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

SOMPRASONG CHODCHOY

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-CAD

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

....
Mr. Somprasong Chodchoy
Candidate

....
Asst. Prof. Nareerat Taechapiroontong,
Ph.D.
Advisor

....
Asst. Prof. Piyapas Tharavanij,
Ph.D.
Chairperson

....
Assoc. Prof. Annop Tanlamai,
Ph.D.
Dean
College of Management
Mahidol University

....
Assoc. Prof. Tatre Jantarakolica,
Ph.D.
Committee member

ACKNOWLEDGEMENTS

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

SOMPRASONG CHODCHOY   5750043

M.M.

THESIS ADVISORY COMMITTEE: ASST. PROF. NAREERAT TAECHAPIROONTONG, Ph.D., ASST. PROF. PIYAPAS THARAVANIJ, Ph.D., ASSOC.PROF. TATRE JANTARAKOLICA, Ph.D.

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 exchange "GBP-CAD." 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 164 economic news from two countries (United Kingdom and Canada) 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-CAD

54 pages

CONTENTS

CONTENTS (cont.)

LIST OF TABLES

LIST OF TABLES (cont.)

LIST OF FIGURES

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-CAD. The scope of study includes Cumulative Abnormal Returns (CAR) which has 1 minute, 5 minute, 15 minute and 30 minute intervals. We use news announcement from two countries: United Kingdom and Canada.

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-CAD. 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 the 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
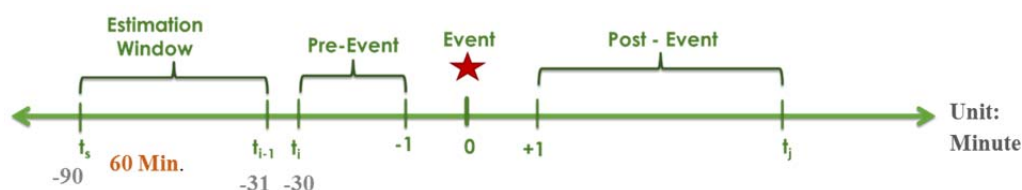
Figure 3.2   Time line for event study (II)

The pre-event interval is used to find the highest return of the currency exchange that occurs 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-CAD 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 153 final events for GBP-CAD, there are 12 events (7.84%) which have a significance level of 10%, 5% and 1% impact to its currency exchange.

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

| | | | | | 1 Minute CAR[-1,+1] | | | | | | |
| | | | | | **GBP- CAD** | | | | | | |
News Code	Name	Country	Degree	N	Std Dev (%)	Mean (%)	Min	Max	SE (%)	t Value	Pr > |t|
28	Budget Report	United Kingdom	2	10	0.00061	-0.00038	-0.00186	0.00036	0.00019	-2.00000	0.07650 *
63	Housing Starts s.a (YoY)	Canada	1	91	0.00036	0.00008	-0.00108	0.00157	0.00004	2.02000	0.04580 **
110	RBC Manufacturing PMI	Canada	2	23	0.00023	0.00009	-0.00024	0.00071	0.00005	1.89000	0.07230 *
156	BoC Senior Deputy Governor Tiff Macklem Speech	Canada	1	4	0.00011	-0.00014	-0.00026	0.00001	0.00006	-2.39000	0.09700 *
168	CB Leading Economic Index	United Kingdom	2	90	0.00049	0.00016	-0.00132	0.00210	0.00005	2.98000	0.00370 ***
184	Early May	United Kingdom	0	7	0.00019	0.00015	-0.00003	0.00038	0.00007	2.15000	0.07470 *
193	Good Friday	Canada	0	12	0.00015	0.00017	0.00000	0.00032	0.00004	4.10000	0.00180 ***
204	Labour Day	United Kingdom	0	5	0.00004	0.00004	-0.00001	0.00009	0.00002	2.17000	0.09580 *
210	Manufacturing Shipments (MoM)	Canada	1	92	0.00036	-0.00009	-0.00161	0.00115	0.00004	-2.39000	0.01870 **
216	MPC Member Miles Speech	United Kingdom	2	5	0.00008	0.00012	0.00005	0.00024	0.00003	3.57000	0.02340 **
258	Victoria Day	Canada	0	7	0.00014	0.00012	-0.00004	0.00037	0.00005	2.21000	0.06940 *
261	Wholesale Sales (MoM)	Canada	0	89	0.00035	0.00007	-0.00070	0.00148	0.00004	1.83000	0.07060 *

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 153 final events for GBP-CAD, there are 15 events (9.8%) which have a significance level of 10% and 5% impact to its currency exchange

Table 4.2 News announcement impact on currency exchange for 5 minutes timeframe of GBP-CAD

News Code	Name	Country	Degree	N	Std Dev (%)	Mean (%)	Min	Max	SE (%)	t Value	Pr > |t|
			5 Minutes [CAAR-5,+5]								
			GBP- CAD								
28	Budget Report	United Kingdom	2	10	0.00087	-0.00051	-0.00292	0.00005	0.00028	-1.85000	0.09730 *
34	CBI Distributive Trades Survey - Realized (MoM)	United Kingdom	1	93	0.00088	0.00015	-0.00338	0.00347	0.00009	1.70000	0.09230 *
40	Consumer Price Index - Core (MoM)	Canada	2	39	0.00033	0.00009	-0.00058	0.00135	0.00005	1.71000	0.0957 0*
84	Net Change in Employment	Canada	0	91	0.00059	-0.00013	-0.00232	0.00099	0.00006	-2.09000	0.03970 **
90	PMI Construction	United Kingdom	1	91	0.00070	0.00017	-0.00098	0.00328	0.00007	2.33000	0.02200 **
110	RBC Manufacturing PMI	Canada	2	23	0.00024	0.00013	-0.00039	0.00057	0.00005	2.57000	0.01760 **
120	Retail Sales (MoM)	Canada	2	185	0.00079	0.00011	-0.00295	0.00495	0.00006	1.91000	0.05820 *
122	Retail Sales ex Autos (MoM)	Canada	0	93	0.00057	0.00013	-0.00144	0.00315	0.00006	2.25000	0.02690 **
128	Total Business Investment (QoQ)	United Kingdom	2	59	0.00102	0.00024	-0.00319	0.00419	0.00013	1.79000	0.07870 *
135	Unemployment Rate	Canada	1	91	0.00059	-0.00013	-0.00232	0.00099	0.00006	-2.09000	0.03970 **
160	BoE Quarterly Bulletin	United Kingdom	1	14	0.00019	0.00009	-0.00015	0.00055	0.00005	1.80000	0.09570 *
168	CB Leading Economic Index	United Kingdom	2	92	0.00068	0.00018	-0.00074	0.00401	0.00007	2.47000	0.01520 **
193	Good Friday	Canada	0	12	0.00018	0.00016	-0.00011	0.00040	0.00005	3.08000	0.01050 **
198	Hometrack Housing Prices s.a (MoM)	United Kingdom	0	36	0.00021	0.00006	-0.00029	0.00094	0.00003	1.79000	0.08140 *
210	Manufacturing Shipments (MoM)	Canada	1	92	0.00047	-0.00010	-0.00296	0.00100	0.00005	-2.15000	0.03400 **

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 153 final events for GBP-CAD, there are 11 events (7.18%) which have a significance level of 10% and 5% impact to its currency exchange.

