The Relationship Between Foreign Exchange Rates (USD/THB) and Financial Market Variables

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An Independent Study Submitted in Partial Fulfillment of the Requirements
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ความสัมพันธ์ระหว่างอัตราแลกเปลี่ยนเงินตราต่างประเทศ (USD/THB) กับตัวแปรทางตลาดการเงิน

น.ส.ชิดชนก เลิศมงคล

สารนิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต
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Field of Study	Business and Managerial Economics
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Accepted by the FACULTY OF ECONOMICS, Chulalongkorn University in Partial Fulfillment of the Requirement for the Master of Arts

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ชิดชนก เลิศมงคล : ความสัมพันธ์ระหว่างอัตราแลกเปลี่ยนเงินตราต่างประเทศ (USD/THB) กับตัวแปรทางตลาดการเงิน. (The Relationship Between Foreign Exchange Rates (USD/THB) and Financial Market Variables) อ.ที่ปรึกษาหลัก : ผศ. ดร.พัชรสุทธิ์ สุจริตตานนท์

งานวิจัยฉบับนี้จัดทำขึ้นเพื่อศึกษาถึงความสัมพันธ์ระหว่างอัตราแลกเปลี่ยน ดอลลาร์ สรอ. ต่อ เงินบาท (USD/THB) กับตัวแปรทางตลาดการเงิน ซึ่งตัวแปรดังกล่าวได้แก่ ดัชนีตลาดหลักทรัพย์ไทย (SET), ดัชนีอุตสาหกรรมดาวโจนส์ (DJI), ราคาทองคำ (Gold Spot Price) และงบดุลของธนาคารสหรัฐอเมริกา (Federal Balance Sheet) โดยใช้ข้อมูลทุติยภูมิแบบอนุกรมเวลา ตั้งแต่เดือนมกราคม พ.ศ. 2552 ถึงเดือนธันวาคม พ.ศ. 2562 และทำการศึกษาโดยวิธีกำลังสองน้อยที่สุดแบบธรรมดา (Ordinary Least Square: OLS) รวมถึงศึกษาความสัมพันธ์เชิงดุลยภาพระยะยาว (Cointegration) และแบบจำลองการปรับตัวระยะสั้น (Error Correction Model: ECM)

ผลการศึกษาพบว่าเมื่อใช้วิธีกำลังสองน้อยที่สุดแบบธรรมดาหาความสัมพันธ์ของตัวแปรพบว่า ดัชนีตลาดหลักทรัพย์ไทย (SET) และราคาทองคำ (Gold Spot Price) มีความสัมพันธ์ ที่เป็นไปในทิศทางที่ตรงกันข้ามกับอัตราแลกเปลี่ยน ดอลลาร์ สรอ. ต่อ เงินบาท (USD/THB) ส่วนงบดุลของธนาคารสหรัฐอเมริกา (Federal Balance Sheet) มีความสัมพันธ์ทางบวก ที่เป็นไปในทิศทางเดียวกันกับอัตราแลกเปลี่ยน ดอลลาร์ สรอ. ต่อ เงินบาท (USD/THB) สำหรับการศึกษาความสัมพันธ์เชิงดุลยภาพระยะยาว พบว่าตัวแปรตามกับตัวแปรอิสระ มีความสัมพันธ์เชิงดุลยภาพระยะยาว และแบบจำลองการปรับตัวระยะสั้น (Error Correction Model: ECM) นั้น ไม่พบความสัมพันธ์กันระหว่างตัวแปรที่ศึกษา

สาขาวิชา	เศรษฐศาสตร์ธุรกิจและการจัดการ	ลายมือชื่อนิสิต .....
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Chitchanok Lertmongkol : The Relationship Between Foreign Exchange Rates (USD/THB) and Financial Market Variables. Advisor: Asst. Prof. PACHARASUT SUJARITTANONTA, Ph.D.

This research was conducted to study the relationship between the USD/THB exchange rate and financial market variables. Which such variables are Thai Stock Exchange Index (SET), Dow Jones Industrial Index (DJI), Gold Spot Price and the central bank of the United States balance sheet (Federal Balance Sheet) using time series secondary data. From January 2009 to December 2019, the Ordinary Least Square (OLS) method was studied and the long-term equilibrium relationship was studied. (Cointegration) and short-term adaptation model (Error Correction Model: ECM).

The results of the study showed that when using the least squares method to find the correlation of the variables, it was found that Stock Exchange of Thailand (SET) and Gold Spot Price are correlated in the opposite direction of USD/THB exchange rate. The US Bank balance sheet (Federal Balance Sheet) has a positive correlation.The Cointegration test found that the dependent variable with independent variables have a long-run equilibrium relationship and a short-run model (Error Correction Model: ECM), no correlation was found.

Field of Study:	Business and Managerial Economics	Student's Signature .....
Academic Year:	2020	Advisor's Signature .....

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Chitchanok Lertmongkol

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CHAPTER 1

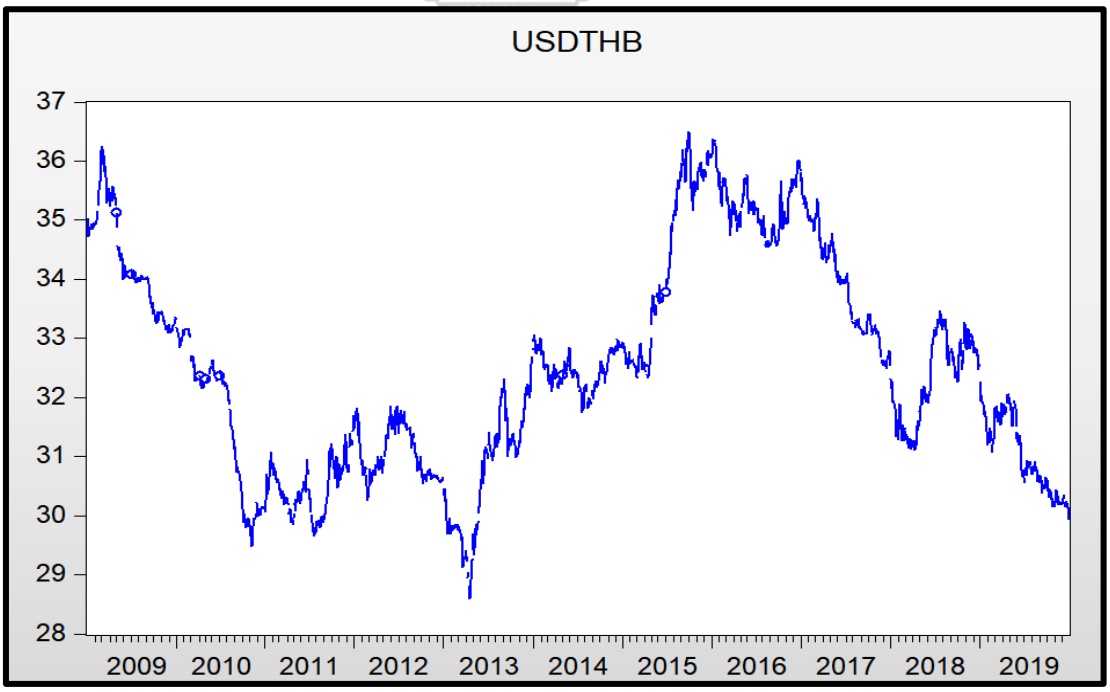
INTRODUCTION

1.1 Background

The currency or foreign exchange market (also known as FX market) is a multinational over the counter (OTC) market, which sets the exchange rate of currencies around the world. FX market not only provides a platform for currency exchange but also allow currency alternative for settlement and investment of international trade. The associates for FX market are banks, FX dealer, investment firm, hedge fund, commercial company, and investor.

Currencies are regularly exchanged in pairs, due to the fact that the price of one currency in the pair is comparable to another. It defines how much of the country currency will purchase from country B. The main role of the FX market is to create a price relationship for the global markets. This is a great support for all the liquidity of financial markets that require long-term stability. The value of the nation's currency depends on whether it is a free float or a fixed float. The floating currencies measure the relative value of market factors such as supply and demand. The fixed float is fix by the government in the country, often informally by pegging to another currency.

Figure 1: Exchange Rates (USD/THB) from 2009 to 2019



Source: Thomson Reuters Eikon (2020: Online)

Figure 1 shows after the Asian financial crisis, the trend of the USD/THB currency pair over the last decade. In 1997-1998, the Asian crises of was to blame for a dramatic decrease in the currencies and stock exchange values of a variety of Asian countries and economies. It also caused repercussion to the global economy (International Monetary Fund, 2008). The crisis all began in Thailand as the baht was facing increasingly intense speculation and markets were losing faith in the country's economy. Consequence in Thai government decision, which devaluate the value of baht. As the recession expands, most of the East Asia has facing with slumping currencies, devaluing capital markets and asset values (Hunter et al., 1999). The crisis has affected the performance of all companies. The economies after Asian crisis are recovering strongly. By the financial supported program advice of International Monetary Fund (IMF) are announced to Indonesia, Korea, and Thailand. The program was prevented the depreciation of the currency to lead to an inflationary spiral and continued depreciation. The tightening of monetary policy was appropriate when after the beginning of the restoration of confidence and the stabilization of market conditions. In the case of Indonesia and South Korea, fiscal policy had to be strict, while in Thailand a fiscal reform had been scheduled to carry deficit growth to a level before the crisis.

