Macroeconomic News Surprises, Business Cycles, and Interest Rate Swap Spreads

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EXTENDED ABSTRACT

This study examines the response of Australian interest rate swap spreads to the arrival of macroeconomic news information during the economic expansion and contraction periods. We find that the impact of news announcements on swap spread change differs and largely depends on the state of the economy. The unexpected inflation rate is the only news released that has significant impact on swap spreads across all maturities during contractions and remains the important news announcement throughout the business cycles. The unanticipated unemployment rate tends to be more relevant to the 10-year swap and the unanticipated change in money supply tends to be more relevant to the 4-and 7-year swaps during expansions. We also find shocks from these news surprises appear to have significant impact on the conditional volatility of the swap spread change during both economic phases. The macroeconomic shocks in general are negatively related to the conditional volatility of the swap spread change, suggesting that the news worthy announcements tend to reduce uncertainty on the news announcement days in the swap market during expansion and contraction periods.

1. INTRODUCTION

Macroeconomic news plays an essential role in financial markets by revealing new information about the fundamentals of the economy. Periodic news announcements such as unemployment rate and consumer price index (CPI) are therefore closely watched by market participants who respond quickly and accordingly to unexpected element of the news. These news surprises therefore form an important part of the price discovery process in financial assets.

An extensive literature examining the impact of macroeconomic news surprises on financial assets has well been documented, mostly on bonds, stocks, and foreign exchange. For example, Fleming and Remolona (1997), Bollerslev et al. (2000), and Green (2004) find that news surprises from GDP, inflation rate, unemployment rate, or consumer confidence are significantly related to changes in Treasury yields especially around the time of the announcements. Similarly, Chen et al. (1986), and Brenner et al. (2005) report that the same economic surprises affect stock prices albeit through a more complicated mechanism due to potential changes in expected cash flows, the discount rate, the risk premium, or a combination of these three pricing factors. In addition, Anderson et al. (2003) and Simpson et al. (2005) show that announcements related to interest rate and inflation have significant impact on the exchange rate.

In addition, a number of empirical studies suggest that macroeconomic fundamentals play an important role in determining credit spread dynamics. For examples, Fama and French (1989) show that credit spreads (the difference between corporate bond yield and Treasury bond yield with an equivalent maturity) are significantly related to macroeconomic conditions and widen during recession periods. Ewing (2003) further shows that the default risk premium is relatively higher during recessionary conditions. Duffie et al. (2006) show that macroeconomic fundamentals have an impact on default rates or yield spread changes. Korajczyjk and Levy (2003) find that macroeconomic conditions account for 12% to 51% of the variation in firms' leverage between 1984 and 1998, and Elton et al. (2001) find that firms' leverage has a significant explanatory power for yield spread changes. A recent study by Tang and Yan (2006) show that firm characteristics have significant effects on credit spreads and these effects vary with economic conditions.

Little empirical work has been done to examine the impact of macroeconomic variables on swap

spreads outside U.S. In this study, we attempt to examine the effects of macroeconomic fundamentals on swap spreads under different state of economy. Specifically, our study addresses the following sets of questions. First, how do unanticipated macroeconomic news announcements impact on the Australian dollar interest rate swap spreads? Second, do these unanticipated macroeconomic announcements affect swap spreads differently across different state of the economy? Third, are these influences consistent with existing theories on interest rate determination? The swap spread is the difference between the fixed rate of a plain-vanilla swap and the yield of a government bond of similar maturity. Since an interest rate swap is an OTC derivative and is not exchange traded, it does not enjoy a payment guarantee by a clearing organization or exchange. Consequently, the pricing of swaps and the corresponding swap spreads reflect credit risk across different maturities. Changes in the swap spreads due to news surprises, the unexpected component of the news announcements, should therefore contain new information about default risk and the overall credit worthiness of the Australian corporate sector in addition to interest rate risk.

To conduct empirical analysis on the effect of news announcements, we examine news of money supply growth, unemployment rate and consumer price index (CPI). We choose these macroeconomic announcements because they are the most closely watched economic indicators and are well known to offer insight into the intrinsic health of the economy, the future direction of interest rates, and the performance of financial markets. A broad consensus has also been reached that only a small number of macroeconomic factors have a significant impact on pricing and return. For interest rate swaps in particular, Fornari (2004) finds that only six macroeconomic variables are influential on US implied volatilities that extracted from swaption prices – namely US non-farm payrolls, the US Institute for Supply Management (ISM) index, jobless claims, the Chicago Purchasing Managers (CPM) index, durable goods orders and retail sales announcements. Because some of the news announcements are not available in Australia and they tend to provide similar information on the economy, hence, we restrict our analysis to the 3 types of macroeconomic announcements.