Table 4.3 News announcement impact on currency exchange for 15 minutes timeframe of GBP-CAD

| | | | | | | 15 Minutes CAAR[-15,+15] GBP-CAD | | | | | | |
News Code	Name	Country	Degree	N	Std Dev (%)	Mean (%)	Min	Max	SE (%)	t Value	Pr > |t|
44	Core Consumer Price Index (YoY)	United Kingdom	2	92	0.00100	-0.00020	-0.00261	0.00260	0.00010	-1.93000	0.05620 *
84	Net Change in Employment	Canada	0	91	0.00107	-0.00021	-0.00393	0.00453	0.00011	-1.90000	0.06060 *
118	Retail Price Index (MoM)	United Kingdom	2	92	0.00100	-0.00020	-0.00261	0.00260	0.00010	-1.93000	0.05620 *
119	Retail Price Index (YoY)	United Kingdom	2	92	0.00100	-0.00020	-0.00261	0.00260	0.00010	-1.93000	0.05620 *
120	Retail Sales (MoM)	Canada	2	185	0.00122	0.00016	-0.00381	0.00662	0.00009	1.81000	0.07190 *
135	Unemployment Rate	Canada	1	91	0.00107	-0.00021	-0.00393	0.00453	0.00011	-1.90000	0.06060 *
163	BRC Retail Sales Monitor - All (YoY)	United Kingdom	2	92	0.00070	-0.00013	-0.00526	0.00102	0.00007	-1.82000	0.07210 *
185	Easter Monday	United Kingdom	0	7	0.00012	0.00013	0.00000	0.00026	0.00005	2.74000	0.03360 **
193	Good Friday	Canada	0	12	0.00047	0.00037	-0.00002	0.00134	0.00014	2.73000	0.01970 **
212	Mark Carney will become the new Bank of England Governor	United Kingdom	1	2	0.00004	0.00035	0.00032	0.00038	0.00003	10.98000	0.05780 *
248	RICS Housing Price Balance	United Kingdom	2	93	0.00068	-0.00015	-0.00526	0.00100	0.00007	-2.16000	0.03340 **

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-CAD, there are 13 events (8.49%) 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 minutes timeframe of GBP-CAD

					30 Minutes CAAR[-30,+30] GBP-CAD						
News Code	Name	Country	Degree	N	Std Dev (%)	Mean (%)	Min	Max	SE (%)	t Value	Pr > |t|
15	BBA Mortgage Approvals	United Kingdom	0	91	0.00189	0.00043	-0.00670	0.00516	0.00020	2.19000	0.03080 **
40	Consumer Price Index - Core (MoM)	Canada	2	39	0.00093	0.00040	-0.00191	0.00209	0.00015	2.64000	0.01190 **
84	Net Change in Employment	Canada	0	91	0.00165	-0.00036	-0.00618	0.00367	0.00017	-2.09000	0.03990 **
120	Retail Sales (MoM)	Canada	2	185	0.00198	0.00025	-0.00832	0.00991	0.00015	1.74000	0.08430 *
122	Retail Sales ex Autos (MoM)	Canada	0	93	0.00183	0.00036	-0.00503	0.00991	0.00019	1.88000	0.06340 *
135	Unemployment Rate	Canada	1	91	0.00165	-0.00036	-0.00618	0.00367	0.00017	-2.09000	0.03990 **
143	10-y Bond Auction	United Kingdom	2	28	0.00135	0.00050	-0.00185	0.00416	0.00026	1.93000	0.06370 *
156	BoC Senior Deputy Governor Tiff Macklem Speech	Canada	1	4	0.00021	-0.00027	-0.00043	0.00002	0.00010	-2.58000	0.08150 *
168	CB Leading Economic Index	United Kingdom	2	92	0.00137	0.00026	-0.00301	0.00450	0.00014	1.81000	0.07390 *
185	Easter Monday	United Kingdom	0	7	0.00021	0.00045	0.00009	0.00070	0.00008	5.78000	0.00120 ***
193	Good Friday	Canada	0	12	0.00032	0.00026	-0.00017	0.00078	0.00009	2.78000	0.01780 **
212	Mark Carney will become the new Bank of England Governor	United Kingdom	1	2	0.00002	0.00052	0.00051	0.00054	0.00002	34.03000	0.01870 **
248	RICS Housing Price Balance	United Kingdom	2	93	0.00090	-0.00018	-0.00617	0.00225	0.00009	-1.96000	0.05260 *

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 51 number of events which has an impact significantly to GBP-CAD. For 1 minute timeframe, there are 12 number of events; for 5 minutes timeframe, there are 15 number of events; For 15 minutes timeframe, there are 11 number of events; For 30 minutes timeframe, there are 13 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-CAD 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 4.5 Degrees of news impact have an effect on currency exchange for 1 minute timeframe of GBP-CAD

| | | | 1 Minute CAR[-1,+1] | | | | | |
| | | | Analysis Variable : car_ cadev | | | | | |
Degree	N Obs	N	Std Dev (%)	Mean (%)	Minimum	Maximum	t Value	Pr > |t|
0	244	244	0.000495	0.000025	-0.002722	0.001309	0.7900	0.4314
1	3522	3522	0.000628	0.000005	-0.005638	0.005357	0.4400	0.6585
2	3383	3383	0.000823	-0.000008	-0.008390	0.005710	-0.600	0.5512
3	1143	1143	0.000558	-0.000022	-0.006519	0.002617	-1.3500	0.1761

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-CAD shows only degree 1 impacts to currency exchange at significance level of 10%.

