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U.S. News Spillover Effects: Sectoral Evidence

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Abstract

This paper is a study of the spillover effects of U.S. macroeconomic news on different sectors of the Australian stock market. We find that an indication of economic contraction from the United States raises the conditional mean, and most news elicits associated volatility in the Australian stock market. We further document that different sectors respond differently to U.S. news. For example, U.S. news has the strongest effect on the first two moments of the Australian Industrials and Property Trusts stock returns and the least impact on the Materials sector. Furthermore, we document that while U.S. news has been absorbed relatively quickly on the conditional mean, the volatility impact is somewhat persistent.

Keywords: EGARCH, macroeconomic news, spillover effects, stock markets

JEL Classification codes: E44, G14, G15

Since the seminal work of Chen, Roll, and Ross (1986), many researchers 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 (Bodie, 1976; Fama, 1981; Geske & Roll; 1983; Pearce & Roley, 1983). On the other hand, the impact of real economic activity variables on stock returns is still an open question that attracts numerous empirical studies. Furthermore, the literature provides strong evidence for the informational leadership of the United States of America (USA) on the Asia Pacific region (Arshanapalli, Doukas, & Lang, 1995; Ghosh, Saidi, & Johnson, 1999; Kim S-J., 2003, 2005; Kim, S-J. & Nguyen, 2008, 2009; Kim, S. & In, 2002; Liu & Pan, 1997; Liu, Pan, & Shieh, 1998; Wongswan,2006). The Australian stock market is of particular interest in the region due to its strong link with the USA through real and financial integration where the USA is Australia's largest two-way goods and services trading partner and accounted for 9.4% of the latter's trading volume in 2009.[1] Furthermore, as at the end of 2009, most of Australia's foreign direct investment assets were located in the USA (28.9% of total).[2]

However, the literature has mainly focused on 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: First, aside from the spillover effects of U.S. macroeconomic news on the aggregate Australian stock index, we take a step further to investigate the Australian sectoral specific responses to U.S. news. Second, by breaking down the daily return horizon into overnight and intraday horizons, we aim to investigate the speed of news absorption in the Australian market.

The key findings of this paper are summarized as follows. First, we find that news of a higher than expected policy interest rate, inflation, and unemployment from the USA has a negative impact on the return of the

Australian stock market, while a higher than expected U.S. gross domestic product (GDP) growth rate leads to an increase in Australian market returns. On the other hand, a sign of contraction in the U.S. economy (higher than expected interest rate, inflation, and unemployment) causes high conditional volatility of the Australian market returns, whereas an economic expansion (higher U.S. GDP growth) results in a lower volatility in the Australian market. Second, we show that different sectors react differently to U.S. news; for example, U.S. news has the strongest effect on the first two moments of the Australian Industrials and Property Trusts stock returns and the least impact on the Materials sector. Third, we find that the U.S. news has been absorbed relatively quickly on the conditional mean of the Australian returns, while the speed of adjustment on the conditional volatility is relatively persistent.

The rest of this paper is organized as follows. The next section contains a discussion of data, followed by a discussion of empirical modeling issues. The estimation results are reported and analyzed in the next section. A discussion of several robustness checks follows, and the final section concludes the paper.

Data

Australian Stock Indices

Because U.S. macroeconomic announcements are made when the Australian stock market is closed, the earliest reaction can be captured at market opening one calendar day after the news announcement. Hamao, Masulis, and Ng (1990) suggested that information spillovers from foreign markets would be expected to show up only in the close-to-open returns as predicted by the international asset pricing model. On the other hand, volatility spillovers to the conditional variances of the close-to-opening and opening-to-close horizons can occur. Therefore, while most previous studies utilize daily closing data to explore the impacts of the macroeconomic news, we employ opening and closing prices to disaggregate the daily investigation horizon into overnight and intraday periods. We collect daily opening and closing data from Reuters for the ASX/S&P 200 benchmark index (AXJO) and its Global Industry Classification Standard (GICS) sector subindices 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).[3]

Following Hamao et al. (1990), we calculate stock index returns over three time horizons. In addition to the standard horizon widely used in previous studies (H0) and calculated over the close on calendar day *t-1* to the close on calendar day *t* (close-to-close), we further divide this horizon into 2 subhorizons: the overnight horizon (H1) measured over the close of day *t-1* to the opening on day *t* (close-to-opening) and the intraday horizon (H2) measured over the opening on day *t* to the close on day *t* (opening-to-close). These subhorizons allow us to have a better analysis of the aggregate spillover effect (H0) of U.S. news on the Australian stock market where the overnight horizon (H1) captures the Australian stock market's first reaction to U.S. news and the intraday horizon (H2) captures any delayed reactions.

Table A1 presents summary statistics for the Australian stock returns over three horizons. As we can see from Table A1, there are significant differences across the returns series over the three time horizons. On average, four returns series have positive returns over all three horizons (Industrials, Information Technology, Financials, and Property Trusts), three series have negative returns over three horizons (Energy, Health Care, and Materials), two series have negative returns over daily and intraday horizons and positive returns during the overnight horizon (Consumer Discretionary and Telecommunications Services), while the opposite is observed for the Consumer Staples series. Finally, the ASX/S&P 200 benchmark index and Utilities series have negative returns over the daily horizon and positive returns during the other horizons. The volatility of returns as measured by the standard error of measurement is lowest during the overnight horizon.

In most cases, the return series demonstrate strong evidence of negative skewness except for Energy, Health Care (overnight return), and Information Technology (daily and intraday returns). In all cases, the return series exhibit leptokurtosis with the highest excess kurtosis during the overnight horizon. In most cases, the returns show significant serial correlation in the first moment except for ASX/S&P 200 and Consumer Discretionary (intraday returns), Industrials and Materials (overnight returns), and Utilities (daily and intraday returns). Finally, all return series demonstrate significant serial correlation in the second moment over all three time horizons.

The U.S. Macroeconomic News

We collected data on four key U.S. macroeconomic announcements for the period from June 2001 to December 2008 as shown in Table 1. The dataset consists of the target interest rate announcements released after the *Federal Open Market Committee* (FOMC) from the Federal Reserve Board meetings (Fed), quarterly GDP percentage level released for the previous quarter, monthly consumer price index (CPI) percentage change, and unemployment (UE) percentage level for the prior month. These are the most important economic announcements as identified by Balduzzi, Elton, and Green (2001).

Table 1
U.S. Macroeconomic News

Releases	Observations	Release time	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 (UE)	90	8.30	Bureau of Labor Statistics
Total	274		

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

To derive the macroeconomic news component from the actual announcements, we use the median of the survey series obtained from Reuters' surveys. If M_i denotes the median of the surveys and A_i 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 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's (2001) 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. Because 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:

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

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.

Table A2 presents descriptive statistics for U.S. macroeconomic news. As can be seen, while the majority of GDP, CPI, and UE announcements are lower than expected, the pattern is not very clear for the Fed fund rate announcements where the number of higher than expected news announcements is marginally greater than lower than expected and no news. Except for GDP, the others have negative means. Except for Fed news, the other three series show positive skewness. Finally, the news series exhibit leptokurtosis.

Empirical Models

This paper contains a dual examination of how the news impacts both the conditional mean and the conditional volatility of daily returns. Furthermore, as the effects of the news on volatility 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 stimuli and calming effects, that is, both higher and lower volatility as a result of the news.