2. DATA

For the 2, 4, 7 and 10-year interest swap rates, we use the daily closing mid-rates from Datastream over the period from January 3, 1995 to December 31, 2004. The Treasury bond yields of corresponding maturities are obtained from the Reserve bank of Australia (RBA). Swap spreads for the 6 maturities are then calculated by subtracting the swap rates from the Treasury bond yields of the same maturity, giving a total sample size of 2533 observations for each swap maturity.

Table 1 provides some descriptive statistics for the swap spreads. It shows that the average swap spread rises as the maturity of the swap increases, capturing the risk premium embedded in the swap rates. The volatility of the swap spread however appears to be fairly constant across all maturities. Across all maturities, the skewness and the kurtosis of the swap spread show non-normality with some skewness and thin tails. Each of the swap spreads also exhibits non-stationarity based on the Augmented Dickey-Fuller (ADF) test, which fails to reject the null hypothesis at the 1 percent significant level.

We also collect 3 different scheduled macroeconomic announcements over the same 10-year period as the swap spreads. Monthly unemployment rate is compiled by the Australian Bureau of Statistics and released at 11:30am on the second Thursday of the month. Information on money supply growth is announced at 11:30 am on the first Friday of the month by the Reserve Bank of Australia. Finally, quarterly consumer price index is made public at 11:30 am on the last Wednesday of the month following every quarter (for example, March quarter CPI is released on the last Wednesday of April). In order to examine the extent to which these economic fundamentals affect the swap market, it is important to understand and properly model the news information arrival. Releases of macroeconomic announcements are partly anticipated by the market. At the point of announcement release, the market only reacts to the unexpected component of the news i.e., to the news information that deviates from market expectations. While the announcement of expected component of news information has little influence since it has largely been absorbed in the current price by the market prior to the release.

Table 1. Descriptive statistics of the interest rate swap spreads. This table reports the summary statistics of the daily interest rate swaps from January 1995 to December 2004. The critical value for t-ratio at 1% and 5% significant level are -3.43 and -2.87 respectively.

	2-year	4-year	7-year	10-year
Mean	0.2495	0.3454	0.3535	0.3797
Medium	0.2350	0.3550	0.3670	0.4070
Std. Dev.	0.1375	0.1423	0.1521	0.1520
Skewness	0.1280	0.0066	0.0302	-0.0053
Kurtosis	2.2820	2.8535	2.3828	2.3314
ADF t-ratio	-3.40	3.37	-2.56	-2.51
N	2533	2533	2533	2533

Since economic activities tend to vary widely over business cycles, one primary question of interest in this study is whether the response of swap spreads to changes in macroeconomic fundamentals varies systematically over time. In other words, could the same information be interpreted differently depending on the state of the economy as the news arrives? To test this hypothesis, we first need to classify the level of economic activities into two different states - expansions and contractions over the business cycles.

Table 2. Australian Business Cycles. This Table reports the Australian business cycles from January 1990 to December 2004. There are 123 expansion and 57 contraction months.

Turning Point		Duration in Months	
Peak	Trough	Contraction (Peak – Trough)	Expansion (Trough – Peak)
1990.01	1991.06	18	18
1992.12	1993.09	9	3
1993.12	1994.12	12	30
1997.06	1997.09	3	33
2000.06	2000.12	6	36
2003.12	2004.09	9	3

We measure expansions and contractions using the local maxima and minima of the sample path of Gross Domestic Product (GDP), the natural measurement of the level of economic activities. With the business cycle reference dates of the Australian Bureau of Statistics (1992), we are able to identify peaks and troughs in Australia's business cycle from 1990 to 2004. We denote the period from trough to peak as expansions and from peak to trough as contractions. Table 2 shows the dates of turning points in the Australian business cycles together with the duration of each phase of cycle. As expected, we find that there are more expansions (123 months) than contractions (57 months). The Australian economy had particularly been doing well from 1995 to 2000 during which expansions took place for most of the sample period.