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

| 5 Minutes CAAR[-5,+5] | | | | | | | | |
| Analysis Variable : ar_ cad 5m | | | | | | | | |
Degree	N Obs	N	Std Dev (%)	Mean (%)	Minimum	Maximum	t Value	Pr > |t|
0	254	254	0.000676	-0.000028	-0.003423	0.002646	-0.6700	0.5043
1	3558	3558	0.000794	0.000024	-0.007453	0.007614	1.7800	0.0750 *
2	3425	3425	0.000915	0.000018	-0.006133	0.007614	1.1700	0.2432
3	1144	1144	0.000645	-0.000011	-0.005063	0.002724	-0.5700	0.5706

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-CAD shows only degree 3 impacts to currency exchange at significance level of 10%.

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

| 15 Minutes CAAR[-15,+15] | | | | | | | | |
| Analysis Variable : ar_ cad30m | | | | | | | | |
Degree	N Obs	N	Std Dev (%)	Mean (%)	Minimum	Maximum	t Value	Pr > |t|
0	254	254	0.001245	-0.000070	-0.006171	0.004254	-0.8900	0.3721
1	3558	3558	0.001218	0.000018	-0.011762	0.009658	0.8900	0.3724
2	3425	3425	0.001314	-0.000002	-0.007096	0.009658	-0.0900	0.9267
3	1144	1144	0.000974	-0.000050	-0.005281	0.004254	-1.7200	0.0855 *

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-CAD shows only degree 1 impacts to currency exchange at significance level of 5%.

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

30 Minutes CAAR[-30,+30]								
Analysis Variable : ar_ cad30m								
Degree	N Obs	N	Std Dev (%)	Mean (%)	Minimum	Maximum	T Value	Pr > |t|
0	254	254	0.001770	-0.000089	-0.008319	0.005565	-0.8100	0.4215
1	3558	3558	0.001725	0.000070	-0.012101	0.012845	2.4300	0.0152 **
2	3425	3425	0.001760	0.000025	-0.011019	0.012845	0.8200	0.4119
3	1144	1144	0.001456	-0.000069	-0.007512	0.006327	-1.600	0.1103

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 announcements are already absorbed by the investor before the announcement happens. For GBP-CAD, both 5 and 30 minutes timeframe have an impact significantly to currency exchange by degree 1 and a significantly impact for 15 minutes timeframe by degree 3.

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% and 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-CAD 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-CAD, 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-CAD

T-Tests					
Variable	**Method**	**Variances**	**DF**	**t Value**	**Pr > |t|**
CAR_CAD	**Pooled**	Equal	2208	0.7300	0.4666
CAR_CAD	**Satterthwaite**	Unequal	1434	0.900	0.3681

Equality of Variances					
Variable	**Method**	**Num DF**	**Den DF**	**F Value**	**Pr > F**
CAR_CAD	**Folded F**	1345	863	46.58	<.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_CAD	1-Single news	864	0.0000	0.0000	0.0001	0.0009	0.0009	0.0010	0.0000	-0.0170	0.0121
CAR_CAD	2-Multiple news	1346	-0.0005	-0.0001	0.0002	0.0061	0.0064	0.0066	0.0002	-0.1020	0.0743
CAR_CAD	Diff (1-2)		-0.0003	0.0002	0.0006	0.0048	0.0050	0.0051	0.0002		

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-CAD 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-CAD, 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 minutes timeframe of GBP-CAD

T-Tests					
Variable	**Method**	**Variances**	**DF**	**t Value**	**Pr > |t|**
CAR_CAD5m	Pooled	Equal	2209	0.6800	0.4992
CAR_CAD5m	Satterthwaite	Unequal	1500	0.8300	0.4066

Equality of Variances					
Variable	**Method**	**Num DF**	**Den DF**	**F Value**	**Pr > F**
CAR_CAD5m	Folded F	1346	863	26.67	<.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_CAD 5m	1-Single news	864	0.0000	0.0000	0.0001	0.0012	0.0012	0.0013	0.0000	-0.0200 0.0155
CAR_CAD 5m	2-Multiple news	1347	-0.0004	-0.0001	0.0002	0.0060	0.0062	0.0065	0.0002	-0.0930 0.0669
CAR_CAD 5m	Diff (1-2)		-0.0003	0.0001	0.0006	0.0048	0.0049	0.0051	0.0002	

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-CAD 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-CAD, 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 minutes timeframe of GBP-CAD

T-Tests					
Variable	**Method**	**Variances**	**DF**	**t Value**	**Pr > |t|**
CAR_CAD15m	Pooled	Equal	2209	0.8600	0.3881
CAR_CAD15m	Satterthwaite	Unequal	1548	1.0500	0.2917

Equality of Variances					
Variable	**Method**	**Num DF**	**Den DF**	**F Value**	**Pr > F**
CAR_CAD15m	Folded F	1346	863	20.19	<.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_CAD 15m	1-Single news	864	0.0000	0.0000	0.0001	0.0014	0.0014	0.0015	0.0000	-0.0200 0.0157
CAR_CAD 15m	2-Multiple news	1347	-0.0005	-0.0002	0.0002	0.0062	0.0064	0.0067	0.0002	-0.0940 0.0688
CAR_CAD 15m	Diff (1-2)		-0.0002	0.0002	0.0006	0.0050	0.0051	0.0053	0.0002	

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-CAD 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-CAD, 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 minutes timeframe of GBP-CAD

T-Tests					
Variable	**Method**	**Variances**	**DF**	**t Value**	**Pr > |t|**
CAR_CAD30m	**Pooled**	Equal	2209	0.52	0.605
CAR_CAD30m	**Satterthwaite**	Unequal	1659	0.62	0.5323
Equality of Variances					
Variable	**Method**	**Num DF**	**Den DF**	**F Value**	**Pr > F**
CAR_CAD 30m	**Folded F**	1346	863	12.63	<.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_CAD 30m	1-Single news	864	-0.0001	0.0000	0.0002	0.0018	0.0019	0.0020	0.0001	-0.0210	0.0161
CAR_CAD 30m	2-Multiple news	1347	-0.0004	-0.0001	0.0003	0.0064	0.0067	0.0070	0.0002	-0.0950	0.0698
CAR_CAD 30m	Diff (1-2)		-0.0003	0.0001	0.0006	0.0052	0.0054	0.0055	0.0002		

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% and 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% and 1%, as described on table 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-CAD

| | | | | 1 Minute CAR[-1,+1] | | | | |
| | | | | **GBP-CAD** | | | | |
Name	**Country**	**Degree**	**News Code**	**Pr > |t|**	**Min.Buy (minute)**	**Significant**	**Min.Sell (minute)**	**Significant**
Budget Report	United Kingdom	2	28	0.0765	-89	*	-6	**
Housing Starts s.a (YoY)	Canada	1	63	0.0458	-42	*	237	*
RBC Manufacturing PMI	Canada	2	110	0.0723	-75	*	4	**
BoC Senior Deputy Governor Speech	Canada	1	156	0.0970	-1	**	37	*
CB Leading Economic Index	United Kingdom	2	168	0.0037	-65	*	43	*
Good Friday	Canada	0	193	0.0018	-74	***	88	*
Labour Day	United Kingdom	0	204	0.0958	-25	*	24	***
Manufacturing Shipments (MoM)	Canada	1	210	0.0187	226	*	237	*
MPC Member Miles Speech	United Kingdom	2	216	0.0234	-52	*	-30	*
Victoria Day	Canada	0	258	0.0694	-43	*	-4	**

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. Budget Report is a news of United Kingdom, degree 2, our conclusion found an entry at 89 minutes before news announcement and exit time at 6 minutes before news announcement.