The econometric literature shows that the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) specification proposed by Bollerslev (1986) and its extensions are among the most widely used models to model daily financial returns series characterized as skewed, leptokurtic, and not normally distributed with time-varying second moments discussed in the section on Australian stock indices. The parsimonious MA-EGARCH (1,1) model with the exponential specification allowing for both positive and negative coefficients on the conditional volatility allowing for a better analysis of the asymmetric shocks on volatility is best suited to this paper's testing purposes.

Equation 3 shows the MA-EGARCH (1,1) model used for the empirical estimation of U.S. macroeconomic news spillover effects. Following Balduzzi et al. (2001), we test the impact of each news announcement 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. The value of 0 is assigned for normal consecutive daily observations, whereas values of 1 or higher are 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 1 for Mondays and 0 otherwise, and the news variable ($News_t$) is used for each of the U.S. macroeconomic variables discussed. 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 U.S. and the Australian markets. The U.S. announcements are released while the Australian market is closed; thus the latter would respond to the news from the USA when it opens for trading one calendar day after the announcements. Therefore, the spillover impacts, if any, would show up in the following day:

$$y_{i,t} = \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} News_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k}$$

$$\ln h_{i,t} = \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{\left|\varepsilon_{i,t-1}\right|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} + \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} \left| News_{i,t-1} \right| \quad (3)$$

In general, in line with the literature, we expect to find the U.S. inflation and monetary policy has a negative impact on Australian stock returns. The impact of other real variables (GDP and unemployment) needs to be empirically tested. The effect on volatility 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 U.S. news to Australian market participants, a market calming effect could be observed if the U.S. news resolves uncertainty in the Australian market.

Empirical Results

Baseline Model's Results

Table 2 shows the estimation of results for the spillover of the US's macroeconomic news on the Australian stock market.[4] On the conditional mean, consistent with the literature on domestic impacts of the U.S. macroeconomic news and a priori expectation, we find that higher than expected interest, inflation, and unemployment rates from the USA have a negative impact, whereas higher than expected GDP growth rates have a positive impact on the Australian stock market's returns. This suggests that a contraction in the U.S. economy has a negative impact on its own stock markets, and this has a contagious effect on the Australian market as well. Furthermore, most significant responses occur during the overnight horizon with 21 out of 30 significant responses; however, only 7 cases persist to the daily horizon. This suggests that the U.S. macroeconomic news is absorbed relatively quickly in the Australian stock market.

Table 2
News Spillover Effects

	ASX/S&P200			Energy			Industrials		
	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
	(0.0121)	(0.3713)	(0.5700)	(0.1144)	(0.0000)	(0.1725)	(0.2748)	(0.7781)	(0.5323)
α_{GDP}	0.0271	0.0166	0.0334	-0.2374	-0.0513 ***	-0.1827	0.1256	-0.0382	0.1466
	(0.8077)	(0.7889)	(0.8413)	(0.2792)	(0.0000)	(0.3214)	(0.2473)	(0.4111)	(0.4002)
α_{CPI}	0.0036	-0.0107	0.0033	-0.0312	0.0216	-0.0290	0.0635 ***	0.0173 ***	0.0417 *
	(0.8810)	(0.3141)	(0.8910)	(0.4623)	(0.1797)	(0.4882)	(0.0099)	(0.0049)	(0.0953)
α_{UE}	0.1393	-0.1259	0.3866	0.2451	-0.0415 ***	0.0599	0.4525	0.2363	0.1168
	(0.7728)	(0.4964)	(0.5262)	(0.8040)	(0.0000)	(0.9564)	(0.4945)	(0.1271)	(0.8631)
Conditional variance equation									
β_{Fed}	0.9071 *	0.6848 ***	0.3460 **	0.2051 **	0.2553	0.2036	0.2335 ***	0.3754 ***	0.3926 ***
	(0.0517)	(0.0000)	(0.0190)	(0.0176)	(0.8129)	(0.6853)	(0.0000)	(0.0004)	(0.0020)
β_{GDP}	-0.3647 ***	0.0565	-0.2950 ***	-0.3758 ***	0.7244 ***	-0.1455 **	-0.5570 ***	0.6969 ***	-0.3657 ***
	(0.0014)	(0.4681)	(0.0085)	(0.0005)	(0.0000)	(0.0257)	(0.0000)	(0.0000)	(0.0058)
β_{CPI}	0.0507 *	0.0696 ***	0.0359	-0.0553	0.0060	-0.0732	-0.0423 ***	-0.0566 ***	-0.0542 **
	(0.0530)	(0.0004)	(0.1973)	(0.2620)	(0.9777)	(0.1967)	(0.0003)	(0.0003)	(0.0236)
β_{UE}	0.1182	0.7544 ***	0.9363 *	-0.3176	0.9523	-0.0777	-0.2758	0.5369 ***	0.6581
	(0.7632)	(0.0000)	(0.0925)	(0.3424)	(0.2421)	(0.8305)	(0.4080)	(0.0000)	(0.1606)

	Consumer Discretionary			Consumer Staples			Health Care		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
Conditional mean equation									
α_{Fed}	-0.4243	-0.6821 *	-0.4267	-0.6733 *	-0.0079 ***	-0.7709	0.8336	0.1529	0.6229
	(0.6146)	(0.0511)	(0.5517)	(0.0699)	(0.0000)	(0.1759)	(0.2210)	(0.6347)	(0.3688)
α_{GDP}	-0.0995	0.0577 ***	-0.1177	0.0408	-0.0267	0.0854	0.0625	0.0507	-0.0108
	(0.6681)	(0.0025)	(0.2347)	(0.7271)	(0.8894)	(0.6007)	(0.7636)	(0.5706)	(0.9719)
α_{CPI}	-0.0047	-0.0196 ***	-0.0137	0.0049	-0.0008	0.0169	0.0119	-0.0042	0.0034
	(0.8535)	(0.0000)	(0.6231)	(0.8334)	(0.8805)	(0.4859)	(0.7285)	(0.4007)	(0.9361)
α_{UE}	0.5184	-0.1433 *	0.5492	0.6317	-0.0319	0.7554	-0.9166	0.0306	-0.2021
	(0.5021)	(0.0817)	(0.4914)	(0.3485)	(0.9259)	(0.2713)	(0.3485)	(0.9402)	(0.2326)
Conditional variance equation									
β_{Fed}	0.5859 **	0.6711	0.2758	0.6486 *	-0.2939 ***	0.5324	0.4983 *	-0.3653 ***	0.4529
	(0.0148)	(0.7055)	(0.4826)	(0.0510)	(0.0005)	(0.2991)	(0.0749)	(0.0000)	(0.2284)
β_{GDP}	-0.1158	-0.7877 ***	-0.1283 *	-0.1695 **	0.1030	-0.0899	-0.1590 ***	0.4897 ***	-0.1097
	(0.1519)	(0.0037)	(0.0948)	(0.0356)	(0.9474)	(0.5556)	(0.0000)	(0.0000)	(0.2019)
β_{CPI}	0.0676 ***	0.2925 ***	0.0735 ***	0.0471 ***	0.0141	0.0334	0.0738	0.0203 ***	0.0465
	(0.0000)	(0.0000)	(0.0036)	(0.0002)	(0.2273)	(0.2391)	(0.8540)	(0.0000)	(0.3970)
β_{UE}	0.7431 **	0.1347 ***	0.5204	0.4730 ***	0.6172 **	0.5678 ***	0.4132 ***	0.9493	0.7293 ***
	(0.0197)	(0.0000)	(0.2597)	(0.0000)	(0.0145)	(0.0000)	(0.0003)	(0.1766)	(0.0001)