3. EMPIRICAL MODELS

In our subsequent analysis, we first examine the surprise effects of the news arrivals on the swap spread change and its volatility over the full sample period, and then proceed to investigate the effects in each state of economy. On the full sample analysis, we run the following MA-EGARCH model,

$$\begin{aligned}
&\Delta Swapsprd_{i,t} = \alpha_{i,c} + \varepsilon_t + \sum_{k=1}^{q} \alpha_{i,k}.\varepsilon_{i,t-k} + \alpha_{i,N} D_{e,t} NEWS_{N,t} \\
&\varepsilon_{i,t} = z_{i,t}\sqrt{h_t} \sim (0, h_{i,t}), z_{i,t} \sim iid(0,1) \\
&\ln(h_{i,t}) = \beta_{i,0} + \beta_{i,1}\ln(h_{i,t-1}) + \beta_{i,2}\frac{\varepsilon_{i,t-1}}{\sqrt{h_{i,t-1}}} + \\
&\beta_{i,3}\left(\frac{|\varepsilon_{i,t-1}|}{\sqrt{h_{i,t-1}}} - \sqrt{\frac{2}{\pi}}\right) + \beta_{i,N} D_{e,t} |NEWS_{N,t}|
\end{aligned} \tag{1}$$

Where:

$\Delta Swapsprd_{i,t}$ = Swap spread change for maturity I (i=1, 2, 3, 4, 5 and 6 for 2, 3, 4, 5, 7 and 10-year swaps respectively)

ε_t = The error term is assumed ~ (0, h_t);

$h_{i,t}$ = Conditional swap spread volatility for maturity i;

q = Number of moving average terms included in the conditional mean equation to remove serial correlation in the estimated standardized errors, z_t;

$\beta_{i,2}$ = Measures the sign effect where a negative shock increases volatility if $\beta_{i,2} <$ -1, and a positive shock reduces volatility if $\beta_{i,2} > -1$;

$NEWS_{N,t,}$ = The unexpected component of each macroeconomic announcement (N = UE, MS, CPI) as measured by the difference between the.

To test whether the state of economy changes the news announcement effects, we multiply the unexpected news $NEWS_{N,t}$, with a dummy variable D_e that captures the state of the economy.

4. EMPIRICAL RESULTS

Table 3 reports the full sample results of the effects of news surprises on swap spread changes. Among the 3 news announcements, we find that only unexpected inflation rate is significant in explaining the swap spread changes across all maturities except 7-year swap. The inverse relationship between inflation surprises and changes in the swap spread indicates that a higher (lower) than expected inflation rate contributes to a reduction (widening) in the swap spreads. The changes of the swap

spread however could come from changes in Treasury yield or changes in swap rate. In other words, a reduction of the swap spread may indicate that the swap rate and Treasury yield move in opposite directions, or in the same direction but different magnitudes. Hence, while a higher than expected inflation rate (indicates a strong economic growth) increases inflation premium on interest rate, it also reduces the default risk premium of the swap rate.

Consistent with previous studies (see Roley (1983), Ederington and Lee (1993), the 4- and 7-year swap spread change respond negatively to unexpected change in money supply In their study, Urich and Watchel (1981) find that interest rate levels have a positive relationship with the unexpected change in money supply. They interpret this as an inflationary effect. That is unexpected change in money supply may exert an upward pressure on interest rate as the central bank may engage in an open market operation that tightens the supply of reserves to offset the unexpected change. Hence, causing the swap spread change to decrease (as interest rates are expected to rise). The 10-year swap spread change is the only swap that responds negatively and significantly to unanticipated unemployment rate change. This suggests that the arrivals of unemployment news have the greatest effect on the long term interest rate swap spread in both economic and statistical sense.

On the conditional volatility of the swap spread changes, the estimates of the lagged volatility coefficient $\beta_{i,1}$ are highly statistically significant and fall within the range 0.8270 – 0.9792. This implies that the swap spread volatilities are highly persistent across all maturities. The asymmetric impact (as measured by $\beta_{i,2}$) is not significant across all swap maturities which means that negative shocks have greater impact on swap market than the positive shocks is not evident. Finally, the coefficients ($\beta_{i,3}$) of lagged innovations are positive and statistically significant.

Table 3. The Impact of macroeconomic News Surprises on Australian Interest Rate Swap Spreads: Full Sample. This table reports quasi-maximum likelihood (QML) estimate results for the EGARCH (1,1) model. The sample period is from January, 1995 to December, 2004. A *, ** and ** * indicate statistical significance at the 1%, 5% and 10% levels respectively.