2. Housing Starts s.a (YoY) is a news of Canada, degree 1, our conclusion found an entry at 42 minutes before news announcement and exit time at 237 minutes after news announcement.

3. RBC Manufacturing PMI is a news of Canada, degree 2, our conclusion found an entry at 75 minutes before news announcement and exit time at 4 minutes after news announcement.

4. BoC Senior Deputy Governor Speech is a news of Canada, degree 1, our conclusion found an entry at 1 minutes before news announcement and exit time at 37 minutes after news announcement.

5. CB Leading Economic Index is a news of United Kingdom, degree 2, our conclusion found an entry at 65 minutes before news announcement and exit time at 43 minutes after news announcement.

6. Good Friday is a news of Canada, degree 0, our conclusion found an entry at 74 minutes before news announcement and exit time at 88 minutes after news announcement.

7. Labour Day is a news of United Kingdom, degree 0, our conclusion found an entry at 25 minutes before news announcement and exit time at 24 minutes after news announcement.

8. Manufacturing Shipments (MoM) is a news of Canada, degree 1, our conclusion found an entry at 226 minutes after news announcement and exit time at 237 minutes after news announcement.

9. MPC Member Miles Speech is a news of United Kingdom, degree 2, our conclusion found an entry at 52 minutes before news announcement and exit time at 30 minutes before news announcement.

10. Victoria Day is a news of Canada, degree 0, our conclusion found an entry at 43 minutes before news announcement and exit time at 4 minutes before news announcement.

11. Wholesale Sales (MoM) is a news of Canada, degree 0, our conclusion found an entry at 3 minutes before news announcement and exit time at 2 minutes before news announcement.

For 5 minutes timeframe, we also 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% 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% and 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 minutes timeframe of GBP-CAD

| | | | | 5 Minutes CAAR[-5,+5] | | | | |
| | | | | GBP- CAD | | | | |
Name	Country	Degree	News Code	Pr > |t|	Min.Buy (minute)	Significa nt	Min.Sell (minute)	Significa nt
Budget Report	United Kingdom	2	28	0.0973	-25	*	-10	**
Consumer Price Index - Core (MoM)	Canada	2	40	0.0957	25	**	80	*
Net Change in Employment	Canada	0	84	0.0397	20	*	240	**
Unemployment Rate	Canada	1	135	0.0397	20	*	240	**
BoE Quarterly Bulletin	United Kingdom	1	160	0.0957	-90	*	240	*
Good Friday	Canada	0	193	0.0105	-75	*	105	**

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. Budget Report is a news of United Kingdom, degree 2, our conclusion found an entry at 25 minutes before news announcement and exit time at 10 minutes before news announcement.

2. Consumer Price Index - Core (MoM) is a news of Canada, degree 2, our conclusion found an entry at 25 minutes after news announcement and exit time at 80 minutes after news announcement.

3. Net Change in Employment is a news of Canada, degree 0, our conclusion found an entry at 20 minutes after news announcement and exit time at 240 minutes after news announcement.

4. Unemployment Rate is a news of Canada, degree 1, our conclusion found an entry at 20 minutes after news announcement and exit time at 240 minutes after news announcement.

5. 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.

6. Good Friday is a news of Canada, degree 0, our conclusion found an entry at 75 minutes before news announcement and exit time at 105 minutes after news announcement.

For 15 minutes timeframe, we also 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% 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% and 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 minutes timeframe of GBP-CAD

| | 15 Minutes CAAR[-15,+15] | | | | | | | |
	GBP-CAD							
Name	**Country**	**Degree**	**News Code**	**Pr > |t|**	**Min.Buy (minute)**	**Significant**	**Min.Sell (minute)**	**Significant**
Net Change in Employment	Canada	0	84	0.0606	30	**	240	**
Unemployment Rate	Canada	1	135	0.0606	30	**	240	**
Mark Carney will become the new Bank of England Governor	United Kingdom	1	212	0.0578	-45	***	45	**

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.   Net Change in Employment is a news of Canada, degree 0, our conclusion found an entry at 30 minutes after news announcement and exit time at 240 minutes after news announcement.

2.   Unemployment Rate is a news of Canada, degree 1, our conclusion found an entry at 30 minutes after news announcement and exit time at 240 minutes after news announcement.

3.   Mark Carney will become the new Bank of England Governor is a news of United Kingdom, degree 1, our conclusion found an entry at 45 minutes before news announcement and exit time at 45 minutes after news announcement.

For 30 minutes timeframe, we also 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% 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% and 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 minutes timeframe of GBP-CAD

30 Minutes CAAR[-30,+30]								
GBP- CAD								
Name	**Country**	**Degree**	**News Code**	**Pr > |t|**	**Min.Buy (minute)**	**Significant**	**Min.Sell (minute)**	**Significant**
BBA Mortgage Approvals	United Kingdom	0	15	0.0308	60	*	240	***
Net Change in Employment	Canada	0	84	0.0399	60	**	240	**
Unemployment Rate	Canada	1	135	0.0399	60	**	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.　BBA Mortgage Approvals is a news of United Kingdom, degree 0, our conclusion found an entry at 60 minutes after news announcement and exit time at 240 minutes after news announcement.

　　　　2.　Net Change in Employment is a news of Canada, degree 0, our conclusion found an entry at 60 minutes after news announcement and exit time at 240 minutes after news announcement.

3. Unemployment Rate is a news of Canada, degree 1, our conclusion found an entry at 60 minutes after news announcement and exit time at 240 minutes after news announcement.

CHAPTER V
CONCLUSION

Of all 164 individual news announcements from GBP-CAD, there are 51 events which have a significant impact to its 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 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.

REFERENCES

Chen, Y.-L., & Gau, Y.-F. (2010). News Announcements and Price Discovery of FX Spot and Futures Markets. *Journal of Banking & Finance*. 34(7), 1628–1636.