	Information Technology			Telecommunications Services			Utilities		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
				Conditional mean equation					
α_{Fed}	0.6234	0.7200	0.0274	0.7190	0.2681	0.0259	-0.0381 ***	0.2937	-0.1229 *
	(0.4330)	(0.2208)	(0.9639)	(0.6257)	(0.7091)	(0.9520)	(0.0011)	(0.5364)	(0.0513)
α_{GDP}	0.2921	0.3490 **	0.1739	-0.0456	-0.0108	-0.0499	-0.0114	0.0851	-0.0935
	(0.1279)	(0.0186)	(0.2401)	(0.7671)	(0.8722)	(0.7480)	(0.8942)	(0.1485)	(0.4035)
α_{CPI}	-0.1093 *	-0.0546 ***	0.0465	-0.0115	-0.0448 ***	-0.0072	0.0295	-0.0456 ***	0.0156
	(0.0596)	(0.0008)	(0.3289)	(0.6831)	(0.0005)	(0.7994)	(0.3253)	(0.0000)	(0.5952)
α_{UE}	0.7131	0.2602	-0.1436	0.1982	-0.0901 ***	0.4119	0.2120	-0.8775 ***	0.7531
	(0.7403)	(0.4513)	(0.9339)	(0.8552)	(0.0001)	(0.6705)	(0.7536)	(0.0005)	(0.2613)
				Conditional variance equation					
β_{Fed}	0.4528	-0.6739	0.0149 ***	0.7149	0.1411	0.2631	-0.2316	-0.0830	0.6421
	(0.1022)	(0.1095)	(0.0019)	(0.2389)	(0.7114)	(0.6740)	(0.4257)	(0.7926)	(0.2018)
β_{GDP}	-0.3320	0.0201	-0.1781 **	-0.4406 ***	-0.1519 ***	-0.2339 **	-0.4910 ***	0.2277 ***	-0.1468
	(0.1399)	(0.9041)	(0.0456)	(0.0000)	(0.0010)	(0.0370)	(0.0000)	(0.0057)	(0.2352)
β_{CPI}	0.0241	0.0029	0.0391 ***	-0.0097	0.2263 ***	-0.0203 *	0.0648	0.0763	0.1405
	(0.2799)	(0.9028)	(0.0000)	(0.1661)	(0.0000)	(0.0556)	(0.5301)	(0.9070)	(0.0000)
β_{UE}	0.7025 *	-0.7571 *	-0.1189	0.1075	0.4058 ***	0.5214	0.2601	0.3453 ***	0.2054
	(0.0593)	(0.0777)	(0.6965)	(0.8126)	(0.0000)	(0.3094)	(0.2333)	(0.0005)	(0.7046)

Note. This table reports the estimation results of the MA-EGARCH models described in Equation 3 for the spillover effect of the U.S. 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.

Amongst the four news components, the CPI news has more significant responses than the others. In particular, 4 out of 8 significant responses to the Fed fund rate news occur during the daily horizon, and 75% significant cases (6 out of 8) are lower means. This is consistent with the finding of Kim and Nguyen (2009) that higher than expected target rate news from the Fed results in lower returns for most stock markets in the Asia Pacific region, including Australia. Except for the Fed fund rate news, the other three news components have the strongest impact during the overnight horizon. For the GDP news, all 5 significant responses occur during the overnight horizon. The CPI news also has the strongest impact during the overnight horizon with 7 of 11 significant responses, and for the UE news, all 6 significant responses occur during that period as well.

On the conditional volatility, in general, news on the U.S. Fed of higher than expected target interest rate, inflation, and unemployment elicits volatility in the Australian stock market. This is consistent with the finding of Kim, and In (2002), who also show a positive influence from the U.S. macroeconomic news on volatility in the Australian stock market. On the other hand, a higher than expected GDP tends to lower volatility in the Australian market. This is consistent with the finding of Flannery and Protopapadakis (2002), who show that real GDP surprises are associated with significantly lower conditional return volatility in the U.S. stock market. This calming influence from the U.S. markets would also possibly be transmitted to the Australian market as a result of the fact that Australia tends to follow the leadership of the USA.

Amongst 81 significant responses, 33 cases occur during the overnight horizon and are persistent to the daily horizon with 27 significant cases. However, individual news has different influence patterns. The Fed news has the most influence during the overnight horizon, and all 7 significant responses persist to the daily horizon. Similarly, the CPI and UE also have the most significant impact during the overnight horizon with 8 and 10 cases respectively; however, only 6 and 4 cases persist to the daily horizon. On the other hand, most of significant impacts from the GDP news occur during the daily horizon.

Sectoral Effects

This section contains an in-depth analysis of the impact of U.S. macroeconomic news on different sectors of the ASX/S&P 200 index. On the conditional mean, the aggregate ASX/S&P 200 index responds to the Fed news only. The subindices respond differently. The Consumer Discretionary and Financials sectors respond to all four U.S. news announcements, mostly overnight. Two sectors respond to three news announcements, namely, the Energy sector responds the Fed rates, GDP, and unemployment news (overnight only), and the Utilities sector responds to the Fed (daily and intraday), CPI, and unemployment news (overnight only). Three sectors react to two news announcements: the Information Technology sector responds to GDP and CPI news (overnight only), the Telecommunications Services sector reacts to CPI and unemployment announcements (also overnight), and Property Trusts respond to GDP (overnight) and CPI news (overnight and daily). Three other sectors respond to only one news type; while the Industrials sector responds positively to the inflation news over all three horizons, the Consumer Staples sector responds negatively to the Fed news during the overnight and daily horizons, and the Materials sector reacts negatively to the unemployment news overnight only. Finally, the Health Care sector is insulated from U.S. news announcements.

Different sectors respond differently to individual news announcements. In particular, while the aggregate ASX/S&P 200 index responds negatively to the Fed news during the daily horizon, the negative impact of the Fed news only shows up during the overnight horizon for the Consumer Discretionary sector. On the other hand, such negative influence is relatively persistent for the Consumer Staples and the Utilities sectors. These are sectors sensitive to the higher interest rate as during the contractionary period, consumers tend to cut spending. However, the Fed news has a positive impact on the conditional mean of the Energy and Financials sectors. We conjecture that as Australia is the net fuel exporter to the USA, a contractionary policy stance in the USA might be viewed as a good opportunity for Australian energy exporters as a result of strengthening or weakening of the U.S. or Australian dollar. The positive impact of the Fed news on the Financials sector is also consistent with the finding of Kim and Nguyen (2008) that due to the balance sheet structure of most Australian banks, which have more U.S. dollar denominated interest rate sensitive assets than liabilities, an unexpected increase in the U.S. target rate would ultimately result in a positive effect on the banks' income and these unexpected windfalls would be shown up in their stock prices.

In addition, the Consumer Discretionary, Information Technology, Financials, and Property Trusts sectors respond positively to the GDP news during the overnight horizon, while the opposite is observed for the Energy sector. Similarly, while only the Industrials sector responds positively to the CPI news over all three

horizons, the other six sectors respond negatively to this news mainly during the overnight horizon (Consumer Discretionary, Information Technology, Telecommunications Services, Utilities, Financials, and Property Trusts). Finally, six sectors respond negatively to the unemployment news during the overnight horizon (Energy, Consumer Discretionary, Telecommunications Services, Utilities, Financials, and Materials).

