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CENTRAL BANK INTERVENTION ON FOREIGN EXCHANGE
VOLATILITY IN MYANMAR

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**CENTRAL BANK INTERVENTION ON FOREIGN EXCHANGE
VOLATILITY IN MYANMAR**

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ABSTRACT

This study tries to examine Central Bank intervention on exchange and interbank market and to analyze the effectiveness of Central Bank intervention on exchange rate volatility in Myanmar. This study is used to analyze effectiveness of Central Bank intervention on exchange rate volatility by using GARCH model. The data was collected by using weekly observations of Myanmar Kyat against US Dollar, spanning the period from 2016 to 2018 after the adoption of floating exchange rate regime. The model includes two exogenous variables as they can contribute to the exchange rate volatility; interest rate differentials and trade balance. This implies that the CBM's net sales of foreign exchange via auctions were associated with volatility of the Myanmar kyat against the US dollar. The results found that the net sale is positively signed, meaning that it seems if there is more CBM intervention through FX Auction, there is more exchange rate volatility in Myanmar. It is because FX auction is just a mechanism for setting reference exchange rate. However, data is not significant. In addition, the interest rate differential between Myanmar and US treasury bill is negative sign and it is statistically significance which means interest rate had not moved the exchange rate in the desired direction as there is no perfect capital mobility. The coefficient of trade balance is positive sign and it is significant. Thus, increase in trade performance leads to increase in volatility as managed float exchange rate regime is used. Therefore, Central Bank should find solutions to trade deficits to encourage exports and tackle down imports can hinder exchange rate volatility in Myanmar.

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Table of Contents

	Page
Abstract	i
Acknowledgements	ii
Table of Contents	iii
List of Tables	v
List of Figures	vi
List of Abbreviations	vii
Chapter I	Introduction 1
	1.1 Rationale of the Study 2
	1.2 Objectives of the Study 3
	1.3 Scope and Method of the Study 3
	1.4 Organization of the Study 4
Chapter II	Literature Review 5
	2.1 Roles and Functions of Central Banking 5
	2.2 Central Bank Policies 6
	2.3 Intervention Channels for Foreign Exchange Rate 8
	2.4 Intervention Operations 11
	2.5 Previous Studies 14
Chapter III	Central Bank Intervention on Foreign Exchange Market in Myanmar 16
	3.1 Roles of Central Bank of Myanmar 16
	3.2 Foreign Exchange Market in Myanmar 17
	3.3 Analysis on Foreign Exchange Rate 21
	3.4 Central Bank Intervention on Interbank Market 22

Chapter IV	Analysis on The Effectiveness of Central Bank Intervention on Foreign Exchange Volatility in Myanmar	26
	4.1 Research Methodology	26
	4.2 Trade Balance of Myanmar	26
	4.3 Interest Rate Trend of the Treasury Bill of Myanmar and US	28
	4.4 Analysis of Central Bank Intervention on Foreign Exchange Rate Volatility	29
Chapter V	Conclusion	34
	5.1 Findings	34
	5.2 Suggestions	35
	5.3 Need for Further Study	36
References		
Appendices		

List of Tables

Table No.	Description	Page
3.1	Purchasing and Selling Times in FX Auction	24
4.1	Unit Root Test Statistics	30
4.2	GARCH Estimation of the Exchange Rate Volatility	32

List of Figures

Figure No.	Description	Page
3.1	Comparison between CBM Reference Rate and Interbank Market Rate	21
3.2	Exchange Rate Volatility in Interbank Spot Rate	22
3.3	Selling and Purchasing Amount in FX Auction	23
3.4	Number of Transactions in FX Auction	24
4.1	Trade Balance in Myanmar	27
4.2	Interest Rate Trend of the Treasury Bill of Myanmar and US	28

List of Abbreviations

ARCH	Autoregressive Conditional Heteroscedasticity
BIS	Bank for International Settlements
CBM	Central Bank of Myanmar
EID	Trade Balance
FEC	Foreign Exchange Currency
FX	Foreign Exchange
GARCH	Generalized Autoregressive Conditional Heteroscedasticity
GDP	Gross Domestic Product
IRD	Interest Rate Differential
MMK	Myanmar Kyat
MOPF	Ministry of Planning and Finance
NSALE	Net Sale
OTC	Over-the-Counter
SDR	Special Drawing Right
USD	United States Dollar

Chapter I

Introduction

The central bank is nowadays primarily regulatory for monetary policy. The structure of Central bank roles, the responsibilities, and the functions vary between countries. Among these roles, monetary stability is also important for economic growth in which exchange rate policy is crucial to consider as a tool to sterilize the growth. To stabilize the monetary policy, foreign intervention is one of the monetary policies of central banks.

With regard to foreign intervention, the collapse of the Bretton Woods system in 1970s brought major changes and broad variety of choices for exchange rate regimes each country had been free to choose any form of exchange arrangement, varying from pure free floating to intermediate regimes, hard pegs, crawling pegs, currency unions and flexible exchange rate. The determination of an exchange rate regime is key factor for countries' macroeconomic stability. Both fixed and flexible regimes have their pros and cons.

Intervention is defined as official purchases and sales of foreign exchange to moderate exchange rate fluctuations, to correct misalignment and disordered market conditions, to accumulate foreign reserves, to supply foreign exchange to market, to control inflation, to prevent speculation and to maintain monetary and financial stability. Moreover, successful intervention depends on the choice of instruments, markets and timing to maximize the impact on the exchange rate.

Intervention may affect the exchange rate through many channels. Under the signaling channel, market participants may adjust their exchange rate expectations when they perceive intervention as signaling a change in future monetary policy. Under the portfolio balance channel, the change in the currency composition of asset portfolios associated with the sterilized intervention generates a change in the risk premium, which triggers an exchange rate adjustment as agents rebalance their portfolio with monetary policy, to stabilize market expectations, calm disorderly markets and limit unwarranted exchange rate movements resulting from temporary shocks.

One view criticized that the exchange rate should be freely determined by market forces, independently of any intervention or targeting by Central Bank's monetary policy, other view confirming the Central Bank intervention and control Michael, M., Masson, P., Swoboda, A., Jadresic, E., Mauro, P., Berg, A. (2000). Therefore, the choice of an exchange rate regime is a critical aspect to ensure competitiveness and economic growth. Floating exchange rate has been regarded as an automatic stabilizer, which is able in some cases to rebalance the unbalanced economy.