Cotte, P., Galli, G., & Rebecchini, S. (1994). *Concerted interventions and the dollar an analysis of daily data*. Cambridge University Press, 201-239.

Danielsson, J., & Payne, R. (2002). Real trading patterns and prices in spot foreign exchange markets. *Journal of International Money and Finance*. 21(2), 203–222.

Dewachter, H., Erdemlioglu, D., Gnabo, J.-Y., & Lecourt, C. (2014). The intra-day impact of communication on euro-dollar volatility and jumps. *Journal of International Money and Finance*. 43(C), 131-154.

Diebold, S. A. M. W. B. F. X. (2001). Range-based estimator of stochastic volatility models. *Journal of Finance*. 57(3), 1047-1092.

Dominguez, K. M., & Frankel, J. (1993). Does Foreign Exchange Intervention Matter? *The Portfolio Effect. The American Economic Review*, 83(5), 1356-1369.

Égert, B., & Kočenda, E. (2014). The impact of macro news and central bank communication on emerging European forex markets. *Journal of Economic Literature*. 38(1), 73-88.

Fatum, R., & Hutchison, M. (2006). Effectiveness of official daily foreign exchange market intervention operations in Japan. *Journal of International Money and Finance*. 25(2), 199-219.

Floros, C. (2009). Modelling Volatility Using High, Low, Open and Closing Prices: Evidence from Four S&P Indices. *International Research Journal of Finance and Economics*. 28(1), 198-206.

Frenkel, M., Stadtmann, G., & Pierdzioch, C. (2001). *The Interventions of the European Central Bank Effects Effectiveness and Policy Implications. Paper provided by Deutsche Bank Research in its series Research Notes*.

Gilson, R. J., & Black, B. S. (1995). *The Law and Finance of Corporate Acquisitions*. Westbury, N.Y: Foundation Press..

Goodhart, C. A. E., & Payne, R. G. (1996). Microstructural Dynamics in a Foreign Exchange Electronic Broking System. *Journal of International Money and Finance*. 15(6), 829–852.

Humpage, O. F. (1999). US intervention assessing the probability of success. *Journal of Money, Credit and Banking*. 31(4), 732–747.

Kearns, J., & Manners, P. (2006). The impact of monetary policy on the exchange rate a study using intraday data. *Journal of Economic Literature*. 2(4), 157-183.

Klass, M. B. G. M. J. (1980). On the Estimation of Security Price Volatility from Historical Data. *Journal of Business*. 53(1), 67-78.

Lien, L. C. D. (2001). Using High, Low, Open and Closing Prices to Estimate the Effects of Cash Settlement on Futures Prices. *International Review of Financial Analysis*. 12(1), 35-47.

Mackinlay, A. C. (1997). Event Studies in Economics and Finance. *Journal of Economic Literature*. 35(1), 13–39.

Mcwilliams, A., & Siegel, D. (1997). Event studies in management research Theoretical and empirical issues. *Academy of Management Journal*. 40(3), 626-657.

Neely, C. J. (2011). A Survey of Announcement Effects on Foreign Exchange Volatility and Jumps. *Federal Reserve Bank of St. Louis Review*. 93(5), 361-407.

Omrane, W. B., Bauwens, L., & Giot, P. (2005). News announcement, market activity and volatility in the euro dollar foreign exchange market. *Journal of International Money and Finance*. 24(7), 1108-1125.

Parkinson, M. (2009). The Extreme Value Method for Estimating the Variance of the Rate of Return. *Journal of Business*. 53(1), 61-65.

Rosa, C. (2011). The high-frequency response of exchange rates to monetary policy actions and statements. *Journal of Banking & Finance*. 35(2), 478-489.

Satchell, L. C. G. R. S. E. (1991). Estimating variance from high, low, and closing prices. *Annals of Applied Probability*. 1, 50–512.

Tauchen, A. R. G. C.-T. H. G. (1999). Using daily range data to calibrate volatility diffusion and extract the forward integrated variance. *The review of economics and statistics*. 81(4), 617-631.

Yoon, L. C. G. R. S. E. S. Y. (1994). Estimating the volatility of stock prices: a comparison of methods that use high and low prices. *Applied Financial Economics*. 4, 241–247.

Zhang, D. Y. Q. (2000). Drift-Independent Volatility Estimation Based on High, Low, Open, and Close Prices. *Journal of Business*. 73(3), 477-491.

APPENDICES
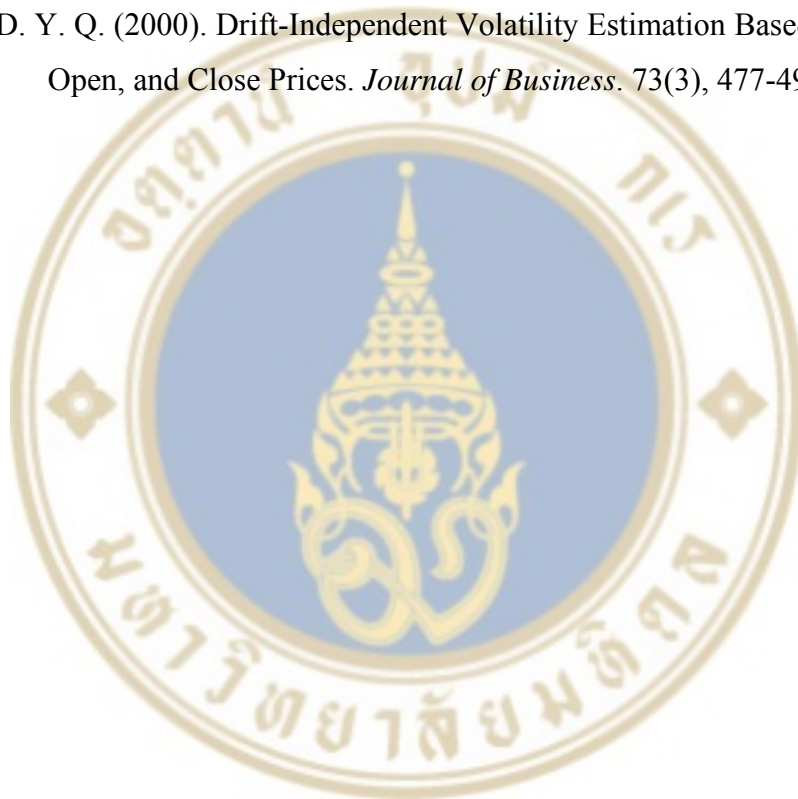
Appendix A: Define News Announcement Code

