UNIVERSITY OF VAASA

FACULTY OF BUSINESS STUDIES

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Are foreign exchange rates only affected by U.S. and domestic news?

Master's Thesis in
Accounting and Finance

VAASA 2017

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UNIVERSITY OF VAASA

Faculty of Business Studies

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Department:	Department of Accounting and Finance
Master's Programme:	Master's Degree Programme in Finance
Year of Entering the University	2012
Year of Completing the Thesis	2017 Pages: 76

ABSTRACT

The purpose of this paper is to determine whether foreign exchange rates are affected by macroeconomic announcements from economies other than Unites States and homelands. The motivation is the economical interaction increase in current globalization trend, while most previous literatures focus on the influence of domestic economic information and the international influence of Unites States on the foreign exchange market.

This paper investigates respectively the responses of seven major currencies (EUR/USD, GBP/USD, USD/JPY, USD/CHF, USD/CAD, AUD/USD and NZD/USD) to macroeconomic announcements (Gross Domestic Product, Consumer Price Index and Unemployment Rate) from eight corresponding economies United States, Euro Zone, United Kingdom, Japan, Switzerland, Canada, Australia and New Zealand. The period covers from 1st January 2011 to 31st December 2015.

Evidences of the responses of exchange rates and trading volumes are provided in this paper. Firstly, most but not all foreign exchange rates are affected by U.S. and domestic macroeconomic announcements. Secondly, the foreign exchange rates are affected also by macroeconomic announcements from economies other than United States and homeland. Thirdly, the trading volumes emerge the peak effects around the release time of certain announcements, but the quantitative analysis cannot provide meaningful evidences.

KEYWORDS :

Macroeconomic Anncouncement, Exchange Rates, Trading Volume, Economies

1. INTRODUCTION

The foreign exchange market is the most dynamic investment market in the world. On one hand, for speculators, the foreign exchange market is massive, most liquid, low cost, whenever and wherever. On the other hand, for business managers, more and more business makes the analysis and predicts on the trend of the foreign exchange rate because their business develops in the international market, even not, they still can't avoid the international economic influence because of their clients, suppliers, regional politics, government monetary policy and so on. Globalization is not only a hot economic topic and it is already the most normal reality, no one can be out of it. Due to this globalization, the economical interaction among all countries become stronger and stronger regardless of countries' government policies, economic strategies, international trade and so on. It makes the co-movement of currencies become strong and clear.

In 2008, the financial crisis of United States spreads to every corner of the world, from Untied States, to Canada, Europe, Japan, China, everywhere. It stormed from the bonds market, equity market, currencies market to international trade, local business markets. The contagion effect wakes up all of us to see cruelty and clearly the close integration between different economies. Many researches in recent years are concerning this contagion effect especially about the U.S. financial crisis 2008, such as Dungey and Gajurel (2015), Ozkan and Unsal (2012) and Kilic et al. (2014).

About the contagion effect, European debt crisis, Asian crisis and other economic information also are researched in previous literature, such as Shen et al. (2015), Kogid et al. (2009), Ghorbel and Boujelbene (2013). Investors are aware that in the past time, many pieces of economic information especially international economic information had been ignored to make their investing decisions. Participators in the financial market should not only pay attentions on single information but also take multiple and multinational

information in consideration. At the same time, due to the fast technical development on internet, online services, big data solution, the international economic information are opened for all people, while the area difference, information cost, professional network could be ignored if you can find a computer and internet. Investors have to rethink which factors they should consider for their decisions, and what factors they must think additionally.

1.1 Purpose of the study

This paper aims to study the empirical relationship between international macroeconomic announcements surprises and the foreign exchange rates. It examines separately the response of the exchange rates and the trading volumes of seven major currency pairs to the macroeconomic news from eight related economies. Seven major currencies are EUR/USD, GBP/USD, USD/JPY, USD/CHF, USD/CAD, AUD/USD and NZD/USD, the macroeconomic announcements are Gross Domestic Product (GDP), Consumer Price Index (CPI) and Unemployment Rate, and the observed economics are correlated with the currency pairs above: United States, Euro Zone, United Kingdom, Japan, Switzerland, Canada, Australia and New Zealand.

The study contains the empirical regressions on 168 separate relationships: 24 independence variable objects (News surprises) and 7 dependence variable objects (currencies' exchange rates and trading volumes). Some of these relationships concerting the response of a single currency to U.S. or domestic news had been already studied in previous research, such as Kim (1998) and Kim (1999) for USD/AUD, Coleman and Karagedikli (2008) for NZD/USD, Haldane and Read (1999) for GBP/USD and so on.

Two major contributions of my paper can be summarized as follow. Firstly, this paper considers the application change of currency theories in the current globalization environment by using the present data (2011 -2015), and tries to provide the relationship

which is more applicable in current foreign exchange market. Secondly, in previous literature, the examined objects of dependence variables and independence variables are never both more than two at the same time, while my paper provides a more comprehensive analysis for the cross-countries effects of eight economies' news separately on seven major currencies. It gives additional valid information to be considered for invest decisions. And also, the magnitude of different news' impact, different economies' power lever for the same news, and the sensitive degree of different currencies rates are compared.

In addition, to verify the results, this paper analyzes also the response of trading volumes to all observed announcements, and tries to observe the trading behavior of participators in the foreign exchange market. The other evidences from the peak test support again the above statements, though there are not meaningful evidences provided by the regression results of trading volume changes against the surprises of macroeconomic announcements.

Moreover, technically, in data processing step, this paper collects corresponding values from high-frequency data, and runs 338 separate regressions, the searching function VLOOKUP in Excel and the command programming in Eviews are applied in the study.

1.2 Research hypotheses

The hypotheses are always around one question: are the foreign exchange rates affected only by U.S. and domestic announcements? Some related researches could be found in literature. Laakkonen (2007) studies the impact of macroeconomic announcements from four economies on the exchange rate volatility of USD/EUR. (See more detail in Section 3). My study extends examined objects one hand from one currency to seven currencies, one the other hand the news from four economies to eight. The major hypothesis below is used separately for each of seven observed currency pairs:

H0: The exchange rates of each currency pair are not affected by economies' macroeconomic news other than U.S. and domestic news.

H1: The exchange rates of each currency pairs are affected by economies' macroeconomic news other than U.S. and domestic news.

Additionally, though the responses of the foreign exchange rates to U.S. and domestic announcements had been studied in previous literature studies, considering the economic environment change, by using present data, the relationship between the foreign exchange rates and U.S. and domestic announcements is also studied. The effect of U.S. and domestic announcements on the foreign exchange rate is studied by Vrugt (2010). He analyzes the response of the exchange rates of USD/EUR, USD/JPY, USD/GBP and USD/CAD to 50 key announcements (U.S. and domestic news) over the period 1996-2009 on. His results suggest that for the relationship of macroeconomic announcements and foreign exchange rates, it is not only U.S. new that matters but also no-U.S. news (domestic news) is equally matter. My paper extends Vrugt (2010) to use the present data (2011- 2015) instead of 1996-2009 and high-frequency data (by 5 minutes) instead of daily price. Other hypotheses are examined below

The second hypothesis relating to the effect of U.S. news is:

H2: The exchange rates of seven major currencies are all affected by U.S. macroeconomic news.

The third hypothesis relating to the effect of domestic news is:

H3: The exchange rates of seven major currencies are all affected by domestic macroeconomic news.

To examine these three hypotheses, the responses of exchange rates and the behavior of trading volumes are both researched. According the efficient market hypothesis and Asymmetric information theory, after the release time of an announcement which is valid information, the exchange rates will digest the information in their values in very short time, and the trading volume of related currency pairs will emerge the peak effect around this release time.

1.3 Structure of the thesis

The rest of this paper is organized as follows. Section 2 gives a literature review. Section 3 illustrates the data set, and data treatment process. Section 4 analyzes the effect of macroeconomic announcements surprises on the changes of exchange rates. Section 5 analyzes the effect of these announcements surprises on the changes of trading volumes of same currency pairs. Section 6 concludes.

2. THEORY AND CURRENY FOUDAMENTALS

This paper investigates the empirical relationship between the international macroeconomic surprises and major foreign exchange rates. To explain well this relationship, this section describe shortly the foundamentals and the theories related to currencies, macroeconomic new and their relationship.

2.1 The fundamentals of foreign exchange rate

Purchasing Power Parity (PPP)

The theory Purchasing Power Party (PPP) states that in the case of international trade balance, the exchange rates between two countries tends to move close to purchasing power parity. The concept illustrates that the exchange rate of two currencies is determined by the ratio between their purchasing power per unit of currency, and is used to compare the living standards between different countries. (Krugman, et al. 2015: 200). The version of PPP is calculated below: （Investopedia, 2016）

(1) $S = P1/ P2$

S represents exchange rate of Currency 1 to Currency 2. P1 represents the cost of good ‘x’ in currency1, and P2 represents the cost of good ‘x’ in currency 2.

The law of One Price (LoP)

The Lop theory points out that a good must sell with the same price in all locations. (Mankiw 2016 :384). The LoP theory constitues the basis of the theory of Purchasing Power Parity. It is the economic thory that the price of a given security, due to the arbitrage

opportunities, commodity or asset has the same price when exchange rates are taken in consideration.

With the LoP theory, one country's goods can be divided into two categories: one is tradable goods, which means through the arbitrage activities to eliminate inter-regional price differences between the goods; the other is non-tradable goods, the goods' interregional price differences can't be eliminated by arbitrage activities. In the other word, if the transaction costs and other factors are ignored, the prices of a commodity in different countries are same if they are measured with the same currency. Expressed by the formula as below: (Mankiw 2016 :385)

(2) $P = e * P'$

P represents the domestic price, P' represents the foreign prices, and e represents the spot price of the exchange rate.

Uncovered Interest Rate Parity (UIP)

The Uncovered Interest Rate Parity (UIP) refers that in the condition that the capital has perfect international mobility, arbitrage investors make the return of silimar assets donominated in diffferent currencies tend to same in the international financial market. The arbitrage of capital's international mobility guarantees the application of the LOP in the internaitonal market. Uncovered Interest Rate Parity gives a link between interest rates (the interest rate in one county $i_{\$}$ and the interest rate in another country i_c , the spot exchange rate S_t, and the expected future exchange rate $E_t (S_{t+k})$. (Schmitt-Grohe and Uribe 2008:156)

(3) $1+ i_{\$} = E_t (S_{t+k})/S_t * (1 + i_c)$

The UIP theory is based on the assumption that investors are risk neutral and they care only about expected returns.

The theories above are applied based on the certain assumptions. The PPP theory assumes that trade barriers and non-tradable factors are ignored, and the effect of capital mobility in the international market on the foreign exchange rate is also ignored. The application of the LOP theory assumes that the exchange of capital, goods services and assets are freedom; the information is fully open, the information cost, the tariff and trade barrier are ignored. The UIP assumes that capital has perfect mobility and assets have perfect substitutability.

2.2 Efficient Market Hypothesis (EMH)

Efficient Market Hypothesis is referred and redeveloped by Fama (1970). The definitional statement that in an efficient market prices "fully reflect" available information is so general that it has on empirically testable implications. In his paper, there are three common forms in which the efficient-market hypothesis is commonly stated as below:

Weak Form efficiency

In weak form efficiency, current price reflects all historical price information, such as historical deal prices, trading volumes. Technical analysis will not be able to produce excess return, while some fundamental analysis could be able to provide it.

Semi-strong form efficiency

In semi-strong form efficiency, current price reflects all published information concerning the business expectation, such the share prices, stock trading volumes, profitable situation. Technical analysis and fundamental analysis both will not be able to provide excess return, while only straight tips may bring excess return.

Strong form efficiency

In strong form efficiency, current price reflects all business information of a company, regardless public information or inside information. There is no way for investors to get excess return.

Efficient Market Hypothesis based on the assumption of perfect market: no market friction, all assets could be separated and sold; price is completely agreed by all participated in the market; information cost is zero; all market participators intelligent.

The EMH theory is applied not only in the stock anyalsis as Fama (1970), but also in the foreign exchange market. Nguyen (2004) analyses the the applicability of the efficient market hypothesis to the foreign exchange rate by testing the profitablility of the filter rule on the spot market, and his result conclude that the EMH is valid in the foreign exchange market.

2.3 Arbitrage Pricing Theory (APT)

The Arbitrage Pricing Theory is proposed by Ross (1976), states that asset pricing that holds that the expected return of a financial asset can be modeled as a linear function of various macro-economic factors or theoretical market indices, where the sensitivity of chenges in each factor is represented by a factor-specific beta coefficients. The factor Model is below :

$$(4) \quad r_i = E(r_i) + \sum_{j=1}^{k} \beta_{ij} * F_j + \epsilon_{i,j}$$

ri is the return of the asset i. E (ri) is the expect return of the asset i. β i,j is factor sensitivity. Fi is surprise in macro-economic factors.

For the application of Arbitrage Pricing Theory in the foreign exchange marekt, McGowan Jr and Tandon (1989) test the cross-sectional robustness of the APT model using foreign exchange rate data, and found the APT model is robust across sample and techniques. Their founding support the medology of my paper on the effect of macroeconomic annoucments on the exchange rates.

