The effects of the United States and Thailand's macroeconomic news on baht/dollar exchange rate behavior

Mr. Panukorn Chantaraprapab

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ผลของข่าวจากสหรัฐอเมริกาและไทยต่อการเคลื่อนไหวของค่าเงินบาทเทียบกับดอลลาร์สหรัฐ

นายพนุกร จันทรประภาพ

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By	Panukorn Chantaraprapab
Department	Economics
Thesis Advisor	Chayodom Sabhasri, Ph.D.

Accepted by the Faculty of Economics, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master 's Degree

…….. Dean of Faculty of Economics
(Assoc.Prof. Suthiphand Chirathivat, Ph.D.)

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การศึกษามุ่งเน้นถึงเรื่องผลของข่าวเศรษฐกิจจากประเทศสหรัฐอเมริกาและประเทศไทยไทยต่อการเคลื่อนไหวของค่าเงินบาทภายใต้ระบบอัตราแลกเปลี่ยนแบบลอยตัว ตั้งแต่เดือนกรกฎาคม 2540 จนถึง เดือนตุลาคม 2543 การศึกษานี้เป็นการศึกษาครั้งแรกที่มีการนำเอาข่าวเศรษฐกิจจากทางประเทศสหรัฐอเมริกามาใช้ในการวิเคราะห์ว่ามีผลกระทบต่อความเคลื่อนไหวของค่าเงินบาทหรือไม่ โดยการเลือกข่าวเศรษฐกิจ ห้ารายการจากประเทศสหรัฐอเมริกา และห้ารายการจากประเทศไทยมาเพื่อทำการวิเคราะห์ โดยมีวัตถุประสงค์เพื่อศึกษาว่าข่าวดังกล่าว ส่งผลกระทบต่อความเคลื่อนไหวของค่าเงินบาทเทียบกับดอลลาร์สหรัฐหรือไม่ ซึ่งจะเป็นประโยชน์ต่อนักลงทุน ผู้ส่งออกและผู้นำเข้า ในการติดตามและวิเคราะห์ความเคลื่อนไหวของอัตราแลกเปลี่ยน

ในส่วนของข่าวจากประเทศสหรัฐอเมริกา ผลการวิจัยสรุปได้ว่าค่าเงินบาทเทียบกับดอลลาร์สหรัฐตอบสนองต่อข่าวการว่างงาน (unemployment) ของสหรัฐที่สูงกว่าที่ตลาดคาดการณ์จากข้อมูลอัตราแลกเปลี่ยนรายเดือน และตอบสนองต่อข่าวดัชนีการผลิตภาคอุตสาหกรรม (industrial production index) ที่ต่างจากตลาดคาดการณ์เพียงเล็กน้อยจากข้อมูลอัตราแลกเปลี่ยนรายวัน ในส่วนของข่าวจากประเทศไทย ข่าวดัชนีราคาผู้ผลิต (producer price index) และการบริโภคภาคเอกชน (private consumption) ส่งผลกระทบต่ออัตราแลกเปลี่ยนรายวัน ในขณะที่ ข่าวดัชนีราคาผู้บริโภค (consumer price index) ที่ออกมาสูงกว่าตลาดคาดการณ์และข่าวดัชนีการผลิต (manufacturing production index) ที่ต่างจากตลาดคาดการณ์เพียงเล็กน้อยส่งผลต่ออัตราแลกเปลี่ยนรายเดือน

การศึกษานี้สรุปได้ว่าข่าวเศรษฐกิจจากทางประเทศสหรัฐอเมริกาและประเทศไทยส่งผลกระทบต่อความเคลื่อนไหวของค่าเงินบาทเทียบกับดอลลาร์สหรัฐ อย่างไรก็ตาม ผลกระทบดังกล่าวส่งผลให้ค่าเงินบาทเปลี่ยนแปลงเพียงเล็กน้อยเท่านั้น ดังนั้น การศึกษานี้จึงช่วยในการเลือกติดตาม ข้อมูลข่าวสาร ว่าข้อมูลข่าวสารใดเกี่ยวข้อง และข้อมูลข่าวสารใดควรให้น้ำหนักและให้ความสำคัญในการวิเคราะห์ความเคลื่อนไหวของค่าเงินบาท

ภาควิชา เศรษฐศาสตร์ ลายมือชื่อนิสิต .....
สาขาวิชา เศรษฐศาสตร์และการเงินระหว่างประเทศ ลายมือชื่ออาจารย์ที่ปรึกษา .....
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This study examines the response of exchange rate of Thai baht vis-à-vis U.S. dollar to macroeconomic news of U.S. and Thailand during the floating exchange period from July 1997 to October 2000. Compared to previous studies, this study attempts, for the first time, to include the news from U.S. macroeconomic data into the news model of exchange rate determination. The news is associated with the unexpected component of the monthly release of five U.S macroeconomic variables and five Thailand macroeconomic variables. The main objective of this study is to investigate whether an exchange rate response to the economic news when the released data are announced in the market. This study would also provide a better understanding on the exchange rate determination related to the macroeconomic news to investors, exporters, and importers.

For U.S. news, the results suggest that the baht/dollar exchange rate does react to positive unemployment news in the monthly model and react to small industrial production index news in daily model. For Thailand, Producer Price Index (PPI) and Private Consumptions (PC) have an impact on an exchange rate movement in daily model while positive Consumer Price Index (CPI) and small Manufacturing Production Index news affect exchange rate in the monthly model.

This study supports the hypothesis that macroeconomic "news" does have an impact to an exchange rate. However, the impact might be seen as quantitatively small. As a result, this study can actively facilitate economic agents on how to rationally select which news information that yields the most impact on the baht/dollar exchange rate movement.

Department Economics Student's signature .....
Field of study International Economic and Finance Advisor's signature .....
Academic year 2000

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Panukorn Chantaraprapab

May 2001

Chulalongkorn University

Bangkok, Thailand

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CHAPTER 1

INTRODUCTION

1.1 Statement of the Problem

The foreign exchange market is the single largest market in the world. More than USD 1.4 trillion is traded in the FX market each day.[1] Exchange rates play a major role in international trade and also international investment. Currencies are bought and sold in exchange for on another in a 24-hour over-the-counter market by individuals, companies, securities firms, and central bank, which 95 percent of all trading are traded through the commercial banks' traders.

Understanding a currency's movements involves fundamental economic analysis, which has been the very interesting topic for economist for the last 30 years after adopting the floating exchange rate system. Economists have been creating numbers of traditional theories and models to help explaining the movement of the very volatile exchange rate. However, most of the theories can be best explained in the medium and the long term but fail to explain the volatility in the short term.

Originally, the foreign exchange market is designed to facilitate international trade. However, with the advent of floating exchange rates and the freeing of

exchange controls on capital movements, there has been a rise in the volume and market share of capital transactions in the foreign exchange market. Now, more and more capital transactions are from the trading between investors and traders around the world.

The result, of course, has been that the foreign exchange market is now dominated on a trading basis to seek short-term profit. These can be observed by the high volatility of exchange rate, which move violently during the trading day. This phenomenon might help give a clearer picture of why the level of exchange rates can look so much at odds with the expected results from the economic analysis. As a result, the economist recently has been shifting to study why and what the underlying factors that move the exchange rate in the short run.

The reactions and effects of economic news on exchange rates have received substantial attention in both the research literature and the financial profession such as bankers, traders and also investors in the last few years in order to explain the movement of exchange rate in the short term. In the recent survey, it shows that most of the traders found that news about macroeconomic indicator is rapidly incorporated into exchange rates.[2] As a result, the examination of exchange rate movement from news has become increasingly popular and is now the professional standard among analysts.

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[1] According to the Bank for International Settlements data.

As the world's major currency, the U.S. dollar has been the core stone of foreign exchange market. It plays a very important role in determining most other currencies. Since most of every currency in the world is quoted against the U.S. dollar, theoretically, the appreciation or depreciation of dollar tends to have an impact on another bilateral exchange rate. As a result, the considerable attention on the U.S. dollar and its fundamental economic indicators is a wise approach to study the exchange rate movement of other currencies.

The "news" view of the determination of foreign exchange rates seems to have wider appeal. For instance, the financial columns of the daily press abound with headlines such as 'unexpectedly good money supply figures result in an appreciation of the exchange rate' and 'an unexpected deterioration in the current account led to exchange rate depreciation'. If new in formation is important in foreign exchange markets then it is probably more appropriate empirically to implement exchange rate models, such as the monetary and portfolio approaches, in a 'news' context rather than regressing the exchange rate on the levels of, for example, relative money supplies.

There are typically two ways of looking at the possible effect of macroeconomic news on asset prices. First is the "direct effect" hypothesis. If news is bad, the market is expected to react negatively to it. The other view is the "policy signaling" hypothesis. It states that if news is bad, the market anticipates the

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[2] Recently, Chenug and Chinn (1999) have conducted a survey of U.S. foreign exchange traders about the macroeconomic implications of their beliefs and behavior and find that trader are increasingly interested in news announcements compare to five year ago.

government will do something to improve the situation so that the market will react "positively" to news.

The primary focus of this study is to examine the reaction of baht/dollar to both U.S. and Thailand's macroeconomic news. The news is associated with the monthly release of U.S. macroeconomic variables that have been classified into two categories: unexpected inflation and unexpected change in economic activity. These economic variables are Consumer Price Index, Producer Price Index, Index of Industrial Production, Retail Sales, Index of Leading Economic Indicators, and Unemployment rates. For Thailand, since there is no survey data, the forecasted variables are applied by using time-series technique.

The major issue under examination is whether one can trace systematic effects of economic news on the evolution of the exchange rate. The direction in which news will move the exchange rate depends on the market's belief about both the model of exchange rate determination and the manner in which monetary authorities will respond to new information.

1.2 Research Objectives

The study of " The Effects of the United States and Thailand Macroeconomic News on baht/dollar Exchange Rate Behavior " aims to investigate:

1. The effects of U.S. and Thailand's macroeconomic news on baht/dollar exchange rate whether they have any impact on Thailand's currency movement.
2. The magnitude of the impact for each individual variable.
3. The explanation behind the transmission of effects from news to exchange rate.

1.3 Research Hypothesis

To conduct this study, the main hypothesis is that the baht/dollar exchange rate movement will react to the major macroeconomic announcements from U.S. and Thai. The study also considers whether the unexpected forecasting error would have a higher impact to exchange rate in the high frequency data (such as daily data) compare to the low frequency data (such as monthly data).

1.4 Scope of the Study

This study aims to investigate only the Thai Baht vis-à-vis U.S. dollar which is the most important and the only traded currency in our system.[3] I scope this study as follows:

1. In order to study the effects of U.S. and Thailand macroeconomic news on baht/dollar exchange rate, the monthly release of five U.S. macroeconomic

[3] For every other currency, it has to be converted into a dollar form before converted into Thai Baht. For example, if investor wants to sell Japanese yen, bank would sell yen and buy dollar and then convert that dollar to Thai baht.

variables and five Thailand macroeconomic variables are analyzed. These variables are classified into two categories: unexpected inflation rate and unexpected changes in economic activities.

2. Focus on monthly economic data from the period of July 1997 to October 2000, which is the period of floating exchange rate regime.

1.5 Benefits of the Study

Since the exchange rate movement is very important and plays a major critical role in conducting a monetary policy, this study would be beneficial in various ways as follows:

- In term of public citizens, this study would provide the basic knowledge of exchange rate reaction to news announcements from domestic and abroad.
- In term of investors and also exporters & importers, they would gain more knowledge and have a better understanding on the exchange determination related to the macroeconomic news.

1.6 Structure of the Thesis

The body of this thesis will be structured into five chapters. The first chapter, which is the introduction, deals with motivation, objectives, scope, and benefits of the study. The second chapter describes the major exchange rate determination theories and also reviews the relevant literatures in the past. The third chapter provides the

sources and descriptions of data and illustration of methodology for this research. Then, the forth chapter, presents the overall empirical results of the study. Then, the last chapter, chapter 5, explains the conclusions obtained from the study and also exhibits the limitation of the study and suggestion for future study.

CHAPTER 2

THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

2.1 Theoretical Framework

In this chapter, the theoretical framework of the study is discussed. The theories presented in this study are 1) traditional exchange rate model and 2) news model of exchange rate determination.

2.1.1 Traditional Exchange Rate Model

In this section, a brief review of the traditional model of exchange rate determination is presented. Theoretically, there are two major approaches determining exchange rate; balance of payment or traditional flow approach and the asset market approach, which can be further developed into monetary model and portfolio balance model. I discuss the major concepts of these theories by the following order: 1) the Traditional flow, 2) Monetary Model, and 3) Portfolio Balance model.

Traditional Flow Model

This model is perhaps the most basic, and one of the most popular, approaches to the determination of the exchange rate. This view is typically known as the balance

of payments approach since the demand and supply for a currency arise out of the transactions recorded in the balance of payments. So, the exchange rate is determined by the equilibrium condition of the demand and supply for foreign exchange offsetting by the net capital flow. In term of current account, the underlying demand for foreign currency is the demand and supply of imports and exports of goods and services. As a result, the relative prices and relative income are the determinants of current account. If domestic prices are higher relative to foreign prices or the domestic real income rises, the demand for foreign goods (and also demand for foreign currency) will be higher and hence, causes the domestic currency to depreciate.

In term of capital account, short-term capital movements respond essentially to interest differentials. Thus, an increase in the foreign interest rate relative to the domestic rate, holding other thing equal, would be expected to lead to a flow of capital to the foreign country as investors increased their demand for the more profitable foreign interest bearing assets and decreased their demand for the less profitable home asset. As a result, there will be an increase demand for the foreign currency and hence, leads to a depreciation of domestic currency.

Monetary Model

The monetary model combines the quantity theory of the demand for money with the purchasing power parity to generate unambiguous conclusions about the effect of changes in exogenous variables on a floating exchange rate, or on the balance of payments. Basically, two types of models are monetary model with flexible prices and monetary model with sticky prices.

With flexible price, the model can be represented by three assumptions:

- The money market equilibrium condition
- The open interest parity condition
- The purchasing power parity

From these assumptions, and the identical parameters in the demand for money functions in each country, a principle equation for equilibrium exchange rate is determined by the differences between the two countries' money supplies, interest rates and real incomes.

The monetary model of a floating exchange rate predicts that the domestic currency will depreciate when 1) the domestic (foreign country) money stock increases (decreases), 2) domestic (foreign) national income falls (rises), and 3) the foreign price level falls. The depreciation will be proportionate to any increase in the relative money stock. Unfortunately, as an explanation of the facts, the monetary model is useful only in the very long run, which shows by the failure of the PPP.

With Fixed price, the Mundell-Fleming model is developed. The M-F model adheres to the Keynesian tradition that it is aggregate supply, which takes the passive role of fixing the price level, while aggregate demand variations determine the level of economic activity. The distinguishing feature of the M-F model is in the emphasis placed on the different conditions determining the current balance, on the one hand, and the net capital inflow, on the others.

With a floating exchange rate, equilibrium requires the domestic money and goods markets to clear, as in the IS-LM model, while in the open sector the sum of the deficits on current and capital accounts is zero. The latter condition ensures a balance of supply and demand in the currency market. In the M-F model of a floating exchange rate, a money supply increase causes a depreciation in the exchange rate, while fiscal expansion causes an appreciation.

Lastly, the sticky prices or Dornbusch model is developed as a hybrid of the earlier models. In its short-run features, it fits into the established Keynesian tradition, with its emphasis on the stickiness of prices in product markets. However, it displays the long-run characteristics of the monetary model.

The fundamental of Dornbusch model lies in his exploration of the consequences of the following observation: while product markets adjust only slowly, financial markets appear to adjust far more rapidly. As a result, financial markets tend to be overadjust to disturbances, in order to compensate for the stickiness of prices in goods markets. Since the price is fixed, shocks which create excess supply (demand) in the money market have liquidity effects, requiring a fall (rise) in the interest rate to clear the domestic market. The change can only be reconciled with uncovered interest rate parity if there is a simultaneous expectation of exchange rate appreciation (depreciation). Given the assumption about the way market expectations are formed, this in turn is only possible if the exchange rate jumps to a level beyond its long-run equilibrium.

The Dornbusch model has been extended by many authors, in particular by Frankel (1979).[4] This extension consists of allowing inflation to occur in the long run, and highlighting the importance of the real interest rate in the determination of the real exchange rate. In this extension, therefore, an increase in the real interest rate leads to a real appreciation of the domestic currency, and vice versa.

Portfolio Balance Model

Another model, but still in the same framework, is portfolio balance model. This model assumes identical portfolio preferences for both home and foreign investors. These investors determine their relative positions between home and foreign investments on the relative return after taking consideration of the risk involved. The model assumes domestic residents hold only three types of asset: domestically issued money and bonds, and foreign currency bonds issued by a foreign government. Assuming that financial markets is clear at all time, short-run equilibrium will be reached when the exchange rate and (domestic) interest rate are at a level where demand is equal supply for any two of the three assets.

