NEWS EVENT SURPRISE ON CURRENCY EXCHANGE: EVIDENT FROM GBP-AUD

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THEMATIC PAPER SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF MANAGEMENT
COLLEGE OF MANAGEMENT
MAHIDOL UNIVERSITY
2016

Thematic paper
entitled

NEWS EVENT SURPRISE ON CURRENCY EXCHANGE: EVIDENT FROM GBP-AUD

was submitted to the College of Management, Mahidol University
for the degree of Master of Management
on
February 15, 2016

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ACKNOWLEDGEMENTS

The thematic paper “News Event Surprise on Currency Exchange: Evident from GBP-AUD”, Foremost, I would like to express my sincere gratitude to my Asst. Prof. Nareerat Taechapiroontong for the continuous support of my thematic paper, for his patience, motivation, enthusiasm, and immense knowledge. Her guidance helped me in all the time of research and writing of this thematic paper. I could not have imagined having a better advisor and mentor for my thematic paper.

Besides my advisor, I would like to thank the rest of my thematic paper committee: Asst.Prof. Piyapas Tharavanij and Assoc.Prof. Tatre Jantarakolica for their encouragement, insightful comments, and hard questions.

Last but not the least, I would like to thank my family, for giving birth to me at the first place and supporting me spiritually throughout my life.

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ABSTRACT

In this paper, we examine the impact of news announcements to the currency exchange by using event study methodology. Focusing on data from the currency exchanges "GBP-AUD". The currency exchange data is collected for the past eight years (January 2007 to September 2015) with one minute timeframe. We calculate average returns for 5, 15 and 30-minute intervals. And for news announcement, we use 187 economic news from two countries (United Kingdom and Australia) which are classified into four degrees (0, 1, 2, 3) based on the degree of likely impacts to currency exchanges. Our result suggests that the news classification by forexfactory.com has no impact on each currency. Secondly, although our result shows economic news has an impact to currency exchange, we cannot be specific whether single or multiple news announcement has more impact on currency exchange than each other. And last, for each news announcement, we are able to identify highest abnormal return and significant t-test within the specific 120 minutes before news announcement and 240 minutes after news announcement. Once we identify the highest abnormal return and significant t-test, we are able to scope down a profitable period for an investor by suggesting a specific entry and exit time period for trading.

KEY WORDS: Even Study/News Announcement /Currency Exchange/GBP-AUD

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CHAPTER I
INTRODUCTION

At present, there are various investment products which offer high return to the investors and one of them is the Currency exchange, “Forex” Forex refers to the Currency exchange market. It is the over-the-counter market in which the major foreign currencies around the globe are traded. Forex is considered the largest and most liquid market in the world, an average daily volume for December 2015 is $ 337 Billion (Thomson Reuters).

Normally, the average amount of money changing hands daily in forex around the globe jumped 21% in October 2015 from a year earlier, to $4.8 trillion. The data came from surveys conducted twice a year by central banks in the U.K., U.S., Canada, Singapore, Australia and Japan and covered a majority of currency trading. (The Wall Street Journal, January 2015)

Currency exchange is always volatile due to the economic or government factors between two-traded currencies (Égert and Kočenda (2014), Kearns and Manners (2006)). In particular, traders have a responsibility to analyze the currency rate and make decision on an investment from the trade currencies.

There are two main analysis for the currency trading which are Technical analysis and Fundamental analysis. The technical analysis is a study of a historical price action to predict future price action. On the other hand, the fundamental analysis is a type of market analysis which involves studying the economic situation of countries. It gives information on how political and economic events influence forex. Figures and statements given in speeches by important politicians and economists are known among traders as economic announcements that have a great impact on currency market moves. Several papers have used high-frequency data to examine the response of currency exchange to macroeconomic news and monetary decisions. These include Dewachter, Erdemlioglu, Gnabo, and Lecourt (2014) ; Neely (2011); Chen and Gau (2010).

From the fundamental analysis view, news event announcement plays an important role for the volatility of the currency exchange, especially the time interval before and after the news announcement shows a great impact. To simulate this situation, this paper draws together the literature on news event announcements and 10 years of currency exchange data to seek a fundamental time interval pattern of news event announcement in studied currencies. As a result, we can identify profitable entry and exit time for trading.

This paper has four objectives. One, how news announcement impacts to the currency exchange movement. Two, are degrees of news impact to currency exchange movement? Three, how multiple news announcements impact to currency exchange compared to single news announcement. Last, identify the profitable entry and exit time of currency exchange movement to investor.

This study covers the period of 8 years from 2007 to September 2015 in GBP-AUD. The scope of study includes Cumulative Abnormal Returns (CAR) which have 1 minute, 5 minute, 15 minute and 30 minute intervals. We use news announcement from United Kingdom and Australia.

This paper is structured as follow: Section 2 covers the theoretical and literature reviews. Section 3 is the hypothesis development, data source and methodologies. Section 4 explains the empirical results and the last section is the conclusion and suggestion.

CHAPTER II
LITERATURE REVIEWS

2.1 Theories

Generally, an Event study is a statistical method to assess the impact of an event on the value of a firm. For example, the announcement of a merger between two business entities can be analyzed to see whether investors believe the merger will create or destroy value. The basic idea is to find the abnormal return attributable to the event being studied by adjusting for the return that stems from the price fluctuation of the market as a whole. Gilson and Black (1995)

As the event methodology can be used to elicit the effects of any type of event on the direction and magnitude of stock price changes, it is very versatile. Event studies are thus common to various research areas, such as accounting and finance, management, economics, marketing, information technology, law, and political science. For instance, event studies are used to investigate the stock market responses to corporate events, such as mergers and acquisitions, earnings announcements, debt or equity issues, corporate reorganizations, investment decisions and corporate social responsibility Mackinlay (1997); Mcwilliams and Siegel (1997)

Methodologically, event studies imply the following based on an estimation window prior to the analyzed event, the method estimates what the normal stock returns of the affected firm(s) should be at the day of the event and several days prior and after the event (i.e., during the event window). Thereafter, the method deducts this “normal returns” from the 'actual returns' to receive 'abnormal returns' attributed to the event.

Event studies, however, may differ with respect to their specification of normal returns. The most common model for normal returns is the “market model” Mackinlay (1997) . Following this model, the analysis implies to use an estimation window (typically sized 120 days) prior to the event to derive the typical relationship between the firm's stock and a reference index through a regression analysis. Based on

the regression coefficients, the normal returns are then projected and used to calculate the abnormal returns. Alternative models for the normal returns include the CAPM model, or more simplistic approaches such as mean returns Mackinlay (1997).

In terms of equity, the Company's activities such as dividend payout, earning announcement, stock split, etc. is an indicator of the firm possession strong or weak future prospects. Thus, signaling to investor to aware the situation of the company which will later reflect to the change in stock price. Similar to currency exchange, any news involving country's economy or political situation will eventually impact the currency exchange of those countries (Investopedia).

2.2 Empirical Studies

The following section is the review of event study on the impact of news announcement on a currency exchange and its volatility.

2.2.1 Impact from Monetary policy change

Many researches have studied the volatility of currency exchange towards certain news announcements. Kearns and Manners (2006) find a sharp spike in the impact in the 10 minutes following the event, emphasizing that monetary policy announcements have a rapid impact on the exchange rate. The movement in the currency exchange reflects within 70 minutes event window.

Further studied by Rosa (2011) continues to investigate the impact of US monetary policy on the volatility of currency exchanges. The result also supports a study from Kearns and Manners (2006) that currency exchanges tend to absorb FOMC monetary surprises within 30-40 minutes from the news announcement release. In addition, Rosa (2011)suggests the surprise component of central bank statements can greatly add the response of currency exchange to monetary policy.

2.2.2 Impact from sterilized intervention

Fatum and Hutchison (2006), find strong evidence that sterilized intervention by Bank of Japan systemically affects the JPY-USD currency exchange in the event period of less than one month. Using the non-parametric sign test and matched-sample

test, the baseline results found intervention events to be effective over a period of 2-5 days, and an extension of the framework showed effects lasting for up to 2 weeks. This finding on intervention affects the currency exchange in the short run consist with the related work of Cotte, Galli, and Rebecchini (1994) and Humpage (1999) and the time-series based study of Dominguez and Frankel (1993)

These results may shed light on why central banks continue to pursue sterilized intervention despite widespread academic skepticism over its effectiveness.

2.2.3 GARCH & EGARCH model to identify an increase in volatility of currency exchange

Frenkel, Stadtmann, and Pierdzioch (2001) detects a high volatility during an intervention in the currency exchange data by using GARCH model. However, the high volatilities, a significant effect, is almost always found unstable over time. As shown in Frenkel et al. (2001) paper, the effect of high volatility was only minor and tended to be reversed on the day following the intervention. Similar to Omrane, Bauwens, and Giot (2005), who applied EGARCH model to find an impact of nine categories of scheduled and unscheduled news announcement on EUR/ USD. The result suggested the volatility increase right before the announcement of both scheduled and unscheduled news

CHAPTER III
DATA AND METHODOLOGY

3.1 Data

3.1.1 Hypothesis

In this paper, we set up the four main hypotheses as follow;

H1: News announcement has significant impact on currency exchange

H2: Degrees of news impact have effects on currency exchange

H3: Multiple news announcements have greater magnitude impact than single news announcement.

H4: Different entry and exit time provide different profit.

3.1.2 Data Sources

The data series used in the event study are listed as follow: GBP-AUD. Data are extracted from January 2007 to September 2015. The recent studies from Kearns and Manners (2006); Danielsson and Payne (2002); Goodhart and Payne (1996) have found that 10-minute intervals data are good proxies for actual transaction prices in currency exchange markets. For this study, we use one- minute interval data acquired from Histdata.com, one of the most reputable free forex data sources. And for news event, we retrieved data from FXstreet.com with a reference time zone of Greenwich Mean Time (GMT). Later, we would like to further investigate 5, 15 and 30 minutes by calculating from 1-minute interval data.

In this paper, we design the empirical study as a single news announcement and a multiple news announcement. By doing that, we first classify types of news announcement from all four countries into 296 types as shown in the appendix I (table 1). Next, we classify news announcement into four categories (degree). The most impact news is classified in category 3 and less impact are in 2, 1 and 0 respectively. We classified news announcement to 4 degree base on FXStreet.com which study the

degree of news announcement which have impact on currency exchange. The degree 0 is very low impact to currency exchange, Degree 1 is low impact to currency exchange, Degree 2 is medium impact to currency exchange and Degree 3 is high impact to currency exchange.

Later, in any day, we may have either a single news announcement or multiple news announcements. Single news announcement is an only economics news that happen in a day on the specific pair currency and multiple news announcement are the multiple economics news in a day on the specific pair currency.

For any news announcement in forexfactory.com, there are 3 types of data specified: previous, actual and consensus. Previous is a type of data which is the actual number announced from last period. Actual is a type of data which is announced on current period. And consensus is a type of data which the analysts forecast on that economic event before the current announcement happen.

In this paper, we assume that every single news is equally weighted. To indicate good news means actual value of news announcement is greater than previous value of news announcement on that specific economic news. Opposite to good news, bad news means actual value of news announcement is less than previous value of news announcement on that specific economic news. For the forecast value, it is used when there is no previous value data. Therefore, multiple news announcement can be mixed between good and bad news announcement in a day. It is consider good multiple news announcement when there are more good news than bad news. For instance, there are three single news announcement in a day, two of them are good news and another one is bad news. Hence, we consider this multiple news announcement as a good news.