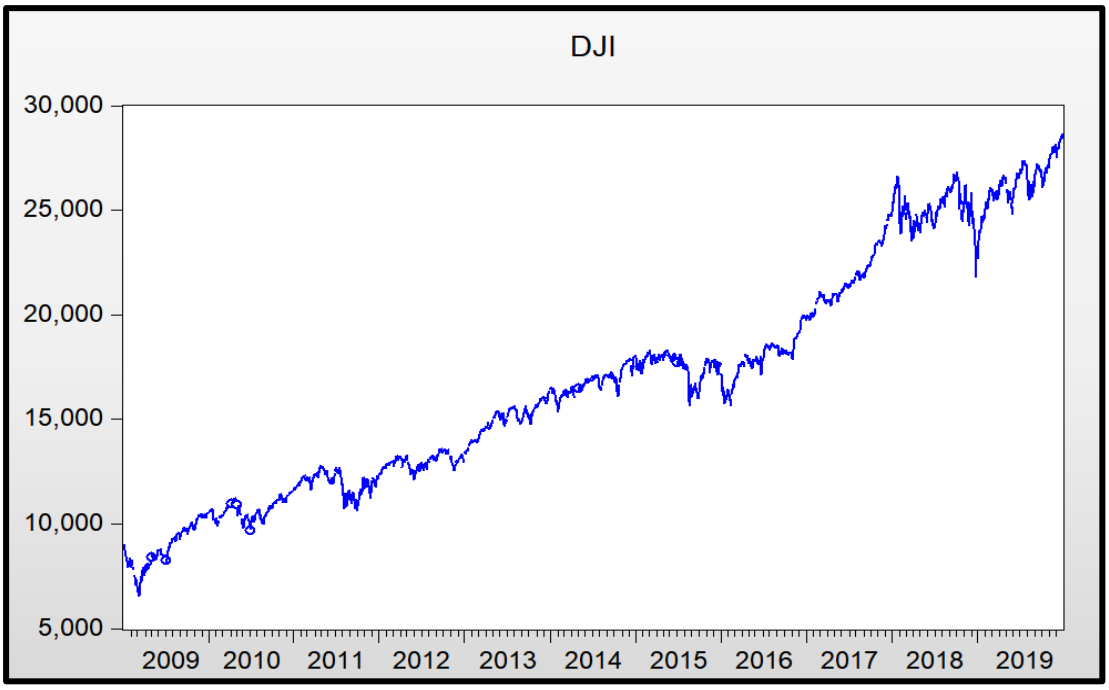
At that time, Exchange rates have been one of the primary determinants of corporate earnings and share prices as global trading and capital flows have continued to rise. (Kim, 2003). Exporters lose competition in the world market as the exchange rate increases, their revenue and profits decline, and their stock values fall. Importers, on the other hand, would increase domestic industry competition. As a result, their income and the value of their stock will increase. As a result, their income and the value of their stock will increase. Depreciation of the exchange rates have a negative impact trading company. Exporters have an competitive advantage over other countries, increasing sales and increasing the value of their inventories (Yau & Nieh, 2006). Therefore, a change in rate of exchange cause affect to both international and domestic firms. To reduce currency uncertainty, hedging means reducing risk or reducing potential profit for all businesses Hedging is an investment that seeks to reduce the risk of adverse fluctuations in the price of an asset. There is a risk-reward trade-off in hedging; as the potential risk is reduced, the potential gains are also reduced. There is no proper hedge in the investment world, you have to use various instruments strategically to offset the risk of unfavorable price movements in the market. There are several ways for hedging the exchange rate, first of all, to hedge currency risk by investing in a specialized currency exchange traded fund (ETF). Second is to invest in derivatives product such as contract for difference (CFD) or option contract. Despite the two choices of derivatives investors can choose to invest in forward exchange contract (FEC). Example, one the most common hedging product is forward contracts, which is use for hedging or speculation, some of corporations in the world could use it to hedge currency and interest rate risks.

In the next two figures below shows the stock index of DJI and SET from the scope of this study. Base on previous study many variables was analyses that it has been result on exchange rate, including stock market. Although, the relative on stock market prices between DJI and SET caused the change of USD/THB was found (Techaadisak, 2016) One of examines found that the relationship between USD/THB

strongly occurs when positive more than negative return of SET and this volatility will take slowly adjustment between variables (Chancharat et al., 2017). Despite the stock market, other study found that EUR/USD have relationship with gold spot price in both short and long term (Kampiew, 2010). Thus, to help a company in protecting its profit margins against the effects of the foreign exchange. It is important to understand the relationship between exchange rate and stock market variables that would allow both domestic and international investors to hedge and diversify their portfolios.

From figure 2 shows the increase in the return of both stock market over time. It is because the globalization that allow all investors to move their investment across the global in order to seek their highly profit. Even though, the DJI is the national stock market indexes in the US.. But its only track 30 largest publicly companies trading on the New York Stock Exchange and the NASDAQ. Then, the DJI will not represent all the situation in the United States. market as expects. Other side of the story, the case of emerging stock market countries would consider small cap since the country may not have many large companies.

Figure 2: The Dow Jones Industrial Average (DJI) from 2009 to 2019

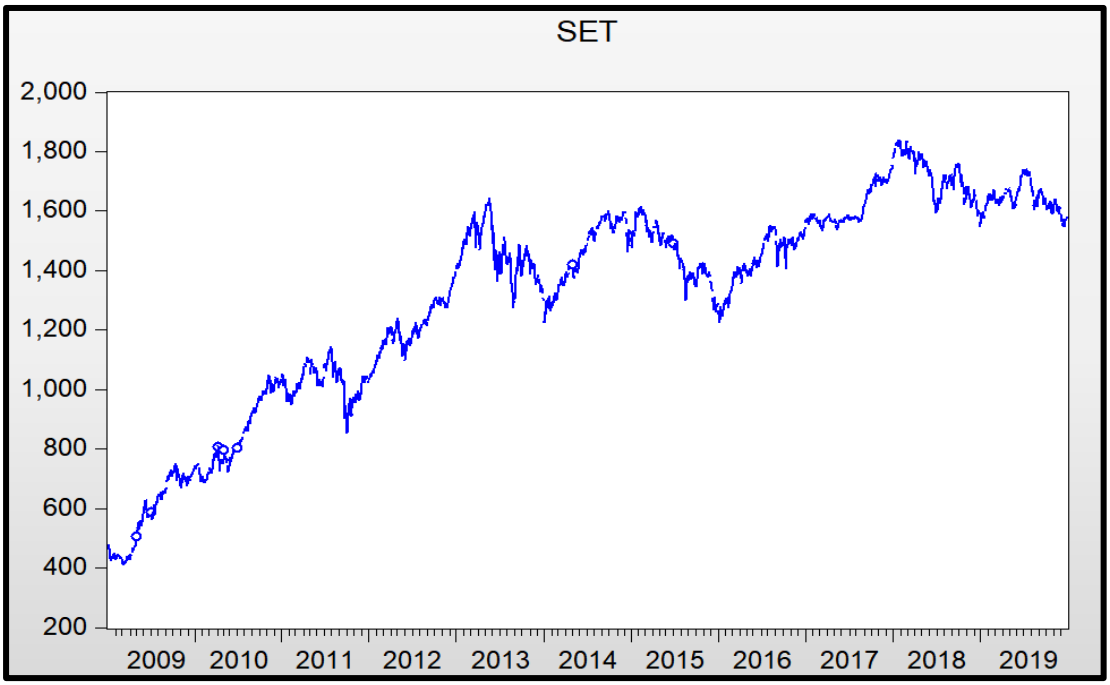


Source: Thomson Reuters Eikon (2020: Online)

Figure 3 also show the movement of Stock exchange of Thailand in the past decades. According to a Bloomberg survey of 17 emerging markets, Thailand is in a good position to invest among the developing countries that could outperform expectations next year. By every inflow and out flow in SET may cause the movement in Exchange rate (USD/THB). Even the Foreign direct investment (FDI) that might be subset of that flows. Recently, many companies aboard and in Thailand, sometimes create some fluctuate movement in the FX market as they are going to merge or

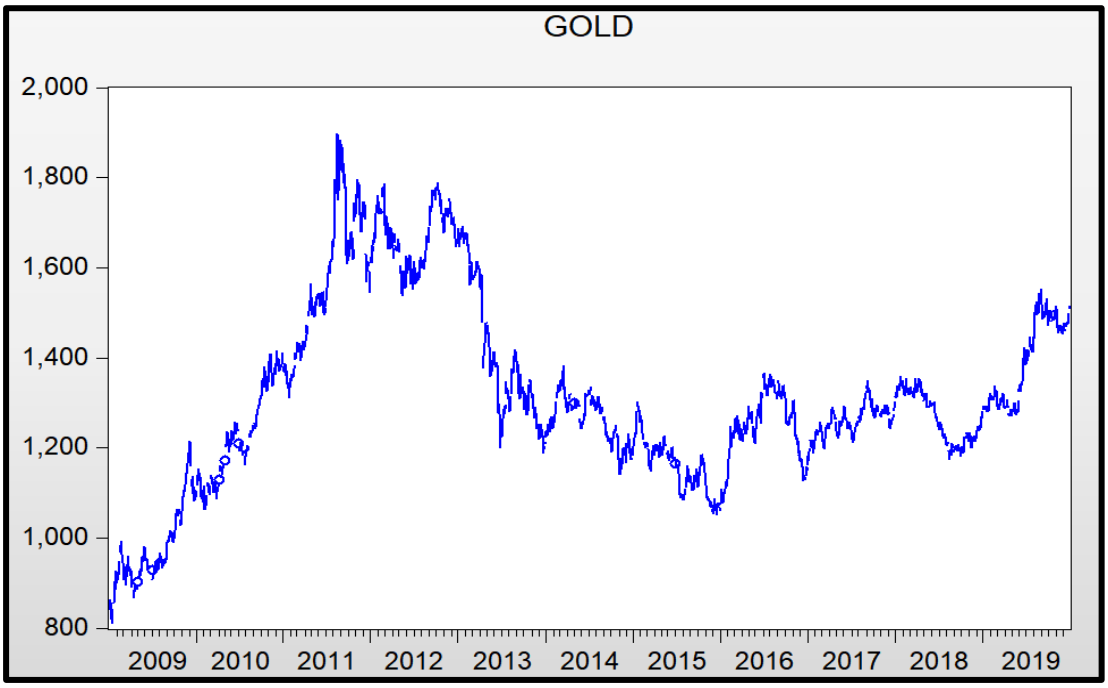
buying the business. Then, knowledge of the relation between variables would give the market player potential in order to take more risk on exchange.