3 LITERATURE REVIEW

Purchasing Power Parity (PPP) and Uncovered Interest Rate Parity (UIP) points out the relationship between the currency rates and macroeconomic situation. Based this relationship, a series of studies investigated the reaction of one currency's exchange rates around the release time the U.S. or domestic macroeconomic announcements. The methodologies are based on the theory Efficient Market Hypothesis (EMH). They interpret the trading is from the information asymmetry, and at every time point, the market has digested all the latest news that can be obtained and included it in stock prices or other speculative prices. The effects of macroeconomic news on the foreign exchange market have received considerable attentions in previous literature. This section sums up separately responses of different currencies to macroeconomic news in previous researches as below:

USD/AUD

Kim (1998) examines the effects of scheduled macroeconomic announcements from Australia and United States on USD/AUD exchange rate changes. His result provides evidences that unexpected Australian GDP surprises affect the value of AUD as well as its volatility, while US announcement shows significant effects on the value of AUD in the next calendar day's Australian trading. Subsequently, Kim (1999) studies the role of Australian macroeconomic announcement on five major Australian dollar (AUD) exchange rates, and proved the existence and the nature of the Australian news effects in the conditional mean and variance of the changes.

NZD/USD

Coleman and Karagedikli (2008) examine the relative size of New Zealand monetary policy and economic data surprises on the New Zealand exchange rates and interest rates, and provide evidences that the spot exchange rate of New Zealand responds by local

macroeconomic announcements surprises: Gross Domestic Product (GDP), the Consumer Price Index (CPI).

JPY/USD

Ito and Roley (1987) examine the relation between the movement of JPY/USD and the News from US and Japan, and find that the relative effects of news from both U.S. and Japan were examined with respect to possible major events behind large jumps and the response of the JPY/USD rate to particular economic announcement in both countries. While Hashimoto and Ito (2010) examine the effects of Japanese macroeconomic announcements on the USD/JPY exchange rates, and find that Tankan (business condition survey conducted by Bank of Japan), GDP, industrial production, price indices and balance of payment have significant effects on the USD/JPY exchange rates and most effects last in 30 minutes of statistic announcements. Later, Kim et al. (2004) investigate the impact of scheduled government announcements (nominal foreign international trade balance, gross domestic product, unemployment rate, retail sales growth, consumer price index, and producer price index) on the risk and return of three major US financial markets. Gross domestic product and retail sales were significant on the JPY/USD exchange rate returns. The results suggest that macroeconomic indicator news may be significant for the foreign exchange market.

EUR/USD

Glati et al. (2003) investigate the effect of macroeconomic news from U.S. and EMU on daily movements of EUR/USD. And the selected macroeconomic announcements are: non-farm payrolls, Unemployment rate, Employment cost index, Durable goods orders, NAPM manufacturing, NAPM non-manufacturing, Advance retail sales, Industrial production, Consumer price index from Untied states, and IFO Index, Unemployment rate, Germany Industrial production, Germany Consumer price index, Germany Producer price index, EU 11 INSEE industrial trends from Euro Zone. Their result shows a statistically significant

correlation between macroeconomic news and the daily return of EUO/USD, some asymmetry is existed, and the impact is stronger when the sign of the news switched.

However, literature above focuses on only the influence of the U.S. or domestic news on the corresponding currency. They examined a series of macroeconomic news in one country, to find most significant announcements on certain exchange rates, but don't have comparisons on the influences power levels of different countries' announcements, and also don't have comparisons on the sensitivity degree of different currency pairs. For this comparison, some articles are mentioned below.

The effect of U.S macroeconomic new on five currencies

Simpson et al. (2005) evaluate the effects of surprises in 23 types of U.S. macroeconomic announcements on foreign exchange rates of five currencies: the Canadian dollar, the German mark, the Japanese yen, the Swiss franc, and the British pound. The article provide evidences that U.S. macroeconomic announcements which related to consumer demand, inflation, and interest rates affect significantly the exchange rate, but U.S. announcements directly related to the general strength of the economy are not.

The effect of macroeconomic news from four economies on the single currency pair

Laakkonen (2007) studies the impact of macroeconomic announcements from United States, Germany, France and ECB (Euro Zone) on the exchange rate volatility of one-minute frequency transaction price data of USD/EUR. His result suggests that the connection between macro fundamentals and exchange rates exists in the short run. The macroeconomic news increases the volatility of the exchange rate USD/EUR immediately after the release time, and the significance depends on the news category, moreover, only the U.S. indicators were significant while ECB news are weakest.

The analysis of Simpson et al. (2005) and Laakkonen (2007) range over the cross-countries issues in effect of macroeconomic announce on the foreign exchange. However, in their research, for the relationship between of independence variable (macroeconomic news) and dependence variable (the foreign exchange rates: different currency pairs), the one side of the relationship is single object.

My paper expands the range of research objects. It considers the application change of the currency theories in the current globalization environment. Eight economies' macroeconomic information is examined and compared for the reaction of the foreign exchange rates of seven major currencies, and to analyze the cross-countries influence of macroeconomic news surprises on foreign exchange rates.

It is worth to mentioned that for the theory Purchasing Power Parity (PPP) and the theory Uncovered Interest Rate Parity (UIP), they both based on the assume that in the case of international trade balance, the non-tradable factors and the constraints of trade costs and trade barriers on international commodity packages are ignored, and the theory Efficient Market Hypothesis (EMH) base on the 'Perfect Market' assumption. In the modern economic society, as the fast technique development and the globalization trend, the information cost is significantly reduced and tend to zero, the costs and barriers of the international trade are getting smaller and smaller. It makes some 'Noise' information in the past to become the meaningful and valid information, and should be reconsidered regularly as the economic affect factors.

4 DATA

The data set used in the empirical analysis contains two parts: the foreign exchange rates and the macroeconomic news from corresponding countries.

4.1 Foreign Exchange Rate Data

The data reports the exchange rates of seven major currencies versus U.S. dollar at 5-minute intervals. The full period is from January 1, 2011 to December 31, 2015, covering 1826 days of bid prices for each currency. The currencies are EUR/USD, AUD/USD, GBP/USD, USD/JPY, USD/CAD, USD/CHF, and NZD/USD. The data contains open, high, low, close price and trading volumes in each five minutes. See **Table 1**.

In this table, there is an issue which is not related with the major topic but should be mentioned. Panel B gives the minimum volumes of eight observed exchange rates are unexpected low, even close to 0, but the trading time is not close date in the foreign exchange market. The trading volumes drop down to this minimum value, which happen on 20th July 2015 around 9:30 am (GMT time), the reason is the crash in the Gold market.

The frequency of the foreign exchange rate is very high, and the rate moves nearly secondly. Two reasons to explain that the data with 5-minutes intervals is used for the empirical analysis: firstly, this investigation focuses on the question if the foreign exchange rates are affected by macroeconomic news by other economies rather than U.S. and Domestic affection, but not investigate deeply the details and movement shape of this cross-affection. Secondly, the analysis period could be longer so that we can also catch the spread affection from other economics.

The data set is collected from Swiss Forex Bank & Marketplace www.dukascopy.com.

Table 1. Summary statistics of the exchange rates.

Currency	EUR/USD	GBP/USD	USD/JPY	USD/CAD	AUD/USD	USD/CHF	NZD/USD
Panel A：Exchange Rates							
Mean	1.2890	1.5859	96.8067	1.0803	0.9382	0.9257	0.7904
Median	1.3130	1.5833	98.2700	1.0336	0.9494	0.9287	0.8059
Maximum	1.4932	1.7182	125.7700	1.3993	1.1075	1.0326	0.8835
Minimum	1.0463	1.4570	75.6210	0.9407	0.6907	0.7102	0.6238
Std.Dev	0.1034	0.0529	16.2184	0.1111	0.1116	0.0424	0.0572
Skewness	-0.7265	0.2136	0.2830	1.1293	-0.6705	-0.8438	-1.0840
kurtosis	2.5845	2.4803	1.6907	3.1078	2.2384	4.9938	3.6014
Obs.	525888	525888	525888	525888	525888	525888	525888
Panel B: Trading volumes							
Mean(Million)	686	521	390	338	441	422	329
Median(Million)	570	397	322	258	366	339	271
Max (Million)	21508	6283	4816	13975	3390	4527	3068
Min (Million)	0.0009	0.0009	0.0001	0.0003	0.0004	0.0005	0.0003
Std.Dev	519	432	285	273	297	324	231
Skewness	2.7082	1.9636	1.9878	2.4156	1.3869	1.3881	1.6117
kurtosis	39.3727	9.9937	10.7211	40.5135	5.6493	5.9420	7.2054
Valid obs.*	374132	374069	374153	374008	374048	374130	373867

* Valid observations remove observations that the volume equates 0.

It is a Swiss innovative online bank based in Geneva, Switzerland. It provides Internet and mobile trading services, banking and other financial services with proprietary technological solutions.

4.2 The Macroeconomic Announcements

Based on the target currencies, macroeconomic announcements investigated are from 8 economies: United States, Euro Zone, Japan, United Kingdom, Switzerland, Canada, Australia and New Zealand. The data of Euro Zone (EU 19) is used rather than EU member countries (EU 25), which is considered that in this thesis, the analysis object is currencies changes but not political issue, therefore, the economic information of Euro Zone affects the currencies directly. The data period is from January 1, 2011 to December 31, 2015. Three macroeconomic announcements from these eight countries are used below.

Gross Domestic Product (GDP).

The GDP growth rates measure the annualized change in the inflation-adjusted value of all goods and services produced by the economy. Seasonally adjusted GDP datasets are used for United States, Euro Zone, Japan, United Kingdom, Switzerland, Australia and New Zealand, and monthly adjusted GDP dataset is used for Canada. Preliminary estimated of GDP data is used for measuring the surprise of macroeconomic news.

Consumer Price Index (CPI)

The CPI measures changes in purchasing trends and inflation. National CPI (Month on Month) and National core CPI (Month on Month) are observed for United States, and the announcements are released monthly. National CPI (Month on Month) is used for Canada and Switzerland, and the announcements are released monthly. National CPI (Year on Year) data is used for Euro Zone and U.K., and the announcements are released monthly.

National Core CPI (Year on Year) announcement is used for Japan and released also monthly. National Core CPI (Month on Month) is used for Australia and New Zealand, and the announcements are released quarterly.

The national Consumer Price Index (CPI) measures the change in the price of goods and services from the perspective of the consumer, while the Core Consumer Price Index (CPI) measures the changes in the price of goods and services, excluding food and energy.

Unemployment Rate

The Unemployment Rate measures the percentage of the total work force that is unemployed and actively seeking employment during the previous month. Monthly released data is used for United States, Euro Zone, Japan, United Kingdom, Switzerland, Canada, Australia, and seasonally released data is used for New Zealand.

There are other announcements are important index to measure the employment situation, such as initial jobless claims (United States), continuing jobless claims (United States), Claimant Count Change (U.K.), Jobs/applications ratio (Japan), and so on, however, considering the announcement consistence from difference countries, unemployment rate is chosen, so that the effect difference between countries could be compared clearly.

The announcements GDP of Unites States are released by U.S. Bureau of Economic Analysis, and the announcement CPI & Core CPI and unemployment rate of United States are released by U.S. Bureau of Labor Statistics. The announcements GDP of Japan are released by Japan Cabinet Office, and the announcement CPI & Core CPI and unemployment rate are released by Japanese Statistics Bureau (The Ministry of Internal Affairs and Communication). The announcements GDP and CPI of Switzerland are released by Swiss Federal Statistical office and the announcements Unemployment rate are released by Swiss State Secretariat for Economic Affairs (SECO). The three announcements GDP, CPI and Unemployment Rate of Euro Zone are released by Eurostat.

United Kingdom, Canada, Australia, and New Zealand release their national macroeconomic news by their national statistic organizations: U.K. Office for National Statistic, Statistics Canada, and Statistics New Zealand.

Considering the time difference in the cross-countries analysis, GMT time is used in all the datasets. The datasets concerning macroeconomic announcements are collected from the financial news provider investing.com, and information of announcements is listed in the **Table 2**.

4.3 Data Processing

For the regressions in the later sections, the changes of the foreign exchange rates and their trading volumes of seven currencies are dependence variable, while the standardized surprises of macroeconomic announcements are explaining variable.

As Section 4.1 mentioned, the database of foreign exchange rates contains seven major currencies and covers the period from 1st January, 2011 to 31st December, 2015 with frequency each 5 minutes. It means that for each currency pair, the data contains 525,888 observations, thus for seven currencies, the accumulation is 3,681,216 observations. As the explaining variable, in the **Table 1**, we can find that the database of macroeconomic news contains three announcements of eight countries so 24 announcements. Ten of them are quarterly announcements, and fourteen of them are monthly data, thus the total data contains 1040 observations.

For the regression in later parts, these 1040 observations of macroeconomic announcement data should find separately their the time-matched observations in the database of foreign exchanges rates in each currency, and return the corresponding value which contains the exchange rate between five minutes before the announcement release time and thirty

Table 2. Summary of macroeconomic announcement data

The table sums the detail of the three major macroeconomic announcements concerning economic Activity (GDP), Inflation (CPI) and Employment situation (Unemployment rate) from eight economics which relates to major currencies. The data covers the period from 1st January 2011 to 31st December 2015. The quarterly GDP announcements are the preliminary estimate.