1.1 Rationale of the Study

In the global, the foreign exchange market is the largest, most globally integrated and most active financial market in the world. The foreign exchange market trades on various jurisdictions, time zones and types of market participants. This gives it the unique ability to provide signals as to how market participants are interpreting or responding to developments taking place in other markets or in the real economy.

According to Central Bank Survey of foreign exchange and derivatives market activity conducted by the Bank for International Settlements (BIS, 2016) across 53 countries in April 2016, total global average daily turnover across over-the-counter (OTC) foreign exchange instruments –including spot, forward, swap and option transactions –was estimated to be USD 5.1 trillion, its first decline since 2001. With respect to Myanmar, Central Bank of Myanmar was separated from Ministry of Planning and Finance (MOPF) according to Central Bank Law (2013). CBM stood independently from MOPF. CBM firstly enacted Foreign Exchange Management Law in 2012. In this law, CBM partially liberalized restriction on foreign exchange and foreign currency holding in public.

According to the new government administration, exchange rate unification in Myanmar started on April, 2012 and the managed floating exchange rate regime and adopted. The reference exchange rate with US Dollar is determined based on the auction mechanism which reflects the market demand and supply. Exchange level is not targeted as exchange rate is market determined and intervention is to avoid volatility. CBM has conducted daily foreign exchange auction on every business day since April, 2012. Then, CBM launched renew Foreign Exchange Management Law (FEM Law) (2015).

Since one of the main CBM's policies is to reduce the exchange rate volatility, including some monetary policy variables in the model allows addressing the issue of how effective they are. Therefore, this study will examine the Central Bank intervention on foreign exchange and will analyze whether Central Bank intervention can reduce exchange volatility in Myanmar. However, as only CBM intervention is not enough to stable exchange rate, this study also analyzes the other factors like domestic interest rate and trade balance of the country.

The interest rate differential between MMK and US Dollar is also major determinant of exchange rate. In trade balance, if export exceeds import, the country will be trade surplus and domestic currency will also be appreciated. In developing countries, trade balance is mostly likely trade deficit because developing countries need to build up new infrastructures which are mostly imported from other countries. Therefore, the CBM, regulator, needs to monitor closely the trade balance, interest rate, foreign exchange inflow and outflow to sterilize the exchange rate in stabilization.

1.2 Objectives of the Study

The objectives of this study are as follows:

- (1) To examine Central Bank intervention in foreign exchange rate and interbank market
- (2) To analyze the effectiveness of Central Bank intervention on exchange rate volatility

1.3 Scope and Method of the Study

In this study, secondary data is used to explore the volatility of the exchange rate in Myanmar, this study employs weekly data. The data set concludes the exchange rate of the Myanmar Kyat against USD spanning from January 2016 to December 2018 that is a total of 157 observations because managed float exchange rate regime was used since 2012 in Myanmar. In addition, observations are enough to carry out time series analysis. Descriptive statistics of variables used in weekly analysis.

Exchange rate data is obtained from website of Central Bank of Myanmar. Moreover, the nominal weekly weighted average spot MMK/USD and weekly

intervention in interbank market are used to analyze central bank intervention on exchange rate volatility and other influencing factors. In this study, the intervention data series are net sales (sales less purchases) in millions of USD. This study is also used not only CBM reference rate but also spot dealing in interbank market because the condition of market is reflected by spot rate of interbank market. Data are obtained from CBM, Bloomberg and Thomson Reuter.

In order to analyze Central Bank intervention on exchange rate volatility by contributing of two exogenous variables: interest rate differentials and trade balance by using the generalized autoregressive conditional heteroskedasticity (GARCH) process which is often used by financial modeling professionals because it provides a more realistic condition to predict the prices and rates of financial instruments.

1.4 Organization of the Study

In this study, chapter (1) is introduction which contains rationale, objectives, scope, method and organization of the study. Chapter (2) discusses literature review on roles, functions and strategy of central banks, intervention channels and operations and previous studies. Chapter (3) explores the roles of Central Bank of Myanmar, foreign exchange market and analysis on foreign exchange rate and interbank market in Myanmar. Chapter (4) analyzes the effectiveness of central bank intervention on foreign exchange volatility in Myanmar. Chapter (5) concludes finding, suggestion and needs for further study.

Chapter II

Literature Review

This chapter presented the roles and functions of central banks, central policies, intervention channel, intervention operations and previous studies.

2.1 Roles and Functions of Central Banking

Before the commencement of the 20th Century, there had been no clearly concept of central banking, Central banking has become an entirely separate branch of banking, as distinct from the functions and operations of commercial banks, industrial banks, agricultural banks, saving banks and investment banks. Central banks have developed their own code of rules and practices which can be described as the art of central banking.

A clearly-defined concept has been evolved, a central bank being generally recognized as a bank which constitutes the apex of the monetary and banking structure of its country and which performs, as best it can in the national economic interest, the following functions:

1. The sole right to issue note or at least a partial monopoly.
2. The serving general banking and agency services for the state.
3. The custody of the cash reserves of the commercial banks.
4. The custody and management of the nation's reserves of international currency.
5. The responsibility of lender of last resort.
6. The settlement of clearance balances between the banks and
7. The imposing monetary policy

A true central bank should always be ready to perform any of the functions enumerated above if the conditions and circumstances in its area of operation render it necessary or desirable for it to do so. The guiding principle for a central bank, whether function or group of functions it performs at any particular moment, is that it should act only in the public interest and it does not orient to get profit. In the primary objectives of central banking, exchange control is also important.

2.2 Central Bank Policies

Central banks conduct in ensuring economic and financial stability. They also play an important role for monetary policy to achieve low and stable inflation. Therefore, Central banks adequate policy frameworks to achieve their objectives. However, operational processes of Central Bank tailored to situation of each country to enhance the effectiveness of the central banks' policies. Therefore, this section explains central bank policies which includes monetary policies, foreign exchange regimes policies, macroprudential policies (International Monetary Fund Factsheet, 2017).