Figure 3: The Stock Exchange of Thailand (SET) from 2009 to 2019



Source: SETSMART (2020: Online)

Figure 4: Gold Spot Price from 2009 to 2019

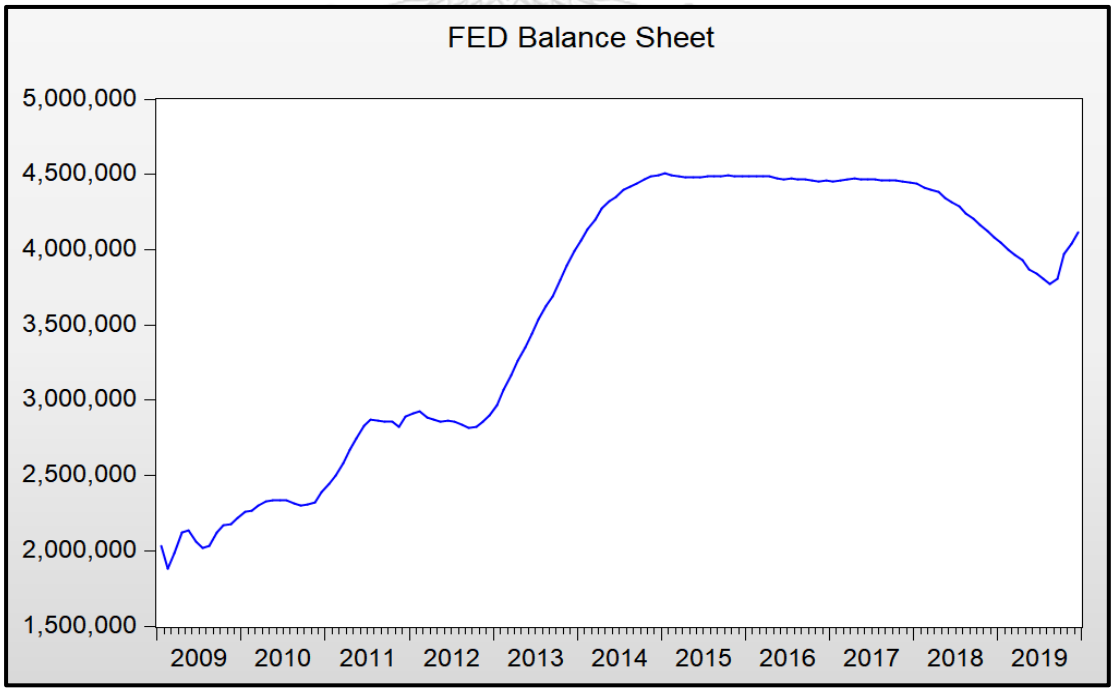


Source: Thomson Reuters Eikon (2020: Online)

In figure 4 show the trend of gold price per ounce in US dollar. The barriers of international trade have reduced because of globalization. It is only created numerous opportunities for investors but also allow them to invest in different markets. There are two majors' sources that investors had invested, which are stock market and foreign exchange market. But the alternatives investment is to invest in commodities. Commodities are basic goods used in commerce. Traditional types of commodities are natural gas, gold, oil, beef, and grains. One way to invest in a commodity is through a futures contract. There are usually two types of investors in the commodity market: commercial or institutional investors and speculative investors.

Invest in gold is not like invest in other commodities because gold is mined, it does not get used up or consumed, it stays in the world. Gold is currently in demand for a variety of uses, including investment and jewelry production, as well as the production of many electronic and medical products. The price of gold is determined by market supply and demand of investor behavior. When the Great Recession began, for example, the price of gold rose. Although, the prices of gold were already high until early 2008. It was peaked in 2011 at $1,921 per ounce in US dollar and has seen ups and downs since that time. But in 2020 there was a pandemic of COVID-29, gold made its new peaked at $2,075.14 per ounce in US dollar. Even if commodities are risk asset, as well as currencies, but gold is neither a risk asset nor a safe haven. Gold is a store of value and most investors still seeking for higher return of its. Although some said "high risk-high return" but if invest wisely, the probability to gain a benefit from investment both risk and safe asset is possible.

Figure 5: The Federal Total Asset from 2009 to 2019



Source: www.federalreserve.gov (2020: Online)

Figure 5 shows how Federal Reserve System manage their balance sheet and handle the after-crisis situation over that period. The Federal Reserve Bank's consolidated balance sheet more than doubled to $ 2.2 trillion since 2008. The Fed's reaction to the financial market crisis has turned it from a key, but small, participant in the U.S. money market to the largest player and central linchpin of that market and, indirectly, of the global financial system. The used the quantitative easing has caused the effect around the financial market. The quantitative easing not only has an effect on the financial market but also on the entire the U.S. economy which may have an impact on the world economy as a whole.

Alternative investments lead to a risk reduction management portfolio. Many successful investors allocate their investments in different ways. The asset allocation is the most important strategy that financial professionals believe. To start investing, it is good to understand that some variables have their relative relevance. Later, this study aimed to analyze the relationship between exchange rate (USD/THB) and financial variables. The exam period starts monthly from January 2009 to December 2019.

1.2 Objectives of the Research

This paper aims to focus on analyzing the relationship between exchange rates (USD/THB) and financial market variables (SET, DJI, Gold spot price, FED balance Sheet). By investigating through Ordinary least square (OLS), Cointegration and Error correction Model (ECM).

1.3 Scope of the Research

The exchange rate (USD/THB) and financial market variables are collected based on monthly basis since January 2009 to December 2019. The data access from Thomson Reuters Eikon, Federalreserve.gov website and SETSMART

1.4 Advantage of this study

The study can be useful to market participants, market makers (dealers) and their customers. The customer can be a financial customer, a corporate customer, or an individual customer. Financial customers are investment firm, hedge fund and proprietary trading company. Corporate customers are importers and exporters of goods and services. Retail customers are small business and people who buy relatively small amounts of currency.

1.5 Independent variables

1.5.1 Exchange rate (USD/THB)
1.5.2 SET index
1.5.3 DJI index
1.5.4 Gold spot price
1.5.5 Federal reserve balance sheet

1.6 Definition

The Exchange rate is the value of the currency of one country and the currency of another country. For example, how much Baht does it cost to buy 1 US dollar (USD/THB)? As of December 30, 2019, the exchange rate is 29.94, which means 29.94 baht to buy the lowest price of the day, $ 1.

The Stock Market refers to all markets and exchanges where there are regular activities to buy, sell and issue shares of public company. These financial activities are carried out through formal institutional exchanges or over-the-counter (OTC) markets which operate under a defined set of rules.

The Stock Exchange of Thailand (SET) was founded in 1975. It is a one-stop center for securities trading that provides all products to investors.

The Dow Jones Industrial Average (DJI) is a stock index that measures the 30 largest public-owned blue-chip firms listed on the New York Stock Exchange (NYSE) and NASDAQ.

The Gold Spot Price is the price at which the commodity could be traded at the future time in the marketplace.

The Federal Reserve's Balance Sheet is a financial statement published once a week that show the assets and liabilities held by the Federal Reserve (Fed).

CHAPTER 2

LITERATURE REVIEW

There are several studied have been examined and prove that the relationship between exchange rate and financial variables does exits. This section will summarize those articles.

Kim (2003) found that in the U.S., the analysis looks at a long-term equilibrium relationship between overall stock price, economic production, actual exchange rates, interest rates, and inflation. From January 1974 to December 1998, data was collected on a monthly basis. The S&P500 index's stock price was discovered to be positively correlated with economic production, but negatively correlated with the current exchange rate, interest rate, and inflation.

Jantra (2004) analysis data from Japan, Hong Kong, Taiwan, Singapore, the Philippines, South Korea, Indonesia, and Thailand to investigate the relationship between foreign exchange rates and stock market indices in a variety of Asian countries from January 1998 to December 2001. The findings revealed that global stock market indexes, such as those in Japan and Hong Kong, did not coordinate. There was, however, a clear link between stock market indexes and exchange rates in Indonesia's and Thailand's smaller stock markets. In conclusion, the scale of the capital market influenced stock market indexes and exchange rates significantly.

Karoui (2006) discusses the relationship between the fluctuations of stock market returns and the exchange rates of certain developing countries against the U.S. dollar, the British pound, and the Japanese yen. The findings generally back up the theory of a positive transmission mechanism between the volatility of equity markets and the exchange rate. These results can be used for diversification and risk management in international portfolios.

Pekkaya and Bayramoğlu (2008) studied during the period 1990-2007, the causality relationship between the YTL/USD, the ISE 100 index, and the S&P500 index was investigated. It was discovered that the causality relationship between the rate of exchange and ISE 100 is two-way. The S&P500 index had an impact on the foreign exchange rate and the ISE 100 index but was unaffected by these factors.

Adjasi, Agyapong and Harvey (2008) have studied the relationship between financial markets and the foreign exchange market has been explored, and it has been discovered that exchange rate variations have an effect on the Ghana stock market. There was a negative association between exchange rate volatility and stock market returns using the Exponential Generalised Autoregressive Conditional Heteroskedascity (EGARCH). In long run, a weakening of the domestic currency raises the capital market's profitability. However, it limits the financial market's liquidity in the short term.

Agrawal, Srivastav, and Srivastava (2010) demonstrate that the relationship between the Nifty return and the exchange rate of the Indian rupee against the U.S. dollar was negative. Furthermore, the Granger causality test was extended to two factors, demonstrating the unidirectional association between stock returns and exchange rates, i.e., a spike in nifty returns induced exchange rates to decline, but not the other way around.

Wen and Tang (2010) examine of exchange rate movements in Asian markets such as China, Malaysia, Singapore, Taiwan and Hong Kong have a huge impact on Asian companies' investment returns. They use monthly data from August 2005 to March 2010 to see whether there is a significant contemporaneous and lagged effect. It is obvious from the outcome. The relationship between Singapore, Taiwan, and Malaysia is opposite. As a developing economy, Singapore has shown that the size of a business has a greater negative effect on currency risk. The outcome indicates a substantial good impact in terms of benefits.

Kutty (2010) study at the relationship between Mexican stock markets and currency exchange rates. There is a short-term relationship between stock prices and exchange rates, but no long-term relationship between the two financial factors, according to experimental data.

Sujit and Kumar (2011) studied 3485 observations and found that the use of data from 2 January 1998 to 5 June 2011 in order to analyze the relationship between gold prices, stock returns, exchange rates, and oil prices. The effect of using vector autoregressive and cointegration techniques shows that shifts in other variables have a large influence on the exchange rate. The stock market, on the other hand, plays a lesser role in manipulating the exchange rate.