Announcement	Country	Frequency	Unite of Measurement	Obs.	Mean	Deviation
Gross Domestic Product (GDP)	United States	Quarterly	% change from previous quarter	20	-0.2072	0.5791
	Euro Zone	Quarterly	% change from previous quarter	20	-0.0798	0.1252
	United Kingdom	Quarterly	% change from previous quarter	20	-0.3082	0.2758
	Japan	Quarterly	% change from previous quarter	20	-0.2190	0.3197
	Switzerland	Quarterly	% change from previous quarter	20	0.3267	0.3061
	Canada	Monthly	% change from previous month	60	-0.1410	0.0020
	Australia	Quarterly	% change from previous quarter	20	-0.0909	0.2751
	New Zealand	Quarterly	% change from previous quarter	20	0.2260	0.0031
Consumer Price Index (CPI)	United States CPI	Monthly	% change from previous month	60	-0.1528	0.0012
	United States Core CPI	Monthly	% change from previous month	60	-0.1291	0.0008
	Euro Zone	Monthly	% change from the same month in	60	-0.0686	0.0015

	United Kingdom	Monthly	the previous year	60	-0.0874	0.0017
	Japan (National Core CPI)	Monthly	% change from the same month in the previous year	60	0.3029	0.0009
	Japan (Tokyo Core CPI)	Monthly	% change from the same month in the previous year	60	0.0509	0.0010
	Switzerland	Monthly	% change from previous month	60	-0.1905	0.0017
	Canada	Monthly	% change from previous month	60	-0.1451	0.0023
	Australia	Quarterly	% change from previous quarter	20	-0.1586	0.0025
	New Zealand	Quarterly	% change from previous quarter	20	-0.6726	0.0020
Unemployment Rate	United States	Monthly	% unemployment rate	60	-0.4871	0.0015
	Euro Zone	Monthly	% unemployment rate	60	-0.1706	0.0010
	United Kingdom	Monthly	% unemployment rate	60	-0.2538	0.0010
	Japan	Monthly	% unemployment rate	60	-0.2217	0.0015
	Switzerland	Monthly	% unemployment rate	60	-0.2379	0.0005
	Canada	Monthly	% unemployment rate	60	0.0860	0.0017
	Australia	Monthly	% unemployment rate	60	-0.2601	0.0015
	New Zealand	Quarterly	% unemployment rate	20	0.2373	0.0027

Stand Deviation: the stand deviation of macroeconomic announcements surprises.

Mean: The average value of standardized surprises.

minutes after the release time with five minutes interval, as well as the corresponding value of the trading volumes.

For example, for quarterly announcement GDP of Untied States, the release time of the first season in 2012 (2012 Q1) is 27th January 2012 13:30 (GMT). On this time point, the exchange rates of AUD/USD is 1.06611, the rate of five minutes before the release time is 1.06605, the five minutes after the release time is 1.06399, until the rate at 30 minutes after the release time is 1.06009. In the same time, the trading volume of the release time is 1497.56 million, the five minutes before the release time is 794.56 million trading volume, the five minutes after the release time is 1392.47, until the 30 minutes after the release time is 1182.41. To collect all data for each release time of each announcement for seven separate currencies, considering the data size of foreign exchange rate, the function VLOOKUP is used in Excel.

(5) VLOOKUP(lookup_value, table_array,col_index_num,FALSE)

Lookup_value is the searching object: the release time (GMT) of the macroeconomic announcements. The format of the time should be same with the one in the foreign exchange database.

Table_array is the searched range and the first column should be the searched object. For each searched currency, the searched range covers the GMT time in the first column, and the open price in the next column and the trading volume in the last.

Col_index_num is the column number in the range containing the return value. In this study, 2 returns the foreign exchange rate (the column on the right of GMT time column), and 3 returns the trading volume (in the third column in the searched range).

FALSE means the return value is the exact matched search.

5 METHODOLOGY

This section illustrates the methodology to analyze the effect of the macroeconomic announcements concerning general economic activity (GDP), inflation (CPI) and employment situation (Unemployment Rate) from eight economies on the foreign exchange rate of seven major currencies. Four questions will be responded: 1, How the foreign exchange rates of each currency are affected by U.S. macroeconomic announcements? 2, How the exchange rates of each currency are affected by its domestic announcements? 3, Are there some announcements from other economies have this international influence on the foreign exchange market? 4, which currencies' exchange rates are more sensitive for international economic announcements?

The methodology accords to the previous literature Balduzzi et al. (2001). They examine the effect of U.S. scheduled macroeconomic announcement on the prices, trading volume and bid-ask spreads of the intraday data from the U.S. interdealer governments bond market. Their result suggests that 17 public news has a significant impact on at least one of instruments in bond market and this effect level vary according to the maturity of the instruments.

In my study, the dependence variable are foreign exchange rates of seven major currencies instead of the instruments in U.S. bonds market, while the independence variable are not limited in U.S. announcements but the macroeconomic news from eight economies whose official currencies are these seven major currencies. As mentioned in section 2, this methodology is applicable in the foreign exchange market. Moreover, based on the assumptions of the EMH theory and the APT model, considering the market size, international mobility, the foreign exchange market could be more close to the 'Perfect Market'.

5.1 Univariate analysis

Measure the surprises in announcements:

(6) $E_{i,j} = A_{i,j} - F_{i,j}$

$F_{i,j}$ denote the value of the forecast survey for the anouncement i from the economy j, and $A_{i,j}$ denote the real-time released value of the anouncement i from the ecnomy j. $E_{i,j}$ is the difference of the released value and the correspond survey forecast value for the anouncement i from the ecnomy j to measure the surprices in anouncments.

(7) $S_{i,j} = E_{i,j} / \epsilon_{i,j} = (A_{i,j} - F_{i,j}) / \epsilon_{i,j}$

$S_{i,j}$ are the 'standardized suprise' as the independent variables in this study. In the regression, to compare the size of regression coefficients of suprcies across different anouncements from different economies, the surprices are standarlized by deviding the surprices $E_{i,j}$ on the standard deviation $\epsilon_{i,j}$ which covers all oberservation, though the standard deviation $\epsilon_{i,j}$ is constant for each anouncement.

This study is to analyze the effect of three macroecnomic anouncemnts from eight different economies on the foreign exchange rate changes of seven major currencies. I regress sepreatly the rates changes of each currency on the 'standarlized' suprices of each anouncment from differnt economies.

(8) $(P_{30mijt} - P_{-5mijt}) / P_{-5mijt} = \beta_{0mij} + \beta_{1mij} S_{ijt} + \sum \beta_{k+1,\, mi,j} * S_{ij,k,t} + e_{ijt}$

P_{30mijt} denote that for the currency m, the price at 30 minutes after the relased time t of the anouncemt i from the economy j. The open prices of the bid quotes in each five minutes are used.

P_{-5mijt} denote that for the currency m, the price at five minutes before the relased time t of the anouncemnt i from the enonomy j.

β_{1mij} denote the sensitivity of the exchange rate of the currency m to the anouncemnt i of the economy j.

k denotes the kth announcement which is released at the same time with announcment i.

S_{ijt} is the standardlized surprise in the kth anouncement which is released at the same time with the anouncement i (from the economy j) at the release time t.

$\beta_{k+1,m,i,j}$ is the sensitivity of the exchange rate to the kth anouncemnt concurrent with the anouncemt i from the economy j.

In this equation, i = 1, 2, 3, to denote GDP, CPI, and unemployment rate, j =1, 2, 3, 4, 5, 6, 7, 8, to denote eight economies: United States, Eurozone, U.K., Japan, Australia, Canada, Swizealand and New Zealand. m= 1, 2, 3, 4, 5, 6, 7, to denote the seven major currencies: EUO/USD, GBP/USD, USD/JPY, USD/CHF, AUD/USD, USD/CAD and NZD/USD.

In fact, the regression equations could be simplified as the one factor model. Balduzzi et al. (2001) use the macroeconomic news from U.S. so that the concurrent announcements happen often. But in my study, nearly all scheduled announcements' released times are not concurrent, except the CPI and Core CPI from Unites States, and National Core CPI and Tokyo CPI from Japan.

Therefore, for all macroeconomic announcements other than U.S. CPI and Japanese CPI and their concurrence announcements, the simplified regressions are one factor model as below.

(9) $(P_{30mijt} - P_{-5mijt}) / P_{-5mijt} = \beta_{0mij} + \beta_{1mij}S_{ijt} + e_{mijt}$

For the announcements concern the inflation situation (CPI) of Untied States and Japan, the simplified regressions are below.

(10) $(P_{30mijt} - P_{-5mijt}) / P_{-5mijt} = \beta_{0mij} + \beta_{1mij}S_{ijt} + \beta_{2mij}S_{i'jt} + e_{mijt}$

j=1 denotes the annoucnements country United States, i=2 denotes the annoucnement CPI, and $S_{i'jt}$ to denotes the surprises of the concurrence annoucements U.S. National Core CPI.

j=2 denotes the annoucnements coutnry Japan, i=2 denotes its annoucnemts National Core CPI and $S_{i'jt}$ to denotes the surprises of the concurrence annoucements Tokyo Core CPI.

To fix the regreesion model concerning U.S. and Japanese CPI, in the first step, the correlation ananlysis is used to test wheather concurrence announcements surprises are autocorrelation series by the equation (10). If the autocorrelation coeffeicients are close to 1, which means that the surprises of conccurence CPI annoncements are autocorrelation, thus, the regreesion model could be modified as one factor model as equation (9). If this autocorrelation coefficents are very low (less than 0.3), which means weak autocorrelation. The regression based on equation (10) should be run.

In the next step, according to the regression results by the equation (10), if the surprises of concurrence annoucnements both affects significantly on the foreign exchange rates, they both are used to measure the the inflation situation of the corresponding economies. If the regression results show only one of concurrence annoucements affects signifiantly on the foreign exchange rates, the equation will be modified as a linear equation with only one indepence variable, so be equation (9).

5.2 The peak effect observation.

To investigate more this globalized information influence, the reaction of trading volume to the macroeconomic news of different economies is studied. The study is divided into two parts: quality analysis (the peak effect test) and quantitative analysis (the empirical regression). The quantitative analysis is same with the methodology in section 5.1.

The peak effect test

The trading volumes of each currency pair around the release time are observed during the period from 5 minutes before to 10 minutes after the release time. The purpose is to test if there is a peak around the release time of each announcement, and for each news during the observed period, if the peak effect emerges regularly.

Beaver (1968) interprets the volume as the disagreement among investors concerning the price adjustment. It is worth to be noted that he is not the first person for this statement. As early as 1900, Bachelier(1900) states the concept on 'disagreements' as below:

"Past, present, and even discounted future events are reflected in market price, but often show no apparent relation to price changes...Contradictory opinions concerning these changes diverge so much that at the same instant buyers believe in a price increase and sellers in a price decrease." (Reprinted in Cootner 1964, p. 17)

In this way, we can expect that if an announcement affects the exchange of one currency pair, it means that before the release time of this announcement, the trading volume of this currency pair will have a distinct increase. As the announcement is released, the trading volume will jump down in very short time, because the informational become open, this disagreement on this announcement will despair.

This understanding in the other way is consistent with another financial theory: the transactions in the financial market are from the information asymmetry. The peak around

the release time performs the conversion from disagreement to agreement, in the other speaking, from asymmetry to symmetry.

The possibility of the peak emerging is tested to analyze if investors in the foreign exchange market pay attention on these announcements.

(11) $\Delta V_{-5,m,i,j,t} = (V_{0\ m,i,j,t} - V_{-5\ m,i,j,t})/V_{-5\ m,i,j,t}$

$\Delta V_{-5,m,i,j,t}$ to denote for the announcement i of the economy j, the percentage change of trading volume of the currency pair m in 5 minutes before the release time t.

$V_{0\ m,i,j,t}$ to denote the trading volume of the currency pair m when the announcement i of the economy j release at the time t.

$V_{-5\ m,i,j,t}$ to denote the trading volume of the currency pair m at the time 5 minutes before the release time t of the announcement i of the economy j.

(12) $\Delta V_{5,m,i,j,t} = (V_{5\ m,i,j,t} - V_{0\ m,i,j,t})/V_{0\ m,i,j,t}$

$\Delta V_{5,m,i,j,t}$ to denote for the announcement i from the economy j, the percentage changes of trading volumes of the currency pair m in 5 minutes after the release time t.

$V_{5\ m,i,j,t}$ to denote the trading volume of the currency pair m in 5 minutes after the release time t of the announcement i from the economy j.

(13) $\Delta V_{10,m,i,j,t} = (V_{10\ m,i,j,t} - V_{0\ m,i,j,t})/V_{0\ m,i,j,t}$

$\Delta V_{10,m,i,j,t}$ to denote for the announcement i from the economy j, the percentage changes of trading volumes of the currency pair m in the second 5 minutes after the release time t.

$V_{10\ m,i,j,t}$ to denote the trading volume of the currency pair m in the second 5 minutes after the release time t of the announcement i from the economy j.

To examine whether there is a peak emerge around the release time of an announcement, here the dummy variables are adopted to denote the sign of volume change. As mentioned before, due to the data size, here I use a command function below (in EVIEW 8) to build the dummy series for each currency pair.

(14) Dummy10_m,i,j, t=@recode(ΔV-5,m,i,j,t >0 andΔV10,m,i,j,t <0,1,na)

It denotes that for the announcement i from the economy j, Dummy10_m,i,j,t return the value 1 if the volume of the currency pair m increase in 5 minutes before the release time t, and the volume decrease in the second 5 minutes after the release time. If not, return NA.

