108	0.2921	0.3490**	0.1739	-0.0456	-0.0108	-0.0499
	(0.7271)	(0.8894)	(0.6007)	(0.7636)	(0.5706)	(0.9719)	(0.1279)	(0.0186)	(0.2401)	(0.7671)	(0.8722)	(0.7480)
α_{CPI}	0.0049	-0.0008	0.0169	0.0119	-0.0042	0.0034	-0.1093*	-0.0546***	0.0465	-0.0115	-0.0448***	-0.0072
	(0.8334)	(0.8805)	(0.4859)	(0.7285)	(0.4007)	(0.9361)	(0.0596)	(0.0008)	(0.3289)	(0.6831)	(0.0005)	(0.7994)
α_{UE}	0.6317	-0.0319	0.7554	-0.9166	0.0306	-0.2021	0.7131	0.2602	-0.1436	0.1982	-0.0901***	0.4119
	(0.3485)	(0.9259)	(0.2713)	(0.3485)	(0.9402)	(0.2326)	(0.7403)	(0.4513)	(0.9339)	(0.8552)	(0.0001)	(0.6705)
Conditional variance equation												
β_{Fed}	0.6486*	-0.2939***	0.5324	0.4983*	-0.3653***	0.4529	0.4528	-0.6739	0.0149***	0.7149	0.1411	0.2631
	(0.0510)	(0.0005)	(0.2991)	(0.0749)	(0.0000)	(0.2284)	(0.1022)	(0.1095)	(0.0019)	(0.2389)	(0.7114)	(0.6740)
β_{GDP}	-0.1695**	0.1030	-0.0899	-0.1590***	0.4897***	-0.1097	-0.3320	0.0201	-0.1781**	-0.4406***	-0.1519***	-0.2339**
	(0.0356)	(0.9474)	(0.5556)	(0.0000)	(0.0000)	(0.2019)	(0.1399)	(0.9041)	(0.0456)	(0.0000)	(0.0010)	(0.0370)
β_{CPI}	0.0471***	0.0141	0.0334	0.0738	0.0203***	0.0465	0.0241	0.0029	0.0391***	-0.0097	0.2263***	-0.0203*
	(0.0002)	(0.2273)	(0.2391)	(0.8540)	(0.0000)	(0.3970)	(0.2799)	(0.9028)	(0.0000)	(0.1661)	(0.0000)	(0.0556)
β_{UE}	0.4730***	0.6172**	0.5678***	0.4132***	0.9493	0.7293***	0.7025*	-0.7571*	-0.1189	0.1075	0.4058***	0.5214
	(0.0000)	(0.0145)	(0.0000)	(0.0003)	(0.1766)	(0.0001)	(0.0593)	(0.0777)	(0.6965)	(0.8126)	(0.0000)	(0.3094)

	AXUJ			AXFJ			AXPJ			AXMJ		
	H0	H1	H2	H0	H1	H2	H0	H1	H2	H0	H1	H2
Conditional mean equation												
α_{Fed}	-0.0381***	0.2937	-0.1229*	0.0597*	-0.0839	0.2219	0.6725	-0.1667	-0.0125	0.4021	0.2438	0.2757
	(0.0011)	(0.5364)	(0.0513)	(0.0948)	(0.1739)	(0.2964)	(0.3612)	(0.7413)	(0.6644)	(0.4941)	(0.5136)	(0.5906)
α_{GDP}	-0.0114	0.0851	-0.0935	0.0339	0.0686*	-0.0273	-0.0480	0.0485***	-0.0655	0.0266	-0.0613	0.1852
	(0.8942)	(0.1485)	(0.4035)	(0.7422)	(0.0613)	(0.8067)	(0.6241)	(0.0000)	(0.4828)	(0.9073)	(0.2617)	(0.4157)
α_{CPI}	0.0295	-0.0456***	0.0156	-0.0199	-0.0147**	0.0092	-0.0557*	-0.0040*	-0.0544	0.0398	0.0260	0.0021
	(0.3253)	(0.0000)	(0.5952)	(0.4638)	(0.0174)	(0.7216)	(0.0810)	(0.0535)	(0.1015)	(0.3286)	(0.1558)	(0.9516)
α_{UE}	0.2120	-0.8775***	0.7531	0.7876	-0.3358**	0.7380	0.3263	0.0644	0.0945	0.5594	-0.3717***	0.6464
	(0.7536)	(0.0005)	(0.2613)	(0.1791)	(0.0113)	(0.2342)	(0.4518)	(0.6463)	(0.9023)	(0.6059)	(0.0000)	(0.1241)
Conditional variance equation												
β_{Fed}	-0.2316	-0.0830	0.6421	0.2125	0.7665*	0.3158***	0.0480**	-0.9092***	0.1327***	0.0958**	-0.0806	0.1816**
	(0.4257)	(0.7926)	(0.2018)	(0.6828)	(0.0687)	(0.0000)	(0.0300)	(0.0000)	(0.0000)	(0.0279)	(0.9248)	(0.0129)
β_{GDP}	-0.4910***	0.2277***	-0.1468	-0.2547***	0.4828***	-0.1171	-0.3067***	-0.7900***	-0.2133*	-0.1399	-0.0421	-0.1869
	(0.0000)	(0.0057)	(0.2352)	(0.0042)	(0.0000)	(0.2767)	(0.0014)	(0.0005)	(0.0785)	(0.2161)	(0.7966)	(0.1137)
β_{CPI}	0.0648	0.0763	0.1405	-0.0286	0.0472**	-0.0200	0.0927***	-0.5568***	0.0822***	0.0520*	0.1884***	-0.0355
	(0.5301)	(0.9070)	(0.0000)	(0.2403)	(0.0337)	(0.4168)	(0.0002)	(0.0000)	(0.0022)	(0.0914)	(0.0004)	(0.2504)
β_{UE}	0.2601	0.3453***	0.2054	0.4276	0.8557***	0.1473*	-0.3564	-0.2586***	0.0017	0.2094	0.3348***	0.6671
	(0.2333)	(0.0005)	(0.7046)	(0.4332)	(0.0000)	(0.0546)	(0.4603)	(0.0000)	(0.9970)	(0.6774)	(0.0000)	(0.2832)