Aduda, Masila, and Onsongo (2012) aim of this study was to look into the factors that influence the growth of the Nairobi stock exchange. For the years 2005-2009, secondary data are included. According to the regression, only macroeconomic variables such as stock market liquidity, institutional productivity, income per capita, domestic saving, and bank performance were major determinants of stock market growth in Nairobi. This finding indicates that overcoming political risk may be a key factor in the Nairobi stock exchange's success.

Anlas (2012) explore the use of data from January 1999 to November 2011, the relationship between fluctuations in foreign exchange rates (EUR/TL, GBP/TL, JPY/TL, CHF/TL, USD/TL, CAD/TL, SA/TL) and A major composite index of the Istanbul Stock Exchange. According to the findings of the empirical study, the Canadian dollar, Saudi Arabian actual, and US dollar all have statistically relevant effects on the ISE100 index. The Canadian dollar and the US dollar have a positive correlation with the ISE 100 index, while the Saudi riyal and monthly time deposit rates have a negative correlation.

Danmola (2013) analyzes the effects of exchange rate volatility on macroeconomic factors, as well as the effects of using a correlation matrix, the Ordinary Least Square (OLS), and the Granger Causality test. As a result, the government must strengthen the positive effect of exchange rate volatility on GDP, foreign direct investment, and trade flexibility, as well as the domestic raw material manufacturing market, in order to boost the country's export base. The reliance on foreign imports should be minimized as well.

Mlambo, Maredza, and Sibanda (2013) uses data from 2000 to 2010 to look at the impact of currency volatility on the South African stock market. The stock market and exchange rate volatility do not have a close relationship. The report also indicates that the government might use the exchange rate as a policy instrument to encourage foreign investment.

Bouraoui and Phisuthtiwatcharavong (2015) discusses the macroeconomic fundamentals that can justify the actions of the Thai baht against the U.S. dollar using monthly data from 2004 to 2013. As a result, at a 95% confidence level, these trade conditions are negatively related to the THB/USD exchange rate. Foreign funds, on the other hand, have a positive relationship with the THB/USD exchange rate.

Cambazoğlu and Güneş (2016) to measure the relationship between the flow of direct investment in Turkey and the level of the real exchange rate, data from January 2007 to January 2015 were used. The findings indicate that foreign direct inflows and short-term exchange rate levels have no connection, but that exchange rates and foreign direct investment flows are related in the long run.

Techaadisak (2016) on merit-based find a positive relationship between USD/THB forward rates at 1 month, 3 month and 6-month periods and the shock of financial market by using time-series secondary data from January 2006 to March 2016. The result indicate that they had the relationship only in the first 2-3 months. With 95% confidence interval, that shows DJIA index and SET index caused the change of all USD/THB forward rates.

Chancharat, Sangsai, and Rujirarangsan (2017) found that the relationship between Stock Exchange of Thailand (SET) and exchange rate (USD/THB). The study based on January 2002 to April 2014. The result found that the relationship strongly occurs when positive more than negative return of SET and this volatility will take slowly adjustment between variables.

The literature review has shown that whenever the relationship between exchange rate and financial variables was analyzed, the empirical results are always mixed, even when the theoretical explanation is sometimes apparent. Different time series data can lead to different results.

CHAPTER 3

DATA

To start run the regression in this paper, by used monthly secondary data since January 2009 to December 2019 has been collected and a sequence of data points over time intervals is called time-series data. When describing and modeling a time series, there is the specific technique to analyses time series data. The following topic will give information for more understand the concept of time series test.

3.1 Time Series Data

Time series is data that collected of observations through a different point in time. Time series data is a collection of data that is also collected periodically over time and arranged chronologically. The time interval in which the data is stored is commonly known as the frequency of a time series. Most of the study, there is the possibility to correlation between observations.

Considered the different form of time series data by plotting the time series graph. This graph plot with observed value on the y-axis against an increment of time on the x-axis. There are four types of data as follow: Mean reverting data, Time trending data, Seasonality, and structural breaks.
Each of it sometimes requires a different statistic method to test the observation.

An important characteristic of stationary time series. If its statistical properties do not change over time, the time series is called stationary. In order to test a correlation between variables, both dependent and independent need to be stationary. There are several methods that can be used to stationary test and it will explain in the methodology chapter.

3.2 Dependent Variables

Exchange rate (USD/THB) is the dependent variable of this analyses. Almost 25 years after massive currency speculative attacks in Thailand. The rate of exchange has been changed since that time. Before the crisis, the baht was pegged to the U.S. dollar, but it is now free-floating, determined by supply and demand in the foreign exchange market. Even though, the crisis was solved but the Bank of Thailand had launched the regulation to prevent this kind of situation to happened again. The BOT had set some regulation to solve the Thai exchange rate situation. Since Thailand is a net exporter, BOT sometimes controlled the currency in case the currency fluctuated rapidly to support entrepreneurs. BOT also do not disrupt the market mechanism to avoid becoming a currency manipulator.

3.3 Independent Variables

As the analyze of exchange rates (USD/THB), the study came up with an idea of some variable that mainly know in term of domestic and international investment both in Thailand and the United States. The independent variables of financial variables are detail below:

1. The Stock Exchange of Thailand (SET)

The capital market in Thailand was found in early 1960s. The market has been developed through time until SET was established in April 1975. The main purposes are as following: 1) To act as a trading center for listed shares and to provide the systems necessary to allow securities trading. 2) To engage in stock-related activities such as clearing, securities depository, securities registrar, and other similar activities. 3) To engage in any other business that the Securities and Exchange Commission has authorized.

2. The Dow Jones Industrial Average (DJI)

DJI was founded in May 1896 by Charles Dow and his business associate Edward Jones. Initial parts of DJI are primarily manufacturing companies linked to coal, sugar, tobacco, railroads, and crude. DJI represents the success of 30 stocks of the U.S. major blue-chip companies.

3. The Gold Spot Price (GOLD)

At the first formal gold price fixing in 1919, the price of gold was fixed at USD 20.67 per ounce. The figure of gold price/ounce always shown will be spot prices of gold. Spot price of gold applies to the price of gold for current delivery as compared to a day in the future trading on the COMEX Exchange.

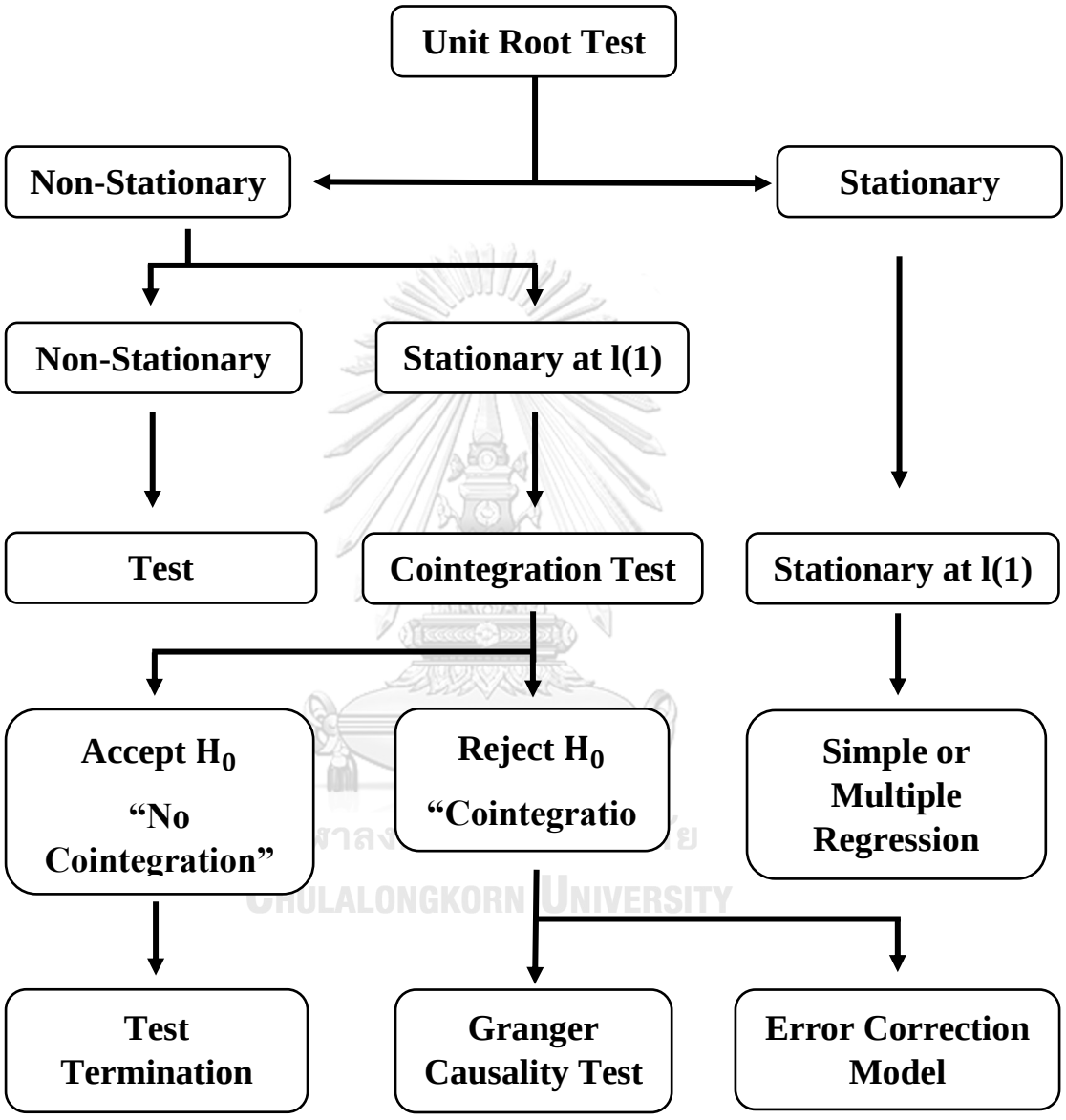
4. The Federal Reserve's Balance Sheet (FED)

The Federal Reserve System is the United States' central bank, in charge of the country's monetary policy. The Federal Reserve operates with a large balance sheet that consists of a large number of separate assets and liabilities. The Fed balance sheet provides a great deal of detail about the size and complexity of its operations. Each week, the Fed publishes its balance sheet, on Thursday afternoon around 4:30 p.m.