On the conditional volatility, the aggregate ASX/S&P 200 index responds to all four news announcements at least during two time horizons. In general, the Fed, inflation, and unemployment news elicit the conditional variance of the ASX/S&P 200 index returns, while the GDP news helps to reduce the volatility level. For sectoral effects, except for the Energy and Materials sectors, the other 10 subindices respond significantly to all four U.S. news announcements. The U.S. news has the strongest impacts on the conditional variance of the Industrials and Property Trusts sectors with 10 significant responses each. Moreover, while the U.S. news acts as a stimulus to the volatility of most of subindices, we observe that the conditional variance of Telecommunications Services and Property Trusts subindices was lower following the U.S. news, especially the good news of higher than expected GDP growth rate over all three time horizons.

For individual news announcements, the Fed news has a positive effect on the conditional variance of seven sectors during at least one time horizon (Energy, Industrials, Consumer Discretionary, Information Technology, Financials, and Materials). On the other hand, a calming effect of the Fed is only shown during the overnight horizon and turns to elicit an effect during the daily horizon for the Consumer Staples and Health Care sectors. Except for the Materials sector, which does not react, the others respond significantly to the GDP news during at least one time horizon. Remarkably, while in general, the effect of the GDP on the conditional variance of the Australian subindices is calming, we observe that in four sectors (Energy, Industrials, Health Care, and Utilities), the GDP elicits volatility during the overnight horizon, but this effect becomes calming during the daily horizon. Except for Energy and Utilities, the other nine sectors respond significantly to the CPI inflation news. Notably, three sectors respond significantly during all three time horizons (Industrials, Consumer Discretionary, and Property Trust). However, the response is different. While the inflation news injects a calming effect into the Industrials sector, the opposite effect is shown for the Consumer Discretionary subindex. For the Property Trust sector, the calming effect is shown only during the overnight horizon, and the reverse is observed during the other two time horizons. For unemployment news, all sectors except for the Energy sector respond significantly during at least one time horizon. Only the Consumer Staples subindex responds significantly to unemployment news during all three horizons. While the unemployment news generally has a volatility raising impact, the calming effect is observed during the overnight horizon for the Information Technology and Property Trust sectors.

On the conditional mean, the U.S. news has the most influence on the Consumer Discretionary, Utilities, and Financials subindices with 4 significant coefficients each. The Health Care sector is insulated from the U.S. news on the mean. On the conditional variance, the U.S. news has the strongest effect on the Industrials and Property Trusts subindices with 10 significant responses each, while it has the least effect on the conditional variance of the Utilities returns with 3 responses. On both the first two moments, the U.S. news has the most influence on the Industrials and Property Trusts returns with 13 significant responses each. On the other hand, the U.S. news has the least effect on both the first two moments of the Materials returns with 6 significant responses.

Robustness Checks

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 a.m. Australian EST (GMT+10) might affect the Australian stock market. 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 U.S. news from the Australian domestic news on the days of multiple information arrivals.[5] In particular, we control for announcements about Australian inflation, employment, international accounts, and retail sales as in Equation 4:

$$y_{i,t} = \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} News_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k}$$

$$\ln h_{i,t} = \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{\left| \varepsilon_{i,t-1} \right|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} \tag{4}$$
$$+ \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} \left| News_{i,t-1} \right| + \beta_{MacroAnn} MacroAnn_t$$

Table 3 shows that controlling for the Australian domestic news, the results are qualitatively similar to what was reported in the section on empirical results where, on the mean, an expansion in the U.S. economy (higher GDP) leads to an increase in the Australian stock market return, while a contraction (higher interest rate, inflation, and unemployment) results in a negative return for the Australian markets. We observe that controlling for the Australian domestic news, aside from those significant responses reported, the Energy subindex also responds significantly to the Fed news during the daily horizon; the aggregate ASX/S&P 200 and the Energy and the Health Care subindices also respond significantly to the inflation news during the overnight horizon; the Property Trusts subindex responds significantly to the inflation news during the intraday horizon, and the Industrials sector also responds to the unemployment news during the intraday horizon.

On the conditional variance, while the general impact reported under empirical results remains qualitatively unchanged, we observe a slight increase to 86 significant responses compared with 81 cases reported. Except for the Property Trusts subindex, all other subindices show some marginal changes. Apart from those significant responses reported under empirical results, the Energy, Consumer Discretionary, and Information Technology subindices respond significantly to the Fed news during the overnight horizon, and the Financials subindex responds significantly to the Fed news during the daily horizon as well. On the other hand, the ASX/S&P 200 and the Industrials subindices no longer respond to the Fed news during the overnight horizon, while the coefficients of the Energy, Consumer Staples, and Information Technology subindices are no longer significant during the daily horizon. For the GDP news, the coefficients of the ASX/S&P 200 and Consumer Discretionary subindices become significant during the overnight and daily horizons respectively, while 2 other coefficients of the Energy and Information Technology subindices become insignificant during the intraday and overnight horizons respectively. For the inflation news, 7 coefficients become significant, namely, Energy and Health Care (intraday and daily), Utilities (overnight and daily) and Property Trusts (intraday). Conversely, coefficients of Telecommunications Services (daily) and Financials (overnight) are insignificant now. In addition, Energy and Health Care (overnight), Industrials (intraday), and Information Technology (daily) returns respond significantly to unemployment news, while the impact is muted during the overnight horizon for the Consumer Staples, Financials, and Materials subindices. Despite of these changes, the general impact is qualitatively similar to what was discussed under empirical results where the U.S. news has the least effect on both the first two moments of the Materials returns (5 significant coefficients) and the most influence on both the first two moments of the Industrials and Property Trusts returns (14 significant responses). On the conditional mean, the U.S. news has the strongest impact on the Energy, Industrials, Consumer Discretionary, Utilities, and Property Trusts sectors (4 responses each) and the least impact on the Health Care sector (1 response). On the conditional variance, the U.S. news has the strongest influence on the Industrials, Health Care, and Property Trust sectors (10 responses each) and the least influence on the Consumer Staples, Telecommunications Services, and Utilities (5 responses each).