Table 3 – The US spillover effects controlling for the Australian news

This table reports the estimation results of the MA-EGARCH models described in equation (4) for the spillover effect of the US news on daily changes of the Australian stock markets. Fed is the FOMC's target rate announcement, GDP is the Gross Domestic Product, CPI is the Consumer Price Index, and UE is the Unemployment rate. P-values are in parentheses. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

$$
\begin{aligned}
y_{i,t} &= \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} News_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k} \\
\ln h_{i,t} &= \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{\left|\varepsilon_{i,t-1}\right|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} \\
&\quad + \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} \left| News_{i,t-1} \right| + \beta_{MacroAnn} MacroAnn_t
\end{aligned}
\tag{4}
$$

	AXJO			AXEJ			AXNJ			AXDJ		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
					Conditional mean equation							
α_{Fed}	-0.1188 **	-0.2600	-0.2038	0.3591 *	0.0224 ***	0.2225	0.8445	0.1482	0.5384	-0.4294	-0.6917 ***	-0.4493
	(0.0115)	(0.2203)	(0.6081)	(0.0899)	(0.0019)	(0.1967)	(0.2846)	(0.9388)	(0.5876)	(0.6109)	(0.0048)	(0.5135)
α_{GDP}	0.0275	0.0219	0.0341	-0.2378	-0.0464 ***	-0.2220	0.1261	-0.0375	0.1472	-0.0971	0.0558 ***	-0.1169
	(0.7836)	(0.7098)	(0.8365)	(0.2595)	(0.0000)	(0.3223)	(0.2250)	(0.3968)	(0.3968)	(0.6674)	(0.0000)	(0.5884)
α_{CPI}	0.0039	-0.0111 **	0.0036	-0.0314	0.0203 ***	-0.0296	0.0654 ***	0.0310 ***	0.0419 *	-0.0054	-0.0217 ***	-0.0144
	(0.8816)	(0.0286)	(0.8798)	(0.4723)	(0.0084)	(0.5085)	(0.0075)	(0.0000)	(0.0933)	(0.8466)	(0.0051)	(0.6041)
α_{UE}	0.1459	-0.1248	0.3933	0.2200	-0.0427	0.0291	0.4643	0.2428 *	0.1164	0.5409	-0.1781 **	0.6040
	(0.7557)	(0.3903)	(0.5125)	(0.8273)	(0.9410)	(0.9782)	(0.4680)	(0.0711)	(0.8566)	(0.4741)	(0.0191)	(0.3812)
					Conditional variance equation							
β_{Fed}	0.8885 *	0.4706	0.3302 **	0.1746	0.7585 *	0.2619	0.2856 ***	0.4252	0.4082 ***	0.6355 **	0.6564 ***	0.2940
	(0.0507)	(0.3559)	(0.0190)	(0.6810)	(0.0675)	(0.5892)	(0.0000)	(0.8868)	(0.0002)	(0.0111)	(0.0000)	(0.4690)
β_{GDP}	-0.3730 ***	0.1624 ***	-0.2849 **	-0.2164 **	0.7823 ***	-0.1530	-0.5662 ***	0.6381 ***	-0.3663 ***	-0.1396 ***	-0.9565 ***	-0.1441
	(0.0000)	(0.0001)	(0.0236)	(0.0158)	(0.0000)	(0.1391)	(0.0000)	(0.0000)	(0.0058)	(0.0073)	(0.0001)	(0.1365)
β_{CPI}	0.0578 **	0.0545 ***	0.0337	-0.0528 *	0.0074	-0.0686 **	-0.0448 ***	-0.0481 ***	-0.0544 **	0.0749 ***	0.0932 ***	0.0782 ***
	(0.0296)	(0.0059)	(0.2398)	(0.0560)	(0.9695)	(0.0228)	(0.0002)	(0.0022)	(0.0253)	(0.0006)	(0.0000)	(0.0028)
β_{UE}	0.0254	1.0226 ***	0.9713 **	-0.4005	1.1916 ***	-0.1285	-0.3785	0.9453 ***	0.6534 *	0.7190 ***	0.1902 ***	0.4125
	(0.9490)	(0.0000)	(0.0284)	(0.2861)	(0.0000)	(0.7369)	(0.2723)	(0.0000)	(0.0768)	(0.0002)	(0.0000)	(0.1975)