3.4 Conceptual Framework

After introducing our variables in this analysis. The next clarification will be details about how to process the analysis. The methodology using by following chart below:

Methodology framework



From chart 1show the flow chart that analytical methods that led to the results of this study. The method starts with a stationary test. If the outcome of time series data is stationary. Then, there are two options to pick the analyses. Firstly, the data need to be test for cointegration test and if reject H_0 and the options are whether test the Granger Causality Test or the Error Correction Model. Lastly, if cannot reject H_0, the only choice left is to test the multiple regression.

CHAPTER 4

METHODOLOGY

There are several stationary tests that can use to test time series data, such as the Dickey-Fuller test (DF), the augmented Dickey-Fuller test (ADF), or the Phillips-Perron test (PP). Stationarity test are used to check whether an observation is stationary or not. A time series is considered to be stationary if its statistical features do not change over time. Furthermore, this chapter will give a clarification about the methodology which uses in this study.

4.1 Unit Root Test: Augmented Dicky-Fuller Test (ADF)

Augmented Dicky-Fuller Unit Root Test (ADF) is the principle behind AR model estimation is based on stationary observations. Another thing to consider is the ADF test, which is basically a test of statistical significance. This means that there is a hypothesis test associated with null and alternative hypotheses, and as a result, test statistics are calculated and P-value reports. The assumption of ADF can be written as:

$$H_0 : \delta = 0 \qquad \text{(Non-Stationary)}$$
$$H_1 : \delta < 0 \qquad \text{(Stationary)}$$

The test begin with test for the stationary at level I(0), if accept H_0 means that y_t at the confidential level is non-stationary or has a unit root. The data need to take the first differentiate I(1). In reverse, if accept H_1 means that y_t at the confidential level is stationary. Supposing it is the case that failed to reject H_0, every data needs to take the differentiate until the data is stationary. If accept H_1 after the first differentiate means that y_t at the first differentiate is stationary. In conclusion that, to avoid a spurious regression results by used time series data, the first thing is the data must stationary. There are three different type of ADF test, it can write as an equation as below:

Random walk of a nonstationary series:

$$y_t = \delta y_{t-1} + \varepsilon_t$$

Random walk with Drift:

$$y_t = \alpha + \delta y_{t-1} + \varepsilon_t$$

Random walk with Drift and Deterministic Trend:

$$y_t = \alpha + \delta y_{t-1} + \beta_t + \varepsilon_t$$

where:

y_t	=	The value of the time series at time 't'
δ	=	The coefficient of the first lag on Y
y_{t-1}	=	The lag 1 of time series
α	=	A drift
β_t	=	A deterministic trend
ε_t	=	An error term with zero mean and finite variance
t	=	The value at time

Using non-stationary time series data in the financial model can cause an inaccurate and spurious result. It is also contributing a weak interpretation and forecasting. The problem can be solved by test the data until it become stationary. In some cases, a set of variables may combine both probabilistic and deterministic trends at the same time. Differentiation and detrending should be used to prevent deceptive outcomes, since it would remove both uncertainty and deterministic trend.

4.2 Ordinary Least Squares

The statistical method used to analyze and estimate the relationships between one or more independent variables is called the Ordinary least squares (OLS). The OLS only study one independent variable (X) predicting a dependent variable (Y). In addition, its logic can be extended to multivariate models with two or more independent variables. Simple linear regression:

$$Y_t = \alpha + \beta X_t + \varepsilon_t$$

where:

Y_t	=	The value of the dependent variable
X_t	=	The value of the independent variable
β	=	The population slope coefficient
α	=	The intercept of the model
ε_t	=	The error term

The econometric methods used to analyze the relationship between the exchange rate (USD/THB) and financial variables are discussed in this section. The simple ordinary least square (OLS) regressions was performed using monthly data from January 2009 to December 2019. The equations estimate as following:

$$EXR = f(SET, DJI, GOLD, FED) \quad (1)$$

The equation could be transformed into a linear function thus:

$$EXR = \alpha + \beta_1 SET + \beta_2 DJI + \beta_3 GOLD + \beta_4 FED + \varepsilon_t \quad (2)$$

Theoretically, the coefficients of equation (2) are expected to take these signs:

$$\beta_1 < 0, \beta_2 > 0, \beta_3 > 0, \beta_3 > 0, \beta_5 > 0$$

where:

EXR	=	Exchange Rate (USD/THB)
SET	=	The Stock Exchange of Thailand
DJI	=	The Dow Jones Industrial Average
GOLD	=	Gold Spot Price
FED	=	The Federal Reserve's Balance Sheet

The association between dependent and independent variables is represented by R-squared (R2). When interpret the result of regression. When interpreting regression effects. As a result, when the R2 of a sample is 0.50, it means that the model's inputs will explain half of the observed variance.

4.3 Cointegration and Error Correction Model

Johansen cointegration test, their principle has demonstrated that data from two or more non-stationary time series data are integrated together in such a way that they cannot step away from any long-run equilibrium. To avoid the issue of spurious correlation, two economists objected to using linear regression to analyze the relationship between multiple time series variables, because removing the trend will not solve the problem. Instead, they purposed to checked time series data for cointegration test. With I(1) trend should be co-integrated if it can be shown that there is a relationship between the variables. If both y_i and x_i, are I(1), there is the possibility of cointegrated. Except that If the variables are on the different orders, one is I(2) another is I(1), there will be no cointegration. Assuming the regression are integrated at the first order as following:

$$Y_t = \alpha + \beta X_t + \varepsilon_t$$

where:

Y_t	=	The value of the dependent variable
X_t	=	The value of the independent variable
β	=	The is a super consistent
α	=	The intercept of the model
ε_t	=	The error term

Johansen cointegration test can applied as hypotheses below:

H_0	:	No Cointegration between variables
H_1	:	Cointegration between variables

If there are the cointegrated, the study can test a short-run relationship between variables which is called Error Correction Model. To elaborate, first the long-run relationship between the cointegrated variables is captured by regressing the values of y and x. Then the error terms of this regression, together with other short-term drivers, is leveraged to correct for the short-term trends, in turn aligning with the long-run equilibrium. Thus, the model can express the relationship with an ECM specification as:

$$Y_t = \alpha + \beta X_t + \varepsilon_t$$

With the lagged residual from (1) is $Z_{t-1} = (Y_{t-1} – \alpha - \beta^* X_{i-1})$, where α^* and β^* are the OLS estimates of α.

where:

y_i	=	The value of the dependent variable
x_i	=	The value of the independent variable
β	=	The is a super consistent
α	=	The intercept of the model
ε_t	=	The error term
Z_{t-1}	=	The error correction term

The ECM regression can re-write s below:

$$\Delta Y_t = \alpha + \beta \Delta X_t + \gamma Zt\text{-}1 + \varepsilon_t$$

CHAPTER 5

EMPIRICAL RESULTS

The analysis of statistical data descriptions by using daily data which are USD, SET, DJI, GOLD and FED. The data was selected from January 2009 to December 2019 can be gathered with the total of 132 months. The results are presented as follows:

5.1 Unit Root Test

When dealing with time-series data, the unit root test can lead to unexpected results in the analysis. The Dickey-Fuller (DF) test was developed by the American statisticians David Dickey and Wayne Fuller in 1979. It is currently popular method in 2000. They also expand their study into another version of unit root test called the Augmented Dickey Fuller Test (ADF) which was more powerful than the old version (DF). The first and important step for this study. If the series does not have seasonal or trending effects, then the time series is stationary. It would be easier to adapt the stationary to any economics model and this will give the efficiency result as well.

Table 1: Unit Root Test Statistics

Variable (Probability)	ADF at Level			ADF at 1st Difference		
	Intercept	Trend and Intercept	None	Intercept	Trend and Intercept	None
USD	0.3908	0.6749	0.2414	0.0000*	0.0000*	0.0000*
SET	0.0910	0.7055	0.9582	0.0000*	0.0000*	0.0000*
DJI	0.9852	0.5010	0.9999	0.0000*	0.0000*	0.0000*
GOLD	0.2564	0.5621	0.8065	0.0000*	0.0000*	0.0000*
FED	0.0847	0.9305	0.9740	0.0000*	0.0000*	0.0000*

Source: Author's Calculation * Significant at the 0.05 level

The result show on table 1 that the Augmented Dickey Fuller the null hypothesis of a unit root (not stationary) is evaluated against the alternative of no unit root (stationary). With 95 percent confidence intervals, finite sample critical values are used which * indicates that the test has significant statistically. From the table shows that all variables test at level of ADF cannot reject the null hypothesis therefore these series are not stationary at level, hence with ADF test at first difference, all series are stationary at first difference.

5.2 Multiple Regression Analysis

Multiple regression is an expansion of sample linear regression. When the study tries to estimate the value of a dependent variable and two or more other variables. Various variables are separate by consequence. The dependent variable is the variable that need to be forecast. The independent variables are the variables that use to determine the dependent variable. Also, R-squared or Adjusted R-squared, could calculates how much variance in the result can be clarified by variation in independent variables. R-squared still increases as more predictors are applied to the multiple regression model.

Estimation Equation:

$$USD = C(1) + C(2)*SET + C(3)*DJI + C(4)*GOLD + C(5)*FED$$

Substituted Coefficients:

$$USD = 35.1737 - 0.0059*SET + 2.6753*DJI - 0.0033*GOLD + 2.4777*FED$$

Table 2: Multiple Regression Statistics

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	35.17369	0.729273	48.23116	0.0000
SET	-0.005876	0.000780	-7.537843	0.0000
DJI	2.68E-05	3.16E-05	0.846783	0.3987
GOLD	-0.003267	0.000515	-6.348005	0.0000
FED	2.48E-06	2.12E-07	11.69841	0.0000
R-squared	0.777415	Mean dependent var		32.52275
Adjusted R-squared	0.770404	S.D. dependent var		1.803968
S.E. of regression	0.864392	Akaike info criterion		2.583562
Sum squared residual	94.89106	Schwarz criterion		2.692759
Log likelihood	-165.5151	Hannan-Quinn criterion		2.627935
F-statistic	110.8920	Durbin-Watson stat		0.146374
Prob(F-statistic)	0.000000			

Source: Author's Calculation * Significant at the 0.05 level

From the output of our regression estimation in table 2 shows the estimated coefficients are mostly significant. The general impact the exchange rate, SET and GOLD give negative coefficients of approximately -0.005876 and -0.003267 while FED give positive coefficients of approximately 2.47767, respectively. The corresponding R^2 is high; 0.777415. Only DJI that is not significantly impact the exchange with estimated positive coefficient of 2.67526. The high R^2 does not conclude the problem with Durbin-Watson stat is 0.146374. This regression seems to have a problem with autocorrelation, which shows positive correlation among variables.