Table 3
U.S. Spillover Effects Controlling for Australian News

	ASX/S&P200			Energy			Industrials		
	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
	(0.0115)	(0.2203)	(0.6081)	(0.0899)	(0.0019)	(0.1967)	(0.2846)	(0.9388)	(0.5876)
α_{GDP}	0.0275	0.0219	0.0341	-0.2378	-0.0464 ***	-0.2220	0.1261	-0.0375	0.1472
	(0.7836)	(0.7098)	(0.8365)	(0.2595)	(0.0000)	(0.3223)	(0.2250)	(0.3968)	(0.3968)
α_{CPI}	0.0039	-0.0111 **	0.0036	-0.0314	0.0203 ***	-0.0296	0.0654 ***	0.0310 ***	0.0419 *
	(0.8816)	(0.0286)	(0.8798)	(0.4723)	(0.0084)	(0.5085)	(0.0075)	(0.0000)	(0.0933)
α_{UE}	0.1459	-0.1248	0.3933	0.2200	-0.0427	0.0291	0.4643	0.2428 *	0.1164
	(0.7557)	(0.3903)	(0.5125)	(0.8273)	(0.9410)	(0.9782)	(0.4680)	(0.0711)	(0.8566)
Conditional variance equation									
β_{Fed}	0.8885 *	0.4706	0.3302 **	0.1746	0.7585 *	0.2619	0.2856 ***	0.4252	0.4082 ***
	(0.0507)	(0.3559)	(0.0190)	(0.6810)	(0.0675)	(0.5892)	(0.0000)	(0.8868)	(0.0002)
β_{GDP}	-0.3730 ***	0.1624 ***	-0.2849 **	-0.2164 **	0.7823 ***	-0.1530	-0.5662 ***	0.6381 ***	-0.3663 ***
	(0.0000)	(0.0001)	(0.0236)	(0.0158)	(0.0000)	(0.1391)	(0.0000)	(0.0000)	(0.0058)
β_{CPI}	0.0578 **	0.0545 ***	0.0337	-0.0528 *	0.0074	-0.0686 **	-0.0448 ***	-0.0481 ***	-0.0544 **
	(0.0296)	(0.0059)	(0.2398)	(0.0560)	(0.9695)	(0.0228)	(0.0002)	(0.0022)	(0.0253)
β_{UE}	0.0254	1.0226 ***	0.9713 **	-0.4005	1.1916 ***	-0.1285	-0.3785	0.9453 ***	0.6534 *
	(0.9490)	(0.0000)	(0.0284)	(0.2861)	(0.0000)	(0.7369)	(0.2723)	(0.0000)	(0.0768)

	Consumer Discretionary			Consumer Staples			Health Care		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
Conditional mean equation									
α_{Fed}	-0.4294	-0.6917 ***	-0.4493	-0.6675 *	-0.0087 ***	-0.7659	0.8491	0.0996	0.6224
	(0.6109)	(0.0048)	(0.5135)	(0.0888)	(0.0000)	(0.1787)	(0.2243)	(0.4184)	(0.3764)
α_{GDP}	-0.0971	0.0558 ***	-0.1169	0.0413	-0.0345	0.0883	0.0616	0.0215	-0.0043
	(0.6674)	(0.0000)	(0.5884)	(0.7173)	(0.2149)	(0.5844)	(0.7725)	(0.6799)	(0.9888)
α_{CPI}	-0.0054	-0.0217 ***	-0.0144	0.0045	-0.0048	0.0171	0.0114	-0.0142 *	0.0035
	(0.8466)	(0.0051)	(0.6041)	(0.8520)	(0.4642)	(0.4821)	(0.8001)	(0.0933)	(0.9280)
α_{UE}	0.5409	-0.1781 **	0.6040	0.6466	-0.0306	0.7591	-0.9619	0.0759	-0.2484
	(0.4741)	(0.0191)	(0.3812)	(0.3331)	(0.8645)	(0.2349)	(0.2595)	(0.7925)	(0.1717)
Conditional variance equation									
β_{Fed}	0.6355 **	0.6564 ***	0.2940	0.6659	-0.4017 ***	0.5354	0.5816 **	-0.6823 **	0.5314
	(0.0111)	(0.0000)	(0.4690)	(0.1192)	(0.0000)	(0.2977)	(0.0451)	(0.0269)	(0.1704)
β_{GDP}	-0.1396 ***	-0.9565 ***	-0.1441	-0.1896 **	0.0436	-0.0967	-0.1631 ***	0.4636 ***	-0.1266
	(0.0073)	(0.0001)	(0.1365)	(0.0225)	(0.8074)	(0.5308)	(0.0000)	(0.0000)	(0.1475)
β_{CPI}	0.0749 ***	0.0932 ***	0.0782 ***	0.0493 *	0.0164	0.0352	0.0720 ***	0.0281 ***	0.0424 ***
	(0.0006)	(0.0000)	(0.0028)	(0.0595)	(0.2050)	(0.2138)	(0.0002)	(0.0000)	(0.0000)
β_{UE}	0.7190 ***	0.1902 ***	0.4125	0.4427 ***	0.6529	0.5509 ***	0.4164 ***	0.8123 ***	0.7384 ***
	(0.0002)	(0.0000)	(0.1975)	(0.0000)	(0.8021)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

	Information Technology			Telecommunications Services			Utilities		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
Conditional mean equation									
α_{Fed}	0.6774	0.0259	0.7115	0.2748	0.0244	0.0239	-0.2974 ***	0.1278	-0.0495 *
	(0.2161)	(0.9249)	(0.6300)	(0.7030)	(0.9536)	(0.9713)	(0.0051)	(0.6452)	(0.0963)
α_{GDP}	0.2819	0.3440 ***	0.1731	-0.0368	-0.0021	-0.0488	-0.0128	0.0849	-0.0994
	(0.1032)	(0.0000)	(0.2399)	(0.8517)	(0.9734)	(0.7173)	(0.8649)	(0.1487)	(0.3907)
α_{CPI}	-0.1103 **	-0.0985 ***	0.0468	-0.0135	-0.0329 **	-0.0055	0.0298	-0.0427 ***	0.0124
	(0.0177)	(0.0008)	(0.4231)	(0.6536)	(0.0115)	(0.8376)	(0.3488)	(0.0000)	(0.6719)
α_{UE}	0.5764	0.0510	-0.0380	0.1703	-0.0590 ***	0.3573	0.2256	-0.8846 ***	0.7436
	(0.7015)	(0.9999)	(0.9820)	(0.8667)	(0.0003)	(0.5930)	(0.7401)	(0.0002)	(0.2598)
Conditional variance equation									
β_{Fed}	0.6931	-0.8688 ***	0.7207	0.2073	0.3074	0.4246	-0.0970	-0.5858	0.1681
	(0.1034)	(0.0000)	(0.2366)	(0.5984)	(0.2673)	(0.3145)	(0.7504)	(0.2343)	(0.7252)
β_{GDP}	-0.3337 ***	0.0131	-0.1778 **	-0.4581 ***	-0.1384 ***	-0.2583 ***	-0.4858 ***	0.2484 ***	-0.1341
	(0.0000)	(0.9263)	(0.0463)	(0.0000)	(0.0068)	(0.0046)	(0.0001)	(0.0023)	(0.2505)
β_{CPI}	0.0188 *	0.0079	0.0393 *	-0.0101	0.2399 ***	-0.0298	0.0639 ***	0.0812 ***	0.1339
	(0.0581)	(0.7533)	(0.0720)	(0.6218)	(0.0000)	(0.3066)	(0.0063)	(0.0052)	(0.0000)
β_{UE}	0.5275 **	-0.6779	-0.2032	0.0071	0.3130 ***	0.3945	0.2503	0.2478 ***	0.2263
	(0.0365)	(0.1182)	(0.5083)	(0.9844)	(0.0000)	(0.2761)	(0.2437)	(0.0000)	(0.4974)

Note. This table reports the estimation results of the MA-EGARCH models described in Equation 4 for the spillover effect of the U.S. 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.