(15) Dummy5_m,i,j,t=@recode(ΔV-5,m,i,j,t >0 andΔV5,m,i,j,t <0,1,na)

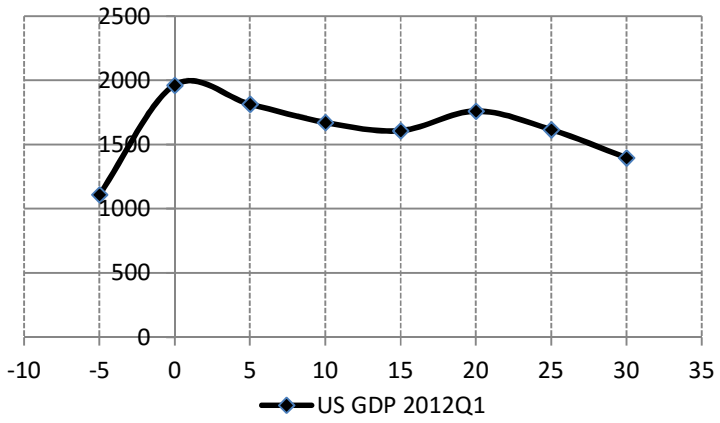
It denotes that for the announcement i from the economy j, Dummy5_m,i,j,t return the value 1 if the volume of the currency pair m increase in 5 minutes before the release time t, while the volume decrease in 5 minutes after the release time. If not, return NA.

For the announcement i from the economy j at the release time t, if Dummy10_m,i,j,t =1, it means that the trading volume of the currency m has a peak between 5 minute before and 10 minutes after the release. If Dummy5_m,i,j,t =1, it means that the trading volume of the currency m has a peak between 5 minute before and 5 minutes after the release. For Dummy 10 and Dummy 5, if any one of them is 1, the peak effect exits, however, the peak emerging situations are different. To understand well the peak emerging behaviors, the examples in four different situations are below.

If Dummy10_m,i,j,t =1 and Dummy5_m,i,j,t =1, it means the peak emerge between 5 minutes after the release time and this effect last more than 10 minutes. For example, the

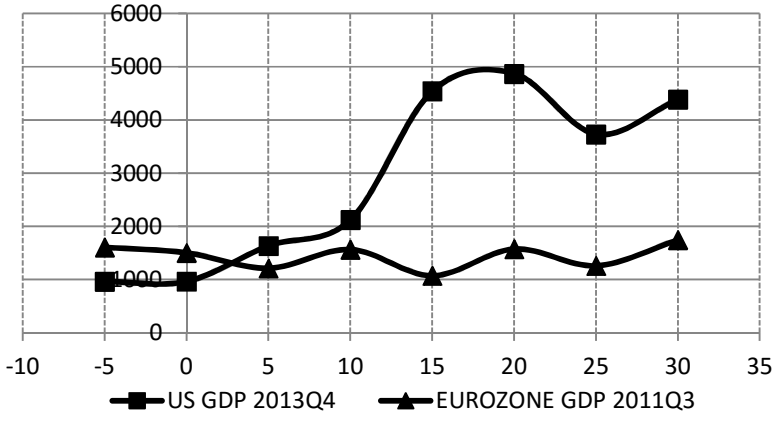
trading volumes of the EUR/USD around the U.S. GDP announcement at the first quarter 2012 (GMT 13:30, 27th January 2012), we can see the peak performance in **Figure 1**.

Figure 1: Dummy10 =1 & Dummy5 =1



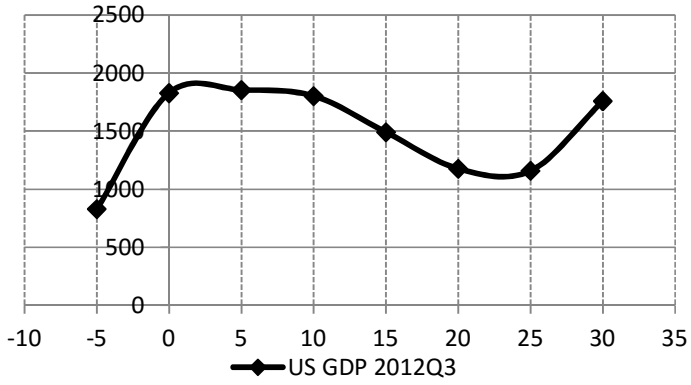
If Dummy10_m,i,j,t =NA and Dummy5_m,i,j,t =NA, it means there is not peak effect in the observed period. For example, the trading volumes of the EUR/USD around the U.S. GDP announcement at the fourth quarter 2013 (GMT 12:30, 7th November 2013), and around the Euro Zone GDP announcement at the third quarter 2011(GMT 9:00, 16th August 2011). We can see in **Figure 2,** there is not any obvious peak effect.

Figure 2: Dummy10 =NA & Dummy5 =NA



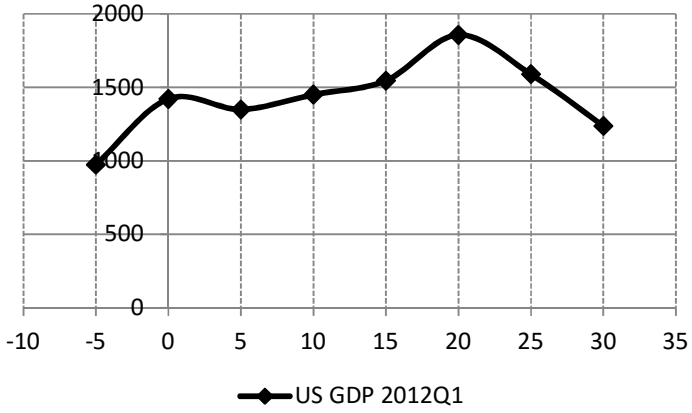
If Dummy10_m,i,j,t =1 while Dummy5_m,i,j,t =NA, it means the peak emerges in the second 5 minutes after the release time. For example, the trading volumes of the GBP/USD around the U.S. GDP announcement at the third quarter 2012 (GMT 12:30, 27th July 2012), we can see the peak performance in **Figure 3**.

Figure 3: Dummy10 =1 & Dummy5 =NA



If Dummy10_m,i,j,t =NA while Dummy5_m,i,j,t =1, it means that the peak emerge in 5 minutes after the release and the peak ends later. For example, the trading volumes of the same currency pair GBP/USD around the U.S. GDP announcement at the first quarter 2012, we can see the peak performance in **Figure 4**.

Figure 4: Dummy10=NA & Dummy5 =1



6 EMPIRICAL RESULTS

The empirical results examines the hypotheses and provide the evidences in two different aspects : for the macroeconomic annoucments, the response of the exchange rate in value and the behaviors of the tradiong volumes.

6.1 The effect of macroeconomic news on the change of exchange rates.

6.1.1 The effect of GDP announcements

Table 3 presents the regression results of seven major currencies (EUR/USD, GBP/USD, USD/JPY, USD/CHF, USD/CAD, AUD/USD and NZD/USD) on the macroeconomic announcements concern economic activity (Gross Domestic Product GDP) of United States, Euro Zone, United Kingdom, Japan, Switzerland, Canada, Australia and New Zealand. The table lists slop coefficient, t-statistics and R square. The main findings are below:

Firstly, not all major currencies' exchange rates are affected by the GDP announcements of United State. For the exchange rates of seven major currencies, three of them (USD/CAD, AUD/USD, NZD/USD) are not affected by U.S. GDP announcements, two of them (GBP/USD and USD/CHF) are affected weakly by the U.S GDP announcement, and only EUR/USD and USD/JPY are affected significantly by U.S. GDP announcements at the 5% level.

The slop coefficients of EUR/USD and GBP/USD against U.S. GDP surprises are negative, while the slop coefficients of USD/JPY and USD/CHF against U.S. GDP surprises are positive. It means that during the period between 5 minutes before and 30 minutes after the U.S. GDP announcements, the EUR/USD and GBP/USD rates go down for good news, while USD/JPY and USD/CHF go up for good news. The opposite signs of the responses

Table 3. The Effect of GDP Surprises on the foreign exchange rates

		EUR/USD	GBP/USD	USD/JPY	USD/CHF	USD/CAD	AUD/USD	NZD/USD
United States	coeff.	**-0.0015 ****	**-0.0006 ***	**0.0009 ****	**0.0015 ***	**0.0001**	**0.0000**	**0.0001**
	R^2	**0.2408**	**0.1574**	**0.2236**	**0.1941**	**0.0010**	**0.0002**	**0.0008**
Euro Zone	coeff.	**-0.0002**	-0.0002 *	0.0001	0.0002	0.0001	-0.0003	-0.0001
	R^2	**0.0254**	0.1508	0.0116	0.0194	0.0266	0.0575	0.0094
United Kingdom	coeff.	0.0004	**0.0025 *****	0.0003***	0.0008**	-0.0004 **	0.0004	0.0002
	R^2	0.0635	**0.3896**	0.2812	0.1985	0.2535	0.0843	0.0194
Japan	coeff.	-0.0003 *	-0.0002	**0.0004**	0.0005 ***	0.0001	0.0000	-0.0001
	R^2	0.1656	0.1359	**0.1154**	0.3631	0.0259	0.0002	0.0070
Swizerland	coeff.	0.0000	0.0000	0.0000	**-0.0001**	0.0000	0.0001	0.0001
	R^2	0.0005	0.0046	0.0050	**0.0375**	0.0036	0.0149	0.0069
Canada	coeff.	-0.0003	-0.0003	0.0002	0.0003	**-0.0014*****	0.0000	-0.0001
	R^2	0.0358	0.0407	0.0127	0.0175	**0.2192**	0.0006	0.0012
Australia	coeff.	0.0004 **	0.0004 ***	-0.0001	0.0005***	-0.0005***	**0.0023 *****	0.0009 **
	R^2	0.2748	0.3246	0.0122	0.5204	0.4583	**0.3295**	0.2372
New Zealand	coeff.	0.0001	0.0001	0.0003	0.0000	-0.0001	0.0004*	**0.0040 *****
	R^2	0.0066	0.0193	0.0864	0.0002	0.0689	0.1612	**0.7466**

*,** and *** indicate that the coefficients are significant at the 10%, 5% and 1% levels.
The coefficient and R2 of the effect from U.S. and domestic announcements are bold print.

between the EUR/USD and GBP/USD rates and the USD/JPY and USD/CHF rates are consist with the reverse of USD direction in different curry pairs. It interprets precisely that U.S. GDP new affect significantly observed exchange rates by USD appreciation with good news and USD depreciation with bad new.

Secondly, not all the exchange rates of observed currencies are affected by their domestic GDP announcements. We can find that for these seven major currencies, four of them (GBP/USD, USD/CAD, AUD/USD, and NZD/USD) are affected very significantly by their domestic GDP announcements, while for Euro zone, Japan and Switzerland, their domestic GDP announcements don't have any influence on the foreign exchange rate of their official currencies.

The slop coefficients of GBP/USD, AUD/USD and NZD/USD are positive, while USD/CAD's is negative. It means that for the period between 5 minutes before and 30 minutes after their domestic GDP announcements release time, in U.K., Australia and New Zealand, the exchange rates of their local currencies go up if their domestic GDP have a good news, and go down for a bad domestic GDP news, while in Canada, the rate of USD/CAD go down when Canadian GDP news is good and go up for bad. This signs of exchange rates' reaction on their domestic news are consist with the above results, good GDP news make the local currency appreciate and bad makes depreciate.

Thirdly, the exchange rates of observed major currencies are affected by GDP announcements from certain economies other than U.S and domestic announcements. Some of them are even not affected by their domestic GDP announcements or U.S GDP announcement, but affected by some other economies' GDP announcements. We can find that the USD/CHF rates show the most sensitivity for international impacts, and we can see that it is not affected by its domestic GDP announcement, but affected significantly by the GDP announcements from Japan, Australia and U.K., and affected weakly by U.S. GDP announcements. The exchange rate of EUR/USD, GBP/USD and USD/CAD are affected significantly by GDP announcements from two economies other than U.S. and domestic

news: EUR/USD rates are affected by GDP announcements from Japan and Australia, GBP/USD rates are affected by GDP announcements from Euro Zone and Australia, and USD/CAD rates are affected by GDP announcements from U.K. and Australia. Other currencies pairs USD/JPY, AUD/USD and NZD/USD are affected by one economy other than U.S. and domestic news, especially USD/JPY rates are not affected by its domestic GDP announcements but affected strong significantly by U.K. GDP announcements. These findings provide the strong evidences to answer "Yes" to the question in the topic of this paper <Are the exchange rates of one currency only affected by U.S. and domestic news?>

Fourthly, GDP announcements from eight economies show their influence power on the exchange rates in different levels. It is surprised that U.S. is not the one with the strongest influence power on the exchange rates of seven major currencies, but Australian GDP announcements released show the strongest effects. We can see in **Table 3** that the GDP announcements from Australia affect very significantly the exchange rates of nearly all major currencies except for USD/JPY. Besides of U.S. GDP announcements, U.K. shows the strong influence power next to Australia. U.K. GDP announcements affect significantly not only the exchange rate of GBP/USD, but also affect strongly the exchange rate of USD/JPY, USD/CHF and USD/CAD. The GDP announcements from Switzerland show the worst influence power on the exchange rates. They don't affect the exchange rates of any currency pairs even USD/CHF. The GDP announcements of Canada and New Zealand shows good influence on the exchange rate of their local currencies, but don't affect the exchange rate of other currencies pairs. The effects of GDP announcement from Euro Zone and Japan are inexplicable, Euro Zone GDP news don't affect the exchange rate of EUR/USD, but affect weakly the exchange rate of GBP/USD, and Japanese GDP news don't affect the exchange rate of its currency USD/JPY, but affect significantly the exchange rate of USD/CHF and affect weakly EUR/USD.