5.3 Cointegration Test

Macroeconomists create time-series models to test economic theories and forecasts. The test of Johansen is a way to determine whether three or more time series are cointegrated. According to economic theory, a large number of time series datasets can shift in together, fluctuating across a long-run equilibrium. When two or more nonstationary time series: To begin, create a long-run equilibrium and then travel together in such a way that their linear combination yields a stationary time series.

Table 3: Cointegration Statistics

Unrestricted Cointegration Rank Test (Trace)				
Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability
None *	0.264597	78.43744	69.81889	0.0087
At most 1	0.155098	38.79107	47.85613	0.2687
At most 2	0.073094	17.05012	29.79707	0.6364
At most 3	0.054399	7.258625	15.49471	0.5478
At most 4	0.000334	0.043097	3.841466	0.8355
Trace test indicates 1 cointegrating eqn(s) at the 0.05 level				

Source: Author's Calculation

Table 4: Cointegration Statistics (continue)

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)				
Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Probability
None *	0.264597	39.64637	33.87687	0.0092
At most 1	0.155098	21.74095	27.58434	0.2340
At most 2	0.073094	9.791495	21.13162	0.7639
At most 3	0.054399	7.215528	14.26460	0.4640
At most 4	0.000334	0.043097	3.841466	0.8355
Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level				

Source: Author's Calculation

The findings of the Johansen cointegration test are seen in Table 4. In the model, there is only one long-run relationship of significant cointegrating between the variables. The null hypothesis of no cointegration is rejected by both the trace and maximal eigenvalue measures, indicating that the sequence is cointegrated.

5.4 Error Correction Test

As the result of cointegrated, ECM is estimated and shown as following equation.

D(USD) = C(1)*(USD(-1) + 0.00274*SET(-1) + 0.00036*DJI(-1) + 0.00147*GOLD(-1) - 2.76904*FED(-1) - 34.17552) + C(2)*D(USD(-1)) + C(3)*D(SET(-1)) + C(4)*D(DJI(-1)) + C(5)*D(GOLD(-1)) + C(6)*D(FED(-1)) + C(7)

Table 5: Error Correction Statistics

Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C(1)	-0.087249	0.023685	-3.683712	0.0003
C(2)	0.362366	0.104580	3.464953	0.0007
C(3)	-0.001361	0.000918	-1.482562	0.1407
C(4)	0.000135	7.42E-05	1.822586	0.0708
C(5)	-0.000289	0.000779	-0.370664	0.7115
C(6)	-1.36E-06	7.72E-07	-1.755024	0.0817
C(7)	-0.014934	0.033556	-0.445043	0.6571
R-squared	0.294562	Mean dependent var		-0.042250
Adjusted R-squared	0.260151	S.D. dependent var		0.395537
S.E. of regression	0.340219	Sum squared residual		14.23716
Durbin-Watson stat	1.826198			

Source: Author's Calculation

In the ECM, the coefficient on indicates how variations from the long-run relationship influence changes in the variable in the following time. In the ECM model, there are several important short-run coefficients. The modification effect or the coefficient of the predicted lagged variables, error correction coefficient shows how much of the disequilibrium is being corrected (C(1) = -0.087249). The only significant variable is only the lag of dependent variable itself (C(2) = 0.362366).

CHAPTER 6

CONCLUSION AND RECCOMENDATION

6.1 Conclusion

This study analyses the relationship between exchange rates (USD/THB) and financial market variables by using a monthly data over the period of 2009-2019, 132 examples are observed. The variables used in the studies are the Exchange Rates (USD/THB), the Stock Exchange of Thailand (SET), the Dow Jones Industrial Average (DJI), the Gold Spot Price and the Federal Balance Sheet. By using the statistical techniques show that all variables are stationary at the 1st difference. The multiple regression could explain by both negative and positive impact to exchange rates, it also includes the one variable that could not explain the exchange rates too.

The DJI is the most well-known and discussed index and it is a benchmark that measures American stocks that are perceived to be the economy's leaders and are traded on the Nasdaq and NYSE. Along with the SET also attractive investors around the world for invest in Emerging Markets. The US dollar It is widely used as a medium of trade and international investment and as the main currency in the reserves of different countries. When assets are safe in a world where they are at their own risk, foreign investment can flow into some countries to hold emerging market assets. They are immune to volatility in the world financial markets and have a strong economic background, especially in foreign countries. Although, the regression result might not significant for the DJI but it does significant for the SET in a negative direction. The negative relationship could imply that when the SET is positive/negative, then the Exchange Rates (USD/THB) would appreciate/depreciate, which is the same sign with the Gold Spot Price. When the Gold Spot Price is rise/drop, the Exchange Rates (USD/THB) would appreciate/depreciate. The price of gold fluctuates due to a number of reasons, including speculation. Investors make predictions of what policymakers and central banks will do and then act on their predictions. When the FED revealed that it was ending the divisive stabilization policy after the financial crisis, gold prices dropped. Foreign investors reduce their investment in high-risk assets to safe havens. Assets in Thailand itself at some stages are seen as a safe haven in Emerging Markets (EMs). When risk-off happened, capital flows often flow out of stock markets or EMs' risky assets hold gold or some of the top safe-haven currencies in the world. Investor mostly invest in cash or short-term government bonds.

The U.S. dollar remains the world's most dominant currency, backed by the U.S. economy's overall strength. The dollar is used in about 90% of forex trading, and almost 40% of global debt is spent in the U.S. dollars. According to the International Standards Organization List, there are 185 currencies in the world, but most of them are only found within their respective countries. Over the past decades, after the Great Recession of 2008, global financial markets began to fluctuate. The financial crisis increased the use of the dollar. The Federal Reserve System take control of the monetary policy by increase Fed fund rate and decreases the money supply, which made borrowing dollars becomes more costly. Moreover, the situation has encouraged

the Federal Reserve System (FED) to launched quantitative easing (QE), which is the ultimately purchase of trillions of government bonds and mortgage-backed securities. From figure 6.1 shows the balance sheet of FED between 2008-2015 has jumped from $900 billion to $4.5 trillion. The purpose of QE's policy is to increase economic activity by injecting more money into the system. Evidence shows that there is a positive relationship between quantitative easing policies and the growing stock market. As reported by the analyze of this study the Federal Balance Sheet also have a positive relationship with our exchange rates. Main reason that the Exchange Rates (USD/THB) has the U.S. dollar as a pair, so the policies or regulation that applied by the U.S., which is caused dollar index movement will have impact on USD/THB both positive and negative relation.

The Cointegration between the Exchange Rates (USD/THB) and Financial Market Variables does exist. This suggests that there is a single common stochastic pattern, showing market integration as a long-run relationship among the variables. Even if the long-run relationship exists, the finding from the Error Correction Model does not indicate the short-run relationship.

In conclusion that the market player, who mostly deal with the foreign exchange market, could use the analysis of this study complied with the experienced to avoid making bad decision in investing or hedging for companies. The world trend has changed all the time, the more updated information of the market the more you gain the profit from it.

6.2 Recommendations

Following by the trend of globalization, all trade barriers have reduced in some condition between a group of countries and the specific regulation for welcoming the investment for home country. The future study may consider on other variables that related to the foreign exchange such as import/export volumes or gross domestic product of Thailand. Also, Thailand is top of the list due to its large reserves and high potential for portfolio inflows. Fund flows would be a good choice to take as a variable because fund flow represents the net movement after analyzing inflows and outflows of monetary assets and just highlights the movement of currency. It can also detect any behavior that is unusual for the organization. To sum up, as world trend are changing in the long-term, some variables that have a relationship with the Exchange Rates in the past may not represent the current Financial world. Keep updating the information will help future study understand new trends of the market.

APPENDIXES

The Augmented Dickey Fuller Test (ADF) of USD at Level

Test with Intercept

Null Hypothesis: USD has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.776313	0.3908
Test critical values:	1% level	-3.481623	
	5% level	-2.883930	
	10% level	-2.578788	

*MacKinnon (1996) one-sided p-values.

Test with Trend and Intercept

Null Hypothesis: USD has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 2 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.849175	0.6749
Test critical values:	1% level	-4.030729	
	5% level	-3.445030	
	10% level	-3.147382	

*MacKinnon (1996) one-sided p-values.

Test with None

Null Hypothesis: USD has a unit root
Exogenous: None
Lag Length: 2 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.110060	0.2414
Test critical values:	1% level	-2.583011	
	5% level	-1.943324	
	10% level	-1.615075	

*MacKinnon (1996) one-sided p-values.

The Augmented Dickey Fuller Test (ADF) of USD at Difference

Test with Intercept

Null Hypothesis: D(USD) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.929243	0.0000
Test critical values:	1% level	-3.481623	
	5% level	-2.883930	
	10% level	-2.578788	

*MacKinnon (1996) one-sided p-values.

Test with Trend and Intercept

Null Hypothesis: D(USD) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.902047	0.0000
Test critical values:	1% level	-4.030729	
	5% level	-3.445030	
	10% level	-3.147382	

*MacKinnon (1996) one-sided p-values.

Test with None

Null Hypothesis: D(USD) has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.863970	0.0000
Test critical values:	1% level	-2.583011	
	5% level	-1.943324	
	10% level	-1.615075	

*MacKinnon (1996) one-sided p-values.

The Augmented Dickey Fuller Test (ADF) of SET at Level

Test with Intercept

Null Hypothesis: SET has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.622351	0.0910
Test critical values:	1% level	-3.480818	
	5% level	-2.883579	
	10% level	-2.578601	

*MacKinnon (1996) one-sided p-values.

Test with Trend and Intercept

Null Hypothesis: SET has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.787278	0.7055
Test critical values:	1% level	-4.029595	
	5% level	-3.444487	
	10% level	-3.147063	

*MacKinnon (1996) one-sided p-values.