3.2 Methodology

In finance, an abnormal return is the difference between the expected return and the actual return. Abnormal returns are sometimes triggered by "events." Events can include news announcement, mergers, dividend announcements, company earnings announcements, interest rate increases, lawsuits, etc. all which can contribute to an abnormal return. Events in finance can typically be classified as occurrences or information that has not already been priced into the market.

$$R_{i,t} = \ln(P_t / P_{t-1})$$

$$E(R_{i,t}) = \frac{\sum_{i=1}^{n} R_i}{n}$$

$$AR_{i,t} = R_{i,t} - E(R_{i,t})$$

Then, Cumulative abnormal return (CAR), is the sum of all abnormal returns up to time. Cumulative Abnormal Returns are usually calculated over small windows, often only days. If no event occurs then CAR equals zero.

$$CAR_T = \sum_{t=1}^{T} AR_t$$

Where:

P_t	is	a price at current period
P_{t-1}	is	a price at previous period
$R_{i,t}$	is	a return on currency i exchange at time t
$E_{(Ri,t)}$	is	an average return on currency i exchange at time t
n	is	a number of observation
$Ar_{i,t}$	is	an abnormal return on currency i exchange at time t
CAR_T	is	a cumulative abnormal return on currency exchange over the T period

Figure 3.1 Time line for event study (I)

$T = t_s$ to t_{i-1}	as the estimation window
$T = t_i$ to -1	as the pre-event period

T = 0 as the event period

T = +1 to t_j as the post event

In this paper, our study based on Cumulative Abnormal Return (CAR). As our data source is extracted from 1-minute interval with closing price, we use 1-minute data as our based line to calculate closing price of 5-minute, 15-minute and 30-minute.

Then, we use standard event study methodology to estimate the impact of news announcement by currency exchange. To calculate on Abnormal Return, we use closing prices. The return is calculated as shown below:

$$R_{i,t} = \ln (P_t / P_{t-1})$$

For an estimation window, we backward the time to the price where there is no volatility (time may varies from minute /hour/day) and simulate the pre and post time interval into the estimation window. Then we use estimation window to subtract in each return (R_t). Based on trial and error, we the best estimation window ranging from 90 minutes to 31 minutes before news announcement.

$$AR_{i,t} = R_{i,t} - E(R_{i,t})$$

Where: $R_{(i,t)}$ is return on currency exchange i at time t

$E(R_{(i,t)})$ is an average return on currency i exchange at time t

$$E(R_{i,t}) = \frac{\sum_{t=1}^{n} R_{i,t}}{n}$$

$$AAR_t = \frac{1}{N} \sum_{i=1}^{N} R_{i,t}$$

Where: AAR_t is average abnormal return on currency exchange i at time t

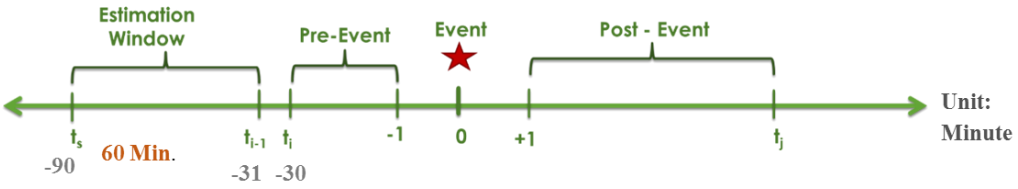

Figure 3.2 Time line for event study (II)

The pre-event interval is used to find the highest return of the currency exchange that occur between period t_i to -1 minute. Similar to pre event, post event is starting from event period + 1 minute to t_j .

We use Abnormal Return (AR) to calculate Cumulative Abnormal Return (CAR) of the currency exchange. We adopt a 60 minute estimation window to compute 1 minute CAR from the news announcement (CAR [-1,+1]). We assume time lag of CAR between 1 minute before news announcement and 1 minute after news announcement because the investor cannot trade at the time of news announcement happen.

$$CAR[-a,+a]= \sum_{t=-1}^{1} AR_{i,t}$$

Where: $CAR[-a,+a]$ is a cumulative abnormal return on currency exchange at a-minute before news announcement to a-minute after news announcement

a : represents 1, 5, 15 and 30

$AR_{(i,t)}$ is an abnormal return on currency i exchange at time t

Standard Error is specified as the equation below

$$SE_{\bar{x}}= \frac{S}{\sqrt{n}}$$

Where: $SE_{\bar{x}}$ is standard error of the mean

S is standard deviation of AR from period –a to +a

n is number of observations of the sample

$$CAAR_t = \sum_{i=1}^{t} AAR_t$$

Where: $CAAR_i$ is Cumulative Average Abnormal Return at time t

For the statistical analysis, we apply the tests of significance to conduct hypothesis testing. First, the news announcement impact to the currency exchange movement, we use CAR[-1,+1] for one-minute data, CAAR[-5,+5] for 5-minute data, CAAR[-15,+15] for 15-minute data and CAAR[-30,+30] for 30-minute data. Second hypothesis, we find the different types of news which have various magnitude impact to currency exchange. The estimation windows is 60 minutes interval (-90 to -31 minutes before news announcement). For pre and post event period will be explained in hypothesis 4. On third hypothesis, we set up the hypothesis to test whether multiple news announcement have greater magnitude impact than single news announcement. For a multiple event, where there is multiple news announcements occur within one day, we start timing at the beginning of first news announcement and ending at the beginning of last news announcement. For last hypothesis, we retrieve the news announcement which has an impact to the currency exchange from the first hypothesis as an input. The result for this hypothesis would suggest the pre and post event of each news announcement by trial and error. By sig-mean testing, we would identify the entry and exit of buy/sell currency exchange, which using an abnormal return range from 120 minutes before news announcement to 240 minutes after news announcement and average it. Hence, the entry position is an abnormal return, at that minute(s), which deviates the most from the mean value of abnormal return during 120 minutes before news announcement. And the exit position is the minute(s) which abnormal return deviates the most from the mean value of abnormal return during 240 minutes after news announcement.

CHAPTER IV
EMPIRICAL RESULTS

This section examines the impact of news announcement to the currency exchange based on 2 methods stated in section 3: Cumulative Abnormal Return (CAR) and Abnormal Return (AR). Inside each methodology, we shall group the empirical results based on paired currency exchange. Ultimately, this section shall recommend a trader or an investor to identify an entry and exit point for each trade cycle.

For the CAR methodology, result from GBP-AUD currency will be elaborated into 4 timeframes: 1, 5, 15, and 30 minutes data, which are calculated under 60 minutes estimation window range from 90 minutes to 31 minutes before news announcement.

4.1 Hypothesis 1: Specific news announcement shows a significant impact to the studied currency exchange

By running CAR methodology, we can identify news announcement that has a significant impact to the currency exchange.

For 1 minute timeframe, as shown in table 1 represents the specific news announcements which have a significant impact to the currency exchange. Out of 117 final events for GBP-AUD, there are 10 events (8.55%) which have a significance level of 10% and 5% impact to its currency exchange.

Table 4.1 News announcement impact on currency exchange for 1 minute timeframe of GBP-AUD

1 Minute CAR[-1,+1]											
GBP-AUD											
News Code	**Name**	**Country**	**Degree**	**N**	**Std Dev (%)**	**Mean (%)**	**Min**	**Max**	**SE (%)**	**t Value**	**Pr > |t|**
42	Consumer Price Index (QoQ)	United Kingdom	1	31	0.00053	-0.00018	-0.00267	0.00050	0.00009	-1.95000	0.06030 *
77	Markit Manufacturing PMI	United Kingdom	2	92	0.00053	-0.00010	-0.00236	0.00137	0.00005	-1.81000	0.07320 *
157	BOE Credit Conditions Survey	United Kingdom	1	13	0.00020	0.00011	-0.00014	0.00054	0.00005	1.93000	0.07730 *
161	BoE's Governor King Speech	United Kingdom	2	57	0.00050	0.00014	-0.00106	0.00215	0.00007	2.08000	0.04260 **
162	Boxing Day	United Kingdom	0	5	0.00011	-0.00018	-0.00027	-0.00002	0.00005	-3.63000	0.02220 **
172	CML New Mortgages	United Kingdom	0	2	0.00011	0.00053	0.00045	0.00060	0.00008	6.85000	0.09230 *
194	Gordon Brown's Speech	United Kingdom	2	2	0.00008	0.00089	0.00083	0.00095	0.00006	14.98000	0.04240 **
199	Import Price Index (QoQ)	Australia	0	30	0.00028	0.00011	-0.00030	0.00116	0.00005	2.19000	0.03680 **
218	MPC Member Sentance Speech	United Kingdom	2	3	0.00014	0.00031	0.00019	0.00047	0.00008	3.85000	0.06140 *
228	Parliamentary Election	United Kingdom	3	2	0.00001	-0.00009	-0.00010	-0.00008	0.00001	-9.58000	0.06620 *

Remark: - * is a significant level of 10%; ** is a significant level of 5%; *** a significant level of 1%

- Degree 0 is very low impact to currency exchange
  Degree 1 is low impact to currency exchange
  Degree 2 is medium impact to currency exchange
  Degree 3 is high impact to currency exchange

For 5 minutes timeframe, as shown in table 2 represents the specific news announcements which have a significant impact to the currency exchange. Out of 117 final events for GBP-AUD, there are 17 events (14.53%) which have a significance level of 10%, 5% and 1% impact to its currency exchange.

Table 4.2 News announcement impact on currency exchange for 5 minute timeframe of GBP-AUD

5 Minutes [CAAR-5,+5] GBP-AUD											
News Code	**Name**	**Country**	**Degree**	**N**	**Std Dev (%)**	**Mean (%)**	**Min**	**Max**	**SE (%)**	**t Value**	**Pr > |t|**
6	Average Earnings excluding Bonus (3Mo/Yr)	United Kingdom	2	92	0.00068	-0.00016	-0.00256	0.00176	0.00007	-2.23000	0.02850 **
7	Average Earnings including Bonus (3Mo/Yr)	United Kingdom	2	92	0.00068	-0.00016	-0.00256	0.00176	0.00007	-2.23000	0.02850 **
15	BBA Mortgage Approvals	United Kingdom	0	91	0.00072	0.00016	-0.00112	0.00436	0.00008	2.13000	0.03570 **
34	CBI Distributive Trades Survey - Realized (MoM)	United Kingdom	1	93	0.00090	0.00018	-0.00461	0.00244	0.00009	1.89000	0.06170 *
35	Claimant Count Change	United Kingdom	1	92	0.00068	-0.00016	-0.00256	0.00176	0.00007	-2.23000	0.02850 **
36	Claimant Count Rate	United Kingdom	2	92	0.00068	-0.00016	-0.00256	0.00176	0.00007	-2.23000	0.02850 **
42	Consumer Price Index (QoQ)	United Kingdom	1	31	0.00046	-0.00020	-0.00129	0.00100	0.00008	-2.41000	0.02230 **
53	Gfk Consumer Confidence	United Kingdom	0	93	0.00046	-0.00009	-0.00274	0.00085	0.00005	-1.94000	0.05500 *
54	Goods Trade Balance	United Kingdom	3	90	0.00064	-0.00011	-0.00138	0.00188	0.00007	-1.69000	0.09440 *
64	ILO Unemployment Rate (3M)	United Kingdom	0	92	0.00068	-0.00016	-0.00256	0.00176	0.00007	-2.23000	0.02850 **
77	Markit Manufacturing PMI	United Kingdom	2	92	0.00067	-0.00015	-0.00346	0.00156	0.00007	-2.10000	0.03820 **
90	PMI Construction	United Kingdom	1	91	0.00071	0.00018	-0.00163	0.00419	0.00007	2.37000	0.01990 **
130	Total Trade Balance	United Kingdom	1	34	0.00046	-0.00022	-0.00127	0.00109	0.00008	-2.80000	0.00850 ***
158	BOE Deputy Governor Paul Tucker speech	United Kingdom	1	8	0.00028	0.00028	-0.00010	0.00083	0.00010	2.83000	0.02530 **
168	CB Leading Economic Index	United Kingdom	2	92	0.00047	0.00011	-0.00126	0.00212	0.00005	2.22000	0.02900 **
193	Good Friday	United Kingdom	0	11	0.00020	0.00012	-0.00028	0.00034	0.00006	2.05000	0.06770 *
253	Summer Bank Holiday	United Kingdom	0	6	0.00014	-0.00014	-0.00031	0.00006	0.00006	-2.39000	0.06260 *

Remark: - * is a significant level of 10%; ** is a significant level of 5%; *** a significant level of 1%

- Degree 0 is very low impact to currency exchange
  Degree 1 is low impact to currency exchange
  Degree 2 is medium impact to currency exchange
  Degree 3 is high impact to currency exchange

For 15 minutes timeframe, as shown in table 3 represents the specific news announcements which have a significant impact to the currency exchange. Out of 117 final events for GBP-AUD, there are 17 events (14.53%) which have a significance level of 10%, 5% and 1% impact to its currency exchange.