In the short run, currency and interest rate will fall if there are open market purchases of either domestic or foreign bonds. On the contrary, increases in the stock of foreign bonds or current account surplus will lead to currency appreciation. In the long run, its equilibrium is characterized by a zero balance on current account, as well

[4] Jeffrey A.Frankel, "On the Mark: a theory of floating exchange rates based on real interest differentials," *American Economic Review*, 69 (September 1979): 610-622.

as static prices, interest rates and exchange rate. Unfortunately, the portfolio model fails on at least two reasons; lack of data and failing to fit the data even for the early part of the floating exchange rate period. As a result, it is difficult to apply in practice and approximations tested have not been very successful in explaining the facts.

2.1.2 "News" Model

In this section, I first present a 'News' model of exchange rate determination. Then, I discuss a concept called the market efficiency and the rational expectations. Finally, I again introduce a 'News' model but combine with the market efficiency and the rational expectation hypotheses, which are the main focus of this study.

The Exchange Rate and 'News': The Ultra-Simple model

I start by examining an ultra-simple model [5] in order to illustrate 'news' approach. The simplest and most general news model would take the following form. Suppose the (log of the) spot exchange rate is given by the relationship:

$$s_t = \gamma z_t \qquad \textbf{(1)}$$

where γ is a slope coefficient and z_t is the variable or variables determining the exchange rate. I shall call z_t the fundamentals or fundamental variables.

Now, assuming rational expectations[6], agents will form their expectations of next period's spot rate using Equation 1. Specifically, at time *t – 1* they will use the available information in the set I_{t-1} so as to form the conditional expectation of s_t *(*defined as E_{t-1}), which, given equation 1 means:

$$E_{t-1}s_t = \gamma E_{t-1}z_t \qquad \textbf{(2)}$$

In other words, forming a (rational) expectation of the exchange rate involves, as a prerequisite, forecasting the fundamentals. In terms of the forecast errors I obviously have, I subtract equation 2 from equation 1:

$$s_t - E_{t-1}s_t = \gamma(z_t - E_{t-1}z_t) \qquad \textbf{(3)}$$

The left-hand side of this equation is the unexpected component of the spot exchange rate. The term in the brackets on the right is the "news": the surprise component of the fundamental variables in z_t

The equation 3 can be rewritten as follows:

$$s_t = E_{t-1}s_t + \gamma(z_t - E_{t-1}z_t) \qquad \textbf{(4)}$$

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[5] See Laurence Copeland, *Exchange Rates and international Finance*, 2nd , (Addison-Wesley, 1994).

[6] See the defintion and details on page 16.

Thus, the above equation states that the spot exchange rate is determined by an expected spot exchange rate in the past and the news component.

Market Efficiency

By definition, market efficiency in foreign exchange market happens when there are abnormal returns from using information when taking positions in foreign exchange.[7] Simply, an abnormal return is equal to the actual return minus the return that would be expected, given the level of risk, if all available information concerning the asset had been utilized in determining the asset's price.

Efficiency can be classified into 3 major forms according to what I include in the set of information, which is assumed to be available to decision makers. The 3 forms are as follows:

1. Weak-form efficiency: if information on only historical prices or returns on the particular asset is included.
2. Semi-strong-form efficiency: if all publicly known information is included.
3. Strong-form efficiency: if all information, including that available to insiders, is included.

To test whether foreign exchange market is efficient, the following model is constructed:

$$s_t = \alpha + \beta F_t + \gamma Z + u_t$$

where s_t = spot exchange rate at time (t)

Z = set of information that the market uses when forming expectations

F_t = forward rate at time (t)

The set of information that Z represents depend on the form of market efficiency for which is testing. If Z consists only of the past values of the exchange rate, spot or forward data available to the market when forming expectations, the test is of weak-form efficiency; if Z consists of all publicly available information the test is of semi-strong-form efficiency; and if Z also includes 'inside' information, the test is of strong-form efficiency.

There is an alternative way of testing for efficiency of foreign exchange markets. This method relies on the concept of whether forecasts of future spot exchange rates are 'rational'. By precise definition, rational means the forecasts that are on average correct and which do not reveal persistent errors. This test replaces the forward rate in the previous equation with the expected future spot rate as given in surveys of opinions of important market participants. That is, I estimate the model as below:

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[7] For further concept of market efficiency, see Stephen F. Leroy, "Efficient Capital Markets and Martingales," *Journal of Economic Literature*, (December 1989):1583- 1621.

$$S_t = \alpha + \beta S_t^e + \gamma Z + u_t$$

where S_t^e = expected future spot rate

From this method, I can still judge market efficiency by whether γ is significantly different from zero for any variable(s) *Z*. Moreover, I can interpret a α that is insignificantly different from zero and a β that is insignificantly different from 1 as implying rational forecasts, because under these joint conditions the market's forecasts are on average correct.

Rational Expectations

One of the major propositions of the rational expectations hypothesis is that unanticipated events, or "news", play a predominant role in affecting real variables and asset yields. The theory of rational expectation states that investors or speculators will take into account all the available information when deciding whether to buy or sell a particular asset. Thus, the price of the asset should fully reflect all available information that could influence expectations of the future.

In the context of the foreign exchange market, it implies that investors use all the available information when deciding whether to buy one particular currency and sell another one. Such information will be crucial in determining the investor's expectation of exchange rate movement. And these expectations will determine the maximum price at which the investor is prepared to continue his exchange of assets.

Market Efficiency and Rational Expectations and 'News' Model: The Linkage

The asset view of exchange rates coupled with the efficient markets hypothesis leads to the following general specification:[8]

$$\ln S_t - \ln S_{t-1} = \alpha + \beta X_t^u + u_t$$

where S_t = spot exchange rate at time (t)

X_t^u = unexpected economic announcements occurring in the interval (t-1) to (t)

u_t = random error term at time (t) uncorrelated with information known at time (t-1)

If expectation are rational, then

$$X_t^u = X_t - E[X_t / I_{t-1}]$$

where X_t = value of X announced at time t

I_{t-1} = information known at (t-1)

[8] Hakkio, Craig S., and D. Pearce, "The Reaction of Exchange Rates to Economic News," *Economic Inquiry*, 23 (1985): 621-636.

And if the foreign exchange market is efficient, only the unexpected part of any economic announcement should cause the exchange rate to move.

2.1.3 The Measurement of Expectation

The major issue, which has received most attention, has been the measurement of expectations with respect to the fundamentals. A number of different approaches have been taken as follows:

Univariated Time Series

Much of the early work involved modeling each fundamental variable as a univariate time series. This bases on the weak Rational Expectation theory: market expectations are conditioned only on the past history of the variable, so that the innovations in each of the fundamentals is simply that part which could not be predicted by looking at the pattern of fluctuations in the variable. For example, this approach would involve extracting an estimate of the future money stock, from a linear combination of past money supply, that is:

$$m_t = \alpha_0 + \alpha_1 m_{t-1} + \alpha_2 m_{t-2} + ... + \alpha_p m_{t-p} + u_t$$

where m_t = money supply at time (t)

Then, the news is simply the residual from the estimating the equation. Unless one believes that market expectations are only weakly rational, this approach is unsatisfactory, though it has the attraction of simplicity.

Multivariate Time Series and Vector Autoregression

From a theoretical point of view, conditioning each news variable on a broader information set is obviously preferable. Taking this approach to its logical conclusion would suggest the following procedure. Suppose I have m variables in the set of fundamentals. Call the first z^1, the second z^2 and so on. Then generate a forecast of z^1_t by using past values of z^1, in combination with past values of all the other fundamentals, z^2 to z^m. In general, the j^{it} fundamental is modeled as:

$$z_t^j = f(z_{t-1}^1, z_{t-2}^1 ... z_{t-L}^1, z_{t-1}^2, z_{t-2}^2 ... z_{t-L}^2 ... z_{t-1}^m ... z_{t-L}^m)$$

where L is the maximum lag (the 'memory length') judged relevant on the basis of the standard tests used in time-series statistics. Then, the 'news' component about z^j is the residual error from this equation. This type of very general, unstructured model is known as a Vector Autoregression or VAR.

Survey Data

Many researchers have made use of data taken from direct surveys of market participants, or of the economists who advise them. In general, survey data has an

advantage. Since I have survey data on market expectations of the fundamentals, I can avoid having to build a sub-model.

Announcement / Event Studies

A number of studies have been published attempting to relate movements in the exchange rate to the 'news' content of macroeconomic variables such as money supply announcements. The work has the characteristics of an event study.

Financial Variables

Another possible way is to look at other financial variables which may embody the same information as the spot exchange rate, for example, a stock price index as a proxy for expected future national income. There are some advantages in using this approach. Firstly, they share with the exchange rate the intrinsically forward-looking characteristics of continuously traded assets: prices are continuous, instantaneously reflecting changes in market perceptions about the level of all the relevant variables, whether they are immeasurable (e.g. political factors or market confidence), or more straightforward macroeconomic variables. Secondly, since the same agents are often active in both markets, there seems reasonable to suppose what is true of perceptions in one market will be equally true in the other market.

2.2 Review of Literature

For the exchange rate, the impact of macroeconomic news on exchange rates has also previously been the subject of extensive research. However, the work of modeling ‘news’ is still in its infancy since the very first published results only have just appeared in 1981. The topic of exchange rate determination has become the key issue in the world of economist mainly because of the dramatic alteration of the international monetary system from a regime of pegged exchange rates into a regime of flexible rates after the Bretton Woods Conference in 1973. During that time, exchange rates fluctuated widely and placed unprecedented pressures on the foreign exchange market. As a consequence of the new economic system and foreign exchange market chaos, during 1970s, there has been an increased interest in studying the process of exchange rate determination.

Numerous economists attempted to develop the theory to explain the exchange rates fluctuation. Most of the pioneer work on the determination of floating exchange rates had been focused on the explanation of the large fluctuations in exchange rates and on the poor performance of forward rates as predictors of future spot rates. The important pioneer works, which aim to explain the exchange rate behavior, are contributed to Mussa (1979), Dornbusch (1978 and 1980), Frenkel (1981) and Edwards (1982) who use innovations in the interest differentials and other macroeconomic variables to model expectations and derive measures for news. Their analytical framework that is used for interpreting the volatility of exchange rates is so called “modern theory of exchange rate determination”. Within this framework,

exchange rates are viewed as the prices of assets that are traded in organized markets and, like the prices of other assets, are strongly influenced by expectations about future events.

2.2.1 The Pioneer Works

Dornbusch (1980) uses definition of unanticipated depreciation as the difference between the actual depreciation and interest differentials. He distinguishes news into three kinds as determinants of unanticipated changes in the exchange rate: current account news, news about cyclical or demand factors and news about interest rate. These are done by using OECD forecasts of specified variables and then compared with actual data, the difference represents the news. His empirical analysis confirms that unanticipated change in selected variables brings about unexpected movements in the exchange rate.

By following the concept of Mussa (1977 and 1979a) and Dornbusch (1978), Frenkel uses “news” as a determinant of the exchange rate. Frenkel (1981) is among the very first economist who used the asset view of exchange rate determination to explain the changes in exchange rate. Within his framework, exchange rates are viewed as the prices of assets that are traded in organized markets and, like the prices of other assets, are strongly influenced by expectations about future events.

Frenkel argues that while variables such as the money supply and income are unlikely to reflect the “news” adequately, the relative interest rate is a relevant

variable because it captures the “news” promptly. Frenkel examines how exchange rate changes respond to the unexpected interest differentials. Assuming that assets market clear fast and that the news is immediately reflected in unexpected changes in the rates of interest, he estimates the model as follows:

$$\ln S_t = \underbrace{\alpha + \beta \ln F_{t-1}}_{\text{expected exchange rate}} + \underbrace{\delta[(i - i^*)_t - E_{t-1}(i - i^*)_t]}_{\text{‘news’}} + u_t$$

where S_t = spot exchange rate at time (t)

F_{t-1} = Forward rate at time (t-1)

i = domestic interest rate at time (t)

i^* = foreign interest rate at time (t)

The bracketed term is the innovation of the (1-month) interest rate differential which better reflects the ‘news’ in the foreign exchange market.

He does this test by using monthly U.S. dollar/UK sterling, U.S. dollar/French franc and U.S. dollar/German mark exchange rates over the period of June 1973 to July 1979. He finds that in all cases the coefficients of the unexpected interest rate differential are positive and only in the case of dollar/UK sterling, the coefficient is statistically significant. From his finding, it implies that current exchange rates already reflect current expectations about the future, while changes in the current rates

reflect primarily changes in these expectations, in which, by definition, arise from new information.

Later on, Edward (1982) further pursues investigating the role of new information in the determination of exchange rates behavior. He implements an extended version of the Flex-Price monetary approach. He suggests that there are at least three ways to incorporate 'news' component into the empirical analysis of exchange market efficiency, which are: (1) directly incorporate unexpected changes of exchange rate determinants to the right-hand side of the traditional market efficiency equation. This has been done by Frenkel (1981) and Dornbusch (1980). (2) use non-linear, full information method, testing simultaneously for market efficiency and rational expectations such as the work done by Hartley (1981) in the context of the simple monetary model. (3) it can be done by using Zellner's seemingly unrelated regressions (SURE) methods that recognize that the unexpected changes of exchange rate determinants correspond to the errors in forecasting equations.

By applying method (3), he estimates for the currencies studied by Frenkel over the same period Frenkel has studied but using SURE estimator. The results show that an unanticipated change in money supply, real income and interest rate lead to an unanticipated depreciation of exchange rate. The results also indicate that once the role of 'news' is taken into account, the efficiency of the tests improves. In general, his findings tend to confirm previous findings [Dornbusch (1980) and Frenkel (1981)] that illustrated the new information plays a considerable role in the explanation of observed market forecasting errors. As is stated in many literatures on the response of

asset prices to economic announcements, it is desirable to take the shortest interval possible around the news since other shocks might dilute the estimated effect over one month. Since the data used in these studies are monthly data, the immediate responses of exchange rates to news announcements are not measure.

2.2.2 Economic Announcements: the Early Works

The studies of the economists mentioned above do not focus on economic announcement, but they sparked the interest for the role of news topic to many others economists. Afterward, many researchers have been constantly producing the works related to news, but this time, they further focus on the impact of exchange rate from the major macroeconomic announcements. In order to study the effects of 'news', the forecasted data have to be used. However, it is quite difficult to create a good forecast for each of these announcements. As a result, instead of creating the forecasted data, most researchers tend to use the survey data of expectation regarding the value of the variable to be released. The survey data that are commonly used are from the Money Market Services (MMS), which is widely used by numerous researchers.[9]

Among the studies, the most of the early works tended to focus on the response of the exchange rate to the U.S. Federal Reserve's weekly money announcements.[10] For example, Roley and Troll (1983) and Urich and Wachtel (1984)

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[9] See for example Engle and Frankel (1984), Hakkio and Pearce (1985), Ito and Roley (1987), Hardovelis(1988), and Hogan et al (1991).

[10] See also Cornel (1982,1983), Hardouvelis (1984), Frankel and Hardouvelis (1985), and Roley (1986).

study the U.S. macroeconomic news but they now turn to study the impact to U.S. interest rate movements and finds that money supply announcements are strongly correlated with interest rate movements. The response of foreign exchange rates to Federal Reserve's weekly money announcements is also investigated by Cornel (1982,1983). Similarly, Engle and Frankel (1984) examine the reaction of the mark/dollar exchange rate to money supply announcements and find that positive money supply announcements are associated with appreciation of the dollar.

The response of exchange rates to other economic announcements also has been considered. For instance, the study by Rose (1984) tests the exchange rate movement on the effect of the interest rate news. He employs the daily data from the U.S. and Canadian one-month forward markets from 1971 to 1980. Based on the assumption that the interest differential is essential not only because of its fundamental role, but also because it is set in relatively perfect financial markets, he tests for the role of news by comparing spot rates with appropriately lagged forward rates, and included the interest rate differential in the equation. He finds that there is little evidence regarding the importance of news on interest rate differential. Batten and Thornton (1984) also examine the response to US discount rate changes. They conclude that unexpected discount rate changes are significant in explaining rate movements.

Furthermore, Hakkio and Pearce (1985) investigate the reactions of several spot exchange rates to the news. They consider the response of exchange rates to announcements of U.S. inflation, industrial production, and unemployment, as well as

to weekly money supply announcements. They conclude that exchange rates do react to unexpected changes in the money stock but do not react to the other measures of economic news. In line with the previous studies, they also find that exchange rates are significant relate to money supply surprises between the pre-October 1979 and the post-October 1979 period. However, they examine exchange rate only in the New York market, but they do not consider the exchange rate movements in the rest of the world. It is important to recognize that not only domestic but also foreign news is very relevant in the determination of the exchange rate. Since an exchange rate is the relative price of two assets, it is important to recognize that the rate could respond to domestic and/or foreign news.

The Importance of Foreign News

As a result, in order to recognize the important of foreign news, Ito and Roley (1987) study the reactions of the yen/U.S. dollar rate to macroeconomic announcements not only in the United States, but also in Japan. They use the data set which consists of the opening and closing quotes of the exchange rate in the Tokyo market and as well as the quotes from the New York market. Since the exchange rate should reflect not only the U.S. news but also the Japanese news, they are interested to consider how Japanese economic announcements compare with U.S. economic announcements with respect to the exchange rate response. In conclusion, they find that U.S. announcements, especially U.S. money announcements, have the most consistent effects while macroeconomics announcements from Japan have no impact.