Test with None

Null Hypothesis: SET has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.386708	0.9582
Test critical values:	1% level	-2.582734	
	5% level	-1.943285	
	10% level	-1.615099	

*MacKinnon (1996) one-sided p-values.

The Augmented Dickey Fuller Test (ADF) of SET at Difference

Test with Intercept

Null Hypothesis: D(SET) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.425852	0.0000
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

*MacKinnon (1996) one-sided p-values.

Test with Trend and Intercept

Null Hypothesis: D(SET) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.691639	0.0000
Test critical values:	1% level	-4.030157	
	5% level	-3.444756	
	10% level	-3.147221	

*MacKinnon (1996) one-sided p-values.

Test with None

Null Hypothesis: D(SET) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.182004	0.0000
Test critical values:	1% level	-2.582872	
	5% level	-1.943304	
	10% level	-1.615087	

*MacKinnon (1996) one-sided p-values.

The Augmented Dickey Fuller Test (ADF) of DJI at Level

Test with Intercept

Null Hypothesis: DJI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.473266	0.9852
Test critical values:	1% level	-3.480818	
	5% level	-2.883579	
	10% level	-2.578601	

*MacKinnon (1996) one-sided p-values.

Test with Trend and Intercept

Null Hypothesis: DJI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.171519	0.5010
Test critical values:	1% level	-4.029595	
	5% level	-3.444487	
	10% level	-3.147063	

*MacKinnon (1996) one-sided p-values.

Test with None

Null Hypothesis: DJI has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		3.478352	0.9999
Test critical values:	1% level	-2.582734	
	5% level	-1.943285	
	10% level	-1.615099	

*MacKinnon (1996) one-sided p-values.

The Augmented Dickey Fuller Test (ADF) of DJI at Difference

Test with Intercept

Null Hypothesis: D(DJI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.61739	0.0000
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

*MacKinnon (1996) one-sided p-values.

Test with Trend and Intercept

Null Hypothesis: D(DJI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.60379	0.0000
Test critical values:	1% level	-4.030157	
	5% level	-3.444756	
	10% level	-3.147221	

*MacKinnon (1996) one-sided p-values.

Test with None

Null Hypothesis: D(DJI) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-9.734818	0.0000
Test critical values:	1% level	-2.582872	
	5% level	-1.943304	
	10% level	-1.615087	

*MacKinnon (1996) one-sided p-values.

The Augmented Dickey Fuller Test (ADF) of GOLD at Level

Test with Intercept

Null Hypothesis: GOLD has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.072013	0.2564
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

*MacKinnon (1996) one-sided p-values.

Test with Trend and Intercept

Null Hypothesis: GOLD has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.061044	0.5621
Test critical values:	1% level	-4.030157	
	5% level	-3.444756	
	10% level	-3.147221	

*MacKinnon (1996) one-sided p-values.

Test with None

Null Hypothesis: GOLD has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		0.435266	0.8065
Test critical values:	1% level	-2.582872	
	5% level	-1.943304	
	10% level	-1.615087	

*MacKinnon (1996) one-sided p-values.

The Augmented Dickey Fuller Test (ADF) of GOLD at Difference

Test with Intercept

Null Hypothesis: D(GOLD) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.730892	0.0000
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

*MacKinnon (1996) one-sided p-values.

Test with Trend and Intercept

Null Hypothesis: D(GOLD) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.711661	0.0000
Test critical values:	1% level	-4.030157	
	5% level	-3.444756	
	10% level	-3.147221	

*MacKinnon (1996) one-sided p-values.

Test with None

Null Hypothesis: D(GOLD) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.714394	0.0000
Test critical values:	1% level	-2.582872	
	5% level	-1.943304	
	10% level	-1.615087	

*MacKinnon (1996) one-sided p-values.

The Augmented Dickey Fuller Test (ADF) of FED at Level

Test with Intercept

Null Hypothesis: FED has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.655723	0.0847
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

*MacKinnon (1996) one-sided p-values.

Test with Trend and Intercept

Null Hypothesis: FED has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.062004	0.9305
Test critical values:	1% level	-4.030157	
	5% level	-3.444756	
	10% level	-3.147221	

*MacKinnon (1996) one-sided p-values.

Test with None

Null Hypothesis: FED has a unit root
Exogenous: None
Lag Length: 1 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.617959	0.9740
Test critical values:	1% level	-2.582872	
	5% level	-1.943304	
	10% level	-1.615087	

*MacKinnon (1996) one-sided p-values.

The Augmented Dickey Fuller Test (ADF) of FED at Difference

Test with Intercept

Null Hypothesis: D(FED) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.684435	0.0000
Test critical values:	1% level	-3.481217	
	5% level	-2.883753	
	10% level	-2.578694	

*MacKinnon (1996) one-sided p-values.

Test with Trend and Intercept

Null Hypothesis: D(FED) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.271294	0.0000
Test critical values:	1% level	-4.030157	
	5% level	-3.444756	
	10% level	-3.147221	

*MacKinnon (1996) one-sided p-values.

Test with None

Null Hypothesis: D(FED) has a unit root
Exogenous: None
Lag Length: 0 (Automatic - based on SIC, maxlag=12)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.124281	0.0000
Test critical values:	1% level	-2.582872	
	5% level	-1.943304	
	10% level	-1.615087	

*MacKinnon (1996) one-sided p-values.

The Multiple Regression Analysis

Dependent Variable: USD
Method: Least Squares
Date: 03/10/21 Time: 19:06
Sample: 2009M01 2019M12
Included observations: 132

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	35.17369	0.729273	48.23116	0.0000
SET	-0.005876	0.000780	-7.537843	0.0000
DJI	2.68E-05	3.16E-05	0.846783	0.3987
GOLD	-0.003267	0.000515	-6.348005	0.0000
FED	2.48E-06	2.12E-07	11.69841	0.0000

R-squared	0.777415	Mean dependent var	32.52275
Adjusted R-squared	0.770404	S.D. dependent var	1.803968
S.E. of regression	0.864392	Akaike info criterion	2.583562
Sum squared resid	94.89106	Schwarz criterion	2.692759
Log likelihood	-165.5151	Hannan-Quinn criter.	2.627935
F-statistic	110.8920	Durbin-Watson stat	0.146374
Prob(F-statistic)	0.000000		

The Cointegration Tests

Date: 03/10/21 Time: 20:07
Sample (adjusted): 2009M04 2019M12
Included observations: 129 after adjustments
Trend assumption: Linear deterministic trend
Series: USD SET DJI GOLD FED
Lags interval (in first differences): 1 to 2

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.264597	78.43744	69.81889	0.0087
At most 1	0.155098	38.79107	47.85613	0.2687
At most 2	0.073094	17.05012	29.79707	0.6364
At most 3	0.054399	7.258625	15.49471	0.5478
At most 4	0.000334	0.043097	3.841466	0.8355

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.264597	39.64637	33.87687	0.0092
At most 1	0.155098	21.74095	27.58434	0.2340
At most 2	0.073094	9.791495	21.13162	0.7639
At most 3	0.054399	7.215528	14.26460	0.4640
At most 4	0.000334	0.043097	3.841466	0.8355

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'*S11*b=I):

USD	SET	DJI	GOLD	FED
-0.759507	-0.001761	-0.000340	-0.000400	2.33E-06
-0.031000	0.010308	-0.000241	-0.003605	-1.91E-06
-0.400884	-0.007036	0.000116	0.000546	3.20E-06
-1.017181	-0.004957	9.45E-05	-0.006731	1.56E-06
-0.455539	-0.007662	0.000356	0.003740	1.26E-06

Unrestricted Adjustment Coefficients (alpha):

D(USD)	0.113606	0.059194	0.051473	0.012382	-0.000681
D(SET)	3.297385	-13.10073	-2.889693	-4.054567	0.263932
D(DJI)	-30.06727	-23.61178	28.53828	-22.75217	7.687592
D(GOLD)	-4.639314	-8.538582	-4.130308	7.419804	0.006799

D(FED)	5036.580	5114.515	-5323.135	-762.0974	135.8163

1 Cointegrating Equation(s): Log likelihood -3770.139

Normalized cointegrating coefficients (standard error in parentheses)

USD	SET	DJI	GOLD	FED
1.000000	0.002318	0.000448	0.000527	-3.07E-06
	(0.00261)	(0.00012)	(0.00155)	(6.4E-07)

Adjustment coefficients (standard error in parentheses)

D(USD)	-0.086285
	(0.02208)
D(SET)	-2.504387
	(2.94725)
D(DJI)	22.83631
	(31.6903)
D(GOLD)	3.523592
	(2.95865)
D(FED)	-3825.318
	(1848.07)

2 Cointegrating Equation(s): Log likelihood -3759.268

Normalized cointegrating coefficients (standard error in parentheses)

USD	SET	DJI	GOLD	FED
1.000000	0.000000	0.000499	0.001329	-2.62E-06
		(7.4E-05)	(0.00113)	(4.1E-07)
0.000000	1.000000	-0.021918	-0.345694	-0.000193
		(0.00744)	(0.11300)	(4.1E-05)

Adjustment coefficients (standard error in parentheses)

D(USD)	-0.088120	0.000410
	(0.02171)	(0.00030)
D(SET)	-2.098259	-0.140855
	(2.80234)	(0.03855)
D(DJI)	23.56828	-0.190456
	(31.6732)	(0.43575)
D(GOLD)	3.788291	-0.079850
	(2.89968)	(0.03989)
D(FED)	-3983.870	43.85395
	(1814.35)	(24.9613)

3 Cointegrating Equation(s): Log likelihood -3754.373

Normalized cointegrating coefficients (standard error in parentheses)

USD	SET	DJI	GOLD	FED
1.000000	0.000000	0.000000	0.005513	-5.05E-06
			(0.00584)	(1.4E-06)
0.000000	1.000000	0.000000	-0.529672	-8.65E-05
			(0.31518)	(7.5E-05)
0.000000	0.000000	1.000000	-8.393848	0.004872
			(11.8282)	(0.00281)

Adjustment coefficients (standard error in parentheses)