2.2.1 Monetary Policy

There are three basic types of monetary policy strategies, each of which uses a different nominal anchor: 1) exchange-rate targeting; 2) monetary targeting; and 3) inflation targeting. Emerging market countries also have used monetary targeting as it a successful strategy. The monetary policy frameworks of most emerging countries' central banks have used the information conveyed by a monetary aggregate to conduct monetary policy. However, the instability of the money-inflation relationship also has been very visible by monetary targeting in emerging market countries. Therefore, monetary targeting has not been attracted very seriously in these countries (International Monetary Fund Factsheet, 2017).

With respect to exchange-rate targeting, it has been an effective way of reducing inflation quickly in both industrialized and emerging market countries. However, exchange-rate targeting can lose of independent monetary policy. Therefore, exchange-rate targets may lead to higher volatility. There are two types of Exchange-rate targeting. They are soft pegs and hard pegs. Soft pegs is the commitment to the peg is not institutionalized, and hard peg is the institutional commitment comes either from establishment of a currency board or from dollarization (International Monetary Fund Factsheet, 2017).

Inflation targeting is a recent monetary policy strategy. It contains five main elements. They are the public announcement of medium-term numerical targets for inflation, an institutional commitment to price stability, an information inclusive strategy, an increased transparency of the monetary policy strategy and an increased accountability

of the central bank for attaining its inflation objectives (International Monetary Fund Factsheet, 2017).

2.2.2 Foreign Exchange Regimes Policies

A monetary framework is closely linked to the exchange rate regime. When a country that has a fixed exchange rate, it will have limited scope for an independent monetary policy. When a country used a flexible exchange rate, it will have dependent monetary policy. Although some countries do not fix the exchange rate, they still try to manage its level, which could involve a trade-off with the objective of price stability. An effective inflation targeting framework is supported by a fully flexible exchange rate regime (Sebastian Fristedt, 2016)

A fixed exchange-rate, commonly referred to as a peg, can be defined as a regime that holds a fixed currency, either to the currency of another country, a currency basket or any other measure of value. The exchange-rate is determined by the monetary authority of that country, whom commits to buy(sell) the home currency at a specific price. The central bank maintains this predetermined price level by intervention in the foreign-exchange market and/or adapting the interest rates (Sebastian Fristedt, 2016).

Crawling bands, crawling pegs and horizontal bands are often referred to as intermediate exchange-rate regimes. These regimes attempt to combine flexibility and stability by implementing a rule-based system for adjusting the par value, typically through a band of rates or as a function of inflation discrepancies. A flexible exchange-rate entails a currency with an exchange-rate that is determined exclusively by the global market forces of supply and demand, and are not pegged nor controlled by any monetary authority. There are two different types of flexible exchange-rates, pure floats and managed floats (Sebastian Fristedt, 2016)

2.2.3 Macroprudential Policy

The global financial crisis showed that countries need to contain risks to the financial systems a whole with dedicated financial policies. Many central banks have responsibilities to promote financial stability by upgrading their financial stability frameworks and establishing macro prudential policy frameworks. Macroprudential

policy needs a strong institutional framework to work effectively. Central banks are well placed to conduct macro prudential policy because they have the capacity to analyze systemic risk. In many countries, legislators have assigned the macro prudential mandate to the central bank or to a dedicated committee within the central bank (International Monetary Fund Factsheet, 2017).

If macroprudential is used, the institution should be strong to counter opposition from the financial industry and political pressures. Policy makers need to be clear objectives and to get the necessary legal powers, and to foster cooperation on the part of other supervisory and regulatory agencies (International Monetary Fund Factsheet, 2017).

2.3 Intervention Channels for Foreign Exchange Rate

Intervention can affect the exchange rate through various channels. Under the signaling channel, market participants may adjust their exchange rate expectations when they perceive intervention as signaling a change in future monetary policy. Under the portfolio balance channel, the change in the currency composition of asset portfolios associated with sterilized intervention generates a change in the risk premium, which triggers an exchange rate adjustment as agents rebalance their portfolios. Under the microstructure approach, dealers are the price setters and base their pricing decisions in part on the order flow they observe, which is private information (Shogo Ishii, Jorge Iván Canales-Kriljenko, Roberto Guimarães, and Cem Karacadag, 2006).

2.3.1 The Signalling Channel

Under the signaling channel, intervention can be effective if it is perceived as a signal of the future stance of monetary policy. In models that support this channel, the exchange rate is treated as an asset price, and is a function of the expected path of money supply. To the extent that intervention, even when sterilized, influences market expectations on future money supply, it can influence the exchange rate. A central bank has an incentive to follow through with policy actions that justify intervention ex post to safeguard its credibility and avoid financial losses. The central bank puts its reputation and capital at stake either because it wants to signal a policy change that would not be

credible otherwise or because it believes, based on its information advantage, that the level and direction of the exchange rate are unwarranted (Shogo Ishii et al., 2006).

The signaling channel depends in part on the institutional and policy credibility of the central bank. The effectiveness of intervention through signaling relies on influencing market expectations by transmitting information on fundamentals or future policy actions. The signaling channel is most effective when interventions are publicly announced, which enhances the visibility of intervention, thus strengthening the central bank's policy signal (Shogo Ishii et al., 2006).

The signaling channel, however, may be less effective in developing countries. First, central banks in many developing economies are at a disadvantage with respect to institutional and policy credibility. They tend to lack the record of prudent macroeconomic management that underpins the strong credibility of monetary authorities in advanced economies. Ongoing structural shifts in many developing economies—among them financial deepening, economic opening, private sector orientation, and shifts in the exchange rate regime—make it difficult to establish predictable and stable links between real and financial variables and, therefore, between intervention and future monetary policies Shogo Ishii et al., (2006).

2.3.2 The Portfolio Balance Channel

Intervention can be effective by altering the currency composition of agents' portfolios. The key assumptions are that domestic and foreign currency-denominated government securities are imperfect substitutes and that market participants are risk averse. As a result, investors demand a risk premium on the bonds denominated in the riskier currency. A sterilized intervention operation changes the relative supply of domestic versus foreign currency securities. It leads agents to rebalance their portfolios to adjust risk and returns. Therefore, these changes cause a change in the exchange rate through the portfolio balance channel (Shogo Ishii et al., 2006).