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
76	Manufacturing Production (YoY)	United Kingdom	0
77	Markit Manufacturing PMI	United Kingdom	2

| Code	Name	Country	Degree
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
195	Government spending review	United Kingdom	2
196	Halifax House Prices (3m/YoY)	United Kingdom	1
197	Halifax House Prices (MoM)	United Kingdom	1

Code	Name	Country	Degree
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

Country Change to Candada

Code	Name	Country	Degree
8	Bank of Canada Business Outlook Survey	Canada	2
9	Bank of Canada Consumer Price Index Core (MoM)	Canada	1
10	Bank of Canada Consumer Price Index Core (YoY)	Canada	0
11	Bank of Canada Monetary Policy Report	Canada	2
16	BoC Governor Poloz Speech	Canada	3
17	BoC Interest Rate Decision	Canada	0
18	BoC Press Conference	Canada	3
19	BOC Rate Statement	Canada	3
20	BoC Review	Canada	1
29	Building Permits (MoM)	Canada	0
40	Consumer Price Index - Core (MoM)	Canada	2
43	Consumer Price Index (YoY)	Canada	2
55	Gross Domestic Product (MoM)	Canada	2
58	Gross Domestic Product Annualized (QoQ)	Canada	0
63	Housing Starts s.a (YoY)	Canada	1
67	Industrial Product Price (MoM)	Canada	2
72	Ivey Purchasing Managers Index	Canada	2
73	Ivey Purchasing Managers Index s.a	Canada	1
84	Net Change in Employment	Canada	0
86	New Housing Price Index (MoM)	Canada	2
87	New Housing Price Index (YoY)	Canada	1
89	Participation rate	Canada	1
97	Raw Material Price Index	Canada	0
110	RBC Manufacturing PMI	Canada	2
120	Retail Sales (MoM)	Canada	2
122	Retail Sales ex Autos (MoM)	Canada	0
135	Unemployment Rate	Canada	1
153	BoC Gov Council Member Lane Speech	Canada	1
154	BoC Governor Council Member Cote Speech	Canada	2
155	BoC Governor Mark Carney Speech	Canada	2
156	BoC Senior Deputy Governor Tiff Macklem Speech	Canada	1
162	Boxing Day	Canada	0
165	Canada Day	Canada	0
166	Canadian portfolio investment in foreign securities	Canada	1
167	Capacity Utilization	Canada	0
180	Daylight Saving Time	Canada	0
182	DO NOT INCLUDE - New Housing Price Index (YoY)	Canada	1
187	Family Day	Canada	0
191	Foreign portfolio investment in Canadian securities	Canada	0
193	Good Friday	Canada	0

Code	Name	Country	Degree
200	International Merchandise Trade	Canada	0
201	Labor Productivity (QoQ)	Canada	1
205	Leading Indicators (MoM)	Canada	1
210	Manufacturing Shipments (MoM)	Canada	1
223	New Motor Vehicle Sales (MoM)	Canada	0
225	New Year's Day	Canada	0
246	Remembrance Day	Canada	0
257	Thanksgiving Day	Canada	0
258	Victoria Day	Canada	0
261	Wholesale Sales (MoM)	Canada	0
264	Consumer Price Index (MoM)	Canada	2
281	Christmas Day	Canada	0
285	Easter Monday	Canada	0
290	Labour Day	Canada	0
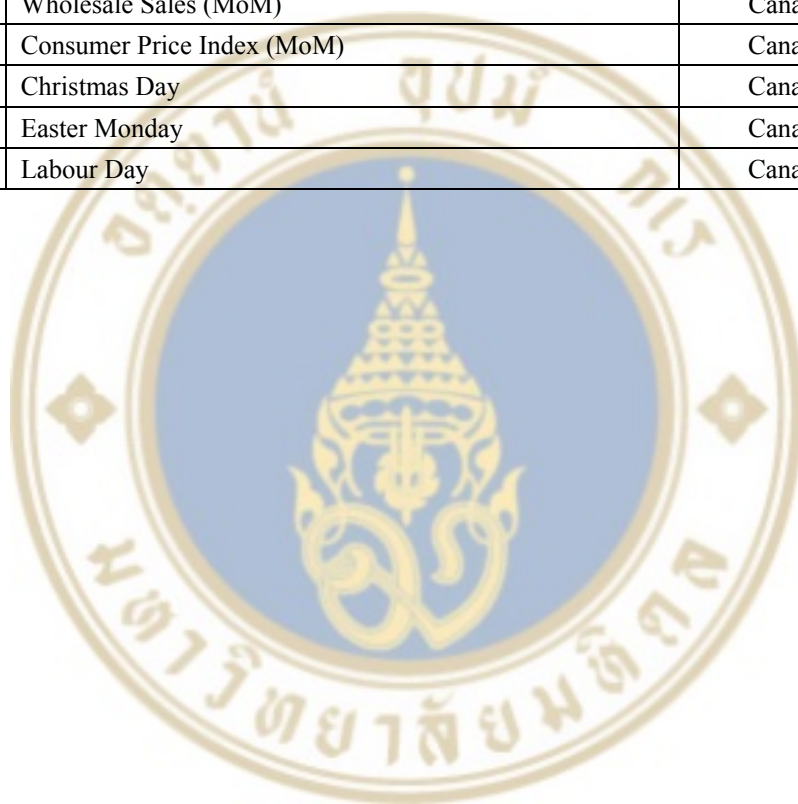
Appendix B: Volatility Methodology

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: $V_{S,t} = \ln(H_t) - in(L_t)_t$. 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): $V_{GK,t} = \frac{1}{2}[\ln(H_t) - \ln(L_t)]^2 - [2\ln2-1][\ln(C_t) - \ln(O_t)]^2$ According to Lien (2001), Model 2 and 3 are unbiased when the sample data are continuously observed with VGK,t being more efficient than $V_{P,t}$

4. When drift term is not zero, neither model 2 nor 3 are 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] ≠ 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] ≠ 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 B-1 and B-2, represents only specific news announcements that have a significant impact to the currency exchange. For GBP-CAD, out of 153 final events, there are 40 events (26.14%) which have a significance level of 0.01 impact to its currency exchange.