6.1.2 The effect of CPI announcements

As section 5 mentioned above, most macroeconomic announcements release in different time except for CPI announcements of United States and Japan. For U.S. and Japanese CPI effect, to select the regression models, the correlations of surprises of those concurring announcements have to be considered before regression.

Figure 5 displays the 'standardized' surprises of National CPI announcements and National Core CPI announcements from United States in the observed period from 1st January 2011 to 31st December 2015. At the same time, the correlation analysis is used to test the relationship between the 'standardized' surprises of these two concurring announcements, and the autocorrelation coefficient is 0.29. Hence, the 'standardize' surprises of these concurring announcements U.S. CPI and U.S. Core CPI are positive correlation but weakly.

Figure 5. Surprises of U.S. CPI and Core CPI

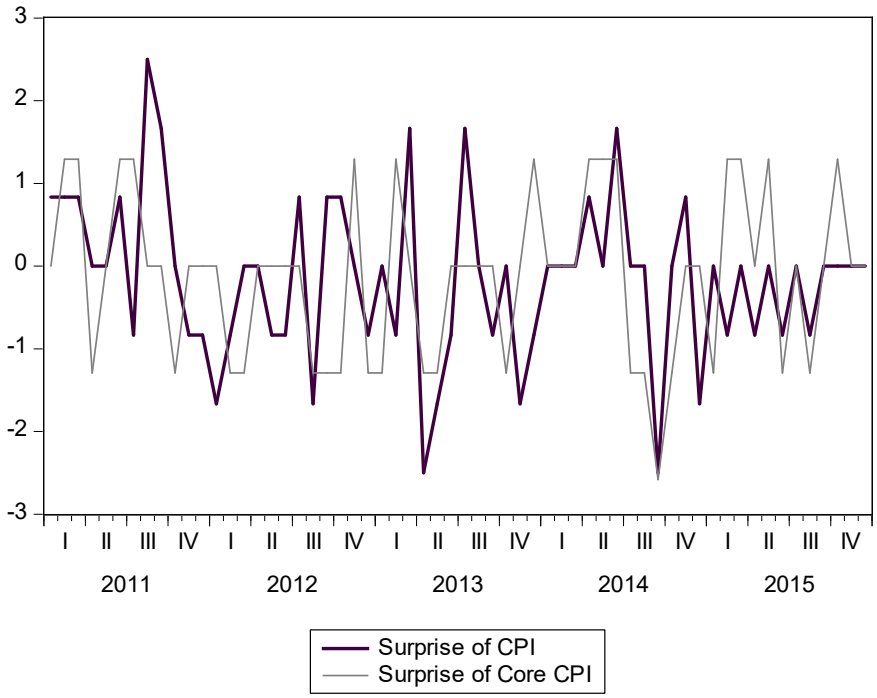
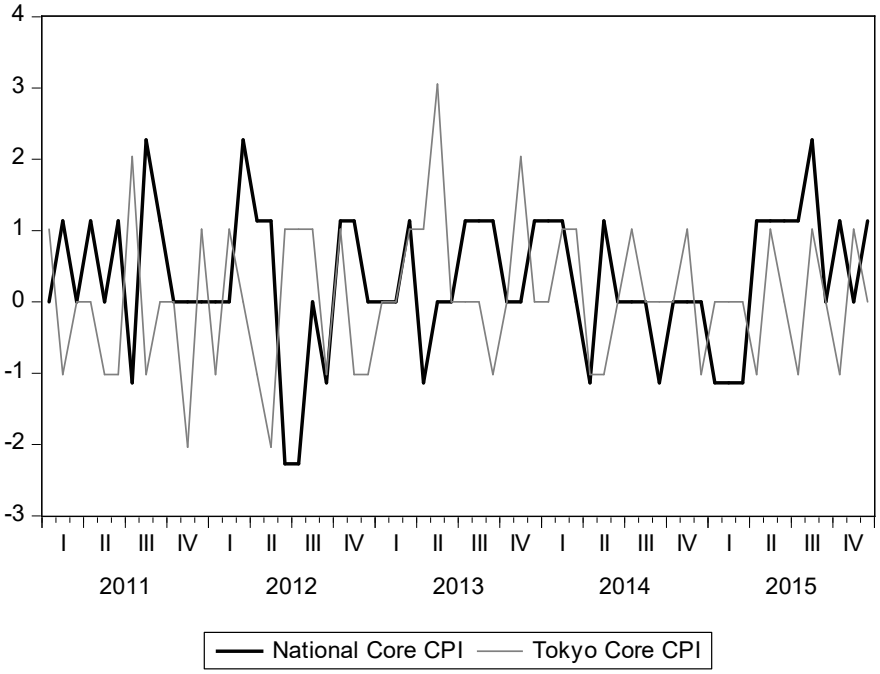


Figure 6 displays the 'standardized' surprises of National Core CPI announcements and Tokyo Core CPI announcements from Japan in the observed period from 1st January 2011 to 31st December 2015.

Figure 6. Surprises of Japanese National Core CPI and Tokyo Core CPI



Here an explanation has to be mentioned, to measure the inflation situation of one economy, national CPI data or national core CPI data are used, normally regional data is ignored, but for Japan economic, regional CPI data (Tokyo Core CPI) is considered. One important reason is according to the results from Hashimoto and Ito (2010). In their study, they examine Japanese news surprise impacts on the return of the USD/JPY exchange rate, by two different regression equations, Tokyo Core CPI announcements shows significant affection on the return of the USD/JPY exchange rate at 5 minutes before and 30 minutes after the release time, while National Core CPI don't have any significant impact on them. Therefore, the Tokyo Core CPI's impacts are not ignored in my study.

The correlation analysis is used to test the relationship between the 'standardized' surprises of Japanese national Core CPI announcements and Tokyo area Core CPI announcements, and the autocorrelation coefficient is -0.25. Hence, the 'standardize' surprises of these concurring announcements Japanese national core CPI and capital area core CPI are

negative correlation but weakly, so that the binary linear regression is applied for the exchange rates of each currency change on the concurring announcements by Ordinary Least Square (OLS). The regressions based on the equation 10) in the section 4 are used to check if concurrence announcements both affect the observed exchange rates.

Table 4 presents the regression results of the effect of CPI surprises which has concurring announcement (U.S. and Japan) on the foreign exchange of seven major currencies. The slop coefficient, t-statistics and Durbin-Watson statistic are listed.

For the CPI announcements from Untied States, we can find that the U.S. national CPI announcements don't affect the foreign exchange rates of any currency pairs in this study, while nearly all exchange rates of these seven major currencies are affected by the announcement U.S. National Core CPI except for USD/CAD. Therefore, the regression model could be defined as Single linear regression as equation (9), and, the surprises of the announcements National Core CPI are used.

For Japanese CPI announcements, both of Japanese national Core CPI and Tokyo Area Core CPI don't have any influence on all researched foreign exchange rates, except that the announcement Japan National CPI have very weak affection on the exchange rate of USD/CAD. Therefore, the effect of Tokyo area Core CPI is ignored, and the National Core CPI is used to measure the inflation situation in Japan, and the regression model is based also on equation (9).

Table 5 presents the regression results of the exchange rate of seven major currencies (EUR/USD, GBP/USD, USD/JPY, USD/CHF, USD/CAS, AUD/USD and NZD/USD) on macroeconomic announcements concern inflation situation (Consumer Prices Index CPI or Core Consumer Price Index CPI) of United States, Euro Zone, United Kingdom, Japan, Switzerland, Canada, Australia and New Zealand. The main results concerning CPI influences from those economies are below.

Table 4. The concurrent announcements concerning CPI Surprises

The table sums the regression results he regression results of the effect of CPI surprises which has concurring announcement (U.S. and Japan) on the foreign exchange of seven major currencies. The regression model is below:

10) $(P_{30m,i,j,t} - P_{-5m,i,j,t}) / P_{-5m,i,j,t} = \beta 0_{m,I,j} + \beta 1_{m,i,j} S_{i,j,t} + \beta 2_{m,i,j} S_{i',j,t} + e_{m,i,j,t}$

a). j=1 denotes the country United States, i=2 denotes the announcements CPI, and $S_{i',j,t}$ to denotes the surprises of the concurrence announcements U.S. National Core CPI.
b). j=2 denotes the country Japan, i=2 denotes its announcements National Core CPI and $S_{i',j,t}$ to denotes the surprises of the concurrence announcements Tokyo Core CPI.

		EUR/USD	GBP/USD	USD/JPY	USD/CHF	USD/CAD	AUD/USD	NZD/USD
United States	CPI coeff.	0.0003	0.0002	0.0000	-0.0003	0.0002	-0.0001	-0.0001
	Core CPI coeff.	-0.0007**	-0.0005 **	0.0005 **	0.0007 **	0.0002	-0.0007 ***	-0.0006**
	DW	1.7426	1.8639	1.8642	1.9612	2.3011	2.1006	1.9715
Japan	National Core CPI coeff.	0.0000	0.0000	-0.0001	-0.0001	-0.0001 *	0.0001	0.0000
	Tokyo Core CPI coeff.	0.0000	0.0000	-0.0001	0.0000	0.0000	0.0000	0.0001
	DW	1.9595	1.7887	2.3421	2.0154	1.8743	1.8740	1.4935

*,** and *** indicate that the coefficients are significant at the 10%, 5% and 1% levels.

DW is the Durbin-Watson statistics.

Firstly, the CPI announcements from Untied States shows their significant impacts on the returns of exchange rates of nearly all observed currencies pairs expect for USD/CAD. In this table, the coefficients of EUR/USD, GBP/USD, AUD/USD and NZD/USD to U.S. national core CPI surprises are negative, while the coefficients of USD/JPY and USD/CHF on U.S. national core CPI surprises are positive. This sign of price reactions is same with the result of the effect of GDP announcements on the foreign exchange rates. It means that considering the period between 5 minutes before and 30 minutes after the release time, the return of the exchange rate EUR/USD, GBP/USD, AUD/USD and NZD/USD go down if the U.S. national core CPI announcement is higher than the forecasted value, and go up if lower. The return of the USD/JPY and USD/CHF go up if the U.S. national core CPI announcement is higher than the forecasted value, and go down if lower.

Secondly, the exchange rates of most observed currencies are affected significantly by their domestic CPI announcements, but not all of them. We can find that for seven major currencies pairs, five of them (GBP/USD, USD/CHF, USD/CAD, AUD/USD and NZD/USD) are affected very significantly by their domestic CPI announcements, while the EUR/USD and USD/JPY are not. The slop coefficients of GBP/USD, AUD/USD and NZD/USD to their domestic CPI surprises are positive, and the coefficients of USD/CHF and USD/CAD are negative. It means that considering the period between 5 minutes before and 30 minutes after their domestic CPI release time, for five countries (U.K., Switzerland, Canada, Australia and New Zealand), to expect their official local currencies appreciation, it is a good new if their domestic CPI announcements are higher than the forecasted value, while it is a bad news that their domestic CPI announcements are lower.

Thirdly, the results in **Table 5** reconfirm the existence of international influence of macroeconomic announcements on foreign exchange rates. Four of seven currencies pairs are affected by CPI announcements which are from some economies other than U.S. and homeland. The exchange rates of USD/JPY are affected weakly by the CPI announcements surprises from EUROZONE besides the effect of U.S. CPI announcements. The exchange

Table 5. The Effect of CPI Surprises on the foreign exchange rates

		EUR/USD	GBP/USD	USD/JPY	USD/CHF	USD/CAD	AUD/USD	NZD/USD
United States (Core CPI)	coeff.	**-0.0006****	**-0.0005 **	**0.0005 **	**0.0006 **	**0.0003**	**-0.0007*****	**-0.0006 **
	R^2	**0.0918**	**0.0841**	**0.0912**	**0.0695**	**0.0353**	**0.1310**	**0.0832**
Euro Zone	coeff.	**0.0001**	0.0000	0.0002 *	0.0000	0.0000	0.0002	0.0001
	R^2	**0.0125**	0.0000	0.0491	0.0008	0.0025	0.0405	0.0172
United Kingdom	coeff.	-0.0002	**0.0010*****	0.0001	0.0003 *	0.0000	0.0000	0.0000
	R^2	0.0337	**0.2311**	0.0278	0.0478	0.0016	0.0010	0.0009
Japan (National Core CPI)	coeff.	0.0000	0.0000	**0.0000**	-0.0001	-0.0001**	0.0001	0.0000
	R^2	0.0002	0.0012	**0.0024**	0.0306	0.0640	0.0303	0.0009
Switzerland	coeff.	-0.0001	-0.0001	-0.0001	**0.0008*****	0.0002	-0.0001	0.0000
	R^2	0.0123	0.0091	0.0126	**0.2686**	0.0386	0.0080	0.0000
Canada	coeff.	0.0001	0.0001	0.0002	0.0000	**-0.0014*****	0.0000	0.0000
	R^2	0.0030	0.0033	0.0350	0.0001	**0.2808**	0.0000	0.0003
Australia	coeff.	-0.0001	-0.0001	-0.0001	0.0000	0.0001	**0.0027 **	-0.0002
	R^2	0.0150	0.0197	0.0208	0.0014	0.0248	**0.2670**	0.0083
New Zealand	coeff	0.0001	0.0000	-0.0001	0.0000	-0.0001	0.0005**	**0.0028*****
	R^2	0.0204	0.0156	0.0346	0.0022	0.0632	0.2972	**0.5725**

*,** and *** indicate that the coefficients are significant at the 10%, 5% and 1% levels.
The coefficient and R2 of the effect from U.S. and domestic announcements are bold print.

rate of USD/CHF are not affected significantly by U.S. and domestic CPI announcements, but are affected weakly by the U.K. CPI announcements. The exchange rates of USD/AUD are not affected by U.S. CPI surprises, but are affected significantly by domestic CPI announcement and Japanese Core CPI announcements. The exchange rates of AUD/USD are affected significantly by the U.S. and domestic CPI announcements as well as New Zealand's. There are not evidences to prove the existence for the exchange rate of EUR/USD, GBP/USD and NZD/USD. The exchange rate of GBP/USD and NZD/USD are only affected and significantly by U.S. and their domestic CPI announcements and the exchange rates EUR/USD are only affected by U.S. CPI announcements.