The Importance of Frequency

Moreover, some researchers based on several U.S. exchange rates sampled at a daily frequency.[11] For example, Hardouvelis (1988) examines the response of exchange rate and interest rates to fifteen U.S. macroeconomic announcements, which are consisted of four monetary figures, two inflation figures, trade deficit, and eight other monthly macroeconomic data. He focuses on the data from October 11, 1979 until August 16, 1984. He finds exchange rate react to news about money supply and trade balances systematically and occasionally to some business cycle variables.

He uses Ordinary Least Squares Method in his model by rationalizing that the OLS estimates are as efficient as the estimates from a seemingly unrelated regression procedure because the set of the independent variables is identical in every equation. Again, the MMS survey data are used in this study.

2.2.3 The Recent Works

In the 1990's, the researches of 'news' effects also have been continuously examined. Hogan, Melvin, and Roberts (1991), and Hogan and Melvin (1994) study the reactions and demonstrate that the U.S. exchange rates respond rapidly to the U.S. money supply and trade balance surprises, but not to other types of the U.S. news.

[11] See Haedouvelis (1988), Aggarwal and Schirm (1992), Harris and Zabka (1995), and Edison (1997)

The study of ‘news’ also extended to other types of foreign exchange market. For instance, Ederington and Lee (1995) use intra-daily data from the foreign currency futures market to demonstrate that transaction prices react very swiftly to the announcement of U.S. economic data.

Later, there are many studies which used a far more coarse sampling frequency that used in the Ederington and Lee study. Harris and Zabka (1996) use daily data on six major currencies to examine the impact of statistics contained in the U.S. employment report on foreign exchange markets. The results from a conventional regression analysis show a clear positive relationship between employment surprises and the U.S. dollar appreciation.

Edison (1997) studies the response of exchange rates and interest rates to six U.S. macroeconomic variables, which are classed into two categories, economic news, related to unexpected inflation and economic news related to unexpected change in economic activity. The economic news used in his study are consumer and producer price indices, industrial production, retail sales, unemployment rates and non-farm payroll employment. Once again, the survey data from the MMS are used as a proxy for the forecasted data. He finds that 100,000 increases on non-farm payroll employment lead to a 0.2 percent appreciation of the exchange rate. He concludes that in general, exchange rates do not react systematically to news on inflation. By contrast, U.S. interest rates respond to both types of news.

Due to the fact that the impacts of ‘news’ on the exchange rate can lose their significance very rapidly when the observation horizon for the exchange rate is increased, Almeida, Goodhart and Payne (1998) turn to use data sampled at a high frequency of 5 minutes interval. They are able to identify systematic impacts of most announcements on the exchange rate change in the 15 minutes post-announcement. In their study, the high frequency reaction of the Deutsche mark/U.S. dollar exchange rate to publicly announced macroeconomic information from Germany and the U.S. is investigated.

2.2.4 Research Conducted in Thailand

For Thailand case, there are two studies recently related to exchange rate and “news”. Klinboon (1997) studies the exchange rate determination both in the short-run and long-run. The analyses are focused during the period of floating exchange rate regime from July 2, 1997 to February 18, 1998. Her study is based on the model of Frenkel (1981) which using ordinary least square method to test the market efficiency. She finds that Thailand foreign exchange market is inefficiency and the forward rate is not the unbiased estimator of the future spot rate. Also, the test of role of ‘news’ to exchange rate can be concluded that the ‘news’ has no significant effect to the change of baht/dollar exchange rate. Nevertheless, the results may be biased since the data she employed might not reflect the market reaction since data are such a short period and the market was very volatile. Further, the news which is the unexpected changes in the rate of interest might not adequately explain the real event in that sample period

since Thailand market at that time had been attacked by the continually bad surprises such as financial institution collapse.

The most recent study in the case of Thailand is Chinprateep (1998) who examines the influences of macroeconomic new releases on exchange and also interest rates in Thailand by using monthly data during March 1995 to March 1998. The independent variables she focuses on are: 1) monetary news (M1, official foreign reserves, interbank rate), 2) trade deficit, 3) consumer price index, and 4) manufacturing production index. In contrast to Klinboon who uses Frenkel (1981) model, Chinprateep applies the model based on Hardouvelis (1988), which interested merely in the unanticipated component or 'news' and skip the relationship between spot rate and forward rate. The model in this study is in the form of equation below:

$$\Delta Fin_t = \alpha_0 + \sum_{i=1}^{n} a_i x_{it}^u + u_t$$

where ΔFin_t is the percentage change in the value of foreign currency

$x_{i,t}^u$ is the unanticipated component of economic series x_i announced at t

u_t is a random error term uncorrelated with the information prior to the announcement at time t

Due to the lack of market survey, she estimates the markets' expectations about the announcement of eight potential variables and then calculates an unexpected

component of those variables by using two models, the autoregressive and vector autoregressive models.

From the study, she concludes that, of the various kind of economic news, monetary news has the strongest effect on both exchange rate and interest rate. However, Chinprateep's study focuses merely the Thai news effect and dose not taken the U.S. news into account. Moreover, the study is conducted until March 1998 which only 9 months after switching to floating exchange rate regime. As a result, the conclusion from her study might not sufficiently reflect the behavior of exchange rate movement after floating.

2.2.5 Contributions to the Literature

This study makes three contributions to the literature. First, this study attempts, for the first time, to correct the incompleteness of the previous studies by adding news from U.S. macroeconomic data into the news model of baht/U.S. dollar exchange rate determination. Second, it uses recent data by extending the scope of study to only after July 1997, the period after float, to December 1999. Third, it examines the asymmetric responses for large/small errors and positive/negative errors, which also is the first study for Thai baht vis-à-vis U.S. dollar.

CHAPTER 3

DATA AND RESEARCH METHODOLOGY

3.1 The Data

In this section, two major sources of data are discussed. First, the U.S. data and their sources are discussed. Next, the data and sources of Thailand are presented. Also, the rationale of macroeconomic news selection is also provided.

3.1.1 United States Data

The macroeconomic news is associated with the monthly release of data on seven U.S. economic variables: consumer price index for urban consumer (CPI), producer price index for finished goods (PPI), the unemployment rate, retail sales, the index of industrial production. I select these variables according to the previous studies as shown in table 3.1 and the importance of the indicators.[12]

For the survey data, the information contained in announcements over this three-year period is extracted via a set of market expectation series supplied by the Money Market Service International (MMS), which is the source used in many

[12] See Carnes S., *The Atlas of Economic Indicators: A Visual Guide to Market Forces and the Federal Reserve*, (New York: HarperCollins, 1991)

previous researches. The data are accessed either via the Reuters' Terminal or the MMS' information service. The MMS expectations in this study are calculated as the median from a survey of forecasts made by leading practitioners and academics. The surveys cover between approximately 40 respondents and are conducted on the Friday immediately preceding each announcement. Hence, the news associated with the release of each variable is identified as the difference between the value released and the median of the survey responses. For the actual data, once again, I also use the data provided by the MMS.

There are basically two reasons for having confidence that the MMS survey-based expectations are better proxies for market expectations than other survey data. Firstly, the data have been shown to have desirable properties such as unbiasedness and efficiency.[13] Secondly, market participants are likely to know the results of the survey before announcement since they are available commercially. In addition, the Wall Street Journal uses them as the "market's expectation." Thus, agents who do not have the same forecasts might treat the survey median forecast as representative of market opinion.

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[13] Pearce and Roley (1985) present evidence supporting the unbiasedness and efficiency of the Money Market Services survey data.

Table 3.1 Major Economic Indicators Used by Previous Studies

Major Economic Indicators Used by Previous Studies	
Money Supply	Edward (1982), Engle and Frankel (1984), Hakkio and Pearce (1985), Ito and Roley (1987), Chinprateep (1998)
Interest Rate	Frenkel (1981), Edward (1982), Rose (1984), Klinboon (1997)
CPI	Hakkio and Pearce (1985), Almeida, Goodhart and Payne (1998), Edison (1997)
PPI	Hakkio and Pearce (1985), Almeida, Goodhart and Payne (1998), Edison (1997), Ito and Roley (1987)
Industrial Production	Hakkio and Pearce (1985), Almeida, Goodhart and Payne (1998), Edison (1997), Ito and Roley (1987)
Unemployment	Hakkio and Pearce (1985), Almeida, Goodhart and Payne (1998), Edison (1997)
Retail Sales	Almeida, Goodhart and Payne (1998), Edison (1997)
Leading Indicator	Almeida, Goodhart and Payne (1998)
Foreign Reserve	Chinprateep (1998)
Manufacturing Production Index	Chinprateep (1998)
Trade Deficit	Almeida, Goodhart and Payne (1998), Chinprateep (1998)

3.1.2 Thailand Data

For Thailand, I use various financial and macro economic data as the proxy for news in Thailand. I use the following data:

- Consumer Price Index
- Producer Price Index
- Manufacturing Production Index
- Private Consumption
- Trade Balance

All of the above data are from Bank of Thailand's Data Bank.[14] These data are usually announced in the monthly economic indicators by the Bank of Thailand every last Friday of the month.

The news is associated with the monthly release of five U.S. macroeconomic variables and five Thailand macroeconomic variables. Basically, these variables have been classified into two categories: unexpected inflation and unexpected change in economic activity based on methodology used by Edison (1997)[15]

Unexpected Inflation Category

The first category of economic news related to unexpected inflation as measured by the unexpected parts of the monthly announcement of the rate of change of the consumer price index (CPI) and producer price index (PPI) of both U.S. and Thailand. It is the impact of these surprises on agents' expectations that determine the response of exchange rates and interest rates. The mechanism should be as follows: if the announced inflation rates are higher than market expected, the market's expectation of future inflation will be higher, then this might cause nominal interest rate to rise and then a fall of the domestic currency. Alternatively, another channel that would affect currency movement is through the expectation of investor and dealer that believe the monetary authorities will react to inflation news and affect the future

[14] The address is *www.bot.or.th*

[15] Edison, H. "The Reaction of Exchange Rates and Interest Rates to News Release." *International Journal of Finance and Economics,* 2 (1997), 87-100.

policy decision. For example, unexpectedly high inflation might lead to a tighter monetary policy, and would lead to higher interest rates and appreciation of domestic currency. As a result, the effect of inflation news is ambiguously unclear. It could be perceived as both positive and negative news depending on the channel the effect goes through.

Unexpected Changes in Economic Activities

The second category is the unexpected changes in economic activities by both U.S. and Thailand. These activities are index of industrial production for U.S. (IP) or manufacturing production index (MPI) for Thailand, U.S. retail sales (RS) or Thailand's private consumptions (PC), U.S. unemployment (UN) and Thailand's trade balance (TB). Once again there are two channels through which unexpected growth, as indicated by unexpected increases in IP, MPI, RS, PC, or a decline in UN, can affect exchange rates. Firstly, the sign of unexpected growth might lead agents to revise their expectations of real growth upward, which leads to an upward revision of money demand and hence an appreciation of the domestic currency. Alternatively, the interpretation of agents would be that the news would be negatively perceived by monetary authority as the overheating economy and leads to an increase in interest rate and hence appreciation of domestic currency. However, no matter what channel, the sign of these news variables should be presumably positive.

For trade balance, the mechanism acts differently. The unexpected increase (decrease) in trade balance would make agents to expect an increase (decrease) in foreign currency and hence an appreciation (depreciation) of domestic currency.

Exchange Rate Data

For the exchange rate, the daily data are derived from set of THB/USD quotations, published by the Bank of Thailand. I use the daily reference rate for the daily model. For the monthly data, I also use the monthly average reference rate which are regularly published by the Bank of Thailand.

3.2 Methodology

For the methodology, I primarily follow the methodology conducted by Edison (1997) and Almeida, Goodhart and Payne (1996) which based on the linear regression model. I conduct this empirical study into two phases. Firstly, I test the impact of news on the exchange rate in term of monthly reaction. However, it is potentially vulnerable to a problem of omitted variables since there might be some other factors that have an impact the exchange rate within a month. As a result, I begin the second phase of analysis by focusing merely the short-term effects which I test the exchange rate reaction on the one-day after announcement basis.

Empirical Model

In the regressions, the dependent variable is 100 times the change in (the log of) the exchange rate between the closing price of the day (or monthly average) after the announcement and the preceding closing price rate.[16] The factor 100 transforms the units of the dependent variable to percentages. More Precisely, the dependent variable is as equation (1) as follows:

$$\Delta s_t = 100 * (\ln S_t - \ln S_{t-1}) \quad \textbf{(1)}$$

where Δs_t denotes the change in the log of the exchange rate from the previous period

Based on the MMS survey data, the unexpected news (forecast error) is computed as:

Forecast Error = Announced Data - Expected Data

Based on Thailand macroeconomics data, the unexpected news (forecast error) is computed as:

Forecast Error = Announced Data – Time series forecasted Data

3.2.1 The foreign exchange reaction to news model – Monthly Model

To investigate the respond of the exchange rate to news, the following equation is estimated:

$$\Delta s_t = \alpha + \sum_{i=j}^{n} \beta_i (x_{i,t}^u + x_{i,t}^e) + u_{i,t} \qquad \textbf{(2)}$$

where

Δs_t denotes the change in the log of the monthly average exchange rate from the previous period

$x_{i,t}^u = x_{i,t} - x_{i,t}^e$, the expectation error of the corresponding economic series at time t

[16] Due to time lag between U.S. and Thailand, the exchange rate on the announcement day is actually a one-day-after rate in Thailand time. For instance, if CPI announce on Tuesday, it will have an effect in Bangkok market in the following day, which is Wednesday.

$x_{i,t}$ denotes the actual announcement at time t and I corresponds to each of the variables

$x^{e}_{i,t}$ denotes the expected figure from either MMS or time-series forecasted data

However, Market efficiency would dictate that the expected portion of an announcement should have no impact on the exchange rate since all market's participants have already factored in the data. As a result, equation (3) is utilized by assuming market efficiency and restricts the parameters β_2 to zero as follows:

$$\Delta s_t = \alpha + \sum_{i=j}^{n} \beta_i x^{u}_{i,t} + u_{i,t} \qquad \textbf{(3)}$$

This model is similar to Hardouvelis (1988) which are used several times by researchers.[17] Equation (3) is estimated when all news variables are considered jointly. In order to test the effect from macroeconomic announcement form each country, I separate the model into two models, U.S. and Thailand models. Firstly, the U.S. model relates the change in the baht/dollar in one month following an announcement to the portions of the selected U.S. announcement that were unexpected.

[17] See for example Edison (1997) and Chinprateep (1998)

Secondly, I apply the same methodology to Thailand case by using unexpected portion as the determinant of exchange rate. Nevertheless, due to the lack of market survey in Thailand, I cannot directly take the survey data into the model. In stead, I utilize the econometric time series model to derive the forecasted data and then calculate the unexpected portion by simply subtracting the forecasted data from the actual data. To do so, the methodology of econometric time series model is discussed further.

Method of Estimation

In this context, the ordinary Least Squares method (OLS) is used in this study.

3.2.2 The foreign exchange reaction to news model – Daily Model

As I discussed earlier, there is a potential problem of omitted variables since there might be some other factors that do have an impact but I do not take them into account. Thus, the second phase of analysis is to distinguish the only short-term effect from the response to that particular news. As a result, the model in this phase relies on the daily data in order to capture the exchange rate reaction on the day-to-day basis.

I construct the model practiced by Almeida, Goodhart and Payne (1996) which is similar to the phase 1 model except that the model does not test the simultaneous effect of all the variables at the same time. On the other hand, I test the reaction of exchange rate on the one by one basis. Logically, I try to figure out whether each

particular variable used in this test alone can be classified as a significant determinant of baht/dollar exchange rate. The equation is adapted as follows:

$$\Delta s_t = \alpha + \beta x^u_{i,t} + u_{i,t} \qquad \textbf{(4)}$$

where

Δs_t denotes the change in the log of the exchange rate from the previous period

$x^u_{i,t} = x_{i,t} - x^e_{i,t}$, the expectation error of the corresponding economic series at time t

$x_{i,t}$ denotes the actual announcement at time t and i corresponds to each of the variables

$x^e_{i,t}$ denotes the expected figure from either MMS or time-series forecasted data

Once again, I also test the reaction from news by considering only the U.S. news announcements and then Thailand one at a time. As a result, I have 2 sets of the equation, one for U.S. and another one for Thailand. For the U.S. model, since I have 6 exogenous variables in total, I do the regression analysis for all of the 6 equations. Similarly, I do the regression analysis for each of the 6 variables in the case of Thailand.

3.2.3 Time Series model for Thailand's News

Since the survey data for U.S. macroeconomic variables are provided by the MMS, I simply take the unexpected part to the estimated model. However, in case of Thailand, survey forecast are not widely done and even there are some survey data,

the data are not sufficient for this study. As a result, I have to construct sub-model to find out the unexpected part for Thai news by using econometric time-series model.

In order to calculate the unexpected part, I first estimate the expected part by using Autoregressive integrated moving average (ARIMA) time-series model, or known as the Box-Jenkins methodology, which is the method of using the past data to determine the movement or the pattern of the current data. More important, this method allows us to construct the Ex Post Forecast in order to use as a proxy for expected part, the required data for the model.