Table 4.3 News announcement impact on currency exchange for 15 minute timeframe of GBP-AUD

			15 Minutes CAAR[-15,+15] GBP-AUD								
News Code	**Name**	**Country**	**Degree**	**N**	**Std Dev (%)**	**Mean (%)**	**Min**	**Max**	**SE (%)**	**t Value**	**Pr > |t|**
6	Average Earnings excluding Bonus (3Mo/Yr)	United Kingdom	2	92	0.00126	-0.00031	-0.00556	0.00186	0.00013	-2.36000	0.02060 **
7	Average Earnings including Bonus (3Mo/Yr)	United Kingdom	2	92	0.00126	-0.00031	-0.00556	0.00186	0.00013	-2.36000	0.02060 **
35	Claimant Count Change	United Kingdom	1	92	0.00126	-0.00031	-0.00556	0.00186	0.00013	-2.36000	0.02060 **
36	Claimant Count Rate	United Kingdom	2	92	0.00126	-0.00031	-0.00556	0.00186	0.00013	-2.36000	0.0206 0**
42	Consumer Price Index (QoQ)	United Kingdom	1	31	0.00072	-0.00036	-0.00203	0.00073	0.00013	-2.81000	0.00860 ***
59	HIA New Home Sales (MoM)	Australia	2	76	0.00056	-0.00012	-0.00195	0.00125	0.00006	-1.93000	0.05780 *
64	ILO Unemployment Rate (3M)	United Kingdom	0	92	0.00126	-0.00031	-0.00556	0.00186	0.00013	-2.36000	0.02060 **
77	Markit Manufacturing PMI	United Kingdom	2	92	0.00112	-0.00025	-0.00572	0.00220	0.00012	-2.12000	0.03710 **
91	PPI Core Output (YoY) n.s.a	United Kingdom	2	41	0.00094	0.00029	-0.00093	0.00335	0.00015	1.96000	0.05670 *
109	RBA's Governor Glenn Stevens Speech	Australia	1	66	0.00070	0.00015	-0.00119	0.00238	0.00009	1.79000	0.07780 *
120	Retail Sales (MoM)	United Kingdom	2	92	0.00110	0.00020	-0.00268	0.00431	0.00011	1.74000	0.08550 *
121	Retail Sales (YoY)	United Kingdom	2	92	0.00110	0.00020	-0.00268	0.00431	0.00011	1.74000	0.08550 *
152	Bank of England Credit Conditions Report (QoQ)	United Kingdom	2	12	0.00138	-0.00088	-0.00413	0.00103	0.00040	-2.21000	0.04940 **
160	BoE Quarterly Bulletin	United Kingdom	1	14	0.00046	-0.00022	-0.00098	0.00043	0.00012	-1.81000	0.09320 *
173	Company Gross Operating Profits (QoQ)	Australia	0	29	0.00054	-0.00024	-0.00123	0.00098	0.00010	-2.34000	0.02660 **
185	Easter Monday	Australia	0	10	0.00011	0.00010	-0.00007	0.00026	0.00004	2.86000	0.01890 **
231	PPI Core Output (MoM) n.s.a	United Kingdom	1	42	0.00094	0.00031	-0.00093	0.00335	0.00014	2.12000	0.03980 **

Remark: - * is a significant level of 10%; ** is a significant level of 5%; *** a significant level of 1%
- Degree 0 is very low impact to currency exchange
Degree 1 is low impact to currency exchange
Degree 2 is medium impact to currency exchange
Degree 3 is high impact to currency exchange

For 30 minutes timeframe, as shown in table 4 represents the specific news announcements which have a significant impact to the currency exchange. Out of 153 final events for GBP-AUD, there are 21 events (13.72%) which have a significance level of 10%, 5% and 1% impact to its currency exchange.

Table 4.4 News announcement impact on currency exchange for 30 minute timeframe of GBP-AUD

30 Minutes CAAR[-30,+30] GBP-AUD											
News Code	**Name**	**Country**	**Degree**	**N**	**Std Dev (%)**	**Mean (%)**	**Min**	**Max**	**SE (%)**	**t Value**	**Pr > |t|**
5	Autumn Forecast Statement	United Kingdom	2	5	0.00036	-0.00056	-0.00111	-0.00027	0.00016	-3.44000	0.02630 **
15	BBA Mortgage Approvals	United Kingdom	0	91	0.00206	0.00048	-0.00926	0.01276	0.00022	2.25000	0.02700 **
38	Consumer Inflation Expectation	Australia	0	81	0.00149	0.00040	-0.00316	0.00678	0.00017	2.44000	0.01690 **
42	Consumer Price Index (QoQ)	United Kingdom	1	31	0.00088	-0.00053	-0.00229	0.00097	0.00016	-3.33000	0.00230 ***
49	Employment Change s.a.	Australia	0	92	0.00097	0.00019	-0.00195	0.00484	0.00010	1.92000	0.05820 *
77	Markit Manufacturing PMI	United Kingdom	2	92	0.00141	-0.00034	-0.00447	0.00335	0.00015	-2.32000	0.02260 **
92	Private Capital Expenditure	Australia	0	31	0.00079	0.00029	-0.00130	0.00231	0.00014	2.06000	0.04830 **
99	RBA Assist Gov Edey Speech	Australia	2	7	0.00041	-0.00035	-0.00082	0.00048	0.00016	-2.26000	0.06490 *
104	RBA Meeting's Minutes	Australia	2	79	0.00079	0.00016	-0.00184	0.00236	0.00009	1.75000	0.08340 *
109	RBA's Governor Glenn Stevens Speech	Australia	1	66	0.00118	0.00028	-0.00315	0.00349	0.00014	1.95000	0.05520 *
136	Unemployment Rate s.a.	Australia	1	92	0.00097	0.00019	-0.00195	0.00484	0.00010	1.92000	0.05820 *
143	10-y Bond Auction	United Kingdom	2	28	0.00136	0.00051	-0.00232	0.00461	0.00026	1.97000	0.05900 *
185	Easter Monday	Australia	0	10	0.00013	0.00022	0.00009	0.00040	0.00004	5.28000	0.00005 ***
186	Export Price Index (QoQ)	Australia	0	30	0.00075	-0.00027	-0.00219	0.00149	0.00014	-1.98000	0.05690 *
193	Good Friday	Canada	0	11	0.00047	0.00026	-0.00047	0.00079	0.00014	1.85000	0.09420 *
218	MPC Member Sentance Speech	United Kingdom	2	3	0.00011	0.00059	0.00050	0.00071	0.00006	9.43000	0.01110 **
220	National Australia Bank's Business Conditions	Australia	2	91	0.00119	-0.00027	-0.00559	0.00274	0.00012	-2.14000	0.03540 **
231	PPI Core Output (MoM) n.s.a	United Kingdom	1	42	0.00117	0.00032	-0.00183	0.00371	0.00018	1.75000	0.08770 *
242	RBA Foreign Exchange Transaction	Australia	1	84	0.00105	-0.00021	-0.00499	0.00187	0.00011	-1.83000	0.07030 *
254	TD Securities Inflation (MoM)	Australia	1	60	0.00066	-0.00024	-0.00240	0.00093	0.00009	-2.76000	0.00770 ***
255	TD Securities Inflation (YoY)	Australia	1	60	0.00068	-0.00021	-0.00240	0.00093	0.00009	-2.42000	0.01860 **

Remark: - * is a significant level of 10%; ** is a significant level of 5%; *** a significant level of 1%

- Degree 0 is very low impact to currency exchange
  Degree 1 is low impact to currency exchange
  Degree 2 is medium impact to currency exchange
  Degree 3 is high impact to currency exchange

In summary, there are 65 number of events which has an impact significantly to GBP-AUD. For 1 minute timeframe, there are 10 number of events; for 5 minutes timeframe, there are 17 number of events; For 15 minutes timeframe, there are 17 number of events; For 30 minutes timeframe, there are 21 number of events.

4.2 Hypothesis 2: Degrees of news impact have an effect on currency exchange

Table 4.5 presents the result of ANOVA analysis and explain a magnitude impact to currency exchange by each degree of news. For 1 minute timeframe, GBP-AUD shows only degree 2 impacts to currency exchange at significance level of 10%.

Table 4.5 Degrees of news impact have an effect on currency exchange for 1 minute timeframe of GBP-AUD

	1 Minute CAR[-1,+1] Analysis Variable : car_audev							
Degree	**N Obs**	**N**	**Std Dev (%)**	**Mean (%)**	**Minimum**	**Maximum**	**t Value**	**Pr > |t|**
0	403	403	0.000537	-0.000020	-0.003565	0.002043	-0.7400	0.4595
1	4026	4026	0.000510	0.000003	-0.006324	0.004051	0.3300	0.7410
2	3732	3732	0.000554	0.000016	-0.005726	0.005828	1.7600	0.0783 *
3	1080	1080	0.000488	0.000001	-0.003177	0.003187	0.0600	0.9510

Remark: - * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

- Degree 0 is very low impact to currency exchange
  Degree 1 is low impact to currency exchange
  Degree 2 is medium impact to currency exchange
  Degree 3 is high impact to currency exchange

For 5 minutes timeframe, GBP-AUD shows an acception of null hypothesis that degrees of news impact have an effect on currency exchange. All degrees show no impact to the currency exchange.

Table 4.6 Degrees of news impact have an effect on currency exchange for 5 minute timeframe of GBP-AUD

5 Minutes CAAR[-5,+5]								
Analysis Variable : ar_aud5m								
Degree	**N Obs**	**N**	**Std Dev (%)**	**Mean (%)**	**Minimum**	**Maximum**	**t Value**	**Pr > |t|**
0	404	404	0.000747	-0.000018	-0.007113	0.004158	-0.4700	0.6363
1	4037	4037	0.000636	0.000012	-0.007702	0.005400	1.1500	0.2489
2	3749	3749	0.000687	0.000006	-0.007113	0.006556	0.4900	0.6228
3	1083	1083	0.000592	-0.000009	-0.002565	0.005815	-0.4900	0.6241

Remark: - * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

- Degree 0 is very low impact to currency exchange
  Degree 1 is low impact to currency exchange
  Degree 2 is medium impact to currency exchange
  Degree 3 is high impact to currency exchange

For 15 minutes timeframe, GBP-AUD shows only degree 1 impacts to currency exchange at significance level of 5%.

Table 4.7 Degrees of news impact have an effect on currency exchange for 15 minute timeframe of GBP-AUD

15 Minutes CAAR[-15, +15]								
Analysis Variable : ar_aud30m								
Degree	**N Obs**	**N**	**Std Dev (%)**	**Mean (%)**	**Minimum**	**Maximum**	**T Value**	**Pr > |t|**
0	404	404	0.001255	-0.000021	-0.005389	0.008178	-0.3400	0.7308
1	4037	4037	0.001081	0.000037	-0.010780	0.008224	2.1800	0.0291 **
2	3749	3749	0.001043	-0.000003	-0.006204	0.008377	-0.2100	0.8374
3	1083	1083	0.000974	-0.000031	-0.006969	0.005732	-1.0500	0.2925

Remark: - * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

- Degree 0 is very low impact to currency exchange
  Degree 1 is low impact to currency exchange
  Degree 2 is medium impact to currency exchange
  Degree 3 is high impact to currency exchange

For 30 minutes timeframe, GBP-AUD shows an acception of null hypothesis that degrees of news impact have an effect on currency exchange. All degrees show no impact to the currency exchange.