Table 3 – Continued

	AXSJ			AXHJ			AXIJ			AXTJ		
	H0	H1	H2	H0	H1	H2	H0	H1	H2	H0	H1	H2
Conditional mean equation												
α_{Fed}	-0.6675 *	-0.0087 ***	-0.7659	0.8491	0.0996	0.6224	0.6774	0.0259	0.7115	0.2748	0.0244	0.0239
	(0.0888)	(0.0000)	(0.1787)	(0.2243)	(0.4184)	(0.3764)	(0.2161)	(0.9249)	(0.6300)	(0.7030)	(0.9536)	(0.9713)
α_{GDP}	0.0413	-0.0345	0.0883	0.0616	0.0215	-0.0043	0.2819	0.3440 ***	0.1731	-0.0368	-0.0021	-0.0488
	(0.7173)	(0.2149)	(0.5844)	(0.7725)	(0.6799)	(0.9888)	(0.1032)	(0.0000)	(0.2399)	(0.8517)	(0.9734)	(0.7173)
α_{CPI}	0.0045	-0.0048	0.0171	0.0114	-0.0142 *	0.0035	-0.1103 **	-0.0985 ***	0.0468	-0.0135	-0.0329 **	-0.0055
	(0.8520)	(0.4642)	(0.4821)	(0.8001)	(0.0933)	(0.9280)	(0.0177)	(0.0008)	(0.4231)	(0.6536)	(0.0115)	(0.8376)
α_{UE}	0.6466	-0.0306	0.7591	-0.9619	0.0759	-0.2484	0.5764	0.0510	-0.0380	0.1703	-0.0590 ***	0.3573
	(0.3331)	(0.8645)	(0.2349)	(0.2595)	(0.7925)	(0.1717)	(0.7015)	(0.9999)	(0.9820)	(0.8667)	(0.0003)	(0.5930)
Conditional variance equation												
β_{Fed}	0.6659	-0.4017 ***	0.5354	0.5816 **	-0.6823 **	0.5314	0.6931	-0.8688 ***	0.7207	0.2073	0.3074	0.4246
	(0.1192)	(0.0000)	(0.2977)	(0.0451)	(0.0269)	(0.1704)	(0.1034)	(0.0000)	(0.2366)	(0.5984)	(0.2673)	(0.3145)
β_{GDP}	-0.1896 **	0.0436	-0.0967	-0.1631 ***	0.4636 ***	-0.1266	-0.3337 ***	0.0131	-0.1778 **	-0.4581 ***	-0.1384 ***	-0.2583 ***
	(0.0225)	(0.8074)	(0.5308)	(0.0000)	(0.0000)	(0.1475)	(0.0000)	(0.9263)	(0.0463)	(0.0000)	(0.0068)	(0.0046)
β_{CPI}	0.0493 *	0.0164	0.0352	0.0720 ***	0.0281 ***	0.0424 ***	0.0188 *	0.0079	0.0393 *	-0.0101	0.2399 ***	-0.0298
	(0.0595)	(0.2050)	(0.2138)	(0.0002)	(0.0000)	(0.0000)	(0.0581)	(0.7533)	(0.0720)	(0.6218)	(0.0000)	(0.3066)
β_{UE}	0.4427 ***	0.6529	0.5509 ***	0.4164 ***	0.8123 ***	0.7384 ***	0.5275 **	-0.6779	-0.2032	0.0071	0.3130 ***	0.3945
	(0.0000)	(0.8021)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0365)	(0.1182)	(0.5083)	(0.9844)	(0.0000)	(0.2761)