6.1.3 The effect of Unemployment Rate announcements

Table 6 presents the regression results of the exchange rate of seven major currencies against macroeconomic announcements concern the employment situation (Unemployment Rate) of observed economies. The main results are below.

Firstly, not any foreign exchange rate of observed currencies is affected significantly by the U.S. Unemployment Rate announcements. Euro Zone, Japan and Switzerland also don't affect any exchange rate of the observed currencies even on their local currencies rate.

Secondly, the domestic effect exists in certain countries. In U.K., Canada, Australia, New Zealand, their domestic announcement (Unemployment Rate) affects separately on the exchange rates of their official currencies pairs GBP/USD, USD/CAD, USD/AUD and NZD/USD at the significant level 1%, 5%, 1% and 1%. The coefficients of the rates GBP/USD and USD/AUD to their domestic announcements surprises are negative and the coefficients of NZD/USD and USD/CAD are positive. It means that in the period between 5 minutes before and 30 minutes after their domestic Unemployment Rate release time, for countries U.K., Canada, Australia, New Zealand, the positive surprises of unemployment rates (bad news) could make their local currencies depreciate.

Table 6: The Effect of Unemployment Rate surprises on the foreign exchange rates

		EUR/USD	GBP/USD	USD/JPY	USD/CHF	USD/CAD	AUD/USD	NZD/USD
United States	coeff.	**0.0003**	**-0.0001**	**0.0003**	**-0.0005**	**0.0003**	**-0.0004**	**-0.0002**
	R2	**0.0052**	**0.0006**	**0.0036**	**0.0099**	**0.0058**	**0.0081**	**0.0022**
Euro Zone	coeff.	**-0.0002**	0.0001	0.0001	0.0002	0.0000	0.0001	0.0002
	R2	**0.0147**	0.0155	0.0066	0.0198	0.0009	0.0215	0.0296
United Kingdom	coeff.	0.0003***	**-0.0008*** **	-0.0002**	-0.0004**	-0.0002**	0.0004***	0.0002
	R2	0.1060	**0.1076**	0.0760	0.0816	0.0696	0.1287	0.0231
Japan	coeff.	0.0000	0.0000	**0.0000**	0.0000	0.0001	0.0000	-0.0001
	R2	0.0056	0.0025	**0.0002**	0.0079	0.0267	0.0033	0.0034
Switzerland	coeff.	0.0000	0.0000	0.0000	**-0.0001**	0.0000	0.0001	0.0001
	R2	0.0007	0.0028	0.0011	**0.0061**	0.0016	0.0091	0.0062
Canada	coeff.	0.0003	0.0001	-0.0006	-0.0003	**0.0012****	-0.0001	0.0000
	R2	0.0112	0.0020	0.0242	0.0104	**0.1023**	0.0016	0.0000
Australia	coeff.	0.0001	-0.0001	0.0000	0.0000	0.0001	**-0.0027*****	-0.0003
	R2	0.0082	0.0118	0.0001	0.0001	0.0199	**0.3251**	0.0243
New Zealand	coeff.	0.0001	0.0000	0.0000	-0.0001	0.0000	-0.0004 *	**0.0026*****
	R2	0.0278	0.0061	0.0015	0.0613	0.0008	0.1612	**0.3512**

*,** and *** indicate that the coefficients are significant at the 10%, 5% and 1% levels.
The coefficient and R2 of the effect from U.S. and domestic announcements are bold print.

Thirdly, for unemployment rate announcements, the most 'power' economy is United Kingdom. We can see in the **Table 6**, the U.K. unemployment rate surprises affect significantly on the exchange rate EUR/USD, GBP/USD and AUD/USD at the 1% level, and affect strongly on the exchange rate USD/JPY, USD/CHF and AUD/USD at the 5% level, and only the NZD/USD are not affected by it. The effect of the U.K. Unemployment Rate announcements provides again the evidences for the statement that the exchange rates of one currency is not only affected by U.S. and domestic macroeconomic announcements, but also other economies'. In addition, the announcements (Unemployment Rates) from the country New Zealand also provide the evidence that it affect weakly the exchange rate of AUD/USD at the level 10%.

6.1.4 The comparison and comprehensive analysis.

The regression results in **Table 4, Table 5 and Table 6** provide the evidences that foreign exchange rates are not only affected by the U.S. and domestic macroeconomic announcements, but also affected by the macroeconomic announcements from other economies. In this part, by comparing and analyzing synthetically these results, some interesting points are found additionally as below:

Firstly, the foreign exchange rates are not always affected by U.S. announcements or domestic news. Sometimes, the exchange rate of one currency could be affected neither U.S. announcements nor domestic news, but they are affected significantly by some other economies' announcements. For example, we can find in **Table 6**, the exchange rate of EUR/USD, USD/JPY, and USD/CHF are affected by the announcements (Unemployment Rate) from United Kingdom, but not affected by the U.S. and domestic announcements

Secondly, among three observed macroeconomic news, Gross Domestic Product (GDP) is the one with the most influence power to affect the foreign exchange rates. We can find in **Table 3**, besides of the effect of U.S. and domestic GDP announcements on the foreign exchange rates, ten evidences are provided for the effects of GDP announcements from

other economies. The evidence of these cross-countries effects arises only four times in **Table 5** about the CPI impacts. It arises six times in **Table 6** for the Unemployment Rate impacts, and it should be noted that five of them are from the effect of only one economy (U.K. Unemployment Rate announcements).

Thirdly, one economy shows different influence power levels for different macroeconomic information. United States shows its strong international influence power with its GDP and CPI announcements, but its Unemployment Rate announcements have not significant influence on any observed exchange rates. Australian GDP announcements affect all observed foreign exchange rates except for the USD/JPY, while its CPI and Unemployment Rate announcements only affect the exchange rate of AUD/USD (Domestic currency). United Kingdome shows also very different importance for different announcements.

Moreover, the domestic announcements effects work very stable and polarized. The exchange rates of GBP/USD, USD/CAD, AUD/USD and NZD/USD are affected very significantly by their domestic announcements (GDP，CPI and Unemployment Rate) at the significant level at most 5%. The exchange rate of EUR/USD, USD/JPY are not affected any of their domestic announcements. USD/CHF is an exception. It is affected by Switzerland CPI surprises, but not affected by its GDP and unemployment rates announcements.

6.2 The Speed of the International Impact.

The above researches find evidences that the effect of macroeconomic announcements from economics other than U.S. and homeland on exchange rates of major currencies. Among them, there are two effects are most noticeable.

The one is that the USD/CHF rates are affected significantly by the GDP, CPI and Unemployment Rate announcements from United Kingdom, and also by GDP

announcements from Japan and Australia. The other interested one is the AUD/USD rates are affected by the announcements GDP, CPI and Unemployment Rate from New Zealand.

Focus on these cross-countries effects, the regression below is used to get the speed of adjustment to news economic information by each 5 minutes in the period between the 5 minutes before and 30 minutes after the announcements release time.

(16) $(P_{30mijt} - P_{-rmijt}) / P_{rmijt} = \gamma_{0mij} + \gamma_{1mij} S_{ijt} + \sum \gamma_{k+1,\, mi,j} * S_{ij,k,t} + e_{ijt}$

P_{30mijt} denotes that for the currency m, its price at 30 minutes after the relased time t of the anouncemt i from the economy j. P_{-rmijt} denotes that for the currency m, its price at r minutes after the relased time t of the anouncemnt i from the enonomy j. In this equation, m are USD/CHF and AUD/USD, i = 1, 2, 3, to denote GDP, CPI, and unemployment rate, j are 3,4, 6 and 7, to denote U.K., Japan, Australia and New Zealand.

The regression results contains slop coefficient, t-statistics and R square and list in **Table 7**. Panel A is for the effect on the exchange rates of USD/CHF by the macroeconomic announcements from the economies other than U.S. and homeland (Switzerland), and panel B is for the effect on the exchange rates of AUD/USD by New Zealand's announcements.

We can find in panel A, the U.K. unemployment rate announcements have the significant effect on the exchange rates of USD/CHF and last in the whole observed period around the release time. The time 10 minutes after the release time is an exception. It is worth mentioned that in **Table 6**, the announcement U.K. unemployment rate shows its strong international influence. It affects significantly the exchange rates of nearly all observed currencies except for NZD/USD. Therefore, we think that the U.K Unemployment Rate announcements have the international influence on the foreign exchange rates of major currencies, and this influence power is wide range and enduring. The other announcements Australia GDP shows the similar influence. They affect significantly the exchange rates of

Table 7 Speed of adjustment to macroeconomic announcements

The table studies the adjustment speed of exchange rates of the USD/CHF and AUD/USD to the macroeconomic announcements from the economies rather than United States and their homelands. The regression model is below:

(16) $(P30_{mijt} - P\text{-}_{rmijt}) / P_{rmijt} = \gamma_{0mij} + \gamma_{1mijSijt} + \sum \gamma_{k+1,\, mi,j} * S_{ij,k,t} + e_{ijt}$

P_{30mijt} denote that for the currency m, the price at 30 minutes after the relased time t of the anouncemt i from the economy j. P-rmijt denote that for the currency m, the price r minutes after the relased time t after the anouncemnt i from the enonomy j. In this equation, m are USD/CHF and AUD/USD, i = 1, 2, 3, to denote GDP, CPI, and unemployment rate, j are 3,4, 6 and 7, to denote U.K., Japan, Australia and New Zealand.

Panel A: The cross-countries effect on USD/CHF								
		-5	0	5	10	15	20	25
UK GDP	coeff.	0.0008 **	0.0008 **	0.0004	0.0003	-0.0001	0.0000	0.0000
	R^2	0.1985	0.2073	0.0925	0.0844	0.0183	0.0003	0.0070
UK CPI	coeff.	0.0003 *	0.0002 *	0.0001	0.0001	0.0001	0.0000	0.0000
	R^2	0.0478	0.0456	0.0255	0.0041	0.0059	0.0006	0.0003
UK Unemployment Rate	coeff.	-0.0004**	-0.0004**	-0.0002 *	-0.0001	-0.0002 **	-0.0002 **	0.0001*
	R^2	0.0816	0.1043	0.0500	0.0339	0.0661	0.0943	0.0514
JAPAN GDP	coeff.	0.0005***	0.0004***	0.0001	0.0000	0.0001	-0.0001	-0.0001
	R^2	0.3631	0.3599	0.0160	0.0017	0.0072	0.0271	0.0131
Australia GDP	coeff.	0.0005***	0.0005***	-0.0002 **	-0.0003**	-0.0002	-0.0001	0.0000
	R^2	0.5204	0.5156	0.1949	0.2600	0.1067	0.1320	0.0128

Table 7 (Continue)

Panel B: the cross-countries effect of New Zealand on AUD/USD		-5	0	5	10	15	20	25
New Zealand GDP	coeff.	0.0004 *	0.0000	-0.0001	0.0000	0.0000	-0.0001	0.0000
	R^2	0.1612	0.0010	0.0200	0.0004	0.0012	0.0221	0.0098
New Zealand CPI	coeff.	0.0005 **	0.0005**	0.0002	0.0003	0.0003	0.0002	0.0000
	R^2	0.2972	0.2232	0.0765	0.0975	0.1396	0.0819	0.0211
New Zealand Unemployment Rate	coeff.	-0.0004 *	-0.0004*	-0.0001	-0.0001	-0.0001	0.0000	0.0001
	R^2	0.1612	0.1669	0.0381	0.0096	0.0177	0.0068	0.0387

*,** and *** indicate that the coefficients are significant at the 10%, 5% and 1% levels.