Standardized Effects

Because measurement units differ across news announcements and to facilitate comparability we standardize the news by dividing it by the standard deviation across all observations following Balduzzi et al. (2001). If $SNews_i$ 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 re-estimate Equation 3 with $SNews_i$ instead of $News_i$ as shown in Equation 6:

$$y_{i,t} = \alpha_c + \sum_{i=1}^{p} \alpha_{Lag,i} y_{t-i} + \alpha_{i,Hol} Hol_{i,t} + \alpha_{i,Mon} Mon_{i,t} + \alpha_{i,News} SNews_{i,t-1} + \varepsilon_{i,t} + \sum_{k=1}^{q} \alpha_{i,k} \varepsilon_{t-k}$$

$$\ln h_{i,t} = \beta_{i,c} + \beta_{i,h} \ln h_{i,t-1} + \beta_{i,\varepsilon 1} \frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \beta_{i,\varepsilon 2} \left(\frac{\left|\varepsilon_{i,t-1}\right|}{\sqrt{h_{i,t-1}}} - \sqrt{2/\pi} \right) + \beta_{i,Hol} Hol_{i,t} + \beta_{i,Mon} Mon_{i,t} + \beta_{i,News} \left| SNews_{i,t-1} \right| \tag{6}$$

The regression coefficient is to be interpreted as the response to a one-standard deviation change in the news variable, $SNews_i$. As can be seen from Table 4, quantitatively, we observe slightly fewer numbers of statistically significant coefficients compared with the baseline model's results reported in the empirical results section with 24 and 76 cases for the conditional mean and volatility respectively. Remarkably, coefficients of the Industrials, Health Care, and Property Trusts subindices are not affected. Four subindices have one coefficient change, and all of them are in response to inflation news, of which three subindices have one coefficient becoming insignificant, that is, Utilities' conditional mean during the overnight horizon, conditional variance coefficients of ASX/S&P 200, and Materials' subindices during the daily horizon, while the coefficient of the Telecommunications Services becomes significant during the daily horizon. Furthermore, five changes are observed in two subindices; while 3 Information Technology conditional variance coefficients become significant in response to Fed and inflation news (overnight), and GDP news (daily), the other 2 coefficients in response to Fed (intraday) and unemployment news (overnight) become insignificant. Similarly, the Financials sector also has five changes; while the Fed's conditional variance coefficient becomes significant during the daily horizon, the conditional mean coefficients of the Fed (daily) and the unemployment news (overnight) as well as the conditional variance coefficients of the Fed (overnight) and the unemployment (intraday) become insignificant. Seven changes have been observed for the Consumer Discretionary sector and eight changes for the Energy sector.

Despite these changes, Table 4 shows evidence consistent with the findings reported under empirical results where the general impact is qualitatively alike, where U.S. news has the least effect on both the first two moments of the Materials returns (5 significant coefficients) and the most influence on both the first two moments of the Industrials and Property Trusts returns (14 and 13 significant responses, respectively). On the conditional mean, the Health Care sector is insulated from the U.S. news, while U.S. news has the strongest impact on the Industrials sector. On the conditional variance, U.S. news has the strongest effect on the Industrials and Property Trusts sectors and the least effect on Consumer Discretionary and Utilities sectors.

Table 4
Standardized News Effects

	ASX/S&P200			Energy			Industrials		
	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
	(0.0121)	(0.2605)	(0.5700)	(0.0703)	(0.0000)	(0.1756)	(0.2748)	(0.6966)	(0.5790)
α_{GDP}	0.0033	0.0020	0.0041	-0.0290	-0.0120	-0.0271	0.0154	-0.0046	0.0179
	(0.8078)	(0.7889)	(0.8414)	(0.2792)	(0.4179)	(0.2789)	(0.2474)	(0.3991)	(0.4000)
α_{CPI}	0.0051	-0.0110	0.0061	-0.0244	0.0057	-0.0210	0.0013 **	0.0049 **	0.0106 **
	(0.7341)	(0.1499)	(0.6462)	(0.2170)	(0.6199)	(0.2849)	(0.0322)	(0.0143)	(0.0417)
α_{UE}	0.0039	-0.0035	0.0107	0.0068	-0.0036	0.0017	0.0126	0.0063 *	0.0032
	(0.7772)	(0.3778)	(0.5262)	(0.8255)	(0.7612)	(0.9586)	(0.4938)	(0.0948)	(0.8630)
Conditional variance equation									
β_{Fed}	0.0287 **	0.0191 ***	0.0416 **	0.0037	0.0147	0.0066	0.0402 ***	0.0450 ***	0.0454 ***
	(0.0459)	(0.0000)	(0.0220)	(0.7383)	(0.3831)	(0.6602)	(0.0000)	(0.0000)	(0.0000)
β_{GDP}	-0.0460 ***	0.0136	-0.0348 **	-0.0251 **	0.0107	-0.0178 **	-0.0682 ***	0.0799 ***	-0.0448 ***
	(0.0005)	(0.1210)	(0.0224)	(0.0176)	(0.9400)	(0.0270)	(0.0000)	(0.0000)	(0.0058)
β_{CPI}	0.0060	0.0552 ***	0.0052	-0.0285 *	0.0118	-0.0287 ***	-0.0154 **	-0.0339 *	-0.0169 **
	(0.4799)	(0.0000)	(0.6099)	(0.0618)	(0.8786)	(0.0008)	(0.0449)	(0.0624)	(0.0246)
β_{UE}	0.0018	0.0305 ***	0.0274 *	-0.0088	0.0671 ***	-0.0022	-0.0077	0.0798 ***	0.0183
	(0.8914)	(0.0000)	(0.0695)	(0.4581)	(0.0000)	(0.8607)	(0.4043)	(0.0000)	(0.1606)

	Consumer Discretionary			Consumer Staples			Health Care		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
Conditional mean equation									
α_{Fed}	-0.0138	-0.0222 *	-0.0139	-0.0219 *	-0.0001 ***	-0.0251	0.0271	0.0037	0.0203
	(0.6130)	(0.0592)	(0.5517)	(0.0693)	(0.0000)	(0.1759)	(0.2216)	(0.5977)	(0.3682)
α_{GDP}	-0.0122	0.0052 *	-0.0144	0.0049	-0.0033	0.0105	0.0076	0.0113	-0.0013
	(0.6679)	(0.0868)	(0.5928)	(0.7292)	(0.3554)	(0.6007)	(0.7695)	(0.5585)	(0.9720)
α_{CPI}	-0.0104	0.0196	-0.0237	0.0082	-0.0044	0.0085	0.0070	-0.0043	0.0187
	(0.5931)	(0.1199)	(0.2142)	(0.5961)	(0.2656)	(0.6292)	(0.7996)	(0.8066)	(0.4945)
α_{UE}	0.0144	-0.0152	0.0152	0.0175	-0.0007	0.0210	-0.0254	0.0007	-0.0334
	(0.5018)	(0.4492)	(0.4912)	(0.3483)	(0.9454)	(0.2713)	(0.3484)	(0.9553)	(0.2326)
Conditional variance equation									
β_{Fed}	0.0191 ***	0.0219	0.0090	0.0211 *	-0.6219 ***	0.0173	0.0163 *	-0.0034 ***	0.0147
	(0.0006)	(0.7503)	(0.4826)	(0.0508)	(0.0000)	(0.2991)	(0.0743)	(0.0000)	(0.2297)
β_{GDP}	-0.0142	-0.1043	-0.0157	-0.0211 **	0.0126	-0.0110	-0.0189 ***	0.0622 ***	-0.0134
	(0.1519)	(0.2043)	(0.2774)	(0.0340)	(0.4527)	(0.5557)	(0.0000)	(0.0008)	(0.2017)
β_{CPI}	0.0111	0.0683 ***	0.0045	0.0139	0.1086 ***	0.0162	0.0044	0.0540 ***	0.0029
	(0.2257)	(0.0000)	(0.7671)	(0.1239)	(0.0000)	(0.3894)	(0.6490)	(0.0000)	(0.8081)
β_{UE}	0.0206 **	0.0144	0.0144	0.0408 ***	0.0486 ***	0.0435 ***	0.0392 ***	0.0267	0.0480 ***
	(0.0197)	(0.2938)	(0.2601)	(0.0000)	(0.0076)	(0.0000)	(0.0003)	(0.2268)	(0.0001)