	AXUJ			AXFJ			AXPJ			AXMJ		
	H0	H1	H2	H0	H1	H2	H0	H1	H2	H0	H1	H2
Conditional mean equation												
α_{Fed}	-0.2974 ***	0.1278	-0.0495 *	0.8134	-0.1046	0.6578	-0.2260	-0.0085	-0.1840	0.8541	0.3088	0.3035
	(0.0051)	(0.6452)	(0.0963)	(0.1840)	(0.6806)	(0.3726)	(0.6789)	(0.8690)	(0.7716)	(0.6013)	(0.1994)	(0.8418)
α_{GDP}	-0.0128	0.0849	-0.0994	0.0369	0.0679 *	-0.0262	-0.0479	0.0505 ***	-0.0681	0.0227	-0.0616	0.1871
	(0.8649)	(0.1487)	(0.3907)	(0.7148)	(0.0971)	(0.8130)	(0.6257)	(0.0000)	(0.4664)	(0.9183)	(0.3328)	(0.3919)
α_{CPI}	0.0298	-0.0427 ***	0.0124	-0.0205	-0.0160 **	0.0097	-0.0560 *	-0.0065 **	-0.0548 *	0.0405	0.0257	-0.0019
	(0.3488)	(0.0000)	(0.6719)	(0.4477)	(0.0146)	(0.7053)	(0.0786)	(0.0233)	(0.0975)	(0.3483)	(0.3830)	(0.9601)
α_{UE}	0.2256	-0.8846 ***	0.7436	0.8124	-0.1702	0.7425	0.3307	0.0459	0.0936	0.5666	-0.4173 **	0.6383
	(0.7401)	(0.0002)	(0.2598)	(0.1510)	(0.6746)	(0.2255)	(0.7090)	(0.6806)	(0.8607)	(0.5902)	(0.0290)	(0.1201)
Conditional variance equation												
β_{Fed}	-0.0970	-0.5858	0.1681	0.8101 *	0.7169 ***	0.0722 **	0.9222 **	-0.4962 ***	0.7714 *	0.1865 ***	-0.0133	0.2131 ***
	(0.7504)	(0.2343)	(0.7252)	(0.0592)	(0.0000)	(0.0282)	(0.0272)	(0.0000)	(0.0877)	(0.0001)	(0.9865)	(0.0076)
β_{GDP}	-0.4858 ***	0.2484 ***	-0.1341	-0.2606 ***	0.5246 ***	-0.1180	-0.3099 ***	-0.8464 ***	-0.2140 *	-0.1388	-0.0414	-0.1998
	(0.0001)	(0.0023)	(0.2505)	(0.0034)	(0.0000)	(0.2765)	(0.0013)	(0.0005)	(0.0806)	(0.1676)	(0.7222)	(0.1055)
β_{CPI}	0.0639 ***	0.0812 ***	0.1339	-0.0289	0.0489	-0.0195	0.0933 ***	-0.5524 ***	0.0824 ***	0.0553 ***	0.1913 ***	-0.0352
	(0.0063)	(0.0052)	(0.0000)	(0.2396)	(0.5668)	(0.4323)	(0.0003)	(0.0000)	(0.0025)	(0.0003)	(0.0004)	(0.2574)
β_{UE}	0.2503	0.2478 ***	0.2263	0.3925	0.9621 *	0.1375 **	-0.3778	-0.8889 ***	0.0112	0.1348	0.5953	0.6204
	(0.2437)	(0.0000)	(0.4974)	(0.3692)	(0.0815)	(0.0151)	(0.3354)	(0.0000)	(0.9778)	(0.7937)	(0.2068)	(0.3271)

Table 4 – Standardized news effects

This table reports the estimation results of the MA-EGARCH models described in equation (6) for the spillover effect of the US news on daily changes of the Australian stock markets using Balduzzi *et al.* (2001) standardized news measures shown in equation (5). Fed is the FOMC's target rate announcement, GDP is the Gross Domestic Product, CPI is the Consumer Price Index, and UE is the Unemployment rate. P-values are in parentheses. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

$$
\begin{aligned}
y_{i,t} &= \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} SNews_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k} \\
\ln h_{i,t} &= \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{|\varepsilon_{i,t-1}|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} + \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} \left| SNews_{i,t-1} \right|
\end{aligned}
\tag{6}
$$

	AXJO			AXEJ			AXNJ			AXDJ		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
Conditional mean equation												
α_{Fed}	-0.0370 **	-0.0084	-0.0074	0.0449 *	0.0198 ***	0.0403	0.0279	0.0049	0.0177	-0.0138	-0.0222 *	-0.0139
	(0.0121)	(0.2605)	(0.5700)	(0.0703)	(0.0000)	(0.1756)	(0.2748)	(0.6966)	(0.5790)	(0.6130)	(0.0592)	(0.5517)
α_{GDP}	0.0033	0.0020	0.0041	-0.0290	-0.0120	-0.0271	0.0154	-0.0046	0.0179	-0.0122	0.0052 *	-0.0144
	(0.8078)	(0.7889)	(0.8414)	(0.2792)	(0.4179)	(0.2789)	(0.2474)	(0.3991)	(0.4000)	(0.6679)	(0.0868)	(0.5928)
α_{CPI}	0.0051	-0.0110	0.0061	-0.0244	0.0057	-0.0210	0.0013 **	0.0049 **	0.0106 **	-0.0104	0.0196	-0.0237
	(0.7341)	(0.1499)	(0.6462)	(0.2170)	(0.6199)	(0.2849)	(0.0322)	(0.0143)	(0.0417)	(0.5931)	(0.1199)	(0.2142)
α_{UE}	0.0039	-0.0035	0.0107	0.0068	-0.0036	0.0017	0.0126	0.0063 *	0.0032	0.0144	-0.0152	0.0152
	(0.7772)	(0.3778)	(0.5262)	(0.8255)	(0.7612)	(0.9586)	(0.4938)	(0.0948)	(0.8630)	(0.5018)	(0.4492)	(0.4912)
Conditional variance equation												
β_{Fed}	0.0287 **	0.0191 ***	0.0416 **	0.0037	0.0147	0.0066	0.0402 ***	0.0450 ***	0.0454 ***	0.0191 ***	0.0219	0.0090
	(0.0459)	(0.0000)	(0.0220)	(0.7383)	(0.3831)	(0.6602)	(0.0000)	(0.0000)	(0.0000)	(0.0006)	(0.7503)	(0.4826)
β_{GDP}	-0.0460 ***	0.0136	-0.0348 **	-0.0251 **	0.0107	-0.0178 **	-0.0682 ***	0.0799 ***	-0.0448 ***	-0.0142	-0.1043	-0.0157
	(0.0005)	(0.1210)	(0.0224)	(0.0176)	(0.9400)	(0.0270)	(0.0000)	(0.0000)	(0.0058)	(0.1519)	(0.2043)	(0.2774)
β_{CPI}	0.0060	0.0552 ***	0.0052	-0.0285 *	0.0118	-0.0287 ***	-0.0154 **	-0.0339 *	-0.0169 **	0.0111	0.0683 ***	0.0045
	(0.4799)	(0.0000)	(0.6099)	(0.0618)	(0.8786)	(0.0008)	(0.0449)	(0.0624)	(0.0246)	(0.2257)	(0.0000)	(0.7671)
β_{UE}	0.0018	0.0305 ***	0.0274 *	-0.0088	0.0671 ***	-0.0022	-0.0077	0.0798 ***	0.0183	0.0206 **	0.0144	0.0144
	(0.8914)	(0.0000)	(0.0695)	(0.4581)	(0.0000)	(0.8607)	(0.4043)	(0.0000)	(0.1606)	(0.0197)	(0.2938)	(0.2601)