To estimate time-series model, the equation is as follows:

$$y_t = a_0 + a_1 y_{t-1} + a_2 y_{t-2} + \ldots + a_p y_{t-p} + \varepsilon_t + \beta_1 \varepsilon_{t-1} + \ldots + \beta_q \varepsilon_{t-q} \qquad \textbf{(5)}$$

where y_t denotes for each of Thailand's variables which are consumer price index, producer price index, manufacturing production index, private consumption, and trade balance.

Steps in the ARIMA model

To perform the ARIMA model, given below are the four main steps in the estimation procedure:

Step 1: Identification (to find the value of p, d, and q) one way is to look at a correlogram and partial correlogram.

Step 2: Estimation

Step 3: Diagnostic checking (to test whether the chosen model fits the data) one way to test is to see if the residuals estimated from the model are white noise.

Step 4: Forecasting

The ARIMA model building starts with the identification of an ARIMA model for the series. Patterns of autocorrelation observed in the data are compared with the patterns expected of various ARIMA models. If non-stationarity is indicated (by an ACF which fails to die out), it will be necessary to difference and/or transform the series prior to identifying a model. Next, the parameters of the model are estimated. All parameter estimates must lie within the bounds of stationarity-invertibility and must be statistically significant. Alternatively, the data can be tested again by applying the Unit Root test.

After the model has been identified and its parameters satisfactorily estimated, it must be diagnosed. To pass diagnosis, the residuals of the model must be white noise. To test whether the entire residual ACF is different from what would be expected of a white noise process, a Q statistic may be use. A null hypothesis is the model residuals are white noise. If the Q statistic for the residual ACF is significant, the null hypothesis must be rejected; the model residuals are not white noise, so the model is not statistically adequate and must be rejected.

If the model passes diagnosis process, the model can be used for the forecast. By following this methodology, finally, I can derive the unexpected errors by subtracting the exposed forecast from actual data.

3.2.4 Additional Test

For Monthly Model

Reaction to positive and negative errors

Since the reactions of the exchange rate to news about a variable can be symmetrical in response to positive or negative errors. Positive error means actual data is better than market expected or better than market forecast. In the contrary, negative error implies the opposite direction. Therefore, I allow for the possibility of an asymmetric response by adding the dummy variable to the equation 3 as follows:

$$\Delta s_t = \alpha + \sum_{i=j}^{n} \beta_i^1 D_P x_{i,t}^u + \sum_{i=j}^{n} \beta_i^2 D_N x_{i,t}^u + u_{i,t} \qquad \textbf{(6)}$$

Where $D_P and D_N$ denote positive and negative dummies, respectively.

Response to large and small errors

Next, I consider whether the response of the baht/dollar depends on the size of the surprise. I use the criteria conducted by Edison (1997) who defines large surprises as those that are above the 90^{th} percentile (positive responses) and those below 10^{th} percentile (negative responses).

The estimated model is quite similar to the previous equation only the definition of dummy is changed. The model is:

$$\Delta s_t = \alpha + \sum_{i=j}^{n} \beta_i^1 D_L x_{i,t}^u + \sum_{i=j}^{n} \beta_i^2 D_S x_{i,t}^u + u_{i,t} \qquad \textbf{(7)}$$

Where $D_L and D_S$ denote large and small dummies, respectively.

For Daily Model

For daily model, I also examine the response to the positive/negative and large/small error, exactly the same as the previous phase. The difference between the monthly and daily model is that the dummy variables are attached to only one news variable at a time. For example, to examine the effects from consumer price index toward the exchange rate, the dummy variables will be assigned to only consumer price index variable. In the monthly model, a pair of dummy variables will be assigned to every news variables. As a result, the total number of dummy variables will be 10 instead of 2 in the daily model.

Reaction to positive and negative errors

$$\Delta s_t = \alpha + \beta_i^1 D_P x_{i,t}^u + \beta_i^2 D_N x_{i,t}^u + u_{i,t} \qquad \textbf{(8)}$$

Where $D_P and D_L$ denote positive and negative dummies, respectively.

Response to large and small errors

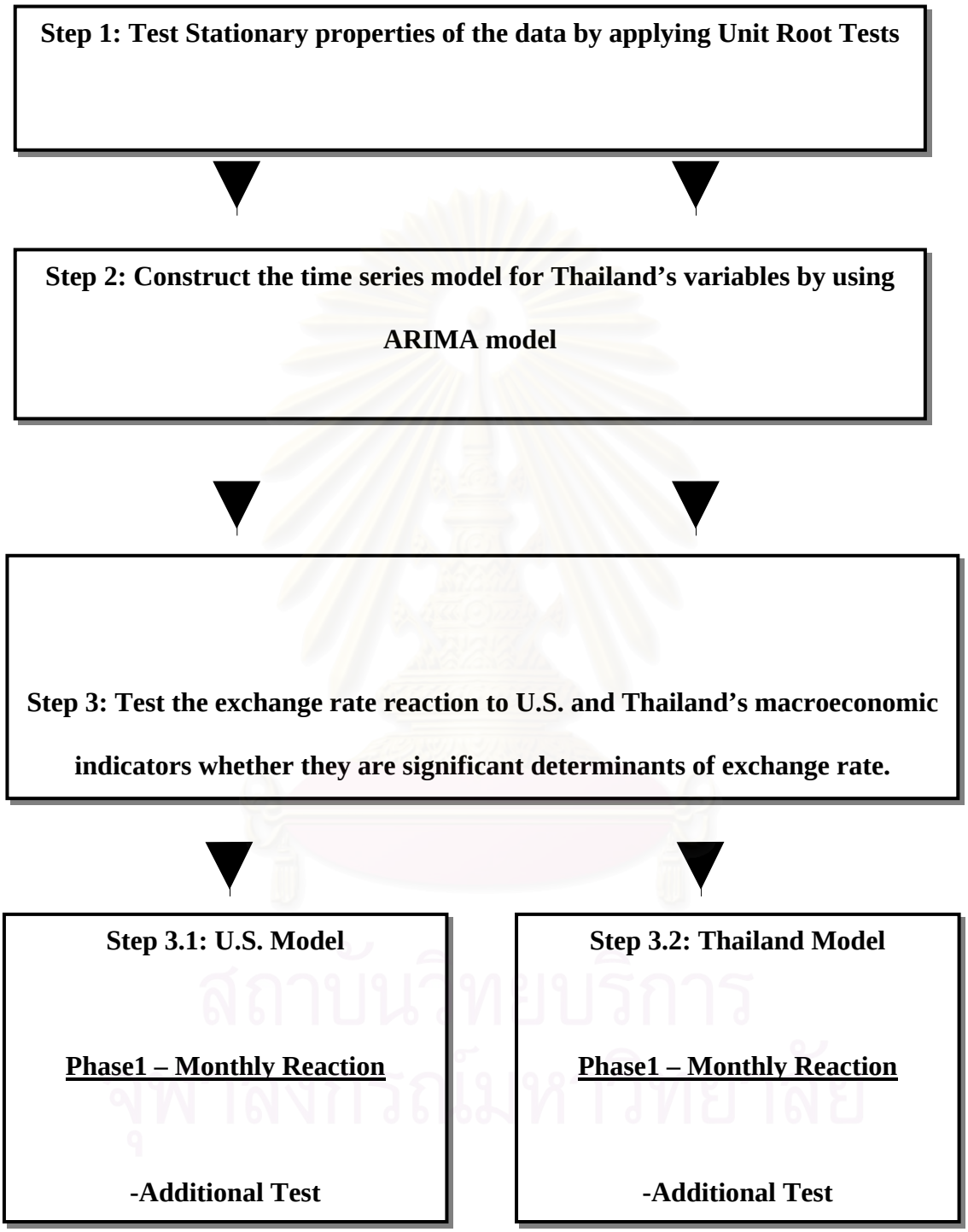
$$\Delta s_t = \alpha + \beta_i^1 D_L x_{i,t}^u + \beta_i^2 D_S x_{i,t}^u + u_{i,t} \qquad \textbf{(9)}$$

Where $D_L and D_S$ denote large and small dummies, respectively.

3.2.5 Data Examination

I also perform the standard time series checking by testing of the stationary property for the Thailand data. Again, in this case, I use both Correlogram and the Unit Root Test or augmented Dickey-Fuller as my methodology.

Figure 3.1 Methodology Steps and Workflow diagram



CHAPTER 4

EMPIRICAL WORK

In this section, the empirical works from econometric models are presented. First, the results from U.S. macroeconomic announcements study are discussed. Then, the results from Thailand macroeconomic announcements study are presented.

4.1 Analysis of U.S. Macroeconomic Announcements

In this section, the results from testing the impact of U.S. data releases on the baht/dollar rate are presented. Having mentioned in the data section, the analysis concentrates on the following monthly U.S. announcements: consumer price index for urban consumer (CPI), producer price index for finished goods (PPI), the unemployment rate, retail sales, and the index of industrial production.

The survey data are from the Money Market Services (MMS), a subsidiary of the Standard and Poor's. The median forecast from the survey is used. Hence, the news associated with the release of each variable is identified as the difference between the value released and the median of the survey responses. For example, in the survey conducted on October 13, 2000, five days prior to the CPI release of the month, the median expected value of the CPI release was 0.4 percent. The actual

release value for the CPI was 0.5 percent; therefore the expectation error or "news" for the month of October was 0.1 percent.

Data Examination

There are 40 announcements (July 1997 – October 2000) in the sample period for every variable. Table 4.1 presents the absolute frequency distribution of the expectation errors associated with each of the variables. This table tells us how close the market expectations are forecasted compared to the actual data. According to the table, survey participants are more accurate at forecasting CPI and UNEMP (37 and 32 percent, respectively) than RS (10 percent).

Table 4.1 Absolute Frequency Distributions of Expectation Errors

Variable	Error Size (percentage points)								
	<-0.3	-0.3	-0.2	-0.1	0	+0.1	+0.2	+0.3	>+0.3
CPI	0	1	1	14	15	7	1	1	0
PPI	2	4	6	6	7	5	3	2	5
IP	2	2	1	6	12	4	4	3	6
RS	3	4	7	4	4	2	6	4	6
UNEMP	0	1	6	6	13	13	1	0	0

Based on the assumption of the classical linear regression model (CLRM) that there is no multicollinearity among the regressors included in the regressions model, next the correlation matrix is established in order to detect the multicollinearity property of these five variables. Theoretically, suggested rule of thumb is that if the pair-wise or zero-order correlation coefficient between two regressors is high, say, in

excess of 0.8, then multicollinearity is a serious problem.[18] From the table 4.2, the result suggests that since there is no any absolute value of correlation higher than 0.8, then the degree of multicollinearity in this case is not serious. As a result, the regression can be proceeded without the remedy or dropping any variable.

Table 4.2 Correlation Matrix

	UN_CPI	UN_IP	UN_PPI	UN_RS	UN_UNEMP
UN_CPI	1	-0.006317	0.21262	0.19989	-0.030053
UN_IP	-0.006317	1	-0.48632	-0.232956	0.086721
UN_PPI	0.21262	-0.48632	1	0.285128	-0.059694
UN_RS	0.19989	-0.232956	0.285128	1	-0.159691
UN_UNEMP	-0.030053	0.086721	-0.059694	-0.159691	1

Next, it is important to detect the stationarity property of the data. So, a visual plot of the data is constructed. Figure 4.1, it shows that the pattern of actual announcement for those five U.S. variables are relatively smooth as well as the survey data and the unexpected components as shown in figure 4.2 and 4.3, respectively.

[18] See Damodar N. Gujarati, "Basic Econometrics" , 3rd (Singapore: McGraw-Hill, 1995), p. 335.

However, visual plot is not sufficient for a guarantee of stationarity property. As a result, each individual univariate statistical property of the released, survey data, and also the unexpected component are tested by using unit root tests. Table 4.3 reports the test results using a simple augmented Dickey-Fuller test with one lag. The null hypothesis of this test is that the time series has a unit root. The null hypothesis is all rejected in most variables at 0.01 percent level. As a result, all the variables employed in the regression model are stationary data and hence, fulfills the assumption that the time series variable in the regression model must be stationary.

Table 4.3 Unit Root Test: U.S. Data

Variables	Actual Data ADF	Survey Data ADF	Unexpected Component ADF
SPOT	**-4.08***		
CPI	-6.28*	-4.45*	**-7.37***
PPI	-4.40*	-3.88*	**-5.42***
IP	-5.33*	-4.12*	**-6.60***
RS	-5.49*	-5.21*	**-5.21***
UNEMP	-2.23	-2.46	**-5.13***

Note: * significantly different from the MacKinnon critical values for rejection of hypothesis of a unit root test at 0.01 percent level

Figure 4.1 U.S. announcement data

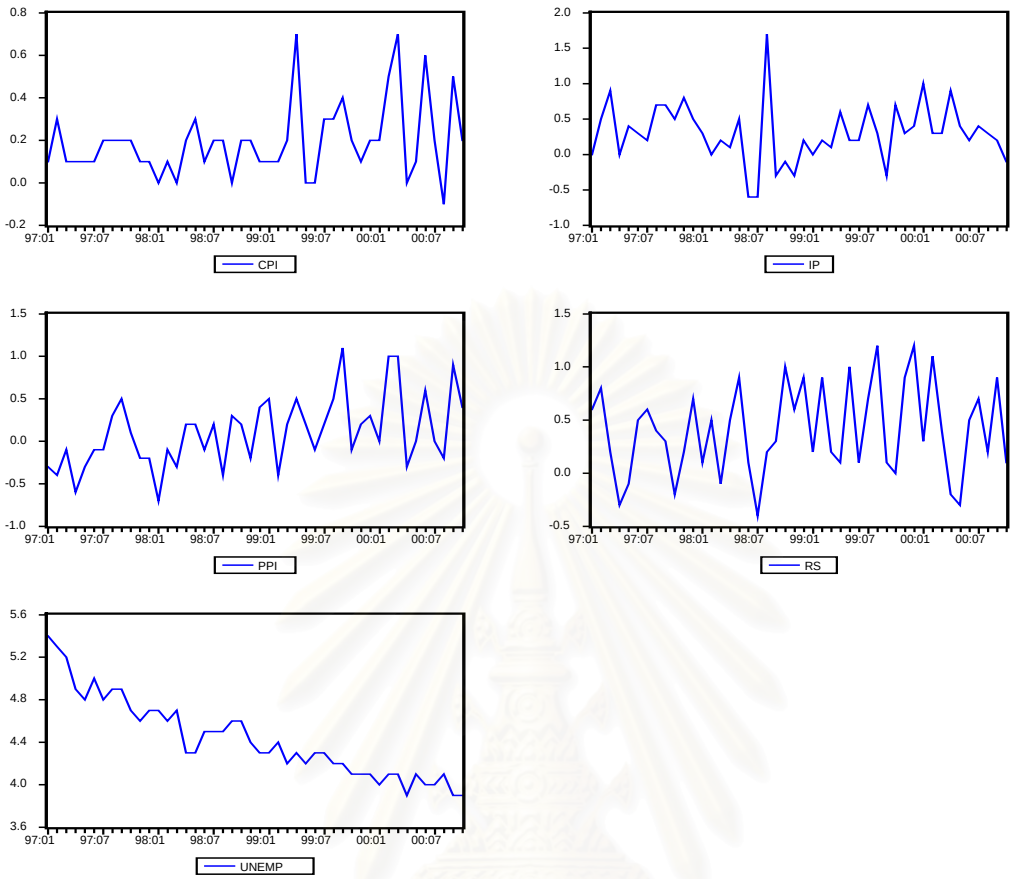


Figure 4.2 Survey Data by Money Market Services (MMS)