The news announcement which have significant impact to GBP-CAD

Analysis Variable : cas_cadev

Event Name	Country	evtcode	N	Std Dev	Mean	Minimum	Maximum	t Value	Pr > |t|
Average Earnings excluding Bonus (3Mo/Yr)	United Kingdom	6	92	0.0000005	0.0000003	-0.0000008	0.0000029	4.81	<.0001
Average Earnings including Bonus (3Mo/Yr)	United Kingdom	7	92	0.0000005	0.0000003	-0.0000008	0.0000029	4.81	<.0001
Bank of England Minutes	United Kingdom	12	92	0.0000005	0.0000002	-0.0000008	0.0000034	3.15	0.0022
BBA Mortgage Approvals	United Kingdom	15	91	0.0000005	0.0000002	-0.0000014	0.0000024	3.29	0.0014
BoE Asset Purchase Facility	United Kingdom	21	50	0.0000001	0.0000001	-0.0000001	0.0000006	3.65	0.0006
BoE Interest Rate Decision	United Kingdom	22	92	0.0000002	0.0000001	-0.0000010	0.0000011	4.36	<.0001
CBI Distributive Trades Survey - Realized (MoM)	United Kingdom	34	93	0.0000006	0.0000002	-0.0000016	0.0000040	3.72	0.0003
Claimant Count Change	United Kingdom	35	92	0.0000005	0.0000003	-0.0000008	0.0000029	4.81	<.0001
Claimant Count Rate	United Kingdom	36	92	0.0000005	0.0000003	-0.0000008	0.0000029	4.81	<.0001
Consumer Price Index - Core (MoM)	Canada	40	39	0.0000000	0.0000000	-0.0000001	0.0000001	-3.64	0.0008
Consumer Price Index (MoM)	United Kingdom	41	184	0.0000003	0.0000001	-0.0000012	0.0000023	4.38	<.0001
Consumer Price Index (YoY)	United Kingdom	43	184	0.0000003	0.0000001	-0.0000012	0.0000023	4.38	<.0001
Core Consumer Price Index (YoY)	United Kingdom	44	92	0.0000004	0.0000002	-0.0000004	0.0000023	4.94	<.0001
Gross Domestic Product (MoM)	Canada	55	92	0.0000001	-0.0000001	-0.0000007	0.0000001	-4.69	<.0001
Gross Domestic Product (QoQ)	United Kingdom	56	92	0.0000008	0.0000003	-0.0000008	0.0000047	3.35	0.0012
Gross Domestic Product (YoY)	United Kingdom	57	92	0.0000008	0.0000003	-0.0000008	0.0000047	3.38	0.0011
ILO Unemployment Rate (3M)	United Kingdom	64	92	0.0000005	0.0000003	-0.0000008	0.0000029	4.81	<.0001
Index of Services (3M/3M)	United Kingdom	66	92	0.0000007	0.0000003	-0.0000008	0.0000033	4.2	<.0001
M4 Money Supply (MoM)	United Kingdom	74	128	0.0000005	0.0000001	-0.0000006	0.0000029	3.57	0.0005
Markit Manufacturing PMI	United Kingdom	77	92	0.0000005	0.0000001	-0.0000009	0.0000029	2.83	0.0058

Analysis Variable : cas_cadev

Event Name	Country	evtcode	N	Std Dev	Mean	Minimum	Maximum	t Value	Pr > |t|
Markit Services PMI	United Kingdom	78	93	0.0000005	0.0000001	-0.0000009	0.0000027	2.82	0.0059
Mortgage Approvals	United Kingdom	80	105	0.0000004	0.0000001	-0.0000006	0.0000029	2.89	0.0046
PPI Core Output (YoY) n.s.a	United Kingdom	91	41	0.0000010	0.0000005	-0.0000004	0.0000056	3.11	0.0034
Producer Price Index - Output (MoM) n.s.a	United Kingdom	94	89	0.0000012	0.0000004	-0.0000011	0.0000065	3.33	0.0013
Producer Price Index - Output (YoY) n.s.a	United Kingdom	95	89	0.0000012	0.0000004	-0.0000011	0.0000065	3.33	0.0013
Public Sector Net Borrowing	United Kingdom	96	92	0.0000008	0.0000003	-0.0000011	0.0000051	3.37	0.0011
Retail Price Index (MoM)	United Kingdom	118	92	0.0000004	0.0000002	-0.0000004	0.0000023	4.94	<.0001
Retail Price Index (YoY)	United Kingdom	119	92	0.0000004	0.0000002	-0.0000004	0.0000023	4.94	<.0001
Retail Sales (MoM)	Canada	120	184	0.0000005	0.0000001	-0.0000006	0.0000037	3.45	0.0007
Retail Sales (YoY)	United Kingdom	121	92	0.0000006	0.0000002	-0.0000006	0.0000037	3.87	0.0002
Retail Sales ex-Fuel (MoM)	United Kingdom	124	50	0.0000003	0.0000001	-0.0000006	0.0000009	3.29	0.0019
Retail Sales ex-Fuel (YoY)	United Kingdom	125	50	0.0000003	0.0000001	-0.0000006	0.0000009	3.47	0.0011
Total Business Investment (QoQ)	United Kingdom	128	59	0.0000009	0.0000004	-0.0000014	0.0000047	3.09	0.003
Total Business Investment (YoY)	United Kingdom	129	59	0.0000009	0.0000004	-0.0000014	0.0000047	3.1	0.003
CBI Industrial Trends Survey - Orders (MoM)	United Kingdom	169	92	0.0000004	0.0000002	-0.0000006	0.0000019	5.27	<.0001
DCLG House Price Index (YoY)	United Kingdom	181	88	0.0000005	0.0000002	-0.0000008	0.0000036	3.71	0.0004
M4 Money Supply (YoY)	United Kingdom	207	126	0.0000005	0.0000001	-0.0000006	0.0000029	3.62	0.0004
PPI Core Output (MoM) n.s.a	United Kingdom	231	42	0.0000010	0.0000005	-0.0000004	0.0000056	3.17	0.0029
Producer Price Index - Input (MoM) n.s.a	United Kingdom	233	89	0.0000012	0.0000004	-0.0000011	0.0000065	3.33	0.0013
Producer Price Index - Input (YoY) n.s.a	United Kingdom	235	89	0.0000012	0.0000004	-0.0000011	0.0000065	3.33	0.0013

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

Event Name	Country	Degree
Average Earnings excluding Bonus (3Mo/Yr)	United Kingdom	2
Average Earnings including Bonus (3Mo/Yr)	United Kingdom	2
Bank of England Minutes	United Kingdom	2
BBA Mortgage Approvals	United Kingdom	0
BoE Asset Purchase Facility	United Kingdom	3
BoE Interest Rate Decision	United Kingdom	0
CBI Distributive Trades Survey - Realized (MoM)	United Kingdom	1
Claimant Count Change	United Kingdom	1
Claimant Count Rate	United Kingdom	2
Consumer Price Index - Core (MoM)	Canada	2
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 (MoM)	Canada	2
Gross Domestic Product (QoQ)	United Kingdom	2
Gross Domestic Product (YoY)	United Kingdom	2
ILO Unemployment Rate (3M)	United Kingdom	0
Index of Services (3M/3M)	United Kingdom	1
M4 Money Supply (MoM)	United Kingdom	1
Markit Manufacturing PMI	United Kingdom	2
Markit Services PMI	United Kingdom	2
Mortgage Approvals	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
Public Sector Net Borrowing	United Kingdom	0
Retail Price Index (MoM)	United Kingdom	2
Retail Price Index (YoY)	United Kingdom	2