Table 4.8 Degrees of news impact have an effect on currency exchange for 30 minute timeframe of GBP-AUD

30 Minutes CAAR[-30,+30]								
Analysis Variable : ar_aud30m								
Degree	**N Obs**	**N**	**Std Dev (%)**	**Mean (%)**	**Minimum**	**Maximum**	**t Value**	**Pr > |t|**
0	404	404	0.001993	0.000101	-0.011292	0.013672	1.0200	0.3094
1	4037	4037	0.001493	0.000036	-0.011292	0.012759	1.5400	0.1226
2	3749	3749	0.001498	0.000032	-0.011292	0.009479	1.2900	0.1978
3	1083	1083	0.001414	-0.000015	-0.011292	0.009050	-0.3500	0.7261

Remark: - * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

- Degree 0 is very low impact to currency exchange
Degree 1 is low impact to currency exchange
Degree 2 is medium impact to currency exchange
Degree 3 is high impact to currency exchange

Based on our assumption, all 4 degrees (0, 1, 2, and 3) should have an effect on currency exchange as suggested from forexfactory.com. However, our study found that the degrees do not have an impact to currency exchange. Although degree 2 or 3 should have more impact on currency exchange than degree 0 or 1, some of the news announcement are already absorbed by the investor before the announcement happens. For GBP-AUD, there is an impact significantly for 1 minute timeframe by degree 2 and a significantly impact for 15 minutes timeframe by degree 1.

4.3 Hypothesis 3: Multiple news announcements have greater magnitude impact than single news announcement

In this hypothesis, we consider T-test if it is a significance level of 10%, 5% or 1%, we can confirm for both single and multiple news announcement to have a significant impact to currency exchange. Subsequently, after identifying an impact of

currency exchange from either single or multiple news announcement, we use mean value to classify whether single or multiple news announcements has more magnitude to currency exchange.

For 1 minute timeframe, the result from GBP-AUD suggests independent t-test is accepted at a significance level of 10% on Satterthwaite t-test method. Although, our result shows that economic news from hypothesis 1 has an impact to GBP-AUD, we cannot specify whether single or multiple news has more impact on its currency.

Table 4.9 Single and multiple news announcement impact on currency exchange for 1 minute timeframe of GBP-AUD

T-Tests

Variable	Method	Variances	DF	t Value	Pr > |t|
CAR_AUD	**Pooled**	Equal	2326	-0.0300	0.9760
CAR_AUD	**Satterthwaite**	Unequal	1562	-0.0400	0.9684

Equality of Variances

Variable	Method	Num DF	Den DF	F Value	Pr > F
CAR_AUD	**Folded F**	1486	840	68.42	<.0001

Statistics

Variable	catday	N	Lower CL Mean (%)	Mean (%)	Upper CL Mean (%)	Lower CL Std Dev (%)	Std Dev (%)	Upper CL Std Dev (%)	Std Err (%)	Minimum	Maximum
CAR_AUD	1-Single news	841	-0.0001	0.0000	0.0001	0.0010	0.0011	0.0012	0.0000	-0.0190	0.0154
CAR_AUD	2-Multiple news	1487	-0.0004	0.0000	0.0005	0.0088	0.0091	0.0094	0.0002	-0.0970	0.0864
CAR_AUD	Diff (1-2)		-0.0006	0.0000	0.0006	0.0071	0.0073	0.0075	0.0003		

Remark: * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

For 5 minutes timeframe, the result from GBP-AUD suggests independent t-test is accepted at a significance level of 10% on Satterthwaite t-test method. Although, our result shows that economic news from hypothesis 1 has an impact to GBP-AUD, we cannot specify whether single or multiple news has more impact on its currency

Table 4.10 Single and multiple news announcement impact on currency exchange for 5 minute timeframe of GBP-AUD

T-Tests					
Variable	**Method**	**Variances**	**DF**	**t Value**	**Pr > |t|**
AR_AUD5m	**Pooled**	Equal	2326	0.1200	0.9053
AR_AUD5m	**Satterthwaite**	Unequal	1729	0.1500	0.8777

Equality of Variances					
Variable	**Method**	**Num DF**	**Den DF**	**F Value**	**Pr > F**
CAR_AUD5m	**Folded F**	1486	840	20.62	<.0001

Statistics

Variable	catday	N	Lower CL Mean (%)	Mean (%)	Upper CL Mean (%)	Lower CL Std Dev (%)	Std Dev (%)	Upper CL Std Dev (%)	Std Err (%)	Minimum	Maximum
CAR_AUD5m	**1-Single news**	841	0.0000	0.0001	0.0002	0.0019	0.0019	0.0020	0.0001	-0.0240	0.0392
CAR_AUD5m	**2-Multiple news**	1487	-0.0004	0.0001	0.0005	0.0085	0.0088	0.0091	0.0002	-0.0820	0.0765
CAR_AUD5m	**Diff (1-2)**		-0.0006	0.0000	0.0006	0.0069	0.0071	0.0074	0.0003	-	-

Remark: * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

For 15 minutes timeframe, the result from GBP-AUD suggests independent t-test is accepted at a significance level of 10% on Satterthwaite t-test method. Although, our result shows that economic news from hypothesis 1 has an impact to GBP-AUD, we cannot specify whether single or multiple news has more impact on its currency.

Table 4.11 Single and multiple news announcement impact on currency exchange for 15 minute timeframe of GBP-AUD

T-Tests					
Variable	**Method**	**Variances**	**DF**	**t Value**	**Pr > |t|**
AR_AUD15m	**Pooled**	Equal	2326	0.0000	0.9978
AR_AUD15m	**Satterthwaite**	Unequal	1751	0.0000	0.9972

Equality of Variances					
Variable	**Method**	**Num DF**	**Den DF**	**F Value**	**Pr > F**
CAR_AUD15m	**Folded F**	1486	840	18.81	<.0001

Statistics

Variable	catday	N	Lower CL Mean (%)	Mean (%)	Upper CL Mean (%)	Lower CL Std Dev (%)	Std Dev (%)	Upper CL Std Dev (%)	Std Err (%)	Minimum	Maximum
AR_AUD15m	**1-Single news**	841	-0.0001	0.0001	0.0002	0.0020	0.0021	0.0022	0.0001	-0.0240	0.0394
AR_AUD15m	**2-Multiple news**	1487	-0.0004	0.0001	0.0005	0.0086	0.0089	0.0093	0.0002	-0.0830	0.0766
AR_AUD15m	**Diff (1-2)**		-0.0006	0.0000	0.0006	0.0070	0.0072	0.0075	0.0003	-	-

Remark: * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

For 30 minutes timeframe, the result from GBP-AUD suggests independent t-test is accepted at a significance level of 10% on Satterthwaite t-test method. Although, our result shows that economic news from hypothesis 1 has an impact to GBP-AUD, we cannot specify whether single or multiple news has more impact on its currency.

Table 4.12 Single and multiple news announcement impact on currency exchange for 30 minute timeframe of GBP-AUD

T-Tests

Variable	Method	Variances	DF	t Value	Pr > |t|
AR_AUD30m	**Pooled**	Equal	2326	-0.0800	0.9358
AR_AUD30m	**Satterthwaite**	Unequal	1808	-0.1000	0.9177

Equality of Variances

Variable	Method	Num DF	Den DF	F Value	Pr > F
CAR_AUD30m	**Folded F**	1486	840	15.22	<.0001

Statistics

Variable	catday	N	Lower CL Mean (%)	Mean (%)	Upper CL Mean (%)	Lower CL Std Dev (%)	Std Dev (%)	Upper CL Std Dev (%)	Std Err (%)	Minimum	Maximum
AR_AUD30m	**1-Single news**	841	-0.0001	0.0001	0.0002	0.0022	0.0023	0.0025	0.0001	-0.0250	0.0404
AR_AUD30m	**2-Multiple news**	1487	-0.0004	0.0001	0.0006	0.0088	0.0091	0.0095	0.0002	-0.0820	0.0773
AR_AUD30m	**Diff (1-2)**		-0.0007	0.0000	0.0006	0.0072	0.0074	0.0077	0.0003		

Remark: * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

4.4 Hypothesis 4: Various entry and exit time reflect different volatilities

Time interval for considering entry and exit in this study will cover 120 minutes before news announcement to 240 minutes after news announcement. For the enter position, we identify the minute(s) which is given the highest abnormal return deviates from the mean value of abnormal return during 120 minutes before news announcement. Similar to the exit position, we identify the minute(s) which is given the highest abnormal return deviates from the mean value of abnormal return during 240 minutes after news announcement. Note: the minute(s) which is given the highest abnormal return must be a significant value as well. And we will not consider the accumulative abnormal return during the holding period, but we are only focusing on the minute(s) which is given the highest abnormal return deviates from the mean value of abnormal return.

For 1 minute timeframe, we use event windows range from 120 minutes before news announcement to 240 minutes after news announcement. In our study for this hypothesis, we use the result from hypothesis 1 with significant level of 10%, 5% or 1% to be an input to perform tests of significance.

Furthermore, we have identified a time interval to entry and exit for individual news announcement, which is referred from hypothesis 1 at a significance level of 10%, 5% or 1%, as described on table 4.13. The result of time entry and exit for each individual news announcement based on each paired of currency exchange is listed below:

Table 4.13 Entry and exit time reflect different volatilities for 1 minute timeframe of GBP-AUD

1 Minute CAR[-1,+1] GBP-AUD								
Name	**Country**	**Degree**	**News Code**	**Pr > |t|**	**Min.Buy (minute)**	**Significant**	**Min.Sell (minute)**	**Significant**
Consumer Price Index (QoQ)	United Kingdom	1	42	0.0603	-11	*	240	**
Markit Manufacturing PMI	United Kingdom	2	77	0.0732	-86	*	240	*
BOE Credit Conditions Survey	United Kingdom	1	157	0.0773	-21	*	57	*
BoE's Governor King Speech	United Kingdom	2	161	0.0426	-90	***	-3	**
Boxing Day	United Kingdom	0	162	0.0222	-88	*	37	*
CML New Mortgages	United Kingdom	0	172	0.0923	-7	*	135	*
Gordon Brown's Speech	United Kingdom	2	194	0.0424	-20	**	156	*
Import Price Index (QoQ)	Australia	0	199	0.0368	-1	**	64	*

Table 4.13 Entry and exit time reflect different volatilities for 1 minute timeframe of GBP-AUD (cont.)

1 Minute CAR[-1,+1] GBP-AUD								
Name	**Country**	**Degree**	**News Code**	**Pr > |t|**	**Min.Buy (minute)**	**Significant**	**Min.Sell (minute)**	**Significant**
MPC Member Sentance Speech	United Kingdom	2	218	0.0614	-5	***	58	*

Remark: - * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

- Degree 0 is very low impact to currency exchange
Degree 1 is low impact to currency exchange
Degree 2 is medium impact to currency exchange
Degree 3 is high impact to currency exchange

1. Consumer Price Index is a news of United Kingdom, degree 1, our conclusion found an entry at 11 minutes before news announcement and exit time at 240 minutes after news announcement.

2. Markit Manufacturing PMI is a news of United Kingdom, degree 2, our conclusion found an entry at 86 minutes before news announcement and exit time at 240 minutes after news announcement.

3. BOE Credit Conditions Survey is a news of United Kingdom, degree 1, our conclusion found an entry at 21 minutes before news announcement and exit time at 57 minutes after news announcement.

4. BoE's Governor King Speech is a news of United Kingdom, degree 2, our conclusion found an entry at 90 minutes before news announcement and exit time at 3 minutes before news announcement.

5. Boxing Day is a news of United Kingdom, degree 0, our conclusion found an entry at 88 minutes before news announcement and exit time at 37 minutes after news announcement.

6. CML New Mortgages is a news of United Kingdom, degree 0, our conclusion found an entry at 7 minutes before news announcement and exit time at 135 minutes after news announcement.

7. Gordon Brown's Speech is a news of United Kingdom, degree 2, our conclusion found an entry at 20 minutes before news announcement and exit time at 156 minutes after news announcement.

8. Import Price Index (QoQ) is a news of Australia, degree 2, our conclusion found an entry at 1 minutes before news announcement and exit time at 64 minutes after news announcement.