Unlike the signaling channel, the portfolio balance channel does not require credibility as a precondition for effectiveness. As such, it potentially can be more potent in some developing economies, where policy credibility tends to be lower, domestic

currency debt is an imperfect substitute for foreign currency debt, and interventions are large relative to foreign exchange market turnover (Shogo Ishii et al., 2006).

2.3.3 The Microstructure Channel

The microstructure channel provides a new window into the functioning of foreign exchange markets and the effectiveness of intervention (Lyons, 2001). Microstructure finance analyzes the impact of order flow on exchange rates. Aggregate order flow is the balance of buyer-initiated and seller-initiated orders; as such, it is a measure of net buying pressure in the foreign exchange market (Evans, 2002) and (Lyons, 2005). In this framework, analyses of the effectiveness of interventions focus on the extent to which central bank trades affect aggregate order flow (Shogo Ishii et al., 2006).

According to the microstructure approach, central banks are uniquely positioned to affect the transmission of fundamentals to the exchange rate through order flow. Central bank intervention can cause market participants to change their expectations on the future path of the exchange rate and lead them to modify their net open foreign exchange positions. The impact of official intervention on order flow and exchange rates can be greater in the presence of noise traders, which follow past trends, and often trade in a correlated fashion (Hung, 1997). Central bank intervenes by small amounts which can trigger a tide of buy or sell orders by trend-chasing traders. Interventions need not be announced and should be timed to maximize the exchange rate impact. Intervention in this context may also lead to higher volatility, which can help promote a sense of two-way risk in the market (Shogo Ishii et al., 2006).

When central banks are perceived to be more knowledgeable about future monetary and exchange rate policies or better equipped to monitor and interpret fundamentals, such as balance of payments trends, market participants may try to learn from central bank trades. In this context, central bank intervention emits information to the market. Stated differently, order flow serves as the vehicle through which the market aggregates information (Shogo Ishii et al., 2006).

To the extent that central bank-initiated order flow transmits information, it can potentially ignite an even greater flow of foreign exchange orders. The microstructure

channel also emphasizes that the size of intervention relative to market turnover determines the effectiveness of that intervention. In principle, the larger the intervention relative to market turnover, the higher its effect on the exchange rate. Thus, intervention has the potential to be more effective in developing countries, where foreign exchange markets are less liquid (Shogo Ishii et al., 2006).

2.4 Intervention Operations

Intervention operations involve a number of technical issues, including the choice of markets and counterparties. In choosing a market for intervention, the authorities must decide on the intervention instrument (or type of foreign exchange contract), meaning either spot, forward, or other derivatives markets; the trading location (onshore or offshore); the currency in which to intervene; and whether to intervene in the wholesale transfer market or retail cash market.

2.4.1 Choice of Markets

Intervention generally should take place in the spot market rather than in the forward market when the goal is to affect the spot exchange rate Shogo Ishii et al., (2006). The reasons are as follows:

- a) Spot market intervention directly affects the spot exchange rate. Forward market intervention relies on the transmission mechanism from forward to spot market rates, which is affected by money market conditions as well as exchange and capital controls.
- b) Spot market intervention is less susceptible to liquidity risk. Spot markets are usually more liquid and less constrained by counterparty limits than are forward markets.

2.4.2 Trading Location: Onshore or Offshore Markets

Intervention should normally take place in onshore markets where the bulk of foreign exchange trading takes place. Concentrating interventions in the domestic market helps maintain the primacy of the domestic market and may give the central bank greater access to market information and intelligence. In addition, central banks can effectively

address the order flow imbalance created offshore by intervening onshore. In some cases, intervention in offshore currency markets may play a useful role (Shogo Ishii et al., 2006)

In particular, the central bank may intervene in offshore currency markets when the local currency trades offshore beyond the normal working hours in the onshore market, exchange rate pressures emerge in offshore markets, and secret intervention is preferred and easier to conduct offshore. Several operational issues must be addressed when intervening in offshore markets. The central bank may have to appoint an agent to act on its behalf, which can be a foreign central bank, the Bank for International Settlements, or a foreign or domestic commercial bank. The central bank or its agent would have to abide by the rules and regulations of the markets in which intervention takes place (Shogo Ishii et al., 2006)

2.4.3 Currency Intervention

The principal intervention currency should be the international currency most widely traded against the domestic currency to reduce costs and facilitate settlement in countries following flexible exchange rate regimes. Intervening in the most widely traded currency pair makes it easier for the central bank to find counterparties and reduces transaction costs as measured by bid-offer spreads. In addition, settlement facilities are usually more reliable. For most developing economies, the intervention currency is the U.S. dollar, because foreign exchange trading is concentrated in the dollar (Canales-Kriljenko, 2004).

The central bank should intervene in one foreign currency at a time to avoid the risk of cross-currency fluctuations. Intervening in many currencies complicates foreign exchange operations and exposes the central bank to exchange rate risk. Operationally, the central bank should announce a limited number of currencies in which it will conduct intervention, and that it will intervene in only one currency at a time (Shogo Ishii et al., 2006).

2.4.3 Wholesale Transfers or Retail Cash Markets

In the absence of exchange controls, central banks should intervene only in the wholesale market for transfers. Wholesale transfers reduce transaction costs by

economies of scale and by avoiding transportation and warehousing costs. In the presence of exchange controls, however, central bank intervention in the retail cash market may rein in unwarranted depreciation expectations (Shogo Ishii et al., 2006).

The retail cash market, which is often linked to the parallel market rate, can become the center for price discovery and the formation of exchange rate expectations, even if it is a small fraction of trading and highly volatile. Therefore, intervention in cash markets, including parallel markets, can sometimes help prevent unwarranted shifts in exchange rate expectations (Shogo Ishii et al., 2006)

2.4.4 Choice of Counterparties

The central bank should establish objective and transparent criteria for choosing counterparties for intervention. More generally, the central bank should trade mainly with market makers, but it may find it useful to extend the range of its counterparties when exchange controls are present or there is little competition. In competitive environments without foreign exchange controls, the central bank should trade mainly with market makers.