USD/CHF until 10 minutes after the release time. And also, we can see in the **Table 3**, the announcements Australia GDP affect the exchange rates of nearly all observed currencies except for USD/JPY. For other three announcements U.K. GDP, U.K. CPI and Japanese GDP, the cross-countries effects on the exchange rates USD/CHF are significant, but since 5 minutes after the release time, the significant effects are despair. It means that this effect only exist in 5 minutes after the release time.

Panel B is the effect of New Zealand's macroeconomic announcements (GDP, CPI and Unemployment rates) on the exchange rates of AUD/USD from 5 minutes before to 30 minutes after the release time. We can see that not effect is significant beyond r=0 minutes. It means that the exchange rates AUD/USD are affected by New Zealand macroeconomic announcements in very short time, and the lasting time will not later than 5 minutes after the release time.

It is understandable that most reaction of the exchange rates last very short time. Compared with other financial instrument such as bond, stock, foreign exchange rates move with the highest frequency even secondly. The huge of the foreign exchange market can explain the high speed of adjustments.

6.3 The effect of macroeconomic news on the bahaviors of trading volumes

Section 6.1 and 6.2 illustrated how the changes of exchange rates are affected by international macroeconomic news, and provide evidences that in the foreign exchange market, the macroeconomic announcements' world-wild influence is also very important factor. Besides domestic and U.S. economic situation, other economies' economic information should be concerned and considered. In this part, to investigate more this globalized information influence, the reaction of trading volume to the macroeconomic news of different economies is studied.

6.3.1 Quality analysis (the Peak effect test)

Table 8 sums up the amount of observations which trading volume of currencies emerge peaks during the period between the time 5 minutes before and 10 minutes after the macroeconomic announcements release time. The observed currencies are EUR/USD, GBP/USD, USD/JPY, USD/CHF, USD/CAS, AUD/USD and NZD/USD, and the macroeconomic announcements are GDP, CPI and Unemployment of United States, Euro Zone, United Kingdom, Japan, Switzerland, Canada, Australia and New Zealand. Panel A collects results concerns the macroeconomic announcements GDP, Panel B collects results concerns the macroeconomic announcements CPI, and Panel C collects results concerns the Unemployment Rate.

For each regression, the total amount for each observed announcement is contained in this table, and to know if the occurrence frequencies of the peak effect are high. In this paper, for the volume performance of one currency pair, if the peak occurrence frequency is higher than 90% of total observation amount, the announcements are considered as an important factor of this currency pairs trading. The main findings are below:

Firstly, the volumes of most observed currencies pairs are affected significantly by U.S. macroeconomic announcements. We can find in Panel A, with total 20 observations, the trading volumes of seven major currencies shows the peak effect around the release time of U.S. GDP announcements with the absence possibility less than 10%, except for EUR/USD. Especially, the trading volume of USD/JPY AUD/USD and NZD/JPY shows significantly this peak effect with only 1 absence in total 20 observations. In Panel B, the trading volumes of the exchange rate EUR/USD, USD/JPY and USD/CHF show the peak effects around the release time of U.S. CPI announcements with less than 10% absence rate. In Panel C, around the release time of U.S. Unemployment announcements, in total 60 observations, the trading volume of the USD/CHF always has the peak effect without any

Table 8. The observation of peaks

Table 8 sums up the times of observations which trading volumes of currencies emerge peaks in the period between the time 5 minutes before and 10 minutes after the macroeconomic announcements release time

Panel A GDP

Announcements	Total obs.	EUR/USD		GBP/USD		USD/JPY		USD/CHF		USD/CAD		AUD/USD		NZD/USD	
		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Untied States	20	16	16	**18**	17	16	**19**	**18**	16	17	**18**	**18**	**19**	**19**	17
Euro Zone	20	16	16	**18**	17	12	15	15	17	13	13	**18**	**19**	13	15
United Kingdom	20	17	17	**19**	19	9	16	16	15	14	12	15	16	15	14
Japan	20	3	11	6	11	0	17	4	8	9	8	5	8	6	9
Switzerland	20	6	6	6	8	4	7	10	9	6	8	9	9	9	9
Canada	60	40	37	37	36	42	41	37	32	**56**	**56**	48	47	40	42
Australia	20	16	15	17	13	12	12	17	14	**19**	19	**19**	**19**	**18**	**18**
New Zealand	20	10	8	10	9	10	7	10	10	10	8	16	17	**18**	**19**

Panel B CPI

Announcements	Total obs.	EUR/USD		GBP/USD		USD/JPY		USD/CHF		USD/CAD		AUD/USD		NZD/USD	
		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Untied States	60	**55**	50	52	48	**56**	53	**55**	50	53	52	49	51	48	47
Euro Zone	60	38	40	41	42	39	40	40	40	39	37	35	35	35	33
United Kingdom	60	35	34	53	**56**	32	32	37	32	32	28	33	32	31	33
Japan	60	25	21	18	22	40	43	21	19	22	19	23	24	18	20
Switzerland	60	26	24	28	23	18	15	36	34	28	28	27	27	21	21
Canada	60	32	30	33	28	34	36	32	28	**58**	**58**	43	41	39	37
Australia	20	11	10	13	11	15	12	13	13	13	11	**19**	17	**20**	**20**
New Zealand	20	8	8	11	8	9	9	8	8	10	8	16	17	**18**	**19**

Table 8 （Continue)

Panal C Unemployment Rate

Announcemnt	Total obs.	EUR/USD		GBP/USD		USD/JPY		USD/CHF		USD/CAD		AUD/USD		NZD/USD	
		(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Untied States	60	**57**	52	53	46	**59**	**57**	**60**	47	**58**	**55**	**57**	51	**56**	46
EuroZone	60	40	40	38	42	32	36	39	40	35	31	35	34	32	36
United Kingdom	60	42	43	**54**	**55**	40	38	39	38	40	40	42	43	42	37
Japan	60	22	19	15	18	38	38	19	22	19	19	23	25	19	19
Switzerland	60	17	15	9	16	14	12	16	23	19	26	16	19	11	13
Canada	60	51	47	49	44	46	42	48	42	**60**	**58**	**55**	51	**56**	51
Australia	60	53	53	50	51	51	51	44	46	**58**	**59**	**60**	**60**	**56**	**56**
New Zealand	20	11	12	14	15	11	15	14	**18**	15	14	**19**	**18**	**20**	**18**

The bold print indicates that the peak effect are significant (at most 10% level)

(1) The peak effect that the volume go up in 5 minutes before the release time, and go down in the second 5 minutes after the release time.

(2) The peak effect that the volume go up in 5 minutes before the release time, and go down in the 5 minutes after the release time.

absence. Except for the volume of the GBP/USD shows weak peak effect with 53/60 occurrence rates, while the EUR/USD, USD/JPY, AUD/USD and NZD/USD show significantly the peak effect with less than 10% absence rate.

Secondly, **Table 8** provides the evidences of domestic announcements' impacts on the trading volumes of the exchange rate. In panel A, we can find that the trading volumes of the exchange rate GBP/USD, AUD/USD and NZD/USD show obviously the peak effect around the release time of U.K.'s GDP announcements, 19 of 20 observations have the peak effect. For monthly release announcements (60 observations), the trading volume of USD/CAD perform the peak effects around the release time of 56 Canadian GDP announcements. In Panel B, four of seven currency pairs' trading volumes have the obvious peak effect around the release time of their domestic announcements. The occurrence rates of the peak effect are higher than 90%. In Panel C, we can also find obviously this peak effect by domestic Unemployment Rate announcements. The trading volumes of GBP/USD, USD/CAD, AUD/USD and NZD/USD have very low absence rate of the peak effect in the observation. Especially, we can find that in my observed period, Canadian released the Unemployment Rate 60 times, the peak effect could be observed every time with 100 % occurrence rate. However, it is worth to mention that the domestic impacts are not always obvious. For example, the volume of the USD/CHF don't have obvious the peak effect, half of observations have peaks around the release time of Swaziland GDP announcements, while the other half don't have it.

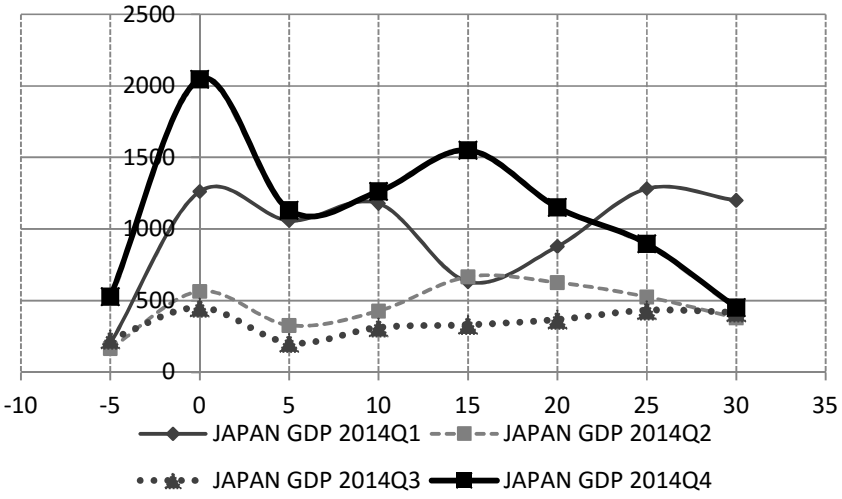
Thirdly, the peak effect of the trading volume occurs also around the release time of macroeconomic announcements from economies other than U.S. and domestic news. It provides again the evidences for the statement that exchange rates are not only affected by U.S. and domestic macroeconomic announcements but also by other economies. Four evidences shows in Panel A. The volumes of GBP/USD and AUD/USD show the distinct peak effect by the GDP announcements from Euro Zone. And also the volumes of USD/CAD and NZD/USD show the distinct peak effect by the GDP announcements from Australia. In Panel B, we can find that the volume of the NZD/USD perform a peak every

time around the release time of Australia CPI announcements without any exception. Six evidences are provided in Panel C. The volumes of USD/CHF and AUD/USD show the distinct peak effect by the announcement (Unemployment rate) from New Zealand. The volumes of AUD/USD and NZD/USD have also the peak effect by the announcement (Unemployment Rate) from Switzerland, and the volume of USD/CAD and NZD/USD performs also the peak effect by the announcement (Unemployment Rate) from Australia.
Fourthly, if use the attention level to interpret the high occurrence rate of the peak effect in the trading volume behavior of observed currencies by different announcements, we can find in the foreign exchange market, investors' pay different attention level on macroeconomic announcements from different economies. In the other words, in the foreign exchange market, to make the decision Buy/Sell, the peak effect inflect if the participators pay attentions and consider these economies' macroeconomic situation.

We can see in the **Table 8**, the macroeconomic announcements from United States are concerned regularly by foreign exchange participators for major currencies, while for the macroeconomic announcements from Japan and Switzerland, in the total observations, it is difficult to get the inevitability of the peak effect around the release time. It means that the foreign exchange participators don't pay attention regularly on these countries' macroeconomic information, and they will not use them to make their Buy/Sell decisions. Canadian macroeconomic announcements get significant and obvious attentions by the exchange participators of the USD/CAD, but the participators of other currencies looks not pay regular attentions on these announcements. New Zealand's announcements (GDP, CPI and Unemployment Rate) are paid regular attentions by foreign exchange participators of the NZD/USD (local currency) as well as the AUD/USD (Australian Currency).

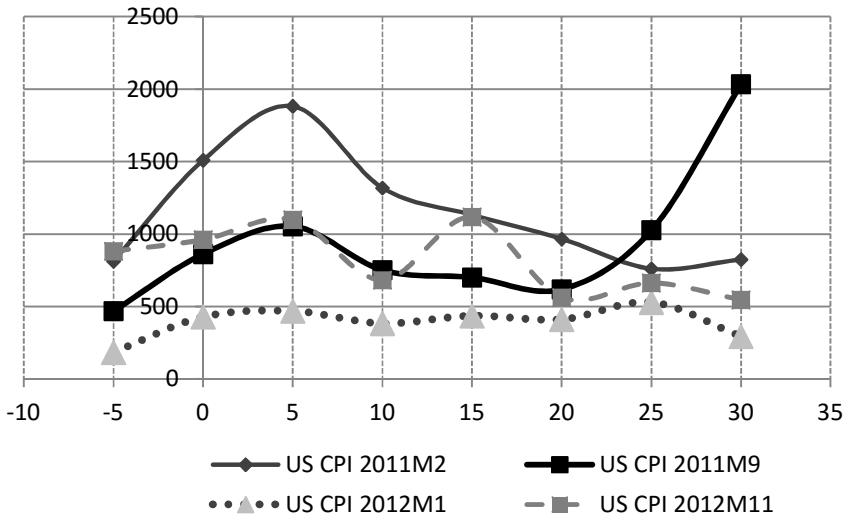
We can see in the table 8, there is a very interesting phenomenon about the peak position on the timeline. For the volume of the USD/JPY, the (1)=0 and (2) =17 by the domestic GDP announcements. It means that except for three release time, around all other release times, the volumes of the USD/JPY have the peak effect, however, the peak always emerge and despair in 5 minutes after the release time. See **Figure 7**.

Figure 7: The trading volume of the USD/JPY to Japanese GDP announcements in 2014



Oppositely, the volume of the USD/JPY by the U.S. CPI announcements, the (1)=56 and (2)=53. There are four times, the peak emerge in the second 5 minutes after the release time. See **Figure 8**. And one time, the peak emerges and ends in the first 5 minutes. (Not shown).