Table 4 – Continued

	AXSJ			AXHJ			AXIJ			AXTJ		
	H0	H1	H2	H0	H1	H2	H0	H1	H2	H0	H1	H2
Conditional mean equation												
α_{Fed}	-0.0219 *	-0.0001 ***	-0.0251	0.0271	0.0037	0.0203	0.0560	0.0009	0.0234	0.0087	0.0008	0.0012
	(0.0693)	(0.0000)	(0.1759)	(0.2216)	(0.5977)	(0.3682)	(0.2688)	(0.8803)	(0.6258)	(0.7091)	(0.9487)	(0.9521)
α_{GDP}	0.0049	-0.0033	0.0105	0.0076	0.0113	-0.0013	0.0357	0.0427 ***	0.0213	-0.0056	-0.0008	-0.0061
	(0.7292)	(0.3554)	(0.6007)	(0.7695)	(0.5585)	(0.9720)	(0.1079)	(0.0000)	(0.2401)	(0.7663)	(0.9226)	(0.7465)
α_{CPI}	0.0082	-0.0044	0.0085	0.0070	-0.0043	0.0187	-0.0210	-0.0432 ***	0.0190	-0.0282	-0.0272 **	-0.0154
	(0.5961)	(0.2656)	(0.6292)	(0.7996)	(0.8066)	(0.4945)	(0.5538)	(0.0000)	(0.5906)	(0.1621)	(0.0315)	(0.4711)
α_{UE}	0.0175	-0.0007	0.0210	-0.0254	0.0007	-0.0334	0.0198	0.0072	-0.0040	0.0072	-0.0303 ***	0.0114
	(0.3483)	(0.9454)	(0.2713)	(0.3484)	(0.9553)	(0.2326)	(0.7404)	(0.4785)	(0.9324)	(0.8116)	(0.0001)	(0.6704)
Conditional variance equation												
β_{Fed}	0.0211 *	-0.6219 ***	0.0173	0.0163 *	-0.0034 ***	0.0147	0.0219	-0.0656 ***	0.0233	0.0046	0.0094	0.0076
	(0.0508)	(0.0000)	(0.2991)	(0.0743)	(0.0000)	(0.2297)	(0.2829)	(0.0052)	(0.2388)	(0.7115)	(0.1719)	(0.4235)
β_{GDP}	-0.0211 **	0.0126	-0.0110	-0.0189 ***	0.0622 ***	-0.0134	-0.0406 ***	0.0024	-0.0218 **	-0.0540 ***	-0.0183 ***	-0.0287 **
	(0.0340)	(0.4527)	(0.5557)	(0.0000)	(0.0008)	(0.2017)	(0.0021)	(0.8755)	(0.0456)	(0.0000)	(0.0016)	(0.0369)
β_{CPI}	0.0139	0.1086 ***	0.0162	0.0044	0.0540 ***	0.0029	0.0036	0.0530 ***	0.0491 ***	-0.0242 *	0.0915 ***	-0.0151 *
	(0.1239)	(0.0000)	(0.3894)	(0.6490)	(0.0000)	(0.8081)	(0.7564)	(0.0000)	(0.0000)	(0.0705)	(0.0000)	(0.0693)
β_{UE}	0.0408 ***	0.0486 ***	0.0435 ***	0.0392 ***	0.0267	0.0480 ***	0.0195 *	-0.0210	-0.0045	0.0030	0.0670 ***	0.0145
	(0.0000)	(0.0076)	(0.0000)	(0.0003)	(0.2268)	(0.0001)	(0.0593)	(0.1311)	(0.5960)	(0.8153)	(0.0000)	(0.3094)