9. MPC Member Sentance Speech is a news of United Kingdom, degree 0, our conclusion found an entry at 5 minutes before news announcement and exit time at 58 minutes after news announcement.

For 5 minutes timeframe, we also use event windows range from 90 minutes before news announcement to 240 minutes after news announcement. In our study for this hypothesis, we use the result from hypothesis 1 with significant level of 10% or above to be an input to perform tests of significance.

Furthermore, we have identified a time interval to entry and exit for individual news announcement, which is referred from hypothesis 1 at a significance level of 10%, 5% or 1%, as described on table 14. The result of time entry and exit for each individual news announcement based on each paired of currency exchange is listed below:

Table 4.14 Entry and exit time reflect different volatilities for 5 minute timeframe of GBP-AUD

5 Minutes CAAR[-5,+5] GBP-AUD								
Name	**Country**	**Degree**	**News Code**	**Pr > |t|**	**Min.Buy (minute)**	**Significant**	**Min.Sell (minute)**	**Significant**
Average Earnings excluding Bonus (3Mo/Yr)	United Kingdom	2	6	0.0285	-90	**	240	*
Average Earnings including Bonus (3Mo/Yr)	United Kingdom	2	7	0.0285	-90	**	240	*
BBA Mortgage Approvals	United Kingdom	0	15	0.0357	5	*	240	**

Table 4.14 Entry and exit time reflect different volatilities for 5 minute timeframe of GBP-AUD (cont.)

5 Minutes CAAR[-5,+5] GBP-AUD								
Name	**Country**	**Degree**	**News Code**	**Pr > |t|**	**Min.Buy (minute)**	**Significant**	**Min.Sell (minute)**	**Significant**
Claimant Count Change	United Kingdom	1	35	0.0285	-90	**	240	*
Claimant Count Rate	United Kingdom	2	36	0.0285	-90	**	240	*
Consumer Price Index (QoQ)	United Kingdom	1	42	0.0223	5	*	240	**
Gfk Consumer Confidence	United Kingdom	0	-53	0.055	5	***	50	*
Goods Trade Balance	United Kingdom	3	54	0.0944	65	*	240	**
ILO Unemployment Rate (3M)	United Kingdom	0	64	0.0285	-90	**	240	*
Markit Manufacturing PMI	United Kingdom	2	77	0.0382	-35	*	240	*
Total Trade Balance	United Kingdom	1	130	0.0085	10	*	240	*
Good Friday	United Kingdom	0	193	0.0677	-15	*	-5	**

Remark: - * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

- Degree 0 is very low impact to currency exchange
  Degree 1 is low impact to currency exchange
  Degree 2 is medium impact to currency exchange
  Degree 3 is high impact to currency exchange

1. Average Earnings excluding Bonus (3Mo/Yr) is a news of United Kingdom, degree 2, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

2. Average Earnings including Bonus (3Mo/Yr) is a news of United Kingdom, degree 2, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

3. BBA Mortgage Approvals is a news of United Kingdom, degree 0, our conclusion found an entry at 5 minutes after news announcement and exit time at 240 minutes after news announcement.

4. Claimant Count Change is a news of United Kingdom, degree 2, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

5. Claimant Count Rate is a news of United Kingdom, degree 2, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

6. Consumer Price Index (QoQ) is a news of United Kingdom, degree 1, our conclusion found an entry at 5 minutes after news announcement and exit time at 240 minutes after news announcement.

7. Gfk Consumer Confidence is a news of United Kingdom, degree 0, our conclusion found an entry at 5 minutes after news announcement and exit time at 50 minutes after news announcement.

8. Goods Trade Balance is a news of United Kingdom, degree 3, our conclusion found an entry at 65 minutes after news announcement and exit time at 240 minutes after news announcement.

9. ILO Unemployment Rate (3M) is a news of United Kingdom, degree 0, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

10. Markit Manufacturing PMI is a news of United Kingdom, degree 2, our conclusion found an entry at 35 minutes before news announcement and exit time at 240 minutes after news announcement.

11. Total Trade Balance is a news of United Kingdom, degree 1, our conclusion found an entry at 10 minutes after news announcement and exit time at 240 minutes after news announcement.

12. Good Friday is a news of United Kingdom, degree 0, our conclusion found an entry at 15 minutes before news announcement and exit time at 5 minutes before news announcement.

For 15 minutes timeframe, we also use event windows range from 90 minutes before news announcement to 240 minutes after news announcement. In our

study for this hypothesis, we use the result from hypothesis 1 with significant level of 10% or above to be an input to perform tests of significance.

Furthermore, we have identified a time interval to entry and exit for individual news announcement, which is referred from hypothesis 1 at a significance level of 010%, 5% or 1%, as described on table 15. The result of time entry and exit for each individual news announcement based on each paired of currency exchange is listed below:

Table 4.15 Entry and exit time reflect different volatilities for 15 minute timeframe of GBP-AUD

15 Minutes CAAR[-15,+15] GBP-AUD								
Name	**Country**	**Degree**	**News Code**	**Pr > |t|**	**Min.Buy (minute)**	**Significant**	**Min.Sell (minute)**	**Significant**
Average Earnings excluding Bonus (3Mo/Yr)	United Kingdom	2	6	0.0206	-90	**	240	*
Average Earnings including Bonus (3Mo/Yr)	United Kingdom	2	7	0.0206	-90	**	240	*
Claimant Count Change	United Kingdom	1	35	0.0206	-90	**	240	*
Claimant Count Rate	United Kingdom	2	36	0.0206	-90	**	240	*
Consumer Price Index (QoQ)	United Kingdom	1	42	0.0086	30	***	240	**
HIA New Home Sales (MoM)	Australia	2	59	0.0578	-90	*	240	**
ILO Unemployment Rate (3M)	United Kingdom	0	64	0.0206	-90	**	240	*
Markit Manufacturing PMI	United Kingdom	2	77	0.0371	30	**	240	**
RBA's Governor Glenn Stevens Speech	Australia	1	109	0.0778	-60	*	225	*
Bank of England Credit Conditions Report (QoQ)	United Kingdom	2	152	0.0494	75	*	90	**

Table 4.15 Entry and exit time reflect different volatilities for 15 minute timeframe of GBP-AUD (cont.)

15 Minutes CAAR[-15,+15] GBP-AUD								
Name	**Country**	**Degree**	**News Code**	**Pr > |t|**	**Min.Buy (minute)**	**Significant**	**Min.Sell (minute)**	**Significant**
BoE Quarterly Bulletin	United Kingdom	1	160	0.0932	-90	***	240	***
Easter Monday	Australia	0	185	0.0189	-90	***	180	*

Remark: - * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%
- Degree 0 is very low impact to currency exchange
Degree 1 is low impact to currency exchange
Degree 2 is medium impact to currency exchange
Degree 3 is high impact to currency exchange

1. Average Earnings excluding Bonus (3Mo/Yr) is a news of United Kingdom, degree 2, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

2. Average Earnings including Bonus (3Mo/Yr) is a news of United Kingdom, degree 2, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

3. Claimant Count Change is a news of United Kingdom, degree 1, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

4. Claimant Count Rate is a news of United Kingdom, degree 2, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

5. Consumer Price Index (QoQ) is a news of United Kingdom, degree 1, our conclusion found an entry at 30 minutes after news announcement and exit time at 240 minutes after news announcement.

6. HIA New Home Sales (MoM) is a news of Australia, degree 2, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

7. ILO Unemployment Rate (3M) is a news of United Kingdom, degree 0, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

8. Markit Manufacturing PMI is a news of United Kingdom, degree 2, our conclusion found an entry at 30 minutes after news announcement and exit time at 240 minutes after news announcement.

9. RBA's Governor Glenn Stevens Speech is a news of Australia, degree 1, our conclusion found an entry at 60 minutes before news announcement and exit time at 225 minutes after news announcement.

10. Bank of England Credit Conditions Report (QoQ) is a news of United Kingdom, degree 2, our conclusion found an entry at 75 minutes after news announcement and exit time at 90 minutes after news announcement.

11. BoE Quarterly Bulletin is a news of United Kingdom, degree 1, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

12. Easter Monday is a news of Australia, degree 0, our conclusion found an entry at 90 minutes before news announcement and exit time at 180 minutes after news announcement.

For 30 minutes timeframe, we also use event windows range from 90 minutes before news announcement to 240 minutes after news announcement. In our study for this hypothesis, we use the result from hypothesis 1 with significant level of 10% or above to be an input to perform tests of significance.

Furthermore, we have identified a time interval to entry and exit for individual news announcement, which is referred from hypothesis 1 at a significance level of 10%, 5% or 1%, as described on table 16. The result of time entry and exit for each individual news announcement based on each paired of currency exchange is listed below:

Table 4.16 Entry and exit time reflect different volatilities for 30 minute timeframe of GBP-AUD

30 Minutes CAAR[-30,+30] GBP-AUD								
Name	**Country**	**Degree**	**News Code**	**Pr > |t|**	**Min.Buy (minute)**	**Significant**	**Min.Sell (minute)**	**Significant**
Autumn Forecast Statement	United Kingdom	2	5	0.0263	30	**	60	*
BBA Mortgage Approvals	United Kingdom	0	15	0.027	30	*	240	**
Consumer Price Index (QoQ)	United Kingdom	1	42	0.0023	30	**	240	**
Markit Manufacturing PMI	United Kingdom	2	77	0.0226	-90	*	240	**
10-y Bond Auction	United Kingdom	2	143	0.059	60	*	240	**
Easter Monday	Australia	0	185	0.0005	-90	***	150	**
National Australia Bank's Business Conditions	Australia	2	220	0.0354	-60	**	210	*
TD Securities Inflation (MoM)	Australia	1	254	0.0077	-90	*	240	**
TD Securities Inflation (YoY)	Australia	1	255	0.0186	-90	**	240	**

Remark: - * is a significant level of 10%; ** is a significant level of 5%;
*** a significant level of 1%

- Degree 0 is very low impact to currency exchange
Degree 1 is low impact to currency exchange
Degree 2 is medium impact to currency exchange
Degree 3 is high impact to currency exchange

1. Autumn Forecast Statement is a news of United Kingdom, degree 2, our conclusion found an entry at 30 minutes after news announcement and exit time at 60 minutes after news announcement.

2. BBA Mortgage Approvals is a news of United Kingdom, degree 0, our conclusion found an entry at 30 minutes after news announcement and exit time at 240 minutes after news announcement.

3. Consumer Price Index (QoQ) is a news of United Kingdom, degree 1, our conclusion found an entry at 30 minutes after news announcement and exit time at 60 minutes after news announcement.

4. Markit Manufacturing PMI is a news of United Kingdom, degree 2, our conclusion found an entry at 90 minutes before news announcement and exit time at 240 minutes after news announcement.

5. 10-y Bond Auction is a news of United Kingdom, degree 2, our conclusion found an entry at 60 minutes after news announcement and exit time at 240 minutes after news announcement.

6. Easter Monday is a news of Australia, degree 0, our conclusion found an entry at 90 minutes before news announcement and exit time at 150 minutes after news announcement.

7. National Australia Bank's Business Conditions is a news of Australia, degree 2, our conclusion found an entry at 60 minutes before news announcement and exit time at 210 minutes after news announcement.

8. TD Securities Inflation (MoM) is a news of Australia, degree 1, our conclusion found an entry at 90 minutes before news announcement and exit time at 210 minutes after news announcement.

9. TD Securities Inflation (YoY) is a news of Australia, degree 1, our conclusion found an entry at 90 minutes before news announcement and exit time at 210 minutes after news announcement.

CHAPTER V
CONCLUSION

Of all 187 individual news announcements from GBP-AUD; there is 65 number of events, which have a significant impact to their currency exchanges.

Based on our assumption, all 4 degrees (0, 1, 2, and 3) should have an effect on currency exchange as suggested from forexfactory.com. However, our study found that the degrees do not have an impact to currency exchange. Although degree 2 or 3 should have more impact on currency exchange than degree 0 or 1, some of the news announcements are already absorbed by the investor before the announcement happens.