First, the central bank can promote the development of a fledgling interbank foreign exchange market when it trades only with market makers that provide liquidity to the market by offering two-way (buying and selling) exchange rates on demand. Second, market makers can efficiently distribute the foreign exchange provided by the central bank by standing ready to trade with other authorized dealers. Third, market makers are usually able to handle large trading volumes, avoiding the need for the central bank to conduct many foreign exchange operations. Fourth, the central bank minimizes the chances of dealing with lesser-quality counterparties. Finally, trading with market makers that routinely interact with other market participants can provide greater control to the central bank on the degree of transparency of its foreign exchange operations.

The central bank should make special settlement arrangements to protect itself against credit risk. When there is little competition, the central bank may consider directly trading with the public at large to increase competition in the foreign exchange market. When the market is thin and a few authorized dealers account for the bulk of

trading and are not willing to offer two-way quotes, the central bank's direct participation can intensify competition.

2.5 Previous Studies

The various channels through intervention affects the exchange rate, some studies have found mixed evidence for the portfolio balance and signaling channels. Under the signaling channel, (Dominguez, 1998) estimated the impact of intervention on current and future exchange rate and found that intervention had a significant impact on expectations. In terms of the portfolio balance effect, (Obstfeld, 1990) finds that the portfolio balance effects are significant but small. The portfolio-balance channel of intervention, (Dominguez, 1998) has lost its appeal because the amounts involved seem too small compared to the size of transactions on the foreign exchange market to induce a significant readjustment in agents' portfolios. The signaling channel came too readily to be confused with one of its specific cases where the signal refers to future monetary policy.

Within the context of a flexible exchange rate regime, the signaling view argues that exchange rates would be influenced by interventions since the latter are used by central banks to enlarge the market's information set by providing it with private central bank information. The literature on the impact of central bank intervention in developing countries is continuously growing with the availability of high frequency data. Unlike in developed countries, the evidence is more clear-cut with respect to the volatility than the exchange rate level (Simwaka and Mkandawire, 2004). These studies indicate that the volatility was increased due to greater market uncertainty.

There are several reasons for these overwhelming results. They are foreign exchange markets in developing and emerging economies are shallow (low turnover) and many countries intervene in amounts that are largely relative to market turnover and besides foreign exchange intervention, the central banks in the developing and emerging countries also supplement these interventions through foreign exchange controls, monetary instruments and banking regulations that effectively increase the efficacy of their foreign exchange interventions. The literature comprises studies which investigate

the impact of foreign exchange intervention on exchange rate volatility (Baillie, 1992) and (Dominguez, 1998).

Most of these studies look at the conditional exchange rate volatility by estimating the Generalized Autoregressive Conditional Heteroscedastic (GARCH) models. Results of these studies indicate mixed trend and some studies suggest that central bank intervention tends to increase the conditional exchange rate volatility (Dominguez, 1998), while other studies show that foreign exchange intervention tends to reduce exchange rate volatility (Dominguez, 1998). In contrast, there are some studies shown that while the impact of foreign exchange intervention on exchange rate volatility, there was no impact of central bank interventions on exchange rate volatility (Baillie, 1992).

According to (Marwa A. Elsberif, 2016), he studied that exchange rate vitality and central bank actions in Egypt by using GARCH in which three variables interest rate, trade balance and official reserves were used. Results found that central bank action impacted positively in exchange rate vitality.

Therefore, this study is based on previous studies to analyzed whether Central Bank of Myanmar actions influence exchange rate volatility by using GARCH by using weekly observations of Myanmar Kyat against US Dollar, spanning the period from 2016 to 2018 after the adoption of floating exchange rate regime.

Chapter III

Central Bank Intervention on Foreign Exchange Market in Myanmar

This chapter will discuss on roles and functions of Central Bank of Myanmar, foreign exchange market reform before 2012 and after 2012. In addition, foreign exchange market revolution and intervention in Myanmar.

3.1 Roles of Central Bank of Myanmar

In 1948, the Union Bank of Burma was established as per Act of Union Bank of Burma 1947 and it was a branch of the Reserve Bank of India. However, the Union Bank of Burma Act was renewed in July 1952. Since Myanmar adopted the socialist economic system in 1962, all banks were nationalized. In addition, a monolithic bank was established under the People's Bank of the Union of Burma Act 1967. (Central Bank of Myanmar's Website)

After 1988, Myanmar economic system has been transformed from the closed to opened economy. Therefore, the government tried to develop the financial system which is in line with the market oriented, and to promote the efficiency of financial activities by enacting the Central Bank of Myanmar Law, 1990. After the new government was formed in 2011, Central Bank of Myanmar needs independent monetary policy to control the price stability in domestic market. (Central Bank of Myanmar's Website)

The main aim of the Central Bank is to control the price stabilities in domestic market and to preserve the internal and external value of the Myanmar Currency. The Central Bank try to get its objectives by promoting efficient payments mechanisms, by monitoring the liquidity, solvency, and well-functioning financial system and by fostering monetary, credit. The main responsibilities of the Central Bank of Myanmar are (Central Bank of Myanmar's Website):

- a) to issue sole domestic currency and to act as a banker to the Government;
- b) to advise to the Government with regard to economic condition;
- c) to inspect and supervise the financial institutions;
- d) to take action as a banker for the financial institutions

- e) to manage the foreign reserves of the State and to make the transactions on behalf of the State in intergovernmental organization and
- f) to undertake all the responsibilities in the name of the Government in dealing with the aforesaid organizations on behalf of the Government.

Moreover, the CBM promotes:

- a) price stability through the proper conduct of monetary policy;
- b) financial stability through prudent banking supervision and regulation; and
- c) an efficient payments and settlements system.

Central Bank of Myanmar used monetary targeting monetary policy framework in 2012. Under monetary targeting regime, the central bank target money supply as intermediate and reserve money is operating target to ensure macroeconomic consistency and to get the ultimate objective of price stability. Central Bank makes decision how much liquidity need to inject or absorb into the market by using liquidity forecasting framework.

In addition, CBM tried to develop Capital Market on behalf of the Government and to give the public more opportunities to save. Therefore, the CBM has issued and sold 3-year and 5-year Government Treasury Bonds in 1993. The Central Bank of Myanmar has formulated and implemented the monetary policy which is consistent with economic and production growth rates.