Figure 8: The trading volume of the USD/JPY to U.S.announcements



6.3.2 Quantitative analysis (empirical regression)

To know more about the reaction of the volume of major currencies on macroeconomic announcements from observed economies, I run regressions of the volume change (in 5 minutes after the release time) against the absolute size of economic surprises.

Table 9 shows the regression results which concern the effect of the absolute value of the GDP announcements surprises from the observed economies on the trading volume of seven major currencies. Very little evidences are provided in this table and they are very erratic.

The volumes of AUD/USD are affected weakly by GDP announcements from EUROZONE and Australia, and we can find these reactions also in **Table 8** （The peak effect test）. However, it is not consist of the results from **Table 3** which concerns the reaction of the exchange rates on the related announcements. Other evidences in **Table 9**, we can find that the volumes behaviors of USD/JPY are affected by GDP announcements from Switzerland and Australia, and the GBP/USD by Switzerland. However, all significant effects in **Table 9** don't shows same as the peak test results in **Table 8**, and also, these results are not consist the analysis results of the effect of macroeconomic announcements on the exchange rate changes in **Table 3**.

Table 10 shows the regression results which concern the effect of the absolute value of the CPI announcements surprises from the observed economies on the trading volume of seven major currencies. The volume changes of the USD/CHF are affected weakly by the U.S. CPI announcements in 5 minutes after the release time. Other results with significant effects are unexplainable. The volume changes of observed currencies are not affected by domestic and U.S. announcements but only affected by a couple of other economics' announcements. the volume change (in 5 minutes after the release time) against the absolute size of economic surprises.

Table 9: The Effect of the size of GDP surprises on the trading volumes.

		EUR/USD	GBP/USD	USD/JPY	USD/CHF	USD/CAD	AUD/USD	NZD/USD
United States	coeff.	0.0202	-0.0389	0.0952	-0.0130	-0.0907	-0.0416	-0.1182
	R^2	0.0025	0.0091	0.0193	0.0014	0.0508	0.0048	0.1020
							*	
Euro Zone	coeff.	-0.0703	-0.0892	-0.0443	-0.0629	-0.1181	-0.1108	-0.0039
	R^2	0.0261	0.0373	0.0157	0.0252	0.0745	0.1600	0.0001
United Kingdom	coeff.	0.0030	0.0595	-0.0358	-0.0275	-0.0512	-0.0337	-0.0441
	R^2	0.0003	0.1150	0.0293	0.0174	0.0139	0.0218	0.0248
Japan	coeff.	0.0685	0.0705	-0.0392	-0.2239	-0.0814	0.0040	0.1103
	R^2	0.0222	0.0120	0.0138	0.0697	0.0132	0.0001	0.0264
			**	*				
Switzerland	coeff.	0.2464	0.3331	0.6731	0.1038	0.1694	-0.0984	-0.0352
	R^2	0.0599	0.2402	0.1503	0.0183	0.0123	0.0178	0.0007
				**				
Canada	coeff.	0.0433	0.0303	0.1187	0.0618	-0.0211	0.0258	-0.0217
	R^2	0.0161	0.0080	0.0754	0.0303	0.0043	0.0066	0.0046
							*	
Australia	coeff.	-0.0118	-0.0576	-0.0709	0.1484	-0.0816	0.0583	-0.0514
	R^2	0.0009	0.0134	0.0220	0.1361	0.0701	0.1736	0.0221
New Zealand	coeff.	0.2579	0.0470	-0.3842	0.2135	0.0684	-0.2042	0.0538
	R^2	0.0412	0.0027	0.1059	0.0393	0.0100	0.1216	0.0260

. *,** and *** indicate that the coefficients are significant at the 10%, 5% and 1% levels
The coefficient and R2 of the effect from U.S. and domestic announcements are bold print.

Table 10： The Effect of the size of CPI Surprises on the trading volumes.

		EUR/USD	GBP/USD	USD/JPY	USD/CHF	USD/CAD	AUD/USD	NZD/USD
United States	**coeff.**	**0.0253**	**0.0660**	**0.0443**	**0.0581***	**-0.0001**	**0.0279**	**0.0243**
	R^2	**0.0089**	**0.0388**	**0.0315**	**0.0563**	**0.0000**	**0.0145**	**0.0057**
Euro Zone	coeff.	**0.0026**	-0.0264	0.0756	-0.0228	-0.0712	0.0026	-0.0430
	R^2	**0.0001**	0.0071	0.0277	0.0042	0.0271	0.0000	0.0074
United Kingdom	coeff.	-0.0491	**-0.0469**	-0.0359	-0.0229	0.0045	0.0248	0.0244
	R^2	0.0221	**0.0323**	0.0050	0.0057	0.0001	0.0048	0.0040
Japan	coeff.	-0.1732 *	-0.0112	**-0.0832**	-0.2951 **	0.0237	-0.0807	-0.0185
	R^2	0.0539	0.0003	**0.0254**	0.0668	0.0010	0.0117	0.0003
Switzerland	coeff.	-0.0084	-0.0427	-0.1561 *	**-0.0964** **	0.0245	-0.0233	-0.0828
	R^2	0.0002	0.0107	0.0471	**0.0809**	0.0031	0.0032	0.0328
Canada	coeff.	-0.0515	-0.0158	-0.1198 **	-0.0390	**-0.0469**	-0.0938 **	-0.0044
	R^2	0.0167	0.0017	0.0657	0.0119	**0.0304**	0.0625	0.0001
Australia	coeff.	0.0023	-0.0430	0.0433	0.0570	0.1440	**0.0459**	0.0554
	R^2	0.0001	0.0105	0.0091	0.0131	0.1409	**0.0195**	0.0277
New Zealand	coeff.	0.0652	0.1319	0.0395	-0.0876	-0.0359	-0.1147	**-0.0709**
	R^2	0.0083	0.0244	0.0057	0.0175	0.0032	0.1005	**0.0776**

*,** and *** indicate that the coefficients are significant at the 10%, 5% and 1% levels.
The coefficient and R2 of the effect from U.S. and domestic announcements are bold print.

Table 11: The Effect of the size of Unemployment rate surprises on the trading volume.

		EUR/USD	GBP/USD	USD/JPY	USD/CHF	USD/CAD	AUD/USD	NZD/USD
United States	coeff.	**-0.0475**	**-0.0370**	**0.0309**	**0.0389**	**0.0111**	**-0.0108**	**0.0261**
	R^2	**0.0458**	**0.0287**	**0.0265**	**0.0327**	**0.0034**	**0.0028**	**0.0101**
Euro Zone	coeff.	**0.0254**	-0.0219	0.0351	-0.0496	-0.0872 *	-0.0514	-0.0569
	R^2	**0.0015**	0.0027	0.0077	0.0224	0.0484	0.0166	0.0134
United Kingdom	coeff.	0.0331	**0.0378**	-0.0461	-0.0006	-0.0761	-0.0231	-0.0304
	R^2	0.0088	**0.0153**	0.0036	0.0000	0.0246	0.0030	0.0048
Japan	coeff.	-0.2263	0.0523	**0.0476**	0.1191	0.0617	0.0556	-0.0047
	R^2	0.0416	0.0054	**0.0125**	0.0126	0.0063	0.0055	0.0000
Switzerland	coeff.	0.0657	0.0897	0.0249	**0.0882**	-0.1234	-0.0201	-0.0010
	R^2	0.0131	0.0149	0.0024	**0.0317**	0.0118	0.0019	0.0000
Canada	coeff.	0.0110	-0.0437	0.0329	0.0048	**0.0154**	0.0281	0.0671 **
	R^2	0.0021	0.0253	0.0066	0.0003	**0.0050**	0.0159	0.0670
Australia	coeff.	-0.0342	-0.0149	-0.0121	-0.0253	0.0275	**-0.0217**	-0.0254
	R^2	0.0163	0.0020	0.0019	0.0029	0.0121	**0.0123**	0.0084
New Zealand	coeff.	0.0041	-0.0948	-0.0095	-0.0009	-0.0685	0.0020	**0.0065**
	R^2	0.0000	0.0530	0.0002	0.0000	0.0140	0.0000	**0.0004**

*,** and *** indicate that the coefficients are significant at the 10%, 5% and 1% levels.
The coefficient and R2 of the effect from U.S. and domestic announcements are bold print.

It should be notice that the impact of U.S. CPI news on the USD/CHF can be also found same evidences in the **Table 8** and **Table 4**, however, the other effects shown in the table 10 are unexplainable, and also can't be found the evidences in the peak test (**Table 8**) and the regression result of announcements' impact on the foreign exchange rate value (**Table 4**).

Table 11 shows the regression results which concern the effect of the Unemployment Rate on the trading volume, but no meaningful evidences are provided.

7 CONCLUSION

This paper investigates the worldwide impact of macroeconomic announcements on the foreign exchange of seven major currencies during the period from 1st January 2011 to 31st December 2015. The macroeconomic announcements examined in this paper are three important economic indexes: Gross Domestic Product (GDP), Consumer Price Index (CPI) and Unemployment Rate. They are from eight economies: United States, Euro Zone, United Kingdom, Japan, Switzerland, Canada, Australia and New Zealand. The exchange rates and the trading volumes are examined for seven major currencies EUR/USD, GBP/USD, USD/JPY, USD/CHF, USD/CAS, AUD/USD and NZD/USD. The major findings are below.

Firstly, the results answered the question in the topic of this paper: are the exchange rates of one currency only affected by U.S. and domestic announcements? The evidences both on the foreign exchange rates and the trading volume of major currencies are provided in this paper, and suggest that the foreign exchange are affected by the macroeconomic announcements from certain economies other than United States and homeland. By OLS regression, the exchange rates of certain currencies are affected significantly by economics other than U.S. and homeland. For example, the exchange rates of the AUD/USD are affected significantly by the announcements GDP, CPI and Unemployment Rates from New Zealand. And the trading volumes of the AUD/USD emerges regularly the distinct peak effects around the release time of New Zealand's announcements (GDP, CPI and Unemployment Rate).

Secondly, in the foreign exchange market, the impacts of macroeconomic announcements from Unites States can't cover all currencies. On one hand, based on the regression results, the exchange rates of certain currencies are not affected significantly by any of observed U.S. announcements. For example, the exchange rate of USD/CAD. On the other hand, in the peak effect test, there are certain currencies' trading volumes don't show regular peak

effect around the release time, for example, the EUR/USD to U.S. GDP announcements, the USD/CAD, AUD/USD and NZD/USD to U.S. CPI announcements, and the GBP/USD to the U.S. Unemployment Rate. This trading volume behaviors support the statement above.

Thirdly, for foreign exchange participators, the impact of domestic macroeconomic announcements should not be ignored. Though for certain currencies, these domestic impacts shows not obviously, most major currencies' exchange rates and trading volumes are affected significantly by their domestic announcements. There is an interesting phenomenon. The impacts of domestic announcements are always polarized, the significant level of these impacts are either very significant (1% level) or not significant at all.

Fourthly, the relationship between the size of the macroeconomic announcements surprises and the trading volume change of currencies are difficult to be quantitative analyzed.

Though the regression results had already answer well the questions: are the exchange rates of one currency only affected by U.S. and domestic news, there are still many points which should be considered more to develop in further researches.

Firstly, the sample size of the observations for each macroeconomic announcement is too small. During the observed period from 1st January 2011 to 31st December 2015, monthly release announcements contain only 60 observations, while quarterly release announcements even only have 20 observations. Though, the regression results give the evidences for the cross-country effect, however, the results could be more accurate if the observed period increase from 5 years to 10 years basic on the theory of probability and Mathematic Statistics.

Secondly, the frequency of foreign exchange data could be higher. In this paper, the exchange rates of seven major currencies by 5 minutes are used in my analysis. However, due to the high frequency movement in the foreign exchange market, the exchange rates of

currencies especial major currencies fluctuate secondly. Therefore, it is better to use the data of foreign exchange rates with the frequency by each minute.

Thirdly, the factors to measure macroeconomic announcement have certain difference in different countries. On one hand, quarterly data and monthly data are used in the analysis, and the regression results from both are compared. For example, most GDP used quarterly data, while Canadian GDP uses monthly data; The CPI announcements data from most countries are monthly, while the ones from Australia and New Zealand are quarterly. On the other hand, to measure the inflation of countries, Unties States use National Core CPI (month to month), Euro Zone uses National CPI (year to year), and Japan uses National Core CPI (year to year), while Australia and New Zealand use the National CPI (quarter to quarter). This paper ignored these differences in the study, and selected the most active macroeconomic announcements in different economies, to find the evidences for the effects of macroeconomic announcements from economies other than Unites States on major currencies exchange rates (other than domestic currencies).

Fourthly, in the regression analysis of the effect of announcements on the trading volumes, evidences provided are very little and freaky. In further researches, it could be considered that run regression analysis by classifying the surprises in good news and bad news.

At last, these evidences can give more choices of economic information to be decision-considered in the foreign exchange market. Investors could give more rounded analysis and more accurate forecast on the trend of currencies. However, the study can only give the evidences from historical database, and prove the existence of the influence, but have not given a good explanation by which economies' relationships, how and why it works like this. And also, the date used only contains the price of 5 minutes before and 30 minutes after new announcements, so that the delay change because of reaction of governments isn't considered in the effect.

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