In this study, we have classified news into 2 categories: Single and multiple news announcements. Single news announcement is an event news in a day whereas multiple news announcements have more than 2 news events within a day. The result suggests that although the economic news has an impact to currency exchange, we cannot be specific whether single or multiple news announcement has more impact on currency exchange than each other.

Lastly, we have further investigated an appropriate entry and exit time period for trading to the investor by using 1, 5, 15 and 30 minute timeframe with an event window range from 120 minutes before news announcement to 240 minutes after news announcement. By identifying the highest abnormal return and significant t-test, we are able to scope down a profitable period for an investor by suggesting a specific entry and exit time period for trading. The result suggests all 3 pairs of currency exchange have average buy position at 90 minutes before news announcement and average sell position at 240 minutes after news announcement.

With a limited resource and time constraint in this study, we have recognized the following activities/ items in order to improve further study of the event study of currency exchange. First, data period can be extended as much as possible to include all world/ related crisis in order to reflect the volatility of currency exchange more accurately. Second, data source shall be collected from many sources based. One source

of data may not be sufficient since in every brokerage, a currency exchange's spread will be calculated differently. Third, the study may be segregated by the critical event e.g. a political change in studied currency exchange, the monetary policy and political crisis, etc. Forth, computer specification to execute the result of currency exchange should be recommended with higher than average PC home user's specification. Last, in addition of the selected data (High, Low, Open, Closed price), we can further improve the data quality by adding a volume variable in order to execute the result more precisely.

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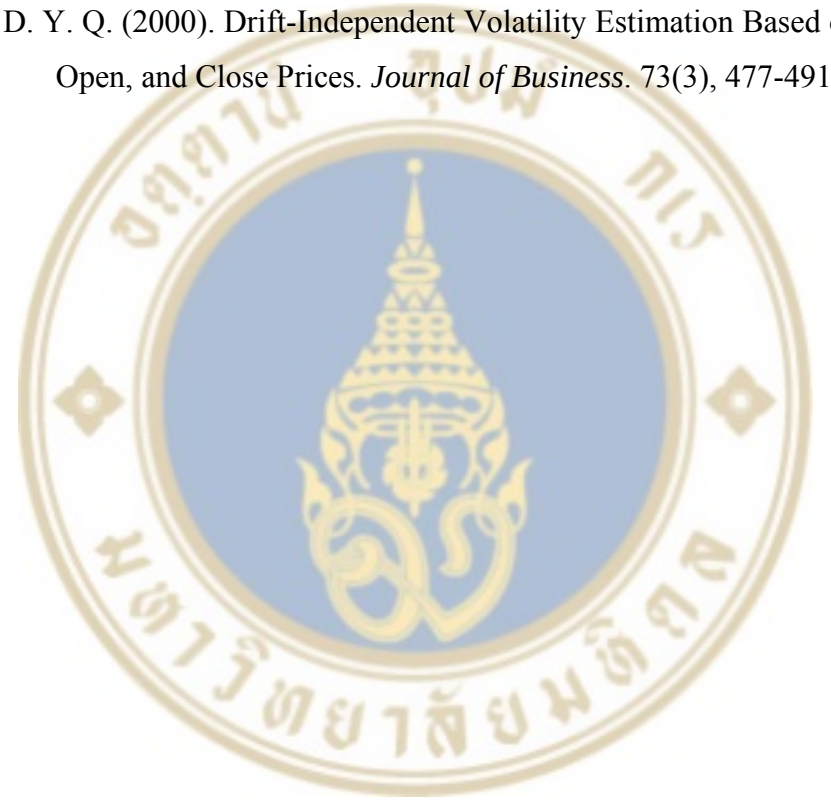

APPENDICES

Appendix A: Define News Announcement Code

Type of news event classification by United Kingdom

Code	Name	Country	Degree
5	Autumn Forecast Statement	United Kingdom	2
6	Average Earnings excluding Bonus (3Mo/Yr)	United Kingdom	2
7	Average Earnings including Bonus (3Mo/Yr)	United Kingdom	2
12	Bank of England Minutes	United Kingdom	2
13	Bank of England Quarterly Inflation Report	United Kingdom	0
14	Bank Stress Test Results	United Kingdom	2
15	BBA Mortgage Approvals	United Kingdom	0
21	BoE Asset Purchase Facility	United Kingdom	3
22	BoE Interest Rate Decision	United Kingdom	0
23	BOE MPC Vote Cut	United Kingdom	3
24	BOE MPC Vote Hike	United Kingdom	3
25	BOE MPC Vote Unchanged	United Kingdom	3
26	BOE's Governor Carney speech	United Kingdom	3
28	Budget Report	United Kingdom	2
34	CBI Distributive Trades Survey - Realized (MoM)	United Kingdom	1
35	Claimant Count Change	United Kingdom	1
36	Claimant Count Rate	United Kingdom	2
37	Consumer Credit	United Kingdom	1
39	Consumer Inflation Expectations	United Kingdom	3
41	Consumer Price Index (MoM)	United Kingdom	2
44	Core Consumer Price Index (YoY)	United Kingdom	2
45	Current Account	United Kingdom	1
51	Financial Stability Report	United Kingdom	2
53	Gfk Consumer Confidence	United Kingdom	0
54	Goods Trade Balance	United Kingdom	3
56	Gross Domestic Product (QoQ)	United Kingdom	2
57	Gross Domestic Product (YoY)	United Kingdom	2
64	ILO Unemployment Rate (3M)	United Kingdom	0
66	Index of Services (3M/3M)	United Kingdom	1
68	Industrial Production (MoM)	United Kingdom	2
69	Industrial Production (YoY)	United Kingdom	2
70	Inflation Report Hearings	United Kingdom	3
74	M4 Money Supply (MoM)	United Kingdom	1
75	Manufacturing Production (MoM)	United Kingdom	0

Code	Name	Country	Degree
76	Manufacturing Production (YoY)	United Kingdom	0
77	Markit Manufacturing PMI	United Kingdom	2
78	Markit Services PMI	United Kingdom	2
80	Mortgage Approvals	United Kingdom	1
83	Nationwide Housing Prices n.s.a (YoY)	United Kingdom	0
85	Net Lending to Individuals (MoM)	United Kingdom	1
88	NIESR GDP Estimate (3M)	United Kingdom	2
90	PMI Construction	United Kingdom	1
91	PPI Core Output (YoY) n.s.a	United Kingdom	2
94	Producer Price Index - Output (MoM) n.s.a	United Kingdom	2
95	Producer Price Index - Output (YoY) n.s.a	United Kingdom	0
96	Public Sector Net Borrowing	United Kingdom	0
118	Retail Price Index (MoM)	United Kingdom	2
119	Retail Price Index (YoY)	United Kingdom	2
121	Retail Sales (YoY)	United Kingdom	2
124	Retail Sales ex-Fuel (MoM)	United Kingdom	2
125	Retail Sales ex-Fuel (YoY)	United Kingdom	2
127	Scottish independence referendum	United Kingdom	3
128	Total Business Investment (QoQ)	United Kingdom	2
129	Total Business Investment (YoY)	United Kingdom	0
130	Total Trade Balance	United Kingdom	1
134	Trade Balance; non-EU	United Kingdom	2
143	10-y Bond Auction	United Kingdom	2
144	30-y Bond Auction	United Kingdom	1
152	Bank of England Credit Conditions Report (QoQ)	United Kingdom	2
157	BOE Credit Conditions Survey	United Kingdom	1
158	BOE Deputy Governor Paul Tucker speech	United Kingdom	1
159	BOE Inflation Letter	United Kingdom	2
160	BoE Quarterly Bulletin	United Kingdom	1
161	BoE's Governor King Speech	United Kingdom	2
163	BRC Retail Sales Monitor - All (YoY)	United Kingdom	2
164	BRC Shop Price Index (MoM)	United Kingdom	0
168	CB Leading Economic Index	United Kingdom	2
169	CBI Industrial Trends Survey - Orders (MoM)	United Kingdom	1
171	CML Gross Mortgage Lending s.a.	United Kingdom	0
172	CML New Mortgages	United Kingdom	0
178	David Cameron speech	United Kingdom	2
181	DCLG House Price Index (YoY)	United Kingdom	1
184	Early May	United Kingdom	0
194	Gordon Brown's Speech	United Kingdom	2

Code	Name	Country	Degree
195	Government spending review	United Kingdom	2
196	Halifax House Prices (3m/YoY)	United Kingdom	1
197	Halifax House Prices (MoM)	United Kingdom	1
198	Hometrack Housing Prices s.a (MoM)	United Kingdom	0
207	M4 Money Supply (YoY)	United Kingdom	0
208	M4 Sterling Lending	United Kingdom	0
211	Mark Carney speaks at UK Parliament	United Kingdom	2
212	Mark Carney will become the new Bank of England Governor	United Kingdom	1
213	MPC Member Bean Speech	United Kingdom	1
214	MPC Member Broadbent Speech	United Kingdom	1
215	MPC Member Dale Speech	United Kingdom	1
216	MPC Member Miles Speech	United Kingdom	2
217	MPC Member Paul Fisher Speech	United Kingdom	1
218	MPC Member Sentance Speech	United Kingdom	2
219	MPC Member Weale Speech	United Kingdom	1
221	Nationwide Consumer Confidence	United Kingdom	2
222	Nationwide Housing Prices s.a (MoM)	United Kingdom	2
228	Parliamentary Election	United Kingdom	3
230	Paul Volcker testifies to UK Banking Standards Comission	United Kingdom	1
231	PPI Core Output (MoM) n.s.a	United Kingdom	1
233	Producer Price Index - Input (MoM) n.s.a	United Kingdom	2
235	Producer Price Index - Input (YoY) n.s.a	United Kingdom	0
248	RICS Housing Price Balance	United Kingdom	2
249	Rightmove House Price Index (MoM)	United Kingdom	1
250	Rightmove House Price Index (YoY)	United Kingdom	1
252	Spring Bank Holiday	United Kingdom	0
253	Summer Bank Holiday	United Kingdom	0
268	Consumer Price Index (YoY)	United Kingdom	2
274	Public Sector Net Borrowing	United Kingdom	0
275	Retail Sales (MoM)	United Kingdom	2
280	Boxing Day	United Kingdom	0
283	Christmas Day	United Kingdom	0
284	Daylight Saving Time	United Kingdom	0
286	Easter Monday	United Kingdom	0
289	Good Friday	United Kingdom	0
295	New Year's Day	United Kingdom	0

News classification by Australia

Code	Name	Country	Degree
1	AiG Performance of Construction Index	Australia	1
2	AiG Performance of Mfg Index	Australia	1
3	AiG Performance of Services Index	Australia	1
27	Budget Release	Australia	3
30	Building Permits (YoY)	Australia	2
33	CB Leading Indicator	Australia	1
38	Consumer Inflation Expectation	Australia	0
49	Employment Change s.a.	Australia	0
52	Fulltime employment	Australia	1
59	HIA New Home Sales (MoM)	Australia	2
60	Home Loans	Australia	2
61	House Price Index (QoQ)	Australia	1
62	House Price Index (YoY)	Australia	1
71	Investment Lending for Homes	Australia	0
81	National Australia Bank's Business Confidence	Australia	2
82	National Australia Bank's Business Confidence (QoQ)	Australia	2
92	Private Capital Expenditure	Australia	0
93	Private Sector Credit (YoY)	Australia	1
98	RBA Assist Gov Debelle Speech	Australia	2
99	RBA Assist Gov Edey Speech	Australia	2
100	RBA Assistant Governor Kent Speech	Australia	2
101	RBA Bulletin	Australia	1
102	RBA Deputy Governor Lowe Speech	Australia	2
103	RBA Interest Rate Decision	Australia	3
104	RBA Meeting's Minutes	Australia	2
105	RBA Monetary Policy Statement	Australia	2
106	RBA Rate Statement	Australia	2
107	RBA trimmed mean CPI (QoQ)	Australia	1
108	RBA trimmed mean CPI (YoY)	Australia	1
109	RBA's Governor Glenn Stevens Speech	Australia	1
126	Retail Sales s.a. (MoM)	Australia	0
131	Trade Balance	Australia	1
136	Unemployment Rate s.a.	Australia	1
137	Wage Price Index (QoQ)	Australia	1
138	Wage Price Index (YoY)	Australia	0
139	Westpac Consumer Confidence	Australia	1
140	Westpac Consumer Confidence Index	Australia	2
142	Westpac Leading Index (MoM)	Australia	2
147	ANZ Job Advertisements	Australia	0
149	Australia Day	Australia	0