The CBM has been actively engaged as an independent central bank, advising and support legislative changes related to Myanmar's financial system as per Central Bank of Myanmar Law (2013). Currently, the Central Bank of Myanmar mainly uses monetary policy instruments such as reserves requirements, interest rate policy and limited open-market operation to get financial sector stability.

3.2 Foreign Exchange Market in Myanmar

From 1977 until the recent reforms 2012, The government employed a fixed exchange rate system, and the official exchange rate was pegged to the special drawing right (SDR) of the IMF at 8.5 kyat per SDR. Under fixed exchange rate regime, the official rate was applied to the public sector only, and there was no formal channel for the private sector to convert currencies. In April 2012, Myanmar changed from the fixed

exchange rate system to a managed floating exchange rate system. Therefore, the below sections present about situation of before and after reform of foreign exchange in Myanmar.

3.2.1 Foreign Exchange Situation Before Reform

From 1977 until the recent reforms 2012, the official kyat exchange rate was fixed to the value of the International Monetary Fund's Special Drawing Rights. However, Myanmar's economy operated with a de facto multiple exchange rate system which distorted the allocation system of foreign exchange operated by the state banks and forced the private sector to rely on informal markets for foreign exchange because of the unrealistic level of the official exchange rate and strict controls on foreign exchange. Therefore, the government unified the exchange rate market by replacing the old system with a managed float to eliminate these distortions. Kubo Koji, (2015)

However, the informal foreign exchange market and the informal fund transfer system are a legacy of the restrictive regulations in the past. Foreign trade was legalized for the private sector in September 1989, but there was no official channel for private firms to convert export revenues into the local currency, the kyat. Myanmar's citizens were not allowed to hold foreign currency note in previous foreign exchange regulation did not permit to hold foreign currency notes. At that time, private exporters were required to make foreign currency transactions at two state owned banks, MFTB, MICB by opening foreign currency deposits account. Additionally, foreign exchange certificates (FECs) issued in 1, 5 and 10 denominations to limit circulation of US currency. Local citizens can also use FECs, however, bank charge a 10 percent as a service fee and they can only withdraw in kyat. The fixed exchange is end in August 2003 and the FECs was discontinued in 2013.

Over time, the official pegged exchange became more and more divorced from the exchange rate used by the general public in the parallel exchange markets that have grown due to the heavily regulated use of foreign exchange in the formal market. The parallel market eventually became the dominant medium for the Myanmar public to satisfy their needs for foreign exchange. As this parallel market was not an official market, the government had little ability to interact and influence the exchange rate in

Myanmar. Replacing the official peg to the SDR with a market-determined exchange rate removed the large discrepancy between the official rate and the real market exchange rates. Therefore, CBM needs to intervene in some circumstance to maintain exchange rate stable in foreign exchange market.

In all these areas, the CBM and other Myanmar authorities worked together to ensure that the changes are smooth and did not cause any market disruptions. Since the official exchange rate has been used by the public sector only, while the private sector has been already using the informal market exchange rate, any significant impact of this change on the private sector did not found. All these areas, the CBM, domestic and international concerned agencies are working together to ensure that the changes were smooth.

In April, 2012, Foreign Exchange Management Law lifts restrictions on transactions on exports and imports of goods and services. In August, 2012, Foreign Exchange Management Law introduces managed float system. In addition, in August, 2013, Interbank foreign exchange market opened for all private banks. And in November, 2013, Financial Institutions of Myanmar Law was revised to install more efficient banking system. In 2014, a new Banking and Financial Institutions Law reached the final stage of drafting.

3.2.2 Foreign Exchange Situation After Reform

After a decision by the Government of Republic of the Union of Myanmar to change the exchange rate system to a managed floating regime, the CBM in consultation with the Ministry of Finance and Revenue has made changes to the existing exchange arrangements. Effective 2012, the CBM has implemented a managed floating exchange rate regime in Myanmar. The external value of the national currency, the Myanmar kyat, to be determined by supply and demand conditions in the exchange market. In line with the new exchange rate regime, reference Foreign Exchange Rate will be publicized daily by CBM.

Under this new exchange rate regime, the CBM's basic exchange policy will be targeted towards stabilizing the value of the kyat in the market with no officially specified binding limits. The CBM retains discretionary power to intervene in the foreign

exchange market to influence the market exchange rate, when the CBM finds this necessary. The kyat exchange rate versus a range of trading partner currencies will be market determined and publicized daily by both the CBM and authorized FX dealers. This decision was part of the reform program for modernizing the economy that the new Government of Myanmar initiated in the second half of 2011. This program aimed to unify the various exchange rates and gradually eliminate restrictions on current international payments and transfers abroad.

Until February, 2019, the CBM is setting the reference exchange rate based on the cut-off rate of its two-way foreign exchange daily auction, which was introduced in 2012. It was in order to facilitate the development of the foreign exchange market. The two-way foreign exchange auction worked to develop foreign exchange market and to discover price. The size of the interbank market increased from 2013-2014 financial year to 2017-2018 financial year. Therefore, the Central Bank of Myanmar try to setup new development which is to determine reference exchange rate as market-based weighted average rate in line with the international best practices of the central banks.

The market-based weighted average rate is calculated the volume weighted average exchange rate of interbank and bank-customer deals during the day. This new mechanism was developed to avoid this misalignment and its reference rate publishes in the same day to reflect current market condition. According to the CBM Instruction No. 5/2019 (dated February 4, 2019), the Reference Exchange Rate of the Myanmar Kyat equivalent to one unit of the US Dollar is computed and published by the Central Bank of Myanmar on its website every bank business day at 16:00.

The reference exchange rate is calculated based on weighted average exchange rate of the spot trades by the banks from 9:00 to 15:00 of that day. The trade deals include: (i) Spot interbank trades conducted between the Authorized Dealer Licensed banks (interbank trades); (ii) Spot trades conducted between the Authorized Dealer Licensed banks and their customers (bank-customers trades).