	AXUJ			AXFJ			AXPJ			AXMJ		
	H0	H1	H2	H0	H1	H2	H0	H1	H2	H0	H1	H2
Conditional mean equation												
α_{Fed}	-0.0421 ***	0.0040	-0.0345 *	0.0273	-0.0072	0.0219	-0.0073	-0.0003	-0.0061	0.0278	0.0101	0.0090
	(0.0054)	(0.6511)	(0.0948)	(0.1739)	(0.2649)	(0.3612)	(0.6607)	(0.7295)	(0.7686)	(0.5905)	(0.3553)	(0.8666)
α_{GDP}	-0.0014	0.0104	-0.0114	0.0041	0.0084 *	-0.0033	-0.0059	0.0064 ***	-0.0080	0.0033	-0.0075	0.0226
	(0.8921)	(0.1466)	(0.4035)	(0.7425)	(0.0634)	(0.8068)	(0.5824)	(0.0000)	(0.4828)	(0.9072)	(0.3338)	(0.5282)
α_{CPI}	0.0104	-0.0052	0.0114	-0.0014	-0.0148 **	0.0073	-0.0034 *	-0.0015 *	-0.0004	0.0312	0.0117	0.0275
	(0.5565)	(0.4178)	(0.5331)	(0.9224)	(0.0275)	(0.5918)	(0.0861)	(0.0564)	(0.9858)	(0.2963)	(0.1109)	(0.2379)
α_{UE}	0.0060	-0.0243 ***	0.0209	0.0219	-0.0047	0.0205	0.0091	0.0015	0.0026	0.0155	-0.0659 ***	0.0457
	(0.7756)	(0.0000)	(0.2613)	(0.1791)	(0.1803)	(0.2342)	(0.3009)	(0.6752)	(0.9023)	(0.6158)	(0.0000)	(0.1246)
Conditional variance equation												
β_{Fed}	-0.0027	-0.0209	0.0069	0.0250 *	0.0429	0.0341 **	0.0299 ***	-0.1767 ***	0.0248 *	0.0380 ***	-0.0004	0.0385 **
	(0.7959)	(0.2018)	(0.6829)	(0.0687)	(0.2798)	(0.0302)	(0.0000)	(0.0000)	(0.0718)	(0.0001)	(0.9895)	(0.0247)
β_{GDP}	-0.0600 ***	0.0270 ***	-0.0180	-0.0312 ***	0.0601 ***	-0.0143	-0.0375 ***	-0.1098 ***	-0.0261 *	-0.0171	-0.0050	-0.0233
	(0.0000)	(0.0069)	(0.2352)	(0.0042)	(0.0000)	(0.2769)	(0.0001)	(0.0001)	(0.0785)	(0.2161)	(0.7266)	(0.2554)
β_{CPI}	0.0028	0.0117	0.0351	-0.0117	0.0667 **	-0.0088	0.0372 ***	-0.1420 ***	0.0310 **	0.0105	0.1370 ***	-0.0072
	(0.6417)	(0.4162)	(0.0237)	(0.3043)	(0.0342)	(0.4758)	(0.0013)	(0.0000)	(0.0125)	(0.4879)	(0.0000)	(0.4895)
β_{UE}	0.0072	0.0652 *	0.0057	0.0119	0.0846 ***	0.0318	-0.0099	-0.0992 ***	0.0004	0.0056	0.0372 ***	0.0187
	(0.4024)	(0.0959)	(0.7046)	(0.4331)	(0.0000)	(0.2342)	(0.4074)	(0.0000)	(0.9977)	(0.7362)	(0.0000)	(0.2768)

Table 5 – The common-sized news effects

This table reports the estimation results of the MA-EGARCH models described in equation (8) for the spillover effect of the US news on daily changes of the Australian stock markets. Common-sized news is measured as actual News relative to their actual announcements as in equation (7). Fed is the FOMC's target rate announcement, GDP is the Gross Domestic Product, CPI is the Consumer Price Index, and UE is the Unemployment rate. P-values are in parentheses. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

$$
\begin{aligned}
y_{i,t} &= \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} CNews_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k} \\
\ln h_{i,t} &= \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{\left|\varepsilon_{i,t-1}\right|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} \\
&\quad + \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} \left| CNews_{i,t-1} \right|
\end{aligned}
\tag{8}
$$