Code	Name	Country	Degree
150	Australia Day (Observed)	Australia	0
151	Bank Holiday	Australia	0
170	Christmas Day	Australia	0
173	Company Gross Operating Profits (QoQ)	Australia	0
174	Construction Work Done	Australia	0
177	Current Account Balance	Australia	1
183	Dwelling Unit Starts (QoQ)	Australia	1
185	Easter Monday	Australia	0
186	Export Price Index (QoQ)	Australia	0
188	Federal election	Australia	3
189	Financial Stability Review	Australia	1
199	Import Price Index (QoQ)	Australia	0
204	Labour Day	Australia	0
220	National Australia Bank's Business Conditions	Australia	2
224	New Motor Vehicle Sales (YoY)	Australia	1
229	Part-time employment	Australia	1
232	Private Sector Credit (MoM)	Australia	0
237	Producer Price Index (QoQ)	Australia	0
238	Producer Price Index (YoY)	Australia	1
239	Queen's Birthday	Australia	0
240	RBA Annual Report	Australia	1
241	RBA Commodity Index SDR (YoY)	Australia	2
242	RBA Foreign Exchange Transaction	Australia	1
251	RPData/Rismark house price index	Australia	1
254	TD Securities Inflation (MoM)	Australia	1
255	TD Securities Inflation (YoY)	Australia	1
263	Building Permits (MoM)	Australia	0
265	Consumer Price Index (QoQ)	Australia	1
266	Consumer Price Index (YoY)	Australia	2
269	Gross Domestic Product (QoQ)	Australia	2
271	Gross Domestic Product (YoY)	Australia	2
273	Participation Rate	Australia	1
277	ANZAC Day	Australia	0
278	Boxing Day	Australia	0
287	Good Friday	Australia	0
292	New Motor Vehicle Sales (MoM)	Australia	0
293	New Year's Day	Australia	0

Appendix B: Volatility Methodology

Cumulative Abnormal Volatility (CAV) Method

Volatility measurement model for identifying a more accurate result of Currency Exchange volatility data

Floros (2009) Reevaluates the performance of several volatility measurement models through four S&P indices (S&P 100, S&P 400, S&P 500, S&P small cap 600) to test whether the volatility estimator models based on high, low, opening and closing are an efficient estimator. The finding result, similar to Zhang (2000), shows a simple measure of volatility defined as first logarithm difference between high and low price is overestimating the defined volatility which using a full range of price (high, low, opening as well as a closing price).

Similar to Lien (2001), the research study four different models to test the efficiency of volatility measurement based on high, low, opening and closing prices – H_t, L_t, O_t and C_t respectively:

1. A simple measure of volatility: $V_{S,t}= \ln(H_t)- \text{in}(L_t)_t$. The model is defined as the first logarithmic difference between the high and low prices Diebold (2001); Tauchen (1999)

2. A volatility measure assuming an underlying geometric Brownian motion with no drift for the prices Parkinson (2009): $V_{(p,t)} = 0.361R^2 = 0.361\ [\ln(H_t/L_t)]^2$ Based on Lien (2001), $V_{P,t}$ could be much as 8.5 time more efficient than log squared returns.

3. A volatility measure based on opening and closing prices Klass (1980): $V_{GK,t} = \frac{1}{2}[\ln(H_t) - \ln(L_t)]^2 - [2\ln2\text{-}1][\ln(C_t) - \ln(O_t)]^2$ According to Lien (2001), Model 2 and 3 are unbiased when the sample data are continuously observed with $V_{GK,t}$ being more efficient than $V_{P,t}$

4. When drift term is not zero, neither model 2 nor 3 ar efficient Lien (2001). Hence, an alternative measure with independent drift is required. Rogers and Satchell (1991), Yoon (1994) propose a volatility measure which is subject to a

downward bias problem: $V_{RS,t} = [\ln(H_t) - \ln(O_t)][\ln(H_t) - \ln(C_t)] + [\ln(L_t) - \ln(O_t)][\ln(L_t) - \ln(C_t)]$.

In the result, their find that $V_{s,t}$ model is over estimates than $V_{GK,t}$, $V_{p,t}$ and $V_{RS,t}$

Similar to Cumulative Abnormal Return (CAR), we use standard event study methodology to appraise the impact of news announcement to currency exchange. However, to find more accurate result, instead of using the return of variance, we introduce the volatility measurement model which use high, low, opening and closing price to calculate the currency exchange spread. The volatility is calculated by the equation shown below:

$$V_{RS,t} = [\ln(H_t) - \ln(O_t)][\ln(H_t) - \ln(C_t)] + [\ln(L_t) - \ln(O_t)][\ln(L_t) - \ln(C_t)]$$

Where; H_t = the current period's high during the trading interval (between [f,1])

L_t = the current period's low during the trading interval (between [f,1])

O_t = opening price of the current period (at time t)

C_t = closing price of the current period (at time t)

f = fraction of the period (between [0,1]) that trading is closed

For an estimation window, we backward the time to the price where there is no volatility (time may varies from minute/hour/day) and simulate the pre and post time interval into the estimation window. Next, we use currency exchange spread to abnormal volatility (AV), the different between the actual volatility and the benchmark volatility of 60 minutes.

$$AV_t = V_{RS,t} - E(V_{RS,t})$$

$$AV_t = V_{RS,t} - \frac{\sum_{t=-30}^{-90} V_{RS,t}}{60}$$

Where ; AV_t = abnormal volatility of currency exchange at time t

$V_{RS,t}$ = Volatility of currency exchange on event period at time t

$E[V_{RS,t}]$ = average the Volatility of currency exchange on estimation at time t

The pre-event interval is used to find the highest return of the currency exchange that occur between period t_i to -1 minute. Similar to pre event, post event is starting from event period + 1 minute to t_j.

And final, we use abnormal volatility to calculate a cumulative abnormal volatility (CAV) of the currency exchange. We adopt a 60 minutes event window to compute the 1 minute cumulative abnormal volatility (CAV [-1, +1] minutes) from the news announcement.

$$CAV_t = \sum_{t=-1}^{1} AV_t$$

Where ; CAV_t = cumulative abnormal volatility of currency exchange at time t

AV_t = abnormal volatility of currency exchange on event period at time t

For first hypothesis, we apply F-test method to conduct hypothesis testing. H1: the news announcement impact to the currency exchange movement, we test mean

H1a: CAV [-1, +1] = 0

H1b: CAV [-1, +1] $\neq$ 0

Second hypothesis, we find the different types of news which have various magnitude impact to currency exchange

$$H2a: CAV\ [-1, +1] = 0$$

$$H2b: CAV\ [-1, +1] \neq 0$$

For third hypothesis, we test whether multiple news announcement have greater magnitude impact than single news announcement. For a multiple event, where there is multiple news announcements occur within one day, we start timing at the beginning of first news announcement and ending at the beginning of last news announcement.

$$H3a: CAV\ [-1, +1] = 0$$

$$H3b: CAV\ [-1, +1] \neq 0$$

And last hypothesis, we find a different entry and exit time that reflect different volatilities. We identify the appropriate entry and exit time interval before and after the official news announcement. In this section, we run data of 1 minute to calculate F-test and initiate further study to examine the data of 10 minutes.

$$H4a: CAV_{x-1, +1-y} = 0$$

$$H4b: CAV_{x-1, +1-y} \neq 0$$

Empirical Study of Cumulative Abnormal Volatility (CAV)

H1: Specific news announcement shows a significant impact to the studied currency exchange

By running the volatility model of full range of price (High, Low, Open, Close), we would be able to identify which news announcement has a significant impact to the currency exchange.

The result, as shown in table A, represents only specific news announcements that have a significant impact to the currency exchange. For GBP-AUD, out of 186 final events, there are 34 events (19.21%) which have a significance level of 0.01 impact to its currency exchange.

The news announcement which have significant impact to GBP-AUD

Analysis Variable : cas_audev

Event Name	Country	evtcode	N	Std Dev	Mean	Minimum	Maximum	t Value	Pr > |t|
BoE Asset Purchase Facility	United Kingdom	21	50	0.0000002	0.0000001	-0.0000002	0.0000009	3.22	0.0023
CBI Distributive Trades Survey - Realized (MoM)	United Kingdom	34	93	0.0000006	0.0000003	-0.0000005	0.0000053	3.96	0.0001
Consumer Credit	United Kingdom	37	80	0.0000002	0.0000001	-0.0000005	0.0000009	3.09	0.0028
Consumer Price Index (MoM)	United Kingdom	41	92	0.0000004	0.0000002	-0.0000009	0.0000018	5.06	<.0001
Consumer Price Index (YoY)	United Kingdom	43	123	0.0000005	0.0000002	-0.0000009	0.0000038	4.2	<.0001
Core Consumer Price Index (YoY)	United Kingdom	44	92	0.0000004	0.0000002	-0.0000009	0.0000018	5.06	<.0001
Gross Domestic Product (QoQ)	United Kingdom	56	123	0.0000003	0.0000001	-0.0000004	0.0000020	3.13	0.0022
Gross Domestic Product (YoY)	United Kingdom	57	123	0.0000003	0.0000001	-0.0000004	0.0000020	3.22	0.0017
Index of Services (3M/3M)	United Kingdom	66	92	0.0000004	0.0000002	-0.0000004	0.0000020	3.89	0.0002
M4 Money Supply (MoM)	United Kingdom	74	128	0.0000003	0.0000001	-0.0000013	0.0000015	2.87	0.0047
Manufacturing Production (MoM)	United Kingdom	75	91	0.0000009	0.0000003	-0.0000019	0.0000050	2.64	0.0096
Manufacturing Production (YoY)	United Kingdom	76	91	0.0000009	0.0000003	-0.0000019	0.0000050	2.64	0.0096
Markit Manufacturing PMI	United Kingdom	77	92	0.0000004	0.0000002	-0.0000006	0.0000019	3.87	0.0002
Mortgage Approvals	United Kingdom	80	105	0.0000002	0.0000001	-0.0000005	0.0000009	3.65	0.0004
Net Lending to Individuals (MoM)	United Kingdom	85	88	0.0000002	0.0000001	-0.0000005	0.0000009	3.14	0.0023
PMI Construction	United Kingdom	90	91	0.0000013	0.0000004	-0.0000006	0.0000081	2.98	0.0037
PPI Core Output (YoY) n.s.a	United Kingdom	91	41	0.0000008	0.0000003	-0.0000003	0.0000041	2.9	0.0061
Producer Price Index - Output (MoM) n.s.a	United Kingdom	94	89	0.0000011	0.0000004	-0.0000019	0.0000056	3.11	0.0025
Producer Price Index - Output (YoY) n.s.a	United Kingdom	95	89	0.0000011	0.0000004	-0.0000019	0.0000056	3.11	0.0025
RBA Interest Rate Decision	Australia	103	84	0.0000004	0.0000002	-0.0000004	0.0000029	3.61	0.0005