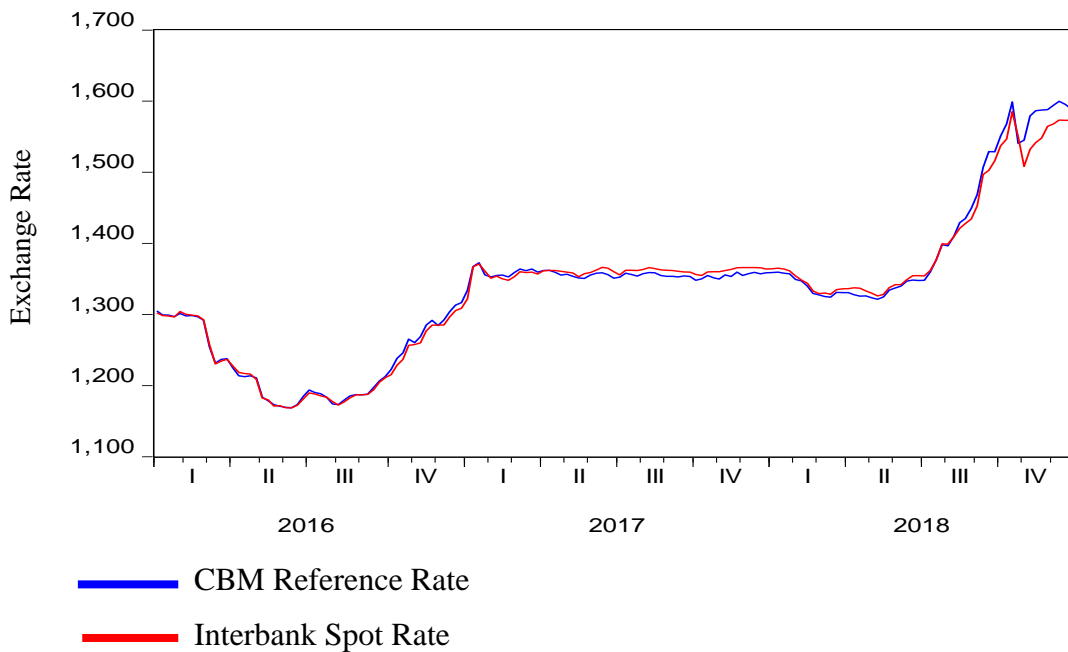
The Reference Exchange Rate is calculated as 60 percent weighted from weighted average exchange rate of the interbank trades and 40 percent weighted from the bank-customers' trade when the total amount of interbank trades is more than three (3) million U.S. Dollar on that day.

The relative weights in calculation of the Reference Exchange Rate is reviewed update to up based on the share of interbank trades. CBM announced that **the Reference Exchange Rate is just an indicative rate. Participants in the foreign exchange market are not required compulsory to use it in their foreign exchange transactions.**

3.3 Analysis on Foreign Exchange Rate

Under this new exchange rate regime, the CBM is currently setting the reference exchange rate based on the cut-off rate of its two-way foreign exchange auction, which was introduced in 2012, According to research data from CBM and Bloomberg, the reference exchange rate and interbank market rate are shown in Figure (3.1). The exchange rate of MMK/USD is depreciated from 2016 to 2018. However, in second and third quarter of year 2016, MMK/USD is appreciated when comparing with other periods. However, starting from second quarter of year 2018, the exchange rate is significantly depreciated about 23% from 2017. According to survey period, in 2018, Myanmar kyats is highest depreciation.

Figure (3.1) Comparison between CBM Reference And Interbank Market Rate

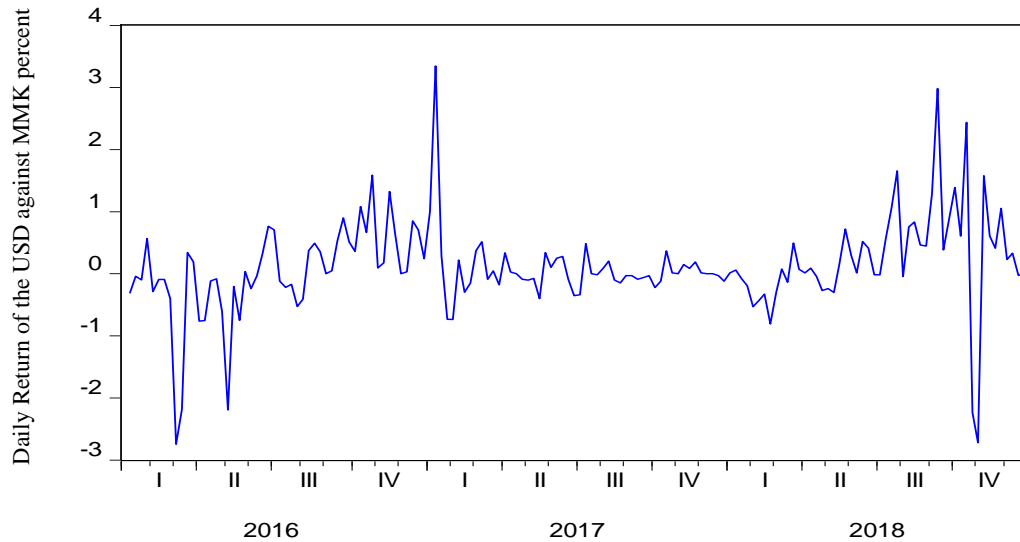


Source: Central Bank of Myanmar and Bloomberg

As per data show in Figure (3.1), CBM reference rate was reflected interbank spot rate at market as there was not significant different. However, fourth quarter of 2018, CBM reference rate is above the interbank spot rate because the CBM also abolished the trading band (Reference rate $\pm 0.8\%$) in August 2018.

Figure (3.2) illustrates volatility of exchange rate in interbank spot rate. Exchange rate of MMK/USD is highly volatility in first and second quarter of 2016, first quarter of 2017 and third and fourth quarter of 2018. The sign was holding MMK to convert USD was risk as volatile from -3 to 3 which was wide range. In addition, for exporter and importer from Myanmar was suffered exchange risk.