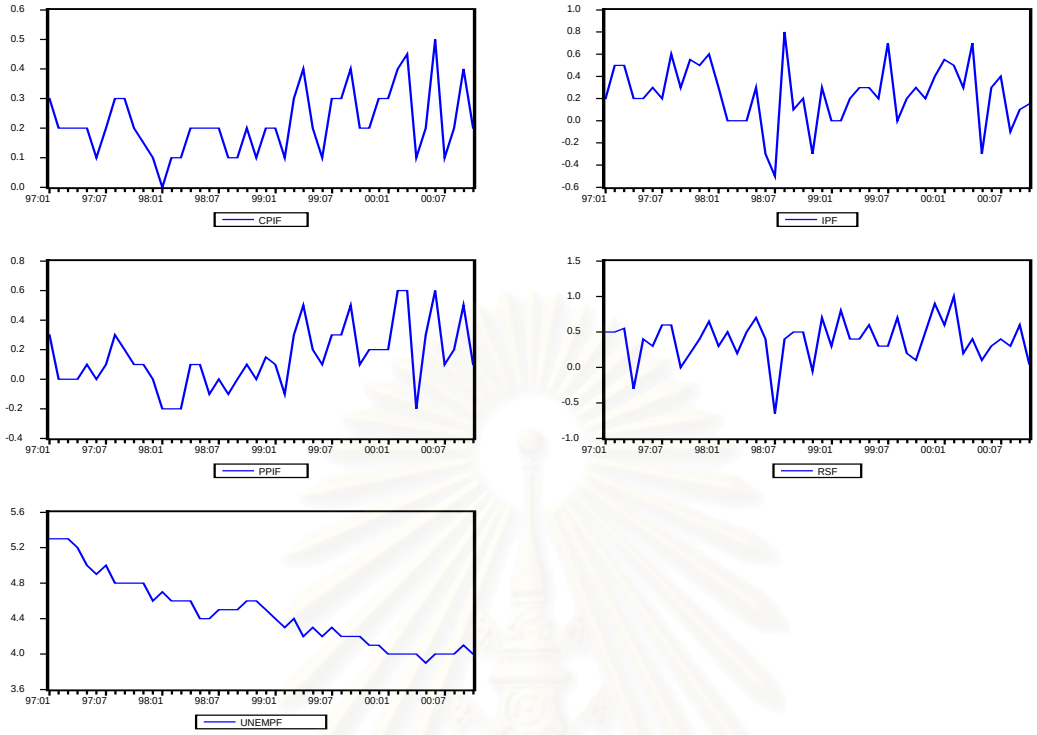
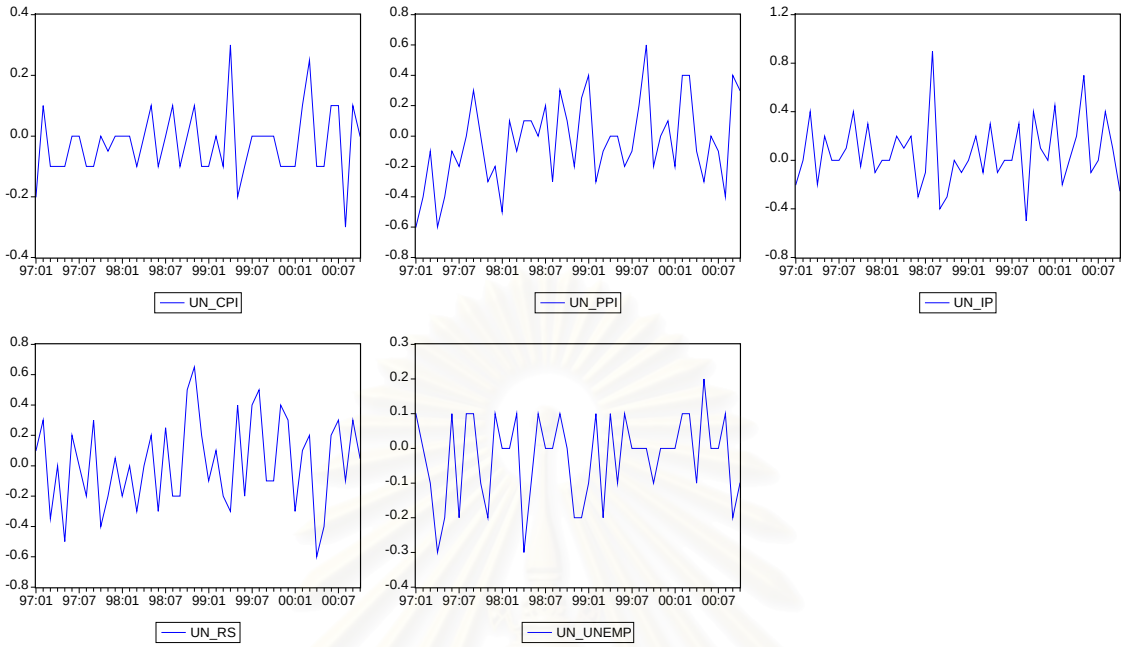


Figure 4.3 Unexpected Component: U.S. data



4.1.1 The Impact of the "unexpected component" to exchange rate: Monthly Model

By applying the equation 3 in the previous section, I regress the change in Baht/dollar exchange rate on the "unexpected component" which is simply the different between the released data and the survey data from the MMS. Using the OLS method, the result is shown below.

Table 4.4 LS Estimation Result: the U.S. Monthly Model

Dependent Variable	Independent Variables			
	Variables	Coefficient	t-statistic	Prob.
SPOT	C	0.2995	0.1961	0.8457
	UN_CPI	-2.3529	-0.3117	0.7573
	UN_PPI	2.5936	0.5717	0.5715
	UN_IP	3.2911	0.9131	0.3680
	UN_RS	2.2389	0.7095	0.4831
	UN_UNEMP	-1.3101	-0.1883	0.8519
	R-square	0.1827		
	Adjusted R-square	0.0295		
	Durbin-Watson	1.9156		
	F-statistic	1.1926		
	Prob (F-statistic)	0.3353		

Note: SPOT1 = [ln (St) – ln (St-1)]*100 (average monthly reference rate)
UN_CPI is an unexpected component of U.S. monthly consumer index
UN_PPI is an unexpected component of U.S. monthly producer price index
UN_IP is an unexpected component of U.S. monthly industrial production index
UN_RS is an unexpected component of U.S. monthly retail sales
UN_UNEMP is an unexpected component of U.S. monthly unemployment rate

The result shows that the news variables in this case are statistically insignificant since they have insignificant t-statistic. In conclusion, the unexpected component computing form U.S. macroeconomic announcements cannot be the

explanatory variable to influence the baht/dollar exchange rate movement in the monthly model environment.

Basically, the result does not surprise the expectation. Since the model is based on monthly data, the effect of these unexpected might be only in short term and might diminish when time passes. As a result, the next examination is focused on the short-term effect by using the daily exchange rate data, which might show us more sensible result.

Additional Test

To extend the above estimation, the segregation of the variables into positive/negative error and also large/small error are conducted and examined. This study intends to test whether the test results will be improved after factoring the sign and the size of the errors into the estimation.

Response to positive and negative error

In order to do so, I add the dummy variables to the equations. By definition, the positive error is the error which its announced data is greater than its forecasted data and negative error is the one which announced data is less than forecasted data. The result is shown in table 4.5.

Unsurprisingly, almost every variable, both positive and negative errors, yields the same result as previous regression. Only positive unemployment error is statistically significant at 10 percent level while the rest are not. The result suggests that the reaction to the exchange rate to a 0.1 U.S. unemployment positive error has been on average 4.59 percent (in *ln* form) or baht is depreciated 4.59 percent from the previous value.

In term of economic rationale, the result reveals that unemployment data is relatively important to the baht/dollar exchange rate, particularly the higher than expected unemployment rate. It also implies that unemployment data is the news that economic agents in the baht/dollar foreign exchange market follow closely. Interestingly, since only higher than expected news counts, it can be implied that the economic agents react more actively to the bad news rather than the good news.

For F-test and R-square, they both inform us the relatively poor result. The negative adjusted R-square indicates that the number of observation might be too small. In this case, when adjusted R-square turns out to be negative, its value is taken as zero.[19] Thus, the result suggests that the overall model does poorly in explaining the exchange rate movement.

[19] See Damodar N. Gujarati, "Basic Econometrics" , 3rd (Singapore: McGraw-Hill, 1995), p. 208.

Table 4.5 Response to Positive and Negative Errors: the U.S. monthly model

Dependent Variable	Independent Variables			
	Variables	Coefficient	t-statistic	Prob.
SPOT	C	2.2740	0.6949	0.4927
	UN_CPI (positive)	-16.4192	-0.9335	0.3583
	UN_CPI (negative)	13.8741	0.7853	0.4387
	UN_PPI (positive)	-6.0602	-0.6984	0.4905
	UN_PPI (negative)	10.1883	1.0083	0.3217
	UN_IP (positive)	2.1877	0.3598	0.7216
	UN_IP (negative)	8.4091	0.7569	0.4552
	UN_RS (positive)	0.0068	0.0009	0.9993
	UN_RS (negative)	7.5290	0.7859	0.4383
	UN_UNEMP (positive)	**45.9619**	**1.923017*** **	**0.0643**
	UN_UNEMP (negative)	-21.0198	-1.4869	0.1478
	R-square	0.2006		
	Adjusted R-square	-0.0751		
	Durbin-Watson	1.3277		
	F-statistic	0.7277		
	Prob (F-statistic)	0.6926		

*** Significantly different from zero at 0.10 level

Response to Large and Small Errors

For the response to large and small errors, the table 4.6 shows the result. Fascinatingly, the responses do not differ significantly between large/small news and the average response. According to the result, no matter the error size is large or small, it does not the factor driving the change in exchange rate.

In conclusion, the macroeconomic news from the U.S. are not the factors explaining the movement of the baht/U.S. dollar exchange rate regardless of size of the news.

Table 4.6 Response to Large and Small Errors: U.S. monthly model

Dependent Variable	Independent Variables			
	Variables	Coefficient	t-statistic	Prob.
SPOT	C	0.3996	0.2581	0.7981
	UN_CPI (large)	-1.9754	-0.1750	0.8623
	UN_CPI (small)	-10.0413	-0.3252	0.7473
	UN_PPI (large)	8.2321	1.0007	0.3252
	UN_PPI (small)	-5.9517	-0.9475	0.3512
	UN_IP (large)	5.8109	0.9428	0.3535
	UN_IP (small)	6.2506	0.8426	0.4064
	UN_RS (large)	0.2302	0.0430	0.9660
	UN_RS (small)	6.5777	1.0608	0.2975
	UN_UNEMP (large)	-13.4094	-1.0747	0.2914
	UN_UNEMP (small)	16.5154	0.9941	0.3284
	R-square	0.1444		
	Adjusted R-square	-0.1506		
	Durbin-Watson	1.2311		
	F-statistic	0.4894		
	Prob (F-statistic)	0.8831		

*Large errors are defined as those that are above the 90th percentile (positive responses) and those below 10th percentile (negative response)

4.1.2 The Impact of “unexpected component” to exchange rate: Daily Model

Next, the test for short-term impact is investigated in order to capture the impact of unexpected macroeconomic announcement within one day after the released data are announced. First, I collect the daily exchange rate the day and the day before the data are announced and regress it on the same set of the unexpected data series. Because of the time lag between U.S. and Thailand, the announcement date in the U.S. (day) will affect the exchange rate on another day (day+1) in Thailand. As a result, the exchange rate changes in this case are the different between the exchange rate on the announcement day and the next day. However, because of the holiday and weekend effect, the next day in this context means the next business day

Again, since this is a time series regression, the stationarity test must be implemented. The stationarity test for unexpected components has been done in the monthly model already, so the test is focused only on daily exchange rate variable. From the table 4.7, the result shows that every exchange rate data are stationary.

In order to extract the impact from each variable, the regression analysis is based on single variable instead of regressing the entire unexpected component at the same time as I did previously. Some of the original estimations are recalculated and corrected if the autocorrelation problem exists. The final results are shown in the table 4.8.

Table 4.7 Unit Root Test for U.S. daily Model

Variables	Actual Data ADF
SPOT for CPI	-3.54**
SPOT for PPI	-4.42*
SPOT for IP	-3.81*
SPOT for RS	-3.52**
SPOT for UNEMP	-5.17*

Note: * and ** are significantly different from the MacKinnon critical values for rejection of hypothesis of a unit root test at 0.01 and 0.05 percent level respectively.

Table 4.8 LS Estimation Result: U.S. Daily Model

Dependent Variable	Independent Variables								
	Variables	Coefficient	t-statistic	Prob (t)	R-square	Adj R-square	DW stat	F-statistic	Prob (F)
spot_cpi	UN_CPI	-0.1771	-0.1368	0.8919	0.2007	0.1563	1.8930	4.5210	0.0177
spot_ppi	UN_PPI	-0.1220	-0.1980	0.8441	0.0944	0.0441	1.7976	1.8758	0.1679
spot_ip	UN_IP	1.0219	1.6286	0.1117	0.0652	0.0406	1.9112	2.6525	0.1117
spot_rs	UN_RS	-0.6537	-1.1330	0.2647	0.2139	0.1702	1.7404	4.8968	0.0132
spot_unemp	UN_UNEMP	-0.2380	-0.1283	0.8986	0.0004	-0.0259	2.1656	0.0165	0.8986

Once again, the result from the daily model fails to explain the exchange rate movement. None of the “news” variables has a coefficient that statistically significant at 5 percent level. According to R-square, retail sales and consumer price index seems to have superior explanation power than the rest of variables. Nevertheless, from the overall results, it indicates that even applying exchange rate data with a higher frequency, baht/dollar exchange rate does not respond to the unexpected components of macroeconomic announcement.

As a result, the hypothesis that the macroeconomic news would have higher impact to exchange rate in the more frequency term (in this case, daily data) has to be rejected in this case.

Additional Test

To extend the above estimation, I again separate the unexpected components into positive/negative error and also large/small error. The test are conducted and examined and shown below. Note that there is no stationary test for the dummy variables because they are derived from unexpected components that are stationary.

Response to Positive and Negative Errors

In contrast to monthly model, the positive/negative errors in the daily model yield no significant variable. None of them is statistically significant at 5 or even 10 percent confidence interval.

Table 4.9 Response to Positive and Negative Errors: U.S. Daily Model

Dependent Variable	Independent Variables								
	Variables	Coefficient	t-statistic	Prob (t)	R-square	Adjusted R-square	Durbin Watson	F-statistic	Prob (F)
spot_cpi	UN_CPI (positive)	3.6304	1.3618	0.1820	0.2572	0.1935	1.8390	4.0392	0.0144
	UN_CPI (negative)	-3.8320	-1.4875	0.1458					
spot_ppi	UN_PPI (positive)	-0.8742	-0.7297	0.4705	0.1091	0.0327	1.8040	1.4283	0.2510
	UN_PPI (negative)	0.7616	0.5569	0.5811					
spot_ip	UN_IP (positive)	0.7839	0.9027	0.3725	0.0693	0.0190	1.9017	1.3775	0.2648
	UN_IP (negative)	1.5838	1.0304	0.3095					
spot_rs	UN_RS (positive)	-0.4589	-0.4164	0.6796	0.2149	0.1476	1.7462	3.1928	0.0354
	UN_RS (negative)	-0.9331	-0.6307	0.5323					
spot_unemp	UN_UNEMP (positive)	-0.1378	-0.0299	0.9763	0.0004	-0.0536	2.1651	0.0083	0.9917
	UN_UNEMP (negative)	-0.2918	-0.0992	0.9215					

Response to Large and Small Errors

However, for large/small error test, it indicates that small forecasting error of U.S. Industrial Production (IP) generally make an average of 0.29 percent baht depreciated for every 0.1 error.

Table 4.10 Response to Large and Small Errors: U.S. Daily Model

Dependent Variable	Independent Variables								
	Variables	Coefficient	t-statistic	Prob (t)	R-square	Adj R-square	DW stat	F-statistic	Prob (F)
spot_cpi	UN_CPI (large)	-0.2890	-0.1865	0.8531	0.2011	0.1326	1.8966	2.9371	0.0467
	UN_CPI (small)	0.3459	0.0823	0.9349					
spot_ppi	UN_PPI (large)	0.3649	0.3889	0.6997	0.1067	0.0301	1.8013	1.3928	0.2612
	UN_PPI (small)	-0.5698	-0.6350	0.5296					
spot_ip	UN_IP (large)	0.2256	0.3169	0.7531	0.1640	0.1188	1.9549	3.6283	0.0364
	UN_IP (small)	**2.9021**	**2.6821**	**0.0109****					
spot_rs	UN_RS (large)	-0.5271	-0.7556	0.4550	0.2164	0.1492	1.7455	3.2217	0.0343
	UN_RS (small)	-0.9328	-0.9244	0.3616					
spot_unemp	UN_UNEMP (large)	-0.4404	-0.1798	0.8583	0.0009	-0.0531	2.1618	0.0163	0.9838
	UN_UNEMP (small)	0.1157	0.0348	0.9724					

** Significantly different from zero at 0.05 level

In conclusion, in the higher frequency model, baht/dollar exchange rate does not react to the macroeconomic news from the U.S. regardless of direction and size of news.

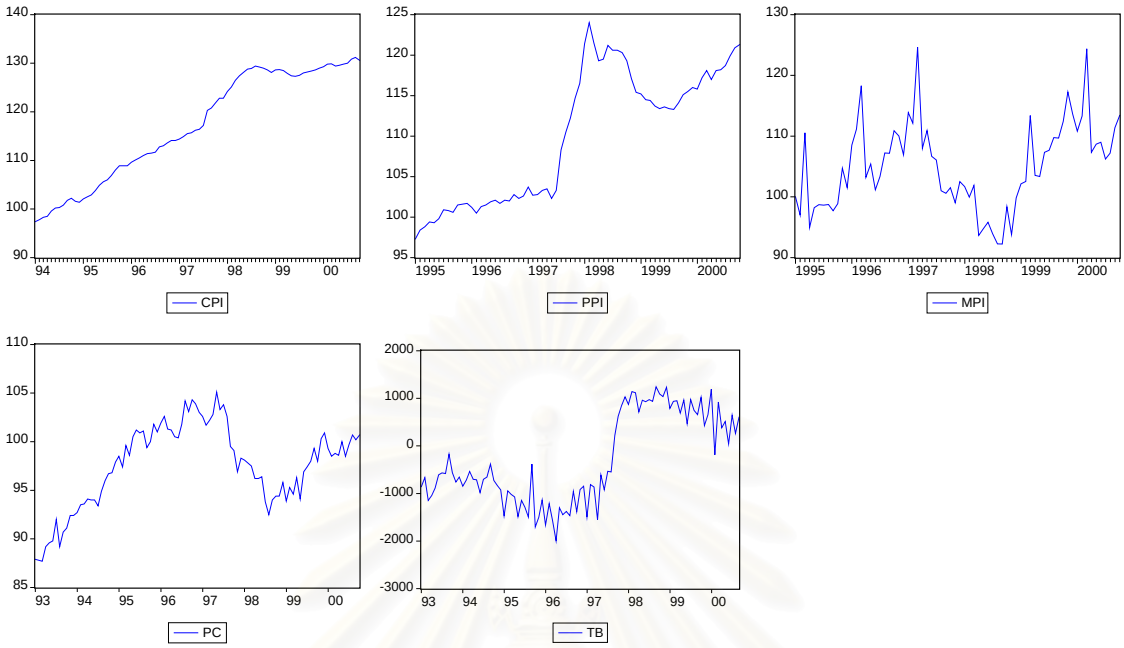
4.2 Analysis of Thailand Macroeconomic Announcements

As I mentioned earlier that there is no survey data of macroeconomic variables, so the unexpected data will be derived from the different between actual data and the forecasted data calculated from the time series forecast model.