Event Name	Country	Degree
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
Total Business Investment (QoQ)	United Kingdom	2
Total Business Investment (YoY)	United Kingdom	0
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 Type of news classified by t-value for GBP-CAD presents the result of regression analysis and explains a magnitude impact to currency exchange by each degree of news

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

Analysis Variable : cas_cadev						
Degree	N	Std Dev	Mean	Minimum	Maximum	t Value	Pr > |t|
0	244	0.0000004	0.0000001	-0.0000008	0.0000029	3.27	0.0012
1	3522	0.0000005	0.0000001	-0.0000016	0.0000083	13.26	<.0001
2	3383	0.0000009	0.0000002	-0.0000013	0.0000144	11.63	<.0001
3	1143	0.0000005	0.0000001	-0.0000011	0.0000074	8.53	<.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.

For the result of GBP-CAD, it shows independent t-test is a significant level of 0.01 on Satterthwaite t-test and mean value for single news announcements is greater than its value for multiple news announcements (0.0005 > -0.003).

Independent t-test value for GBP-CAD

		T-Tests			
Variable	**Method**	**Variances**	**DF**	**t Value**	**Pr > |t|**
CAR_sCAD	**Pooled**	Equal	2208	3.05	0.0023
CAR_sCAD	**Satterthwaite**	Unequal	1439	3.77	0.0002

Mean value for GBP-CAD

						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 CAD	1	864	0.00020	0.0005	0.00090	0.00520	0.00540	0.00570	0.00020	-0.0040	0.14000
CAR_s CAD	2	1346	-0.00300	-0.0030	-0.00100	0.03440	0.03570	0.03720	0.00100	-0.5960	0.18810
CAR_s CAD	Diff (1-2)		0.00370	0.0037	0.00610	0.02730	0.02810	0.02900	0.00120		

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 0.05 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 64 for summary of entry and exit for individual currency exchange with 1 minute data. GBP-CAD found an entry at 5 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-CAD	-5	+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-CAD found an entry at 10 minutes before news announcement and exit time at 190 minutes after news announcement.

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

	10 Minutes Interval	
Currency	**Buy**	**Sell**
GBP-CAD	+10	*+190*

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-CAD of currency exchange are listed below:

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

			1 Min		10 Mins	
Event Name	**Country**	**Degree**	**Buy**	**Sell**	**Buy**	**Sell**
Average Earnings excluding Bonus (3Mo/Yr)	United Kingdom	2	+1	+120	+10	+190
Average Earnings including Bonus (3Mo/Yr)	United Kingdom	2	+1	+120	+10	+190
Bank of England Minutes	United Kingdom	2	+3	+120	+10	+190
BBA Mortgage Approvals	United Kingdom	0	+1	+120	+10	+170
BoE Asset Purchase Facility	United Kingdom	3	-96	-1	-60	-1
BoE Interest Rate Decision	United Kingdom	0	-120	-1	-70	-120
CBI Distributive Trades Survey - Realized (MoM)	United Kingdom	1	-1	+1	-60	+1
Claimant Count Change	United Kingdom	1	+1	+120	+10	+190
Claimant Count Rate	United Kingdom	2	+1	+120	+10	+190
Consumer Price Index - Core (MoM)	Canada	2	-120	-82	-90	-82
Consumer Price Index (YoY)	United Kingdom	2	-1	+1	-60	+1
Core Consumer Price Index (YoY)	United Kingdom	2	-1	+120	-60	+170
Gross Domestic Product (MoM)	Canada	2	-120	-60	-80	-60
Gross Domestic Product (YoY)	United Kingdom	2	-61	+120	+10	+240
ILO Unemployment Rate (3M)	United Kingdom	0	+1	+120	+10	+190
Index of Services (3M/3M)	United Kingdom	1	-1	+120	-60	+230
M4 Money Supply (MoM)	United Kingdom	1	+1	+120	+10	+250
Markit Manufacturing PMI	United Kingdom	2	-1	+120	-60	+230
Markit Services PMI	United Kingdom	2	+1	+120	+10	+180
Mortgage Approvals	United Kingdom	1	-60	+120	+10	+210
PPI Core Output (YoY) n.s.a	United Kingdom	2	-1	+120	-60	+120
Producer Price Index - Output (MoM) n.s.a	United Kingdom	2	-1	+32	-60	+32
Public Sector Net Borrowing	United Kingdom	0	+1	+120	+10	+130
Retail Price Index (YoY)	United Kingdom	2	-1	+120	-60	+170
Retail Sales (MoM)	United Kingdom	2	-60	+6	-	+6
Retail Sales (YoY)	United Kingdom	2	-61	+120	+10	+240
Retail Sales ex-Fuel (YoY)	United Kingdom	2	-61	-	-	-
Total Business Investment (QoQ)	United Kingdom	2	+1	-	-	-
CBI Industrial Trends Survey - Orders (MoM)	United Kingdom	1	-1	+5	-60	+5
DCLG House Price Index (YoY)	United Kingdom	1	-1	+120	-60	+150

GBP-CAD						
Event Name	**Country**	**Degree**	**1 Min**		**10 Mins**	
			Buy	**Sell**	**Buy**	**Sell**
M4 Money Supply (YoY)	United Kingdom	0	+1	+120	+10	+250
PPI Core Output (MoM) n.s.a	United Kingdom	1	-1	+120	-60	+150
Producer Price Index - Input (MoM) n.s.a	United Kingdom	2	-1	+32	-60	+32

Conclusion of Cumulative Abnormal Volatility (CAV)

Of all 164 individual news announcements from GBP-CAD, there are 40 events with 99% significant level e.g. Unemployment rate, service PMI, etc.

Based on our assumption, all 4 degrees (0, 1, 2, 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-CAD rejects null hypothesis at 99% significant level for all degree.

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-CAD is greater magnitude impacted by single news announcement than by multiple news announcements.

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-CAD has best buy position at 5 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-CAD has best buy position at 10 minutes before news announcement and best sell at 190 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-CAD has best buy position at 10 minutes before news announcement and best sell position at 270 minutes after news announcement.