	2-year swap spread		4-year swap spread		7-year swap spread		10-year swap spread	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
				Panel A: Conditional Mean				
$\alpha_{i,c}$	0.0002	0.0003	-0.0001	0.0003	0.0001	0.0003	0.0006	0.0003**
$\alpha_{i,MS}$	-0.0025	0.0022	-0.0046	0.0019**	-0.0053	0.0019*	-0.002	0.0028
$\alpha_{i,UE}$	0.0081	0.0167	-0.0047	0.0326	-0.0152	0.0245	-0.0306	0.0148**
$\alpha_{i,CPI}$	-0.0093	0.0015*	-0.0077	0.0038**	-0.0005	0.0031	-0.0022	0.0007*
				Panel B: Conditional Variance				
$B_{i,0}$	-0.3339	0.0828*	-0.4326	0.1227*	-0.2269	0.0715*	-1.4765	0.2625*
$\beta_{i,1}$	0.9703	0.0106*	0.9567	0.0146*	0.9792	0.0077*	0.8319	0.0342*
$\beta_{i,2}$	-0.0035	0.0253	-0.0101	0.02688	0.0288	0.0252	-0.0533	0.0492
$\beta_{i,3}$	0.2103	0.0324*	0.2371	0.0558*	0.144	0.0399*	0.5017	0.0585*
$\beta_{i,MS}$	-0.0421	0.0563	-0.0401	0.04697	0.0563	0.0458	-0.4259	0.1067*
$\beta_{i,UE}$	-0.5406	0.8471	0.1443	0.9756	-0.7584	0.681	-1.7572	1.5344
$\beta_{i,CPI}$	-0.8468	0.2775*	-0.3072	0.2571	-0.1079	0.203	-1.572	0.2631*

In relation to the unanticipated macroeconomic announcements on the conditional volatility of swap spread change, the unanticipated news on inflation rate are found to have negative effects on the conditional volatility of 2-year and 10-year swap spread change and the unexpected component of the change in money supply also has a significantly negative effect on the 10-year conditional volatility of swap spread change. Overall, the results seem to be consistent with

Ederington and Lee (1996) and Brenner, et al. (2005). Ederington and Lee (1996) show that implied volatility tends to rise in the days before news announcement release. They also find that there is a sharp fall in implied volatilities just after announcements. They argue that the announcement itself helps market to resolve uncertainty.

Further into our analysis, we examine swap spread responses to macroeconomic announcement surprises under different state of economy. Recent studies (see Boyd et al. (2005) and Anderson et al. (2005)) suggest that the impact of some macroeconomic variables tends to dominate in periods of economic growth while other variables may be more influential in periods of economic slowdowns. Tables 4 and 5 report the impact of macroeconomic surprises on swap spreads during expansions and contractions respectively.

It is interesting to note that in the economic expansion periods (see Table 4), swap market participants seem to ignore the inflation rate surprises as none of the coefficients of inflation rate surprises (measured by $\alpha_{i,CPI}$) in the mean equation is statistically significant. Other macroeconomic surprises have the same significant effects on swap spread change as discussed in the full sample periods.

In contrast to the findings during economic expansions, inflation rate surprises appear to be the most influential news information during contractions. Table 5 shows that swap spread change across all maturity is highly responsive to the CPI surprises. The coefficient $\alpha_{i,CPI}$ for inflation rate surprises is negatively significant at the 5 percent level for all swap spread change. One explanation for the significant relationship during contractions is that swap market participants pay more attention to inflation figure because an increase in inflation (indicates future interest rates are expected to increase) is associated with an improving business condition, which in turn improves credit quality and subsequently causes the swap spread to decline. Unlike during expansions however, news surprises on inflation rate are not important on the swap spread changes.

Table 4. The Impact of Macroeconomic News Surprises on Australia Interest Rate Swap Spreads: Expansion Periods. This table reports quasi-maximum likelihood (QML) estimate results. The sample period is from January, 1995 to December, 2004. A *, ** and ** * indicate statistical significance at the 1%, 5% and 10% levels respectively.

	2-year swap spread		4-year swap spread		7-year swap spread		10-year swap spread	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
				Panel A: Conditional Mean				
$\alpha_{i,c}$	0.0002	0.0003	-0.0002	0.0003	0.0001	0.0003	0.0006	0.0003**
$\alpha_{i,MS}$	-0.0022	0.0028	-0.0061	0.0019*	-0.0071	0.0021*	-0.0034	0.0034
$\alpha_{i,UE}$	-0.032	0.0202	-0.0282	0.0356	-0.0242	0.0252	-0.0397	0.0163**
$\alpha_{i,CPI}$	-0.008	0.0067	-0.0256	0.0206	0.0143	0.0093	-0.0053	0.0052
				Panel B: Conditional Variance				
$B_{i,0}$	-0.3287	0.0875*	-0.4703	0.1148*	-0.2203	0.0622*	-1.1133	0.2493
$\beta_{i,1}$	0.9717	0.0110*	0.9548	0.0142*	0.981	0.0069*	0.8775	0.0317*
$\beta_{i,2}$	-0.0015	0.0244	-0.0149	0.0271	0.0234	0.0225	-0.0493	0.0525
$\beta_{i,3}$	0.2077	0.0329*	0.2624	0.0465*	0.1365	0.0333*	0.4329	0.0627*
$\beta_{i,MS}$	-0.0131	0.0529	-0.0436	0.0483	0.0702	0.0451	-0.2866	0.1179**
$\beta_{i,UE}$	0.1673	0.7737	0.6149	0.8542	-0.0354	0.6238	-1.9174	1.4305
$\beta_{i,CPI}$	-1.1384	0.3769*	0.4372	0.507	0.6666	0.3624	-1.7613	0.4647*