	AXJO			AXEJ			AXNJ			AXDJ		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
Conditional mean equation												
α_{Fed}	-0.1818**	-0.0243	-0.1555	0.1028	0.0031***	0.0006	0.4469	0.0588	0.2699	-0.4994*	-0.0458	-0.3895
	(0.0376)	(0.7955)	(0.4972)	(0.7551)	(0.0040)	(0.9987)	(0.4794)	(0.6198)	(0.3427)	(0.0631)	(0.6179)	(0.1759)
α_{GDP}	0.1236	0.0202	0.0515	-0.4796	-0.1027***	-0.4465	0.1533	-0.0974	0.3650	-0.6826	0.1208***	-0.6342
	(0.7314)	(0.8536)	(0.9019)	(0.1142)	(0.0000)	(0.1366)	(0.4781)	(0.3018)	(0.1576)	(0.2676)	(0.0000)	(0.2921)
α_{CPI}	0.0704	-0.1119***	0.0894	-0.0003	0.0549	-0.0010	0.0187	0.1026***	0.1124	-0.1354	-0.2262***	-0.2817
	(0.6252)	(0.0057)	(0.4813)	(0.9985)	(0.7521)	(0.9954)	(0.9028)	(0.0057)	(0.3605)	(0.4965)	(0.0001)	(0.2143)
α_{UE}	0.1513	-0.7956	0.3400	0.0405	-0.7079	0.1969	0.4862	0.1097	0.1741	0.2839	-0.6705	0.9290
	(0.6364)	(0.2568)	(0.4573)	(0.8573)	(0.7382)	(0.9740)	(0.4550)	(0.1222)	(0.6964)	(0.4051)	(0.1853)	(0.4715)
Conditional variance equation												
β_{Fed}	0.3819**	0.2826***	0.4781**	0.1357	0.9111***	0.1906	0.2878**	0.3292***	0.4043***	0.0554	0.0754	0.1832
	(0.0218)	(0.0048)	(0.0145)	(0.3920)	(0.0000)	(0.2745)	(0.0261)	(0.0001)	(0.0041)	(0.3669)	(0.5396)	(0.1993)
β_{GDP}	-0.4456**	0.5148***	-0.3031**	-0.4734***	0.3859***	-0.4522**	-0.7644***	0.9156***	-0.6315***	-0.0351	-0.4376*	-0.0071*
	(0.0165)	(0.0000)	(0.0151)	(0.0011)	(0.0013)	(0.0128)	(0.0000)	(0.0000)	(0.0001)	(0.8039)	(0.0567)	(0.0974)
β_{CPI}	0.2014**	0.4671***	0.1226	-0.3844**	0.1581	-0.3983***	-0.1881*	-0.5219*	-0.1623	0.1684***	0.8266***	0.1573
	(0.0139)	(0.0000)	(0.3825)	(0.0137)	(0.9077)	(0.0001)	(0.0987)	(0.0817)	(0.2346)	(0.0000)	(0.0000)	(0.2337)
β_{UE}	0.1349*	0.9777***	0.6217**	-0.5589	0.2939	-0.1870	-0.8116	0.1829***	0.6946	0.8823**	0.7016***	0.6718
	(0.0596)	(0.0000)	(0.0153)	(0.5045)	(0.2324)	(0.9389)	(0.6496)	(0.0000)	(0.1460)	(0.0254)	(0.0000)	(0.2933)

Table 5 – Continued

	AXSJ			AXHJ			AXIJ			AXTJ		
	H0	H1	H2	H0	H1	H2	H0	H1	H2	H0	H1	H2
Conditional mean equation												
α_{Fed}	-0.1970	-0.0022 ***	-0.1054	0.4259	0.0180	0.3787	0.3281 **	0.0216	0.9653 **	0.1257	0.0295	0.0611
	(0.3412)	(0.0000)	(0.6000)	(0.2271)	(0.8630)	(0.2860)	(0.0216)	(0.1022)	(0.0490)	(0.5695)	(0.8441)	(0.6951)
α_{GDP}	0.0982	-0.0850 *	0.2694	0.1151	0.1847	-0.0567	0.1808	0.5575 ***	-0.0197	-0.1894	-0.1688	-0.0217
	(0.8186)	(0.0738)	(0.5509)	(0.8520)	(0.2808)	(0.8737)	(0.6335)	(0.0000)	(0.9594)	(0.6737)	(0.3317)	(0.9588)
α_{CPI}	0.0670	-0.0307	0.1117	0.0625	-0.1579 ***	0.1698	-0.2346	-0.2878 ***	0.3291	-0.2619	-0.3723 ***	-0.0026
	(0.6786)	(0.5591)	(0.5266)	(0.8624)	(0.0000)	(0.6012)	(0.5795)	(0.0000)	(0.4299)	(0.2071)	(0.0000)	(0.9901)
α_{UE}	0.7810	-0.0341	0.2715	-0.8356	0.2654	-0.7304	0.0867	0.6464	0.4561	0.5711	-0.9578 ***	0.5510
	(0.3129)	(0.9863)	(0.2264)	(0.5938)	(0.2771)	(0.2840)	(0.7058)	(0.3596)	(0.9650)	(0.7778)	(0.0002)	(0.6075)
Conditional variance equation												
β_{Fed}	0.0392	-0.3623 ***	0.0083	0.1206	-0.0509 ***	0.0886	0.0435	-0.3020 ***	0.0581	0.0496	0.1876 **	0.0459
	(0.7463)	(0.0000)	(0.9657)	(0.2492)	(0.0000)	(0.5408)	(0.7860)	(0.0005)	(0.7790)	(0.7271)	(0.0168)	(0.7517)
β_{GDP}	-0.3594 *	0.0565	-0.2270	-0.0668	0.5612 ***	-0.1160	-0.2592 **	0.2626	-0.1279 **	-0.6708 ***	-0.3825 ***	-0.2894 **
	(0.0895)	(0.8413)	(0.4450)	(0.5720)	(0.0000)	(0.7963)	(0.0261)	(0.2139)	(0.0449)	(0.0002)	(0.0000)	(0.0123)
β_{CPI}	0.0872	0.2220 ***	0.1155	0.1287 *	0.3275 ***	0.0800	0.0473	0.9225 ***	0.5147 ***	-0.2283 *	0.7029 ***	-0.1097
	(0.3555)	(0.0000)	(0.4907)	(0.0789)	(0.0000)	(0.3612)	(0.6372)	(0.0000)	(0.0000)	(0.0751)	(0.0000)	(0.2410)
β_{UE}	0.6159 ***	0.2845 ***	0.9411 ***	0.7914 ***	0.6676 ***	0.5358 ***	0.1552	-0.4992	-0.4003	0.1685	0.3111 ***	0.7599 *
	(0.0000)	(0.0005)	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.2986)	(0.1411)	(0.3438)	(0.6281)	(0.0000)	(0.0582)