D(USD)	-0.108754	4.80E-05	-4.70E-05
	(0.02420)	(0.00035)	(1.2E-05)
D(SET)	-0.939828	-0.120524	0.001707
	(3.15985)	(0.04634)	(0.00159)
D(DJI)	12.12775	-0.391244	0.019222
	(35.7362)	(0.52414)	(0.01799)
D(GOLD)	5.444065	-0.050791	0.003161
	(3.26176)	(0.04784)	(0.00164)
D(FED)	-1849.912	81.30624	-3.562442
	(2007.13)	(29.4383)	(1.01066)

4 Cointegrating Equation(s): Log likelihood -3750.765

Normalized cointegrating coefficients (standard error in parentheses)

USD	SET	DJI	GOLD	FED
1.000000	0.000000	0.000000	0.000000	-1.34E-05
				(4.0E-06)
0.000000	1.000000	0.000000	0.000000	0.000714
				(0.00032)
0.000000	0.000000	1.000000	0.000000	0.017556
				(0.00667)
0.000000	0.000000	0.000000	1.000000	0.001511
				(0.00048)

Adjustment coefficients (standard error in parentheses)

D(USD)	-0.121349	-1.34E-05	-4.58E-05	-0.000314
	(0.03746)	(0.00038)	(1.2E-05)	(0.00022)
D(SET)	3.184401	-0.100427	0.001324	0.071619
	(4.87071)	(0.04954)	(0.00162)	(0.02804)
D(DJI)	35.27083	-0.278472	0.017072	0.265901
	(55.3028)	(0.56249)	(0.01839)	(0.31837)
D(GOLD)	-2.103221	-0.087567	0.003863	-0.019565
	(4.97090)	(0.05056)	(0.00165)	(0.02862)
D(FED)	-1074.721	85.08361	-3.634468	-18.23171
	(3108.66)	(31.6183)	(1.03401)	(17.8961)

The Error Correction Model

Vector Error Correction Estimates
Date: 03/10/21 Time: 22:27
Sample (adjusted): 2009M03 2019M12
Included observations: 130 after adjustments
Standard errors in ( ) & t-statistics in [ ]

Cointegrating Eq:	CointEq1
USD(-1)	1.000000
SET(-1)	0.002745 (0.00270) [1.01766]
DJI(-1)	0.000362 (0.00012) [3.07175]
GOLD(-1)	0.001474 (0.00166) [0.88717]
FED(-1)	-2.77E-06 (6.8E-07) [-4.08044]
C	-34.17552

Error Correction:	D(USD)	D(SET)	D(DJI)	D(GOLD)	D(FED)
CointEq1	-0.087249 (0.02369) [-3.68371]	-0.604516 (3.08398) [-0.19602]	44.38056 (32.8331) [1.35170]	2.556713 (3.10969) [0.82218]	-2514.564 (2268.59) [-1.10842]
D(USD(-1))	0.362366 (0.10458) [3.46495]	-30.56473 (13.6172) [-2.24457]	-239.8653 (144.973) [-1.65455]	-19.23486 (13.7307) [-1.40086]	24599.93 (10016.9) [2.45585]
D(SET(-1))	-0.001361 (0.00092) [-1.48256]	0.115488 (0.11950) [0.96646]	0.827947 (1.27220) [0.65080]	-0.161817 (0.12049) [-1.34297]	90.48041 (87.9020) [1.02933]
D(DJI(-1))	0.000135 (7.4E-05) [1.82259]	-0.016760 (0.00966) [-1.73431]	-0.057084 (0.10288) [-0.55485]	0.002390 (0.00974) [0.24525]	-3.699965 (7.10861) [-0.52049]
D(GOLD(-1))	-0.000289 (0.00078) [-0.37066]	-0.068438 (0.10144) [-0.67465]	-1.220135 (1.07999) [-1.12977]	0.220629 (0.10229) [2.15694]	110.0704 (74.6213) [1.47505]
D(FED(-1))	-1.36E-06 (7.7E-07) [-1.75502]	3.03E-05 (0.00010) [0.30120]	0.002111 (0.00107) [1.97223]	2.39E-05 (0.00010) [0.23609]	0.621032 (0.07396) [8.39679]
C	-0.014934	8.897809	122.1472	3.176237	7684.668

	(0.03356) [-0.44504]	(4.36924) [2.03647]	(46.5164) [2.62589]	(4.40566) [0.72094]	(3214.03) [2.39097]
R-squared	0.294562	0.093699	0.081644	0.098963	0.499537
Adj. R-squared	0.260151	0.049489	0.036847	0.055009	0.475124
Sum sq. resids	14.23716	241378.5	27359002	245419.6	1.31E+11
S.E. equation	0.340219	44.29928	471.6258	44.66857	32586.79
F-statistic	8.559974	2.119407	1.822509	2.251551	20.46207
Log likelihood	-40.70287	-673.6902	-981.1684	-674.7694	-1531.780
Akaike AIC	0.733890	10.47216	15.20259	10.48876	23.67354
Schwarz SC	0.888296	10.62656	15.35700	10.64317	23.82795
Mean dependent	-0.042250	8.682692	156.4542	4.185970	17187.15
S.D. dependent	0.395537	45.43788	480.5625	45.95030	44979.36

Determinant resid covariance (dof adj.)	3.93E+19
Determinant resid covariance	2.98E+19
Log likelihood	-3837.038
Akaike information criterion	59.64675
Schwarz criterion	60.52906
Number of coefficients	40

Dependent Variable: D(USD)
Method: Least Squares (Gauss-Newton / Marquardt steps)
Date: 03/10/21 Time: 22:29
Sample (adjusted): 2009M03 2019M12
Included observations: 130 after adjustments

D(USD) = C(1)*(USD(-1) + 0.002744942696*SET(-1) + 0.0003624969709*DJI(-1) + 0.00147404597873*GOLD(-1) - 2.76904821314E-06*FED(-1) - 34.1755238268) + C(2)*D(USD(-1)) + C(3)*D(SET(-1)) + C(4)*D(DJI(-1)) + C(5)*D(GOLD(-1)) + C(6) *D(FED(-1)) + C(7)

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	-0.087249	0.023685	-3.683712	0.0003
C(2)	0.362366	0.104580	3.464953	0.0007
C(3)	-0.001361	0.000918	-1.482562	0.1407
C(4)	0.000135	7.42E-05	1.822586	0.0708
C(5)	-0.000289	0.000779	-0.370664	0.7115
C(6)	-1.36E-06	7.72E-07	-1.755024	0.0817
C(7)	-0.014934	0.033556	-0.445043	0.6571

R-squared	0.294562	Mean dependent var	-0.042250
Adjusted R-squared	0.260151	S.D. dependent var	0.395537
S.E. of regression	0.340219	Akaike info criterion	0.733890
Sum squared resid	14.23716	Schwarz criterion	0.888296
Log likelihood	-40.70287	Hannan-Quinn criter.	0.796631
F-statistic	8.559974	Durbin-Watson stat	1.826198
Prob(F-statistic)	0.000000		

REFERENCES

Adjasi, C., Harvey, S. K., & Agyapong, D. A. (2008). Effect of exchange rate volatility on the Ghana stock exchange. *African Journal of Accounting, Economics, Finance and Banking Research*, *3*(3).

Aduda, J., Masila, J. M., & Onsongo, E. N. (2012). The determinants of stock market development: The case for the Nairobi Stock Exchange. *International journal of humanities and social science*, *2*(9), 214-230.

Agrawal, G., Srivastav, A. K., & Srivastava, A. (2010). A study of exchange rates movement and stock market volatility. *International Journal of Business and Management*, *5*(12), 62.

Anlas, T. (2012). The effects of changes in foreign exchange rates on ISE-100 index. *Journal of Applied Economics and Business Research*, *2*(1), 34-45.

Bouraoui, T., & Phisuthtiwatcharavong, A. (2015). On the determinants of the THB/USD exchange rate. *Procedia economics and finance*, *30*, 137-145.

Cambazoğlu, B., & Güneş, S. (2014). The relationship between foreign exchange rate and foreign direct investment in Turkey.

Chancharat, S., Sangsai, H., & Rujirarangsan, K. (2017). The Relationship between Exchange Rate and Return of the Stock Exchange of Thailand. *WMS Journal of Management*, *6*(2), 1-6.

Danmola, R. A. (2013). The impact of exchange rate volatility on the macro economic variables in Nigeria. *European Scientific Journal*, *9*(7).

Jantra, S. (2004). *The relationship between foreign exchange rates and stock market indices in selected Asian countries* Chiang Mai University].

Johansen, S., & Juselius, K. (1990). Maximum likelihood estimation and inference on cointegration—with appucations to the demand for money. *Oxford Bulletin of Economics and statistics*, *52*(2), 169-210.

Kampiew, K. (2010). *An Analysis of The relationship between World's gold spot price and the U.S. exchange rate using cointegration method* Chiang Mai University].

Karoui, A. (2006). The correlation between FX rate volatility and stock exchange returns volatility: An emerging markets overview. *Available at SSRN 892086*.

Kim, K.-h. (2003). Dollar exchange rate and stock price: evidence from multivariate cointegration and error correction model. *Review of Financial economics*, *12*(3), 301-313.

Kutty, G. (2010). THE RELATIONSHIP BETWEEN EXCHANGE RATES AND STOCK PRICES: THE CASE OF MEXICO. *North American Journal of Finance & Banking Research*, *4*(4).

Mlambo, C., Maredza, A., & Sibanda, K. (2013). Effects of exchange rate volatility on the stock market: A case study of South Africa. *Mediterranean Journal of Social Sciences*, *4*(14), 561.

Pekkaya, M., & Bayramoglu, M. (2008). Causality test between exchange rate and stock prices: An analysis on USD/YTL, ISE 100 and S&P 500. *J. MUFAD*, *38*, 163-176.

Sujit, K., & Kumar, B. R. (2011). Study on dynamic relationship among gold price, oil price, exchange rate and stock market returns. *International journal of applied business and economic research*, *9*(2), 145-165.

Techaadisak, T. (2016). *The Relationship between Forward Rate (USD/THB) and*

Financial Market Variables Bangkok University].
Wen, M., & Tang, T. (2010). *The relationship between weeklyexchange rate movements and stockreturns: Empirical evidence in five Asian markets* Umeå School of Business].
Yau, H.-Y., & Nieh, C.-C. (2006). Interrelationships among stock prices of Taiwan and Japan and NTD/Yen exchange rate. *Journal of Asian Economics, 17*(3), 535-552.

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