	Information Technology			Telecommunications Services			Utilities		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
Conditional mean equation									
α_{Fed}	0.0560	0.0009	0.0234	0.0087	0.0008	0.0012	-0.0421 ***	0.0040	-0.0345 *
	(0.2688)	(0.8803)	(0.6258)	(0.7091)	(0.9487)	(0.9521)	(0.0054)	(0.6511)	(0.0948)
α_{GDP}	0.0357	0.0427 ***	0.0213	-0.0056	-0.0008	-0.0061	-0.0014	0.0104	-0.0114
	(0.1079)	(0.0000)	(0.2401)	(0.7663)	(0.9226)	(0.7465)	(0.8921)	(0.1466)	(0.4035)
α_{CPI}	-0.0210	-0.0432 ***	0.0190	-0.0282	-0.0272 **	-0.0154	0.0104	-0.0052	0.0114
	(0.5538)	(0.0000)	(0.5906)	(0.1621)	(0.0315)	(0.4711)	(0.5565)	(0.4178)	(0.5331)
α_{UE}	0.0198	0.0072	-0.0040	0.0072	-0.0303 ***	0.0114	0.0060	-0.0243 ***	0.0209
	(0.7404)	(0.4785)	(0.9324)	(0.8116)	(0.0001)	(0.6704)	(0.7756)	(0.0000)	(0.2613)
Conditional variance equation									
β_{Fed}	0.0219	-0.0656 ***	0.0233	0.0046	0.0094	0.0076	-0.0027	-0.0209	0.0069
	(0.2829)	(0.0052)	(0.2388)	(0.7115)	(0.1719)	(0.4235)	(0.7959)	(0.2018)	(0.6829)
β_{GDP}	-0.0406 ***	0.0024	-0.0218 **	-0.0540 ***	-0.0183 ***	-0.0287 **	-0.0600 ***	0.0270 ***	-0.0180
	(0.0021)	(0.8755)	(0.0456)	(0.0000)	(0.0016)	(0.0369)	(0.0000)	(0.0069)	(0.2352)
β_{CPI}	0.0036	0.0530 ***	0.0491 ***	-0.0242 *	0.0915 ***	-0.0151 *	0.0028	0.0117	0.0351
	(0.7564)	(0.0000)	(0.0000)	(0.0705)	(0.0000)	(0.0693)	(0.6417)	(0.4162)	(0.0237)
β_{UE}	0.0195 *	-0.0210	-0.0045	0.0030	0.0670 ***	0.0145	0.0072	0.0652 *	0.0057
	(0.0593)	(0.1311)	(0.5960)	(0.8153)	(0.0000)	(0.3094)	(0.4024)	(0.0959)	(0.7046)

	Financials			Property Trusts			Materials		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
Conditional mean equation									
α_{Fed}	0.0273	-0.0072	0.0219	-0.0073	-0.0003	-0.0061	0.0278	0.0101	0.0090
	(0.1739)	(0.2649)	(0.3612)	(0.6607)	(0.7295)	(0.7686)	(0.5905)	(0.3553)	(0.8666)
α_{GDP}	0.0041	0.0084 *	-0.0033	-0.0059	0.0064 ***	-0.0080	0.0033	-0.0075	0.0226
	(0.7425)	(0.0634)	(0.8068)	(0.5824)	(0.0000)	(0.4828)	(0.9072)	(0.3338)	(0.5282)
α_{CPI}	-0.0014	-0.0148 **	0.0073	-0.0034 *	-0.0015 *	-0.0004	0.0312	0.0117	0.0275
	(0.9224)	(0.0275)	(0.5918)	(0.0861)	(0.0564)	(0.9858)	(0.2963)	(0.1109)	(0.2379)
α_{UE}	0.0219	-0.0047	0.0205	0.0091	0.0015	0.0026	0.0155	-0.0659 ***	0.0457
	(0.1791)	(0.1803)	(0.2342)	(0.3009)	(0.6752)	(0.9023)	(0.6158)	(0.0000)	(0.1246)
Conditional variance equation									
β_{Fed}	0.0250 *	0.0429	0.0341 **	0.0299 ***	-0.1767 ***	0.0248 *	0.0380 ***	-0.0004	0.0385 **
	(0.0687)	(0.2798)	(0.0302)	(0.0000)	(0.0000)	(0.0718)	(0.0001)	(0.9895)	(0.0247)
β_{GDP}	-0.0312 ***	0.0601 ***	-0.0143	-0.0375 ***	-0.1098 ***	-0.0261 *	-0.0171	-0.0050	-0.0233
	(0.0042)	(0.0000)	(0.2769)	(0.0001)	(0.0001)	(0.0785)	(0.2161)	(0.7266)	(0.2554)
β_{CPI}	-0.0117	0.0667 **	-0.0088	0.0372 ***	-0.1420 ***	0.0310 **	0.0105	0.1370 ***	-0.0072
	(0.3043)	(0.0342)	(0.4758)	(0.0013)	(0.0000)	(0.0125)	(0.4879)	(0.0000)	(0.4895)
β_{UE}	0.0119	0.0846 ***	0.0318	-0.0099	-0.0992 ***	0.0004	0.0056	0.0372 ***	0.0187
	(0.4331)	(0.0000)	(0.2342)	(0.4074)	(0.0000)	(0.9977)	(0.7362)	(0.0000)	(0.2768)

Note. This table reports the estimation results of the MA-EGARCH models described in Equation 6 for the spillover effect of the U.S. news on daily changes of the Australian stock markets using standardized news measures shown in Equation 5 (Balduzzi et al., 2001). 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.

Conclusion

We empirically investigate the impact of U.S. macroeconomic news on both the conditional mean and daily changes in volatility in the returns of the Australian stock market subindices. In general, we find that news of higher than expected interest rates, inflation, and unemployment from the USA has a negative impact on the returns of the Australian stock market, while a higher than expected U.S. GDP growth rate leads to an increase in the Australian market returns. On the other hand, a sign of contraction in the U.S. economy (higher than expected interest rate, inflation, and unemployment) elicits conditional volatility of the Australian market returns, whereas an expansion (higher U.S. GDP growth) results in a lower volatility in the Australian markets. We also document Australian sectoral specific responses to U.S. news where, for instance, the Australian Industrials and Property Trusts respond strongly to the U.S. news, while the Materials sector does not react strongly. Finally, we find that while the speed of adjustment on the conditional volatility is somewhat persistent, the U.S. news has been absorbed relatively quickly on the conditional mean of the Australian return. We reserve the task of investigating potential transmission channels for U.S. news to the Australian stock market, such as the financial and real integration channels, for future research.

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Footnotes

1 See Tooke, Monico, Andrew, & Batty (2010).
2 See Foreign Direct Investment Fact Sheet, available at http://www.innovation.gov.au/Section/AboutDIISR/FactSheets/Pages/ForeignDirectInvestmentFactSheet.aspx
3 The earliest date of data availability for the Australian subindices was June 26, 2001.
4 We vary the lags of the dependent variables and EGARCH lags to address the remaining serial correlations in the first two moments of the standardized residuals. This did not materially change the estimation results. Interested readers can obtain diagnostic tests upon request.
5 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 difference in belief of the news (S-J. Kim & Nguyen, 2009).