Finally, results in Panel B of Tables 4 and 5 show that the macroeconomic shocks in general are negatively related to changes in conditional volatility of the swap spreads, suggesting that

these news worthy announcements tend to reduce uncertainty on the announcement days in the swap market during expansion and contraction periods. While there are some variations on the effects of the news surprises in different phase of the business cycles, the impacts appear to be quite consistent. For example, shocks generated from inflation rate announcements are generally negatively significant at the 1 percent level across all maturities in both states of economy. They also tend to dominate other news announcements in the swap market. The shocks from the inflation rate appear to dampen the conditional volatility of the swap spread. On the other hand, the shocks from money supply changes are restricted to the conditional volatility of 10-year swap spread during both expansions and contractions. The effect from the money supply shocks tends to calm down the conditional volatility of the swap spread.

Table 5. The Impact of Macroeconomic News Surprises on Australia Interest Rate Swap Spreads: Contraction Periods. This table reports quasi-maximum likelihood (QML) estimate results for the EGARCH (1,1) model The sample period is from January, 1995 to December, 2004. A *, ** and ** * indicate statistical significance at the 1%, 5% and 10% levels respectively.

	2-year swap spread		4-year swap spread		7-year swap spread		10-year swap spread	
	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
				Panel A: Conditional Mean				
$\alpha_{i,c}$	0.0003	0.0003	0.0001	0.0002	0.0001	0.0003	0.001	0.0004*
$\alpha_{i,MS}$	-0.0016	0.0047	0.0105	0.0051**	0.0016	0.0054	0.0074	0.0129
$\alpha_{i,UE}$	0.0241	0.0316	0.0286	0.0192	0.0336	0.0384	0.0171	0.0329
$\alpha_{i,CPI}$	-0.0098	0.0012*	-0.0065	0.0027**	-0.0044	0.0021**	-0.0021	0.0005*
				Panel B: Conditional Variance				
$B_{i,0}$	-0.4386	0.1164*	-0.3619	0.1172*	-0.2433	0.0624*	-1.4371	0.2870*
$\beta_{i,1}$	0.9601	0.0149*	0.9644	0.0145*	0.9768	0.0076*	0.8399	0.0368*
$\beta_{i,2}$	0.001	0.0269	-0.01	0.0261	0.0232	0.0266	-0.0579	0.0517
$\beta_{i,3}$	0.2493	0.0347*	0.2044	0.0543*	0.1451	0.0372*	0.5208	0.0698*
$\beta_{i,MS}$	-0.0728	0.2916	-0.0302	0.4735	0.2416	0.2461	-1.0446	0.3650*
$\beta_{i,UE}$	-1.6225	2.4772	-0.9855	4.7043	-3.7345	1.8632**	-4.9003	2.664***
$\beta_{i,CPI}$	-0.521	0.2551**	-0.825	0.2934*	-0.5112	0.2438**	-1.3955	0.2765*

5. CONCLUSIONS

This study investigates which macroeconomic news announcements are more influential on the behaviour of Australian interest rate swap spreads and to the extent that they affect the changes in the swap spread during economic expansions and contractions. Using news releases from money supply growth, unemployment rate and inflation rate, we find that news information provided by inflation rate announcements is the only important news throughout the business cycles but most dominant during economic contractions. Whilst the unanticipated unemployment rate tends to be more relevant to 10-year swap and the unanticipated change in money supply tends to be more relevant to 4-and 7-year swaps during expansions. Our findings suggest that market participants pay attention to different macroeconomic news announcements depending on the state of the economy. Information revealed by these news releases therefore may vary in their relevance in each phase of the business cycles. We also find shocks from these news surprises appear to have significant impact on the conditional volatility of the swap spreads during both economic phases. The macroeconomic shocks in general are negatively related to changes in conditional volatility of the swap spreads, suggesting that these news worthy announcements tend to reduce uncertainty on the news announcement days in the swap market during expansion and contraction periods. While there are some variations on the effects of the news surprises in different phase of the business cycles, the impacts appear to be quite consistent

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