Calculating the forecasted data: ARIMA model

To employ ARIMA model, the stationarity property is a necessary condition to further estimate the model. I can check visually by looking at the graphical plot of the data in figure 4.4. Basically, the data are not smooth.

Figure 4.4 Thailand Macroeconomic Announcements



The vertical axis is the unit value of the variables and horizontal is the time (in month)

CPI is monthly consumer index (1994 is a base year)
PPI is monthly producer price index (1995 is a base year)
MPI is monthly manufacturing production price index (1995 is a base year)
PC is monthly composite private consumption index (1995 is a base year)
TB is monthly trade balance (in million of US$)

First step, I plot the correlogram to prove the hypothesis that the data are not stationary. In order to do that, I look at the Autocorrelation function (ACF) and Partial autocorrelation function (PACF). Theoretically, the ACF of a nonstationary process is expected to have a relatively high positive value for ACF and successive lags of the ACF are expected to die out slowly to Zero. Based on ACF, the autocorrelation functions of all variables tail off while their PACF show spikes. This pattern seems to indicate that these data are nonstationary and have possibility that their stationary can be derived from first-order autoregressive process.

As a result, I transform the data into stationary by putting the first difference form and then test by plotting ACF and APCF again. The results are satisfied, every first difference form of all series are stationary. The results are reported below in the table 4.11. I also test the stationarity property again by applying the Unit Root Test reported in table 4.12. Also, the ADF value from the Unit Root Test give us the same conclusion.

Table 4.11 The Stationary Test: Thailand data

Variables	Particular lag that the statistic lies outside the 95% confidence interval	
	Level	1st difference
CPI	almost all	1, 3, 5, 14, 20
PPI	almost all	1, 11, 15
MPI	almost all	1, 11, 12, 13, 24, 25
PC	almost all	1, 9, 23
TB	almost all	1,3,4,11,12,16,23,24

Note: based on the 95% confidence limit for pk which is calculated from $-1.96(1/\sqrt{n})$ and $+1.96(1/\sqrt{n})$

Table 4.12 The Stationarity tested by Unit Root Test: Thailand data

Variables	ADF Test Statistic	
	Level	1st diffrence
CPI	-1.73	-3.27**
PPI	-0.97	-3.29**
MPI	-1.85	-5.60*
PC	-2.44	-4.94*
TB	-0.77	-5.72*

* significantly different from the MacKinnon critical values for rejection of hypothesis of a unit root test at 0.01 percent level
** significantly different from zero at 0.05 level

Then, using the lag lengths derived from the correlogram, the autoregressive model for forecasting are constructed. Then, to diagnose and check the equation, I calculate the Q-statistic and test whether the residuals estimated from the equations are purely random. From the test, every Q-statistic is less than the chi-square distribution with 25 lags (37.65) at 5 percent level of significance. These indicate that the equations shown in the table 4.15 is appropriate and may not need to look for another ARIMA model.

Table 4.13 Best Autoregressive Estimation and Diagnostic Test

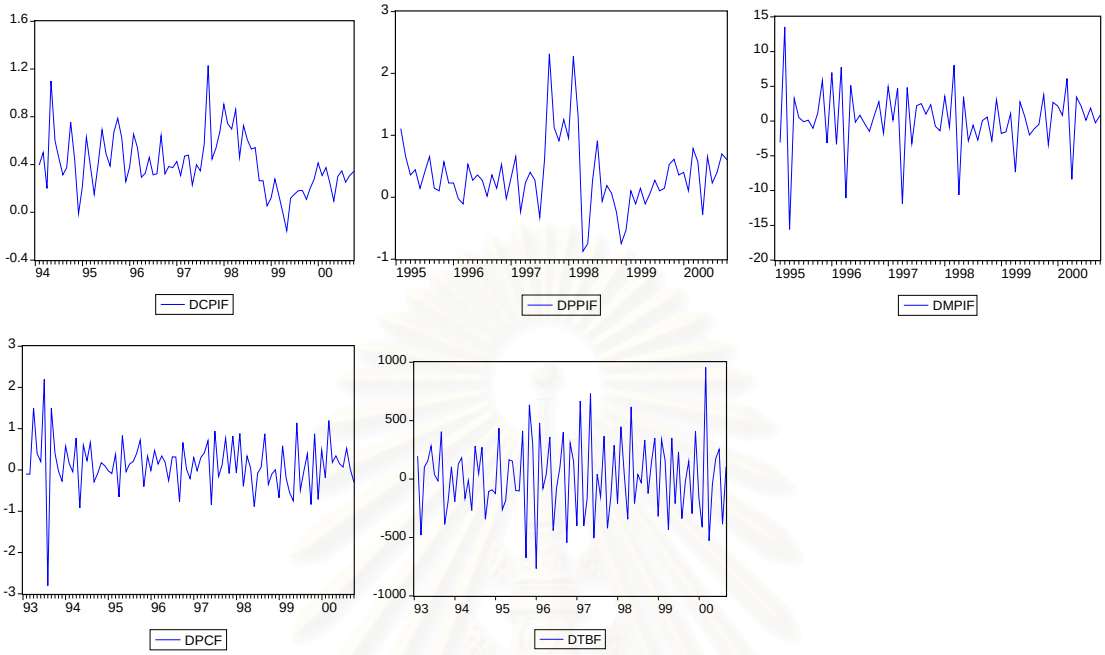
Variable Equation	R^2	Adjusted R^2	Q-stat
DCPI = 0.37 + 0.32 DCPI (-1) + 0.23 DCPI (-5) *(4.53) (3.17) (2.20)*	0.17	0.15	32.258
DPPI = 0.3291 + 0.4253 DPPI (-1) *(1.33) (3.83)*	0.18	0.16	30.932
DMPI = -0.01 + 0.21 DMPI (-1) + 0.61 DMPI (-12) *(-0.02) (-2.12) (2.46)*	0.52	0.5	17.86
DPC = 0.1067 – 0.2563 DPC (-1) + 0.3180 DPC (-9) *(0.80) (-2.50) (6.20)*	0.15	0.13	30.842
DTB = 25.42 – 0.54 DTB (-1) + 0.32 DTB (-3) *(0.76) (-6.22) (3.83)* + 0.26 DTB (-12) – 0.22 DTB (-23) *(2.45) (-2.15)*	0.56	0.54	16.88

Note: The numbers in parenthesis are *t* value.
DCPI = the first difference of CPI
DPPI = the first difference of PPI
DMPI = the first difference of MPI
DPC = the first difference of PC
DTB = the first difference of TB

Next, I use this best-estimated model shown above to forecast the expected macroeconomic announcements. Theoretically, by rational expectations hypothesis, it can be assumed that economic agents would use these historical data as the best predictor for future macroeconomic announcements.

Also, the notion that each person will update his/her forecast by the latest macroeconomic announcements that are announced in the previous period is assumed. As a result, it is legitimate to use the static forecasting method for this study. The result is demonstrated in Figure 4.5.

Figure 4.5 Forecasted value computing by autoregressive equation (in the first difference form)



Calculating Unexpected Component

After the forecasted data are estimated, next I calculate the difference between the actual data and the forecasted data obtaining from the autoregressive equations. These differences are “unexpected component”. However, the estimated equations are in the first difference form. As a result, before computing the unexpected component, all the expected data in the first difference form must be converted into the normal form by adding back the raw data from the previous period in order to extract the expected value in the level form.

Again, in order to detect the stationarity property of the data, the visual plot of both forecasted and unexpected component data are graphically constructed as shown in figure 4.6 and figure 4.7, respectively.

Figure 4.6 Forecasted value (Expected Component)

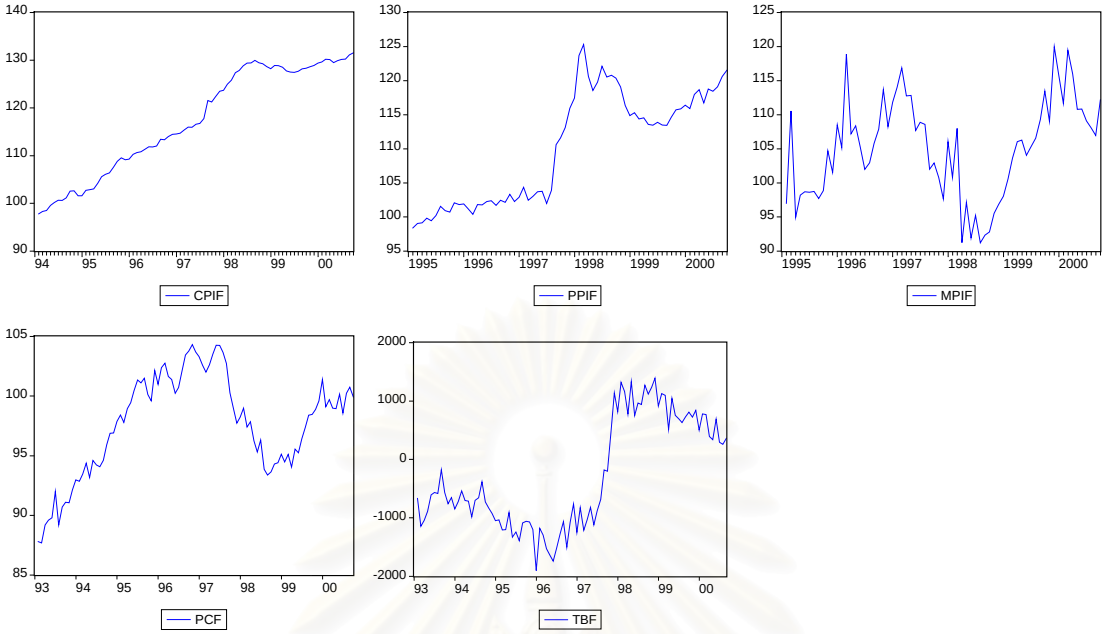
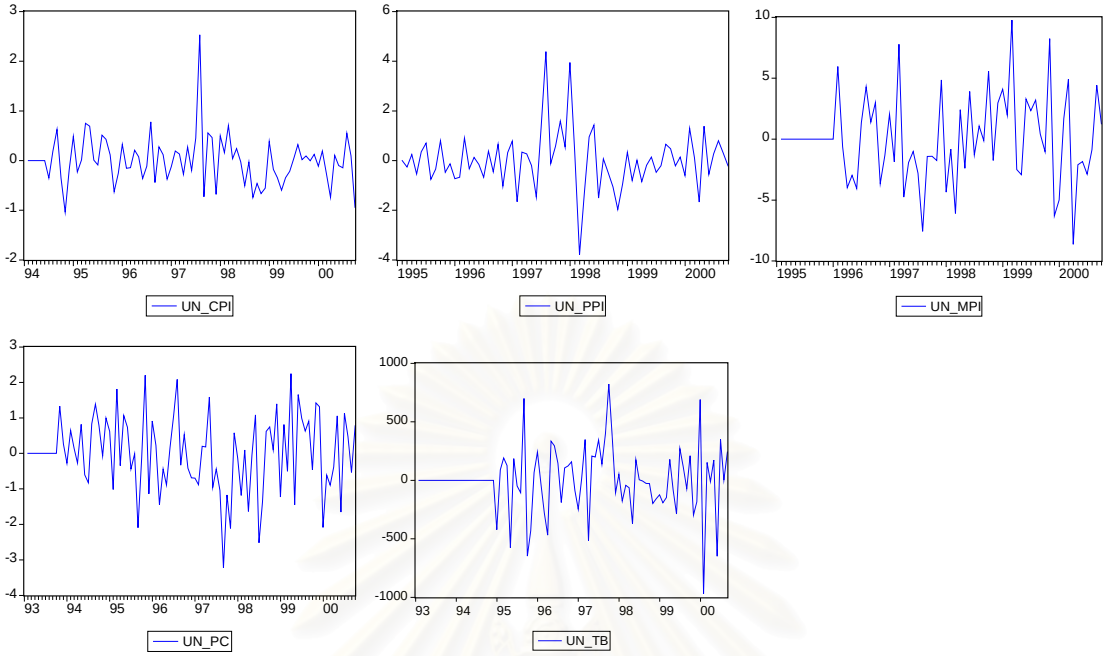


Figure 4.7 Unexpected Component: Thailand data



Data Examination

The stationarity property for the unexpected component data is checked again by unit root test reported in table 4.14. The result reveals that the unexpected component data are stationary.

Table 4.14 The Stationarity tested by Unit Root Test: Unexpected Component

Variables	Actual Data ADF	Unexpected Component ADF
SPOT	-4.08*	
CPI	-1.73	-3.70*
PPI	-0.97	-5.01*
MPI	-1.85	-4.23*
PC	-2.44	-3.55**
TB	-0.77	-4.03*

* and ** is significantly different from the MacKinnon critical values for rejection of hypothesis of a unit root test at 0.01 and 0.05 percent level, respectively.

Again, the multicollinearity problem is detected by plotting the correlation matrix. From the table 4.15, the result suggests that since there is no any absolute value of correlation higher than 0.8 (the same criteria mentioned in the U.S. model), then the degree of multicollinearity in this case once again is not serious issue. As a result, the regression can be proceeded without the remedy or dropping any variable.

Table 4.15 Correlation Matrix: Thailand Model

	UN_CPI	UN_MPI	UN_PC	UN_PPI	UN_TB
UN_CPI	1.0000	-0.3006	-0.1148	0.5851	0.1160
UN_MPI	-0.3006	1.0000	0.2023	-0.0739	-0.2178
UN_PC	-0.1148	0.2023	1.0000	-0.0270	-0.1926
UN_PPI	0.5851	-0.0739	-0.0270	1.0000	0.0877
UN_TB	0.1160	-0.2178	-0.1926	0.0877	1.0000

4.2.1 The Impact of "unexpected component" to exchange rate: Monthly Model

Then, the next process is to quantify the impact of the unexpected components to the baht/dollar exchange rate. Now, since both dependent and independent variables are stationary data, then the regression procedure can be carried on. Having mentioned earlier, the method of Ordinary Least Squares Method (OLS) is applied. The results are shown in Table 4.16 below.

Table 4.16 The LS estimation Result: Thailand Monthly Model

Dependent Variable	Independent Variables			
	Variables	Coefficient	t-statistic	Prob.
SPOT	C	1.0965	1.0724	0.2911
	UN_CPI	1.6667	0.7182	0.4775
	UN_PPI	-0.1171	-0.1319	0.8958
	UN_MPI	0.1546	0.5713	0.5715
	UN_PC	-0.7647	-0.9235	0.3623
	UN_TB	0.0030	0.9085	0.3700
	R-square	0.0763		
	Adjusted R-square	-0.0595		
	Durbin-Watson	6.3579		
	F-statistic	0.5617		
	Prob (F-statistic)	0.7285		

SPOT = [ln (St) – ln (St-1)]*100 (average monthly reference rate)
UN_CPI = unanticipated component of change in CPI
UN_PPI = unanticipated component of change in PPI
UN_MPI = unanticipated component of change in MPI
UN_PC = unanticipated component of change in PC
UN_TB = unanticipated component of change in TB

The result indicates that the overall estimation yields negative adjusted R-square (-0.05), which means the explanatory power of a regression equation is zero. With a 5 or even 10 percent level of significance, no variable in this equation has a

significant *t* value. The F-statistic of 0.56 also confirms that the estimated coefficients are not acceptable under the 5 percent confidence interval.

In conclusion, the unexpected component computing form ARIMA model cannot be the explanatory variable to influence the monthly baht/dollar exchange rate movement.

Basically, the result resembles the outcome from the previous the U.S. monthly model. It follows the beginning stated hypothesis that impact from unexpected forecasting error of macroeconomic data will be faded along with time. In other words, it dose not have much impact to the exchange rate in the longer period. As a result, the “news” or unexpected component could not be a factor to explain the exchange rate movement in this monthly data model.

The possible explanation might come from the fact that the model is based on monthly data. As a result, the effect of these unexpected might be faded when time passes and newer information are assimilated.