Analysis Variable : cas_audev

Event Name	Country	evtcode	N	Std Dev	Mean	Minimum	Maximum	t Value	Pr > |t|
RBA Rate Statement	Australia	106	56	0.0000003	0.0000002	-0.0000002	0.0000017	3.96	0.0002
Retail Price Index (MoM)	United Kingdom	118	92	0.0000004	0.0000002	-0.0000009	0.0000018	5.06	<.0001
Retail Price Index (YoY)	United Kingdom	119	92	0.0000004	0.0000002	-0.0000009	0.0000018	5.06	<.0001
Retail Sales (MoM)	United Kingdom	120	92	0.0000004	0.0000002	-0.0000013	0.0000014	4.7	<.0001
Retail Sales (YoY)	United Kingdom	121	92	0.0000004	0.0000002	-0.0000013	0.0000014	4.7	<.0001
Retail Sales ex-Fuel (MoM)	United Kingdom	124	50	0.0000002	0.0000001	-0.0000001	0.0000010	4.22	0.0001
Retail Sales ex-Fuel (YoY)	United Kingdom	125	50	0.0000002	0.0000001	-0.0000001	0.0000010	4.42	<.0001
BRC Retail Sales Monitor - All (YoY)	United Kingdom	163	91	0.0000001	0.0000000	-0.0000007	0.0000005	-2.79	0.0064
CBI Industrial Trends Survey - Orders (MoM)	United Kingdom	169	92	0.0000006	0.0000003	-0.0000005	0.0000031	5.06	<.0001
DCLG House Price Index (YoY)	United Kingdom	181	88	0.0000004	0.0000002	-0.0000009	0.0000018	3.88	0.0002
M4 Money Supply (YoY)	United Kingdom	207	126	0.0000003	0.0000001	-0.0000013	0.0000015	3.02	0.003
PPI Core Output (MoM) n.s.a	United Kingdom	231	42	0.0000007	0.0000003	-0.0000003	0.0000041	2.93	0.0055
Producer Price Index - Input (MoM) n.s.a	United Kingdom	233	89	0.0000011	0.0000004	-0.0000019	0.0000056	3.11	0.0025
Producer Price Index - Input (YoY) n.s.a	United Kingdom	235	89	0.0000011	0.0000004	-0.0000019	0.0000056	3.11	0.0025

List of specific news announcement which have significant impact to GBP-AUD

Event Name	Country	Degree
BoE Asset Purchase Facility	United Kingdom	3
CBI Distributive Trades Survey - Realized (MoM)	United Kingdom	1
Consumer Credit	United Kingdom	1
Consumer Price Index (MoM)	United Kingdom	2
Consumer Price Index (YoY)	United Kingdom	2
Core Consumer Price Index (YoY)	United Kingdom	2
Gross Domestic Product (QoQ)	United Kingdom	2
Gross Domestic Product (YoY)	United Kingdom	2
Index of Services (3M/3M)	United Kingdom	1
M4 Money Supply (MoM)	United Kingdom	1
Manufacturing Production (MoM)	United Kingdom	0
Manufacturing Production (YoY)	United Kingdom	0
Markit Manufacturing PMI	United Kingdom	2
Mortgage Approvals	United Kingdom	1
Net Lending to Individuals (MoM)	United Kingdom	1
PMI Construction	United Kingdom	1
PPI Core Output (YoY) n.s.a	United Kingdom	2
Producer Price Index - Output (MoM) n.s.a	United Kingdom	2
Producer Price Index - Output (YoY) n.s.a	United Kingdom	0
RBA Interest Rate Decision	Australia	3
RBA Rate Statement	Australia	2
Retail Price Index (MoM)	United Kingdom	2
Retail Price Index (YoY)	United Kingdom	2
Retail Sales (MoM)	Canada	2
Retail Sales (YoY)	United Kingdom	2
Retail Sales ex-Fuel (MoM)	United Kingdom	2
Retail Sales ex-Fuel (YoY)	United Kingdom	2
BRC Retail Sales Monitor - All (YoY)	United Kingdom	2

Event Name	Country	Degree
CBI Industrial Trends Survey - Orders (MoM)	United Kingdom	1
DCLG House Price Index (YoY)	United Kingdom	1
M4 Money Supply (YoY)	United Kingdom	0
PPI Core Output (MoM) n.s.a	United Kingdom	1
Producer Price Index - Input (MoM) n.s.a	United Kingdom	2
Producer Price Index - Input (YoY) n.s.a	United Kingdom	0

H2: Degrees of news impact have an effect on currency exchange.

Table C present the result of regression analysis and explain a magnitude impact to currency exchange by each degree of news. For the result of GBP-AUD, we reject null hypothesis at significance level of 0.01 for degree of 1, 2 and 3.

Type of news classified by t-value for GBP-AUD

Analysis Variable : cas_audev							
Degree	**N**	**Std Dev**	**Mean**	**Minimum**	**Maximum**	**t Value**	**Pr > |t|**
0	403	0.0000004	0.0000000	-0.0000016	0.0000034	1.78	0.0752
1	4026	0.0000005	0.0000001	-0.0000022	0.0000115	10.73	<.0001
2	3732	0.0000007	0.0000001	-0.0000022	0.0000088	12.44	<.0001
3	1080	0.0000008	0.0000001	-0.0000009	0.0000179	6.21	<.0001

H3: Multiple news announcements have greater magnitude impact than single news announcement.

In this hypothesis, we validate if our variances in each pair of currency are Pooled (equal variance) or Satterthwaite t-test (unequal variance). Our sample size in all paired currency is Satterthwaite t-test.

By considering independent t-test from Satterthwaite t-test, if it is greater than significant level of 0.05, we can confirm that both single and multiple news announcements have a significant impact to the paired currency exchange.

Subsequently, after identifying both single and multiple news announcements have an impact to currency exchange, we use mean value to classify whether single or multiple new announcements has more magnitude to currency exchange.

The result from GBP-AUD suggests independent t-test is a significant level of 0.05 on Satterthwaite t-test and mean value for multiple news announcements is greater than its value for single news announcement (0.0115 > 0.0006).

Independent t-test value for GBP-AUD

T-Tests

Variable	Method	Variances	DF	t Value	Pr > |t|
CAR_sAUD	**Pooled**	Equal	2326	-4.11	<.0001
CAR_sAUD	**Satterthwaite**	Unequal	1517	-5.44	<.0001

Mean value for GBP-AUD

Statistics

Variable	catday	N	Lower CL Mean	Mean	Upper CL Mean	Lower CL Std Dev	Std Dev	Upper CL Std Dev	Std Err	Minimum	Maximum
CAR_s AUD	**1**	841	0.00020	0.00060	0.00090	0.00540	0.00560	0.00590	0.00020	-0.03300	0.13980
CAR_s AUD	**2**	1487	0.00760	0.01150	0.01550	0.07460	773.00000	0.08020	0.00200	-0.86500	1.00750
CAR_s AUD	**Diff (1-2)**		-0.01600	-0.01100	-0.00600	0.06020	0.06190	0.06370	0.00270		

H4: Various entry and exit time reflect different volatilities

For 1 minute timeframe, we use event windows range from 120 minutes before news announcement to 120 minutes after news announcement. In our study for this hypothesis, we use the result from hypothesis 1 with a significant level of 5% to be an input to perform test sig-mean. Our conclusion found an entry at 21 minutes before news announcement and exit time at 120 minutes after news announcement. See table F for summary of entry and exit for individual currency exchange with 1 minute data.

For GBP-AUD found an entry at 11 minutes before news announcement and exit time at 120 minutes after news announcement.

Summary of entry and exit for individual currency exchange with 1 minute data

10 Minutes Interval		
Currency	**Buy**	***Sell***
GBP-AUD	-11	+120++

Our team has initiated further study to examine the data of 10 minutes to test sig-mean with event windows range from 120 minutes before news announcement to 720 minutes after news announcement. Our conclusion found an entry at 10 minutes before news announcement and exit time at 270 minutes after news announcement. See table 65 for summary of entry and exit for individual currency exchange with 10 minute data.

For GBP-AUD found an entry at 10 minutes before news announcement and exit time at 270 minutes after news announcement.

Summary of entry and exit for individual currency exchange with 10 minute data

10 Minutes Interval		
Currency	**Buy**	**Sell**
GBP-AUD	+10	+270

In our research paper, we have looked into more detail for each paired of currency by identifying a time interval to entry and exit for individual news announcement, which is referred from hypothesis 1 at significance level of 0.01.

The result of time entry and exit for each individual news announcement based on GBP-AUD is listed below:

Time to entry and exit for each individual news announcement GBP-AUD

Event Name	Country	Degree	1 Min		10 Min	
			Buy	Sell	Buy	Sell
BoE Asset Purchase Facility	United Kingdom	3	-120	-1	-120	-60
CBI Distributive Trades Survey - Realized (MoM)	United Kingdom	1	-64	-1	-60	-
Consumer Credit	United Kingdom	1	+1	+120	+10	+250
Consumer Price Index (YoY)	United Kingdom	2	-60	+120	-60	+240
Core Consumer Price Index (YoY)	United Kingdom	2	-61	+120	-60	+250
Gross Domestic Product (YoY)	United Kingdom	2	+1	+120	+10	+380
Index of Services (3M/3M)	United Kingdom	1	+1	+120	+10	+240
M4 Money Supply (MoM)	United Kingdom	1	+1	+120	+10	+320
Manufacturing Production (YoY)	United Kingdom	0	+1	+6	-	-
Markit Manufacturing PMI	United Kingdom	2	+1	+120	+10	+280
Mortgage Approvals	United Kingdom	1	+1	+120	+20	+270
Net Lending to Individuals (MoM)	United Kingdom	1	+1	+120	+10	+260
PMI Construction	United Kingdom	1	-61	+120	-60	+220
PPI Core Output (YoY) n.s.a	United Kingdom	2	-63	+120	-60	+160
Producer Price Index - Output (YoY) n.s.a	United Kingdom	0	+1	+18	+10	-
RBA Interest Rate Decision	Australia	3	-48	+3	-30	-10
RBA Rate Statement	Australia	2	-60	+8	-60	-10
Retail Price Index (YoY)	United Kingdom	2	-61	+120	-60	+250
Retail Sales (MoM)	United Kingdom	2	-62	+120	-60	+430
Retail Sales (YoY)	United Kingdom	2	-62	+120	-60	+430
Retail Sales ex-Fuel (YoY)	United Kingdom	2	-61	+120	-60	+250
BRC Retail Sales Monitor - All (YoY)	United Kingdom	2	-120	+35	-120	+500
CBI Industrial Trends Survey - Orders (MoM)	United Kingdom	1	-71	+35	-70	+30
DCLG House Price Index (YoY)	United Kingdom	1	+1	+120	+10	+240
M4 Money Supply (YoY)	United Kingdom	0	+1	+120	+10	+340
PPI Core Output (MoM) n.s.a	United Kingdom	1	-63	+120	-60	+180
Producer Price Index - Input (MoM) n.s.a	United Kingdom	2	+1	+18	+10	-

Conclusion of Cumulative Abnormal Volatility (CAV)

Of all 77 individual news announcements from GBP-AUD, there are 34 number of events with significant level of 0.1, 0.05 and 0.01 such as consumer price index, Gross Domestic Product (GDP), manufacturing PMI, etc. out of 77 initial number of event for GBP-AUD. Whereas about 40 no. of events with 99% significant level e.g. Unemployment rate, service PMI, etc.

Based on our assumption, all 4 degrees (0, 1, 2, and 3) should have an effect on currency exchange as suggested from forexfactory.com. However, our study found out that not every degree will impact to currency exchange. The study showed that GBP-AUD is reject null hypothesis at 99% significant level for degree of 1, 2 and 3. Hence, we conclude that degree 0 does not have an impact to GBP-AUD currency exchange.

In this study, we have classified news into 2 categories: Single and multiple news announcements. Single news announcement is in one event news in a day whereas multiple news announcements have more than 2 news events within a day. Our study found that all 3 pairs of currency exchange are impacted by both single and multiple news announcements. For GBP-AUD, multiple news announcements have greater magnitude impact than single news announcement.

Lastly, we have further investigated an appropriate entry and exit time for the investor. By using 1 minute timeframe, we use event window range from 120 minutes before news announcement to 120 minutes after news announcement. The result suggests GBP-AUD has best buy position at 11 minutes before news announcement and best sell position at 120 minutes after news announcement.

We noticed that 1 minute timeframe may be too short to trade for investor. So we have extended the study to 10 minutes timeframe, which has an event window range from 120 minutes before news announcement to 720 minutes after news announcement. The result suggests GBP-AUD has best buy position at 10 minutes before news announcement and best sell position at 270 minutes after news announcement.