	AXUJ			AXFJ			AXPJ			AXMJ		
	H0	H1	H2	H0	H1	H2	H0	H1	H2	H0	H1	H2
Conditional mean equation												
α_{Fed}	-0.3973	0.0138	-0.0062	0.1382	-0.0494	0.0529	-0.2385	-0.0013 ***	-0.1758	0.2150	0.0899	0.1111
	(0.2348)	(0.8631)	(0.9835)	(0.5997)	(0.5130)	(0.8579)	(0.3262)	(0.0000)	(0.5533)	(0.6214)	(0.6088)	(0.8298)
α_{GDP}	-0.1533	0.1478 ***	-0.0702	-0.1103	0.0662	-0.1200	-0.0600	0.0930 ***	-0.1799	0.0061	-0.3203 ***	0.3575
	(0.5722)	(0.0000)	(0.6733)	(0.6952)	(0.4156)	(0.7048)	(0.7631)	(0.0009)	(0.3736)	(0.9898)	(0.0001)	(0.5101)
α_{CPI}	0.0643	-0.1214	0.0484	-0.0129	-0.1871 ***	0.1429	-0.0953	-0.0242	-0.0600	0.3591	0.1220 ***	0.2908
	(0.7302)	(0.2206)	(0.8114)	(0.9277)	(0.0061)	(0.2836)	(0.5461)	(0.5107)	(0.7259)	(0.2423)	(0.0000)	(0.2077)
α_{UE}	0.0844	-0.8806 **	0.1056	0.4693	-0.6591 **	0.1801	0.4365	0.3482	0.9479	0.1939	-0.6145 ***	0.6936
	(0.7518)	(0.0337)	(0.2839)	(0.1482)	(0.0192)	(0.2068)	(0.5886)	(0.7169)	(0.7496)	(0.2346)	(0.0000)	(0.1173)
Conditional variance equation												
β_{Fed}	-0.0206	-0.7196 ***	0.1722	0.3007 **	0.5149 ***	0.4480 ***	0.4141 ***	-0.0221 ***	0.4169 ***	0.3279 ***	-0.2711	0.3601 *
	(0.8296)	(0.0007)	(0.3107)	(0.0339)	(0.0000)	(0.0027)	(0.0000)	(0.0000)	(0.0003)	(0.0080)	(0.1445)	(0.0503)
β_{GDP}	-0.9231 ***	0.9989 ***	-0.4903 **	-0.2171	0.9607 ***	-0.0917	-0.2854 *	-0.3749 *	-0.2306	-0.3407	-0.9802 ***	-0.3467
	(0.0000)	(0.0000)	(0.0101)	(0.1589)	(0.0000)	(0.6283)	(0.0622)	(0.0969)	(0.2445)	(0.1137)	(0.0023)	(0.2001)
β_{CPI}	0.1278 **	0.0627	0.0202	-0.2307 **	0.8032 ***	-0.1945 *	0.1104	-0.5508 ***	0.0253	-0.2909 **	0.4620 ***	-0.1551
	(0.0224)	(0.7117)	(0.8872)	(0.0116)	(0.0000)	(0.0815)	(0.1257)	(0.0000)	(0.8441)	(0.0291)	(0.0000)	(0.1502)
β_{UE}	0.8690 *	0.7446 ***	0.5540	0.3171	0.8399 ***	0.9230 *	-0.2194	-0.1061 ***	-0.3632	0.2535	0.4298 ***	0.4768
	(0.0935)	(0.0003)	(0.8496)	(0.4326)	(0.0000)	(0.0656)	(0.2847)	(0.0000)	(0.8749)	(0.5968)	(0.0000)	(0.2812)