Additional Test

Again, to examine the impact of positive and negative errors, I add the dummy variables to the equations. The result is shown in table 4.17 and 4.18.

Response to positive and negative error

Noticeably, the different between these results is that CPI becomes statistically significant when news is split this way. For the rest of the news, impact from both positive and negative errors yields almost the same result as previous regression. For overall model, both F-test and adjusted R-square report relatively poor result.

For CPI, only positive error of consumer price index is statistically significant at 5 percent level with the positive coefficient. It simply suggests that the reaction to the exchange rate to a 0.1 CPI positive error has been on average 0.83 percent. Generally speaking, the underestimation of CPI (announced CPI is higher than expected) leads to an increase in exchange rate (depreciation)

Rationally, the result confirms the purchasing power parity theory (PPP) that domestic inflation leads to domestic currency depreciation. In this case, the higher than expected CPI tells the market that the inflation condition might be worse than previous prediction.

Table 4.17 Response to Positive and Negative Errors: Thailand Monthly Model

Dependent Variable	Independent Variables			
	Variables	Coefficient	t-statistic	Prob.
SPOT	C	-0.2459	-0.0748	0.9409
	UN_CPI (positive)	**8.3696**	**2.110283****	**0.0436**
	UN_CPI (negative)	-6.0471	-1.3370	0.1916
	UN_PPI (positive)	-2.1374	-1.1687	0.2521
	UN_PPI (negative)	1.1169	0.6473	0.5225
	UN_MPI (positive)	0.0456	0.0912	0.9279
	UN_MPI (negative)	0.3698	0.5976	0.5547
	UN_PC (positive)	-1.1417	-0.5167	0.6093
	UN_PC (negative)	0.3030	0.1807	0.8579
	UN_TB (positive)	0.0100	1.5531	0.1312
	UN_TB (negative)	-0.0042	-0.7212	0.4765
	R-square	0.2354		
	Adjusted R-square	-0.0282		
	Durbin-Watson	1.2604		
	F-statistic	0.8929		
	Prob (F-statistic)	0.5511		

** Indicates that the statistic is significant at 0.05 level

Response to large and small errors

For the response to large and small errors, the table 4.18 suggests that overall model cannot explain the exchange rate movement since it yields negative adjusted R-square and high F (prob) value. However, the model reveals that the exchange rate will react to the small MPI prediction error. The variable is statistically significant at 10 percent, but the size of the coefficient remains small, indicating that the effect is quantitatively small.

According to the economic rationale, the manufacturing production index news can affect exchange rate movement by sending the signal of the domestic economic activity level.

However, the result from this study is unclear about how the economic mechanism really works. Since the size of its coefficient is very small, it would be a reasonable action to exclude the MPI news when analyzing the exchange rate.

Table 4.18 Response to Large and Small Errors: Thailand Monthly Model

Dependent Variable	Independent Variables			
	Variables	Coefficient	t-statistic	Prob.
SPOT	C	0.8288	0.7752	0.4445
	UN_CPI (large)	1.0284	0.3829	0.7046
	UN_CPI (small)	-1.8665	-0.3832	0.7044
	UN_PPI (large)	0.0918	0.0888	0.9299
	UN_PPI (small)	0.7125	0.3653	0.7175
	UN_MPI (large)	-0.1545	-0.4397	0.6634
	UN_MPI (small)	**0.8096**	**1.713561*** **	**0.0973**
	UN_PC (large)	-1.6361	-1.3279	0.1946
	UN_PC (small)	-0.7780	-0.5814	0.5654
	UN_TB (large)	0.0016	0.3729	0.7119
	UN_TB (small)	0.0104	1.4203	0.1662
	R-square	0.1812		
	Adjusted R-square	-0.1011		
	Durbin-Watson	1.4158		
	F-statistic	0.6418		
	Prob (F-statistic)	0.7663		

*** Indicates that the statistic is significant at 0.10 level

4.2.2 The Impact of "unexpected component" to exchange rate: Daily Model

Next, the test for short-term impact is investigated in order to capture the impact of unexpected macroeconomic announcement within one day after Bank of Thailand announces the real data. First, I collect the daily exchange rate the day and the day before the data are announced and regress it on the same set of the unexpected data series. In order to extract the impact from each variable, the regression analysis is based on single variable instead of regressing the entire unexpected component at the same time as I did previously.

Next, the stationarity property must be checked again. Since the unexpected component data are previously checked, only the spot rate in Thailand daily model is tested and presents in table 4.19.

Table 4.19 Unit Root Test: Thailand Daily Model

Variables	Actual Data ADF
SPOT	-4.57*

Table 4.20 LS Estimation Result: Thailand Daily Model

Dependent Variable	Independent Variables								
	Variables	Coefficient	t-statistic	Prob (t)	R-square	Adj R-square	DW stat	F-statistic	Prob (F)
spot	UN_CPI	0.0264	0.0122	0.9903	0.0000	-0.0263	1.4693	0.0001	0.9903
spot	**UN_PPI**	**-1.9125**	**-2.3167****	**0.0263**	**0.1411**	**0.0934**	**2.0122**	**2.9578**	**0.0647**
spot	UN_MPI	-0.0402	-0.1332	0.8948	0.0005	-0.0258	1.4759	0.0177	0.8948
spot	**UN_PC**	**-1.7070**	**-1.8325*****	**0.0747**	**0.0812**	**0.0570**	**1.5229**	**3.3583**	**0.0747**
spot	UN_TB	0.0040	1.0435	0.3033	0.0279	0.0023	1.6804	1.0888	0.3033

** indicates that the statistic is significant at 0.05 level
*** indicates that the statistic is significant at 0.10 level

The regression result in table 4.20 indicates that forecasted error of both production price index (PPI) and private consumption (PC) are the underlying factors related to the movement of exchange rate. For PPI, 0.1 forecasted error leads to a 0.19 percent appreciation of baht while a 0.1 forecast error of PC leads to a 0.17 percent appreciation of baht.

However, this test could not make us fully understand in detail about the mechanism of market perception whether the baht appreciation is a result of higher or lower than market expectation. So, in order to extract the effect of PPI and PC on exchange rate, the additional test will be conducted in the next section.

Additional Test

As discussed earlier, the additional test is conducted in order to find out how different in term of sign and magnitude play a role in determining the exchange rate movement. The result is shown in table 4.21 and table 4.22.

Response to positive and negative errors

Once again, the responses do not differ dramatically from the average responses. However, it reveals that for producer price index, only the positive errors tend to have an impact on exchange rate.

According to economic rationale, the higher than expected producer price index news might affect the Thai baht to appreciate through the different mechanism compared to the case of consumer price index news in monthly data. It might be possible that the economic agents perceive the news as the sign of potential central bank intervention. Since the inflation is higher than prediction, economic agents expect the central bank to increase the interest rate in order to counteract the inflation. Thus, the expected increase in interest rate might cause Thai baht to appreciate immediately.

Table 4.21 Reaction to Positive and Negative Errors: Thailand Daily Model

Dependent Variable	Independent Variables								
	Variables	Coefficient	t-statistic	Prob (t)	R-square	Adjusted R-square	Durbin Watson	F-statistic	Prob (F)
spot	UN_CPI (positive)	2.8042	0.9250	0.3610	0.0435	-0.0083	1.4277	0.8404	0.4396
	UN_CPI (negative)	-5.7538	-1.1629	0.2523					
spot	**UN_PPI (positive)**	**-2.8223**	**-2.5219****	**0.0164**	0.1691	0.0979	1.9910	2.3748	0.0868
	UN_PPI (negative)	-0.6971	-0.4875	0.6289					
spot	UN_MPI (positive)	-0.2058	-0.3509	0.7276	0.0034	-0.0505	1.4782	0.0634	0.9387
	UN_MPI (negative)	0.1447	0.2272	0.8215					
spot	UN_PC (positive)	0.1308	0.0541	0.9571	0.0978	0.0490	1.5051	2.0051	0.1490
	UN_PC (negative)	-2.9147	-1.6774	0.1019					
spot	UN_TB (positive)	0.0106	1.5928	0.1197	0.0649	0.0143	1.8024	1.2834	0.2891
	UN_TB (negative)	-0.0027	-0.3967	0.6939					

. ** Indicates that the statistic is significant at 0.05 level

Response to large and small errors

According to the fact that exchange rate does react to private consumption news in the short run, this findings further explain that it is only the large errors on private consumption forecasting that push the exchange rate to move.

It can be best explained by applying the economic rationale. Larger than expected private consumption might convey the economic agents to perceive as a sign of economic booming or declining. As a result, it can be interpret as follows: 1) the economic agents perceive that larger increase in private consumption would lead to a economic prosperity and appreciation of domestic currency or 2) larger decrease in private consumption might reduce the level of import as well as the outflow of foreign currency. As a result, it is probable that the domestic currency would appreciate.

Table 4.22 Response to Large and Small Errors: Thailand Daily Model

Dependent Variable	Independent Variables								
	Variables	Coefficient	t-statistic	Prob (t)	R-square	Adj R-square	DW stat	F-statistic	Prob (F)
spot	UN_CPI (large)	0.0458	0.0178	0.9859	0.0000	-0.0540	1.4693	0.0002	0.9998
	UN_CPI (small)	-0.0259	-0.0061	0.9952					
spot	UN_PPI (large)	-2.0452	-2.3691	0.0235	0.1501	0.0772	1.9877	2.0599	0.1233
	UN_PPI (small)	-1.0830	1.6018	-0.6761					
spot	UN_MPI(large)	-0.3233	-0.8729	0.3883	0.0439	-0.0078	1.4335	0.8489	0.4361
	UN_MPI (small)	0.4904	0.9673	0.3397					
spot	**UN_PC (large)**	**-2.4583**	**-2.0188*** **	**0.0508**	0.1035	0.0550	1.4861	2.1358	0.1325
	UN_PC (small)	-0.6699	-0.4692	0.6417					
spot	UN_TB (large)	0.0028	0.6414	0.5252	0.0358	-0.0163	1.7391	0.6873	0.5093
	UN_TB (small)	0.0079	0.9814	0.3328					

*** Indicates that the statistic is significant at 0.10 level

CHAPTER 5

CONCLUSION

This study started out with a set of ambitious tasks. Its major goal is to study one of the great unknowns in international finance, the process by which new information influences exchange rate behavior. It has reached most of its initial objectives, but more work needs to be done if we are to have a better understanding of the reactions to news of exchange rate.

In this section, five topics are discussed. First, let's start with its main accomplishment, the conclusions from the U.S. and Thailand macroeconomic announcement. Next, the contribution of this study is outlined and followed by the final conclusion. Finally, the paper concludes this study with its limitations and suggestions for future research.

5.1 U.S. macroeconomic announcement

The Impact of News

This section begins with the table 5.1, which summarizes all the reaction results from both monthly and daily model for U.S. macroeconomic announcement study. Only the positive unemployment news in the monthly model and the small

industrial production index news in daily model affect the movement of baht/dollar exchange rate.

Table 5.1 The summary of U.S. news announcement reactions

Variable	Monthly Model Reaction				Daily Model Reaction		
	basic	positive/negative	large/small		basic	positive/negative	large/small
Consumer Price Index	no	no	no		no	no	no
Producer Price Index	no	no	no		no	no	no
Industrial Production Index	no	no	no		no	no	**Small (depre.)**
Retail Sales	no	no	no		no	no	no
Unemployment Rate	no	**Positive (depre.)**	no		no	no	no

(depre.) = baht depreciated
(appre.) = baht appreciated

Inflation Announcements

The results are corresponding with the Edison (1997) study, which he concluded that in general, exchange rate does not react systematically to news on inflation. For this study, all the inflation coefficient both consumer price index (CPI) and producer price index (PPI) are not statistically significant.

Theoretically, the inflation figure should hint the economic agents about future movement of interest rate. Thus, the new direction of interest rate should correct the exchange rate's value shortly according to the interest rate parity. However, from this

study, it can be concluded that in this particular model, the case of Thai baht/dollar does not follow the theory.

Economic Activity Announcements

1) Industrial Production Index

In line with the Hakkio and Pearce's study, the exchange rate does not react to normal unexpected news on industrial production index. However, when study further, the result shows that in the shorter interval as in the daily model and when the size of the unexpected part is small, the news would make an average of 0.29 percent baht depreciated for every 0.1 error.

2) Retail Sales

Once again, the result confirms the previous study of Edison (1997) and Almeida, Goodhart and Payne (1998). Exchange rate does not react to any Retail Sales news, no matter the time horizon is. Even when the data is segregate into positive/negative and large/small error, the news coefficient still cannot show any statistically significant. As a result, it can be concluded that retail sales news does not have an impact in the baht/dollar movement.

3) Unemployment Rate

According to the empirical test, Thai baht will depreciate 4.59 percent if there is a higher-than-expected U.S. unemployment data. The result is quite contradicted to the economic hypothesis that a weaker-than-expected U.S. economy should make dollar depreciated. However, it implies that the U.S. unemployment data is a critical information that the economic agents always take into account when trade baht/dollar exchange rate. Also its impact does obviously exhibit in the only monthly model while there is no effect in the daily model.

From the result, it suggests that the positive error in forecasting U.S. unemployment rate or in another word, when market underestimates the unemployment data, baht/dollar exchange rate tends to react more comparatively to the unemployment data error when the direction of this error is not differentiate.

One possible explanation is that when market underestimates the unemployment data, the economic agents would interpret that the news is negatively perceived by the Federal Reserve as a sign of economy slowdown. So, it might leads to a lower inflation in the future. Thus, it is expected that the future real interest rate would rise and hence increase the value of U.S. dollar. As a result, Thai baht would be depreciated eventually.

Conclusion from U.S. study

The implications for the U.S. model are significant. Those who pay attention to the news and analysis on foreign exchange might familiar with comments essentially on the impact of U.S. announced data which routinely published through the newspaper or online terminal such as Reuters, Bloomberg or Datastream. Most of the announced data are predicted by the census or market survey and the comments usually focus on the difference between the announced data and the market forecast. For example, it might comment that the U.S.'s CPI data for January 2001 is expecting to be 0.3 and the exchange rate might move if the announced data does not inline with the market forecast.

According to the study, the hypothesis that Baht/dollar exchange rate volatility is influenced by news component of U.S. macroeconomic indicators has been mostly rejected. Except for the two news variables, the only two news which can move exchange rate are 1) the higher-than-expected unemployment news in monthly model and 2) the small forecasted error on Industrial Production news in daily model.

However, the effects from those variables are very small. As a result, the economic agents who involve in exchange rate transaction, even if they do not consider the effect of the forecast error to baht/dollar exchange rate, the cost of doing that might be minimal. But for those who consider, they should focus more on forecasted errors from unemployment and industrial production rather than the inflation's forecast errors.

5.2 Thailand macroeconomic announcement

The Impact of News

Again, the table 5.2 summarizes all the reactions from Thailand's news announcements. Compare to the U.S. model, the news model hypothesis for Thailand tend to be relatively convincing since there are quite a few variables which are statistically significant. According to the assumption that economic agent use historical data to form their expectation on macroeconomic variables, the responses from different type of news are concluded as follow:

Table 5.2 The summary of Thailand news reactions

Variable	Monthly Model Reaction				Daily Model Reaction		
	basic	Positive/negative	large/small		basic	positive/negative	large/small
Consumer Price Index	no	**Positive (depre.)**	no		no	no	no
Producer Price Index	no	no	no		**Yes (appre.)**	**Positive (appre.)**	no
Manufacturing Production Index	no	no	**Small (depre.)**		no	no	no
Private Consumption	no	no	no		**Yes (appre.)**	no	**Large (appre.)**
Trade Balance	no	no	no		no	no	no

(depre.) = baht depreciated
(appre.) = baht appreciated

Inflation Announcements

In term of inflation news, positive consumer price index (CPI) tends to make Thai baht depreciated in the monthly model. Contrast to the previous U.S. model and the previous study by Edison (1997), Thai baht react to the higher-than-expected CPI announced data. The mechanism could be explained by higher-than-expected CPI leads to a higher market's expectation of future inflation. Then, according to the PPP theory, the higher future inflation will cause the exchange rate to depreciate.

For the producer price index (PPI), however, exchange rate does not react to average PPI announcement in monthly model but it does react in daily model. The logic could be explained by either 1) unexpected higher PPI leads to a tighter monetary policy, and would eventually lead to higher real interest rates and appreciation of domestic currency, or 2) lower than expected PPI might leads to an expectation of lower future inflation and hence exchange rate to appreciation according to PPP hypothesis.

Furthermore, in that daily model, exchange rate does react just only when the PPI announcements are higher than expected (positive news). Practically speaking, economic agents tend to typically relate exchange rate movement to the PPI data only when its announcement is higher than the market consensus. It might implies that in general economic agents perceive that an unexpected higher in PPI data would leads to a potential inflation concern from monetary authority and would tighter monetary policy, and as a result, a higher real interest rates and appreciation of a domestic

currency. A 0.1 higher than expected error would lead to a 0.28 percent appreciation of Thai baht.