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Table A1
Summary Statistics: Australian Stock Return Series

	ASX/S&P200			Energy			Industrials			Consumer Discretionary		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
No. of observations	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960
Mean	0.0032	0.0101	-0.0067	0.0490	0.0012	0.0473	-0.0117	-0.0110	-0.0008	-0.0381	0.0074	-0.0457
Std. deviation	1.0447	0.3301	0.9273	1.5192	0.3438	1.5129	1.0942	0.3241	1.0222	1.3090	0.4642	1.3087
Skewness	-0.6328	-1.1044	-0.4767	-0.5325	0.5703	-0.5184	-0.6259	-1.6056	-0.4732	-0.2788	-0.3883	-0.1989
Kurtosis	9.0166	24.1401	7.2020	7.1025	58.8618	6.2496	6.4561	20.7119	4.8987	4.7887	48.2793	4.3970
Jarque-Bera	6770.17	7989.21	4312.37	4212.27	6832.71	3279.13	3531.97	5875.74	2033.98	1898.12	9005.34	1592.67
Ljung-Box Q test												
Return	32.16 **	34.80 **	26.00	31.42 **	177.38 ***	37.78 ***	25.55	43.47 ***	33.12 **	29.76 *	61.14 ***	56.80 ***
P-Value	(0.0416)	(0.0212)	(0.1657)	(0.0499)	(0.0000)	(0.0094)	(0.1811)	(0.0018)	(0.0327)	(0.0738)	(0.0000)	(0.0000)
Volatility	2704.83 ***	188.05 ***	2101.11 ***	1598.24 ***	192.22 ***	1531.09 ***	1794.88 ***	158.78 ***	1731.82 ***	697.25 ***	75.90 ***	868.81 ***
P-Value	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0011)	(0.0000)	(0.0000)

	Consumer Staples			Health Care			Information Technology			Telecommunications Services		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
No. of observations	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960
Mean	0.0190	-0.0105	0.0296	0.0258	0.0056	0.0200	-0.0321	-0.0234	-0.0079	-0.0201	0.0177	-0.0369
Std. deviation	0.9898	0.2536	0.9990	1.1965	0.3657	1.2099	1.7868	0.9045	1.6323	1.2060	0.6856	1.0350
Skewness	-0.5520	-2.6816	-0.4443	-0.2312	0.7410	-0.2952	0.0777	-0.1494	0.2337	-0.4657	-1.0473	-0.0349
Kurtosis	10.7941	50.0055	9.6808	2.8654	94.7159	3.0121	5.0096	13.7565	4.6620	5.9765	12.5895	2.9558
Jarque-Bera	9614.73	6560.57	7722.00	687.98	9982.49	769.83	2051.53	5462.10	1793.74	2987.85	3302.02	714.28
Ljung-Box Q test												
Return	36.12 **	196.16 ***	27.28	40.92 ***	35.97 **	58.63 ***	47.15 ***	40.51 ***	42.75 ***	28.95 *	49.82 ***	39.59 ***
P-Value	(0.0149)	(0.0000)	(0.1275)	(0.0038)	(0.0155)	(0.0000)	(0.0006)	(0.0043)	(0.0022)	(0.0888)	(0.0002)	(0.0056)
Volatility	1062.73 ***	220.89 ***	1055.35 ***	455.81 ***	7.60	414.29 ***	273.82 ***	773.77 ***	197.89 ***	256.50 ***	257.15 ***	385.26 ***
P-Value	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.9942)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0011)	(0.0000)	(0.0000)

	Utilities			Financials			Property Trusts			Materials		
	H0	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**	**H0**	**H1**	**H2**
No. of observations	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960	1960
Mean	0.0172	0.0434	-0.0261	-0.0101	-0.0012	-0.0085	-0.0201	-0.0070	-0.0128	0.0376	0.0298	0.0078
Std. deviation	1.0151	0.5311	0.9129	1.2010	0.2989	1.1214	1.3396	0.2334	1.3434	1.6782	0.8073	1.2600
Skewness	-0.4273	-0.2976	-0.0388	-0.0374	-3.1394	-0.0456	-1.1331	-6.3046	-1.1070	-0.5278	-0.2782	-0.2929
Kurtosis	6.0229	8.7128	3.3646	9.3498	57.2376	7.9304	13.6474	149.3817	13.4191	6.9129	13.1401	4.0696
Jarque-Bera	3022.10	6228.48	925.48	7139.72	7071.54	5139.47	5629.97	5366.88	5113.99	3993.75	4126.08	1381.27
Ljung-Box Q test												
Return	24.56	128.69 ***	24.22	81.02 ***	34.80 **	71.71 ***	146.74 ***	87.95 ***	147.97 ***	26.86	65.09 ***	30.59 *
P-Value	(0.2188)	(0.0000)	(0.2331)	(0.0000)	(0.0212)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.1394)	(0.0000)	(0.0608)
Volatility	1051.00 ***	731.67 ***	1484.78 ***	2629.62 ***	24.45 ***	2440.92 ***	3021.54 ***	3.11	2928.48 ***	3628.16 ***	2310.35 ***	2225.58 ***
P-Value	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(1.0000)	(0.0000)	(0.0011)	(0.0000)	(0.0000)

Note. This table reports descriptive statistics for the Australian stock indices for the period June 2001 to December 2008. p values are in parentheses. *, **, *** denote significance at 10%, 5%, and 1%, respectively.

Table A2
Summary Statistics :U.S. Macroeconomic News

	Fed fund rates				GDP			
	Total	**Higher than expected**	**Lower than expected**	**No surprise**	**Total**	**Higher than expected**	**Lower than expected**	**No surprise**
No. of observations	64	23	19	22	30	14	16	0
Proportions	(100%)	(36%)	(30%)	(34%)	(100%)	(47%)	(53%)	(0%)
Summary statistics								
Mean	-0.0171	0.1053	-0.1851		0.1484	0.9143	-0.5125	
Std. deviation	0.1808	0.0940	0.2331		0.9777	0.9172	0.4097	
Skewness	-2.1642	0.6801	-1.5426		1.1688	1.1794	-0.9709	
Excess Kurtosis	9.8466	1.7974	4.1767		4.4985	3.2556	2.7012	
Min	-0.7733	0.0055	-0.7733		-1.4000	0.1000	-1.4000	
Max	0.2760	0.2760	-0.0084		2.9000	2.9000	-0.1000	

	CPI				Unemployment			
	Total	**Higher than expected**	**Lower than expected**	**No surprise**	**Total**	**Higher than expected**	**Lower than expected**	**No surprise**
No. of observations	90	35	55	0	90	30	42	18
Proportions	(100%)	(39%)	(61%)	(0%)	(100%)	(33%)	(47%)	(20%)
Summary statistics								
Mean	-0.1988	0.5782	-0.6933		-0.0226	0.2300	-0.2143	
Std. deviation	0.7591	0.4329	0.4375		0.2232	0.1494	0.1027	
Skewness	0.2484	0.8352	-0.4345		0.4346	0.5137	-0.5954	
Excess Kurtosis	2.5198	3.3221	2.3627		2.7576	1.8934	2.3594	
Min	-1.6948	0.0199	-1.6948		-0.4000	0.1000	-0.4000	
Max	1.7264	1.7264	-0.0422		0.5000	0.5000	-0.1000	

Note. This table reports descriptive statistics for U.S. macroeconomic news for the period June 2001 to December 2008.