Economic Activity Announcements

1. Manufacturing Production Index

According to Chinprateep (1998), exchange rate does not react to manufacturing production index (MPI) news. In general, this study gives us the same result. However, when the additional test is applied, it shows that actually exchange rate does react to the MPI news in the monthly model, but the unexpected part must be only in a small size. However, the response of exchange rate is once again, extremely small.

2. Private Consumption

In general, Private Consumption (PC) news has an impact to exchange rate in the daily basis, especially its large errors. Economic agents are rather more concern when the PC is announced significantly diverging from the market forecast. Every 0.1 on large error announcement, no matter it is higher or lower than expected; it would lead to a 0.24 percent appreciation on baht/dollar.

Usually, the larger-than-expected errors cause the economic agents to form the expectation of either 1) higher growth which will eventually increase the domestic

money demand and leads to an appreciation of a domestic currency, or 2) fewer import and lesser foreign outflow which leads to an appreciation of a domestic currency.

3. Trade Balance

The response from trade balance (TB) news is parallel to the previous study that exchange rate does not react to news from trade balance. It shows that in both daily and monthly model, the statistic proved to be insignificant.

Conclusion from Thailand study

With the assumption that agents in the foreign exchange market use the past Thailand's macroeconomic announcement as a proxy to predict the future movement, it appears that some of the news does have an impact to the Baht/dollar exchange rate movement of both monthly and daily model.

In contrast to U.S. model, exchange rates tend to react to Thailand news about both the inflation and economic activities. Due to the statistic results of all the variables in the model, it can be concluded that the baht/dollar exchange rates do response to the positive CPI and small MPI in the monthly period while they react to PPI and PC news for the daily period.

5.3 Contributions of the Study

The main contribution of this dissertation is that it constitutes an innovative attempt at combining a theory of news model of exchange rate determination with formal and empirical models in the case of Thailand. Traditionally, most of the studies previously conducted were to link the announced macroeconomic news to the exchange rate movement by applying concept from the fundamental economic factors standpoint.[20]

However, there are only few studies ever conducted concerning the effect of news on baht/dollar exchange rate, especially after Thailand had adopted the floating rate system since 1997. The main contributions from this study are listed as followed:

1. Evidently, this thesis is the first study attempting to examine the exchange rate reaction in term of the United States major macroeconomic news. In previous study, the news was generally extracted from domestic information, for example, in the Kinboon (1997) and Chinprateep (1998).

2. In this study, for the case of Thailand data, the study attempts to examine further the reaction of the news when the direction and magnitude are involved. As a result, it is also the first time to include the additional test distinguishing the news into positive/negative and large/small error. The basic

[20] See Nitinant Wisaweisuan, "Exchange Rate Forecasting Model," *Thammasat Economics Journal*, 1 (March 1996): 43-57.

idea behind the concept is to help investigating the reaction when economic agents perceive different scenario of news. And the study has accomplished this proposal by showing that the direction and magnitude of the forecasted error does really have an impact to some of the selected variables in this study.

3. For economic agents of international finance operation, the results of all these studies are of prime importance. Corporations and traders in banking industry could develop these findings into the practical analysis concerning their exchange rate exposure.

4. Lastly, this study emphasizes heavily the importance of the market forecast. I hope this would inspire some of the government or private agency to initiate the standard market survey in order to construct the news model as a basis for analyzing the exchange rate behavior.

5.4 Implications and Conclusion

Overall, the tests in the paper support the hypothesis that macroeconomic "news" does have an impact to exchange rate. However, the impact might be seen as quantitatively small. The main conclusion that emerges from the empirical results is that exchange rates are more likely to react to news about the state of economy, rather than about past inflation.

However, the impact might be seen as quantitatively small. Even though it is statistically significant, it does not appear to be quantitatively significant. As a result, it depends critically on the resources of the economic agents. If they have profuse resources to focus all the relevant variables, the news mentioned in this paper should help them to have a better picture on the baht/dollar exchange rate movement. However, if resources are limited, they can sensibly select the news variable that yield the most impact on the exchange rate.

Since the reaction to news depends greatly on how long the time horizon is, each economic agents should invest their time and effort in analyzing different news. For the economic agents who simply interested in daily exchange rate movement (e.g., corporate dealer, foreign exchange dealer and broker), they should take into account the news from domestic Producer Price Index, domestic Private Consumption and U.S. Industrial Production Index rather than other news.

On the other hand, the exporters or importers who usually buy a forward contract (especially, a one month contract) to minimize their exchange rate exposure, should shift their focus on the news from domestic CPI and domestic MPI figure as well as the U.S. employment situation.

5.5 Limitations and Suggestions

Small number of observations

It might be too soon to conclude that the news components of both U.S. and Thailand do not have much relationship with exchange rate movement since the data in this test are collected just only 40 observations. Since Thailand's exchange rate policy has just been changed only three years, it is possible that the implication of the news model has not been fully developed and recognized by economic agents. As a result, it is encouraged to test this model again in the future when the floating exchange rate system has long been established and stable.

Low frequency data

Some researchers suggested the announcements might have discernible impacts on exchange rates when examined in a higher frequency setting, with the disappearance of the effects at lower frequencies due to their being drowned in

subsequent exchange rate fluctuations.[21] As a result, it also convinces that using higher frequency data should yield more reliable results.

Lack of survey data for Thailand

Due to the lack of survey data for Thailand, this test must be essentially conducted by construction the ex post forecast data by assuming that the past announcement would be the best predictor of the future announcement. However, in practical, this does not always hold true. Thus, economic agent possible perceived the Thailand macroeconomic announcement in a different way. As a result, in Thailand model, there should be an organization who do the market survey as the MMS does for U.S. announcements in order to have a consensus opinion which would be more valid to be applied in this model

Changes in market participants perception/expectations

This paper does not address the extent to which gradual changes in market participants' perceptions or expectations are priced into exchange rates. This is an important case for Thailand when economic agents rely on past data. Since new information might affect their expectation, further research should take into account the newly arrived information in the model.

[21] See Almeida, Goodhart and Payne (1998).

Lack of incorporation of the political news

It might be possible that the political uncertainty in Thailand is a major influential factor in determining exchange rate. Recently, Euromoney magazine has ranked Thailand's political risk at no. 54 down from 47 in 1999.[22] Generally, political instability attributes significantly to the exchange rate movement. As a result, it might be possible that the impact of macroeconomic announcement from both U.S. and Thailand itself does little effect on the exchange rate compare to the political factors.

[22] See *http://www.euromoney.com/confidential/polls/crisk/em.00.03/em.00.03.11b.html*

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APPENDICES

APPENDIX A

UNITED STATES' ECONOMIC INDICATOR: DEFINITION[23]

Consumer Price Index (United States)

Lag Factor

Data released around 15th of the month for previous month's data.

Source

Bureau of Labor Statistics (http://stats.bls.gov/news.release/cpi.toc.htm)

Approximate Release Time

8:30 AM EST

Revision Factor

Previous three months data are revised every month. These revisions are occasionally, but not usually, substantial. Major benchmark revisions are made approximately every ten years.

Financial Impact

Financial markets are extremely sensitive to unexpected changes in the index. Projections of the change in the CPI are fairly accurate, but inaccurate projections are not infrequent.

Brief Description

The Consumer Price Index (CPI) is a measure of the average change over time in the prices paid by urban consumers for a fixed market basket of consumer goods and services from A to Z. The CPI provides a way for consumers to compare what the market basket of goods and services costs this month with what the same market

basket cost a month or a year ago. The CPI reflects spending patterns for each of two population groups: All Urban Consumers (CPI-U) and Urban Wage Earners and Clerical Workers (CPI-W). The CPI-U represents about 80 percent of the total U.S. population.

The CPI represents all goods and services purchased for consumption by urban households. The CPI reports price changes in over 200 categories, arranged into eight major groups. The CPI includes various user fees such as water and sewerage charges, auto registration fees, vehicle tolls, and so forth. Taxes that are directly associated with the prices of specific goods and services (such as sales and excise taxes) are also included. But, the CPI excludes taxes not directly associated with the purchase of consumer goods and services (such as income and Social Security taxes).

Each month, Bureau of Labor Statistics (BLS) surveys retail establishments throughout the U.S. and gathers price information on thousands of items. These items are then put into one of the 200 expenditure categories and by weighting these items by their importance, price changes in the categories can be estimated. These categories are then weighted by their importance and further aggregations are done until an overall CPI number is produced.

[23] www.dismal.com

PPI (United States)

Lag Factor

Previous month's data are released during the second full week of the current month.

Source

Bureau of Labor Statistics (http://stats.bls.gov/news.release/ppi.toc.htm)

Approximate Release Time

8:30 AM EST

Revision Factor

Data is revised once, four months after original publication to account for the availability of late reports as well as corrections by respondents. New seasonal adjustment factors are introduced annually, and affect the data for the preceding five years. Major benchmark revisions are made every ten years.

Financial Impact

Financial markets follow the PPI for finished goods closely because it is an important indicator of commodity price pressure, and because it usually presages changes in the Consumer Price Index.

Brief Description

The Producer Price Index (PPI) is a family of indexes that measures average changes in selling prices received by domestic producers for their output. The PPI tracks changes in prices for nearly every goods producing industry in the domestic economy, including agriculture, electricity and natural gas, forestry, fisheries, manufacturing, and mining.

There are three primary publication structures for the PPI: industry; commodity; and stage-of-processing. The industry structure organizes products according to the Standard Industrial Classification (SIC) system. Thus, prices of products from the same industry are computed together. The commodity structure organizes products by material composition or similarity of end uses.

The stage-of-processing structure is the most commonly used for economic analysis. This structure organizes products by the degree of fabrication. Goods are classified into three broad groups. The first group, Crude Materials for Further Processing, consists of products that are entering the market for the first time which have not been manufactured or fabricated. Examples include coal, crude petroleum, grains, logs and timber, and iron ore. The second group, Intermediate Materials, Supplies, and Components, consists of commodities that have been processed but require further processing and finished goods. Examples include flour, lumber, fabric, and leather. The last grouping, Finished Goods, is the most closely watched as an indicator of inflationary pressures. Finished goods are products that will not undergo further processing, and are ready for sale to the final user. Examples include bakery products, apparel, gasoline, and books.

Industrial Production (United States)

Lag Factor

Low. The first estimate of output for a month is published around the 15th of the following month.

Source

Federal Reserve Board (http://www.bog.frb.fed.us/releases/G17/Current/)

Approximate Release Time

9:15 AM EST

Revision Factor

The estimate is preliminary and subject to revision in each of the subsequent three months as new source data become available. After the fourth month, indexes are not revised further until the time of an annual or benchmark revision.

Financial Impact

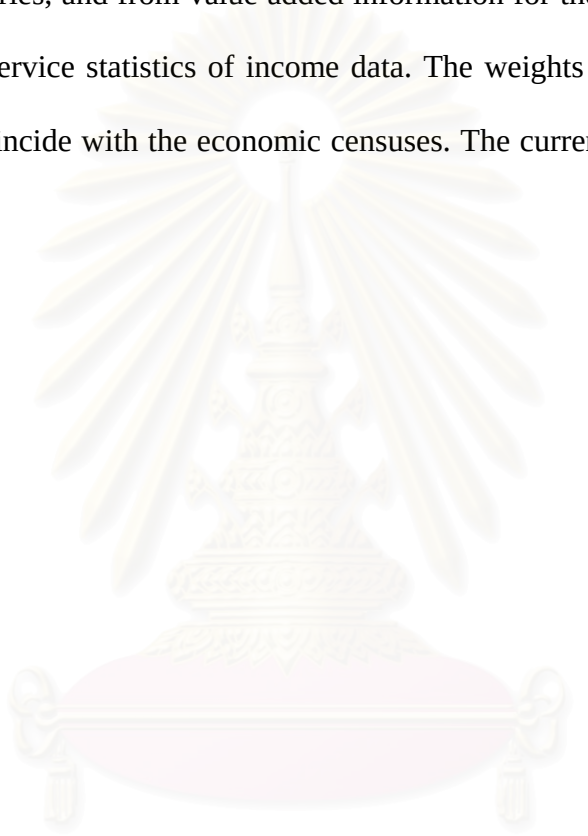
Because industrial production is responsible for a large share of the variation in national output, this data set provides keen insight into the current state of the economy. Also, capacity utilization provides a valuable measure of available slack in the economy.

Brief Description

The industrial production (IP) index measures the change in output in U.S. manufacturing, mining, and electric and gas utilities. Output refers to the physical quantity of items produced, unlike sales value which combines quantity and price. The index covers the production of goods and power for domestic sales in the United States and for export. It excludes production in the agriculture, construction, transportation, communication, trade, finance, and service industries; government

output, and imports.

The IP index is developed by weighting each component according to its relative importance in the base period. The information for weights is obtained from the value added measures of production in the economic censuses of manufacturer and minerals industries, and from value added information for the utility industries in Internal Revenue Service statistics of income data. The weights are updated at five-year intervals to coincide with the economic censuses. The current index base year is 1992.



Retail Sales (United States)

Lag Factor

Short. Data starts from previous month.

Source

Bureau of Census (http://www.census.gov/svsd/www/advtable.html)

Approximate Release Time

8:30 AM EST

Revision Factor

High. Data are revised three months back every month and can be substantial. Every April, data are revised to incorporate annual survey information and new seasonal factors. Comprehensive benchmark revisions take place once every five years with the release of the Census of Retail Trade.

Financial Impact

Retail sales is an indicator of secondary importance to financial markets.

Brief Description

Retail sales include merchandise sold (for cash or credit at retail or wholesale) by establishments primarily engaged in retail trade. Services that are incidental to the sale of merchandise, and excise taxes that are paid by the manufacturer or wholesaler and passed along to the retailer, are also included. Sales are net after deductions for refunds and allowances for merchandise returned by customers. Sales exclude sales taxes collected directly from customer and paid directly to local, state or federal tax agency. The monthly retail trade estimates are developed from samples representing all sizes of firms and kinds of business in retail trade throughout the nation.

Employment Situation (United States)

Lag Factor

Data starts from previous month.

Source

Bureau of Labor Statistics (http://stats.bls.gov/news.release/empsit.toc.htm)

Approximate Release Time

8:30 AM EST

Revision Factor

Average. Each month, the previous month's release is revised. These revisions are occasionally, but not usually, substantial. Each June, the BLS revises the previous year's employment totals.

Financial Impact

Probably no other report is as widely monitored by financial markets.

Brief Description

Payroll employment is a measure of the number of jobs in more than five hundred industries except for farming and in all states and 255 metropolitan areas. The employment estimates are based on a survey of larger businesses. This release is the single most closely watched economic statistic because of its timeliness, accuracy and its importance as an indicator of economic activity. Payroll figures are reported each month by the Bureau of Labor Statistics in their employment situation report, which also provides information on average weekly hours worked and average hourly earnings, which are important indicators of the tightness of labor markets—something the Federal Reserve pays close attention to when setting interest rates. An index of aggregate weekly hours worked is also included in the release, which gives an

important early indication of production before the quarterly GDP numbers come out. An estimate of the labor force, employment and unemployment is provided in a parallel survey of U.S. households. The household survey based employment statistics sometimes tells a very different story than the payroll survey.

APPENDIX B

THAILAND'S ECONOMIC INDICATORS: DEFINITION[24]

Inflation

In Thailand, the inflation rate is measured in two ways, from changes in the consumer price index which is a weighted average of prices of goods and services regularly consumed and from changes in producer price index. For consumer price index, weights are determined from household spending patterns obtained by surveys. The consumer and producer price index are calculated by Department of Internal Trade, Ministry of Commerce.

Manufacturing Production Index (MPI)

It is the indicator of production level in the manufacturing sector. Monthly report of MPI has been carried out by the Bank of Thailand since 1980. The Index covers 45 industrial categories which account for around 62.4% of the total manufacturing sector in 1995. The index is predominantly based on survey data from 255 producers.

The indices are calculated by using the Laspeyres formula. The weights are derived by using the value-added of each industry as a share of the total value-added of total manufacturing in 1995, tabulated by the National Economic and Social Development Board (NESDB).

Private Consumption

Private consumption basically is the market value of all goods and services, including durable products (such as cars, washing machines, and home computers) purchased or received as income in kind by households and nonprofit institutions.

Trade Balance

It is the difference between exports and imports of goods. Data are obtained through the Customs Department, adjusted for some items to be compliant with the balance of payments concept. Transactions which do not concern exchange of ownership of do not involve trading with nonresidents (e.g. shipment for repair, temporary goods, sample goods rented items, etc.) are excluded, while trading not incurred Customs procedure (e.g. military imports, electricity imported from neighboring countries, and commercial aircrafts) are included

[24] *www.bot.co.th*

BIBLIOGRAPHY

Panukorn Chantaraprapab was born in Bangkok on May 2, 1976. He received his bachelor's degree in business administration (international program) at Thammasat University in 1997. He worked as an assistant securities analyst at Securities One where he analyzed and routinely wrote a report on finance and securities companies as well as its industry trend before entering the master program at Chulalongkorn University.

He also worked as an assistant corporate dealer at Thai Farmers bank, trading foreign exchange and money market products with the corporate customers and served as a regular foreign exchange analyst for various radio and TV program such as 101 radio, Nation Channel. He is currently studying the Master of Business Administration (MBA) at the State University of New York at Buffalo, USA.