Figure (3.2) Exchange Rate Volatility in Interbank Spot Rate



Source: Calculating data by using eview (Data is from CBM and Bloomberg)

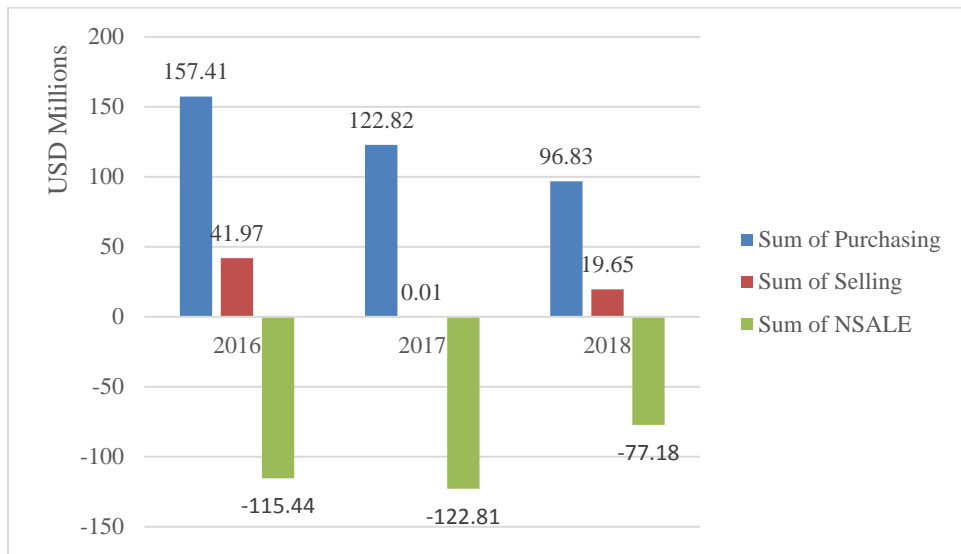
3.4 Central Bank Intervention on Interbank Market

Figure (3.3) shows the invention amount through FX Auction by CBM to formal market. According to data, Central Bank purchased USD 315.43 million from private banks from 2016 to 2018. Central Bank intervened large amount in 2016 by purchasing USD 157.41 million and selling USD 41.97 million, net purchasing is USD 115.44 million through FX Auction from private banks. In 2017, purchase USD 122.82 million, sale USD 0.01 million and net purchase USD 122.81 million. In 2018, purchase USD

96.83 million, sale USD 19.65 million and net purchase USD 77.18 million. According to data from survey period, CBM intervened by absorbing USD liquidity in market.

As the foreign exchange auctions are two-way, they can lead to either accumulation or dissipation of foreign reserves. In survey period, the daily sales and purchases of foreign exchange were net purchase USD 315.43 million, net inflow of USD to CBM.

Figure (3.3) Selling and Purchasing Amount in FX Auction

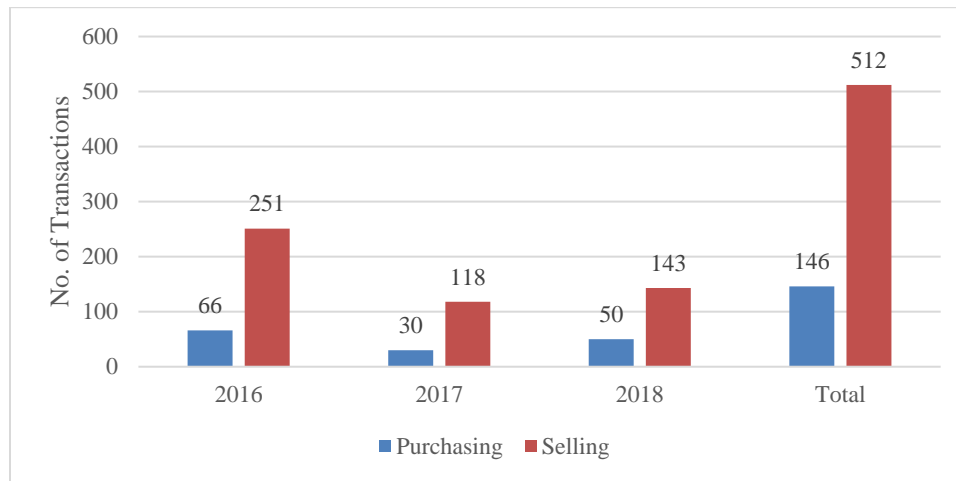


Source: Central Bank of Myanmar

In 2016, MMK was appreciated and CBM bought USD 115.44 million from interbank market which mean market had excess USD supply. Moreover, in 2018, MMK was depreciated and highest deprecation MMK along survey period and CBM purchased USD 77.88 million. Although intervention amount was low in 2018, intervention times was high because CBM sold USD in FX Auction to determine CBM daily reference rate to reflect the market.

Figure (3.4) indicates intervention times in interbank through FX Auction. According to data, Central Bank intervene 146 times in purchasing and 512 times selling from 2016 to 2018.

Figure (3.4) Number of Transactions in FX Auction



Source: Central Bank of Myanmar

As exhibited by Table (3.1), CBM has intervened on approximately 25% for purchasing and 96% for selling in FX auction of all trading days from January to December 2016. In 2017, 11% for purchasing and 45% for selling in FX auction of all trading days are intervened. The intervention times were decreased twice from 2016 to 2017. However, CBM purchased more reserves from market in 2017.

Table (3.1) Purchasing and Selling Times in FX Auction

Year	Purchasing	Purchasing Proportion by Business Days	Selling	Selling Proportion by Business Days
2016	66	25%	251	96%
2017	30	11%	118	45%
2018	50	19%	143	54%

Source: Central Bank of Myanmar

In 2018, 19% for purchasing and 54% for selling in FX auction of all trading days are intervened. The single largest daily intervention, USD 37 million, occurred in fourth quarter of 2018, and the largest yearly average intervention occurred in 2017 with USD 122.81 million. The data also suggests an asymmetry in the nature of CBM's intervention

operations as there are fewer foreign exchange sales. Specifically, net sales of foreign exchange are less frequent within 2017 and 2018.

Within 2016 and 2018, CBM intervened in market. CBM heavily purchased any excess supply of dollars. This not only protected the export competitiveness but also enabled CBM to build foreign exchange reserves. The total purchase amount was USD 315.43 million and exchange rate depreciated by 20.26%. Since one of the main CBM's policies is to reduce the exchange rate volatility, including some monetary policy variables in the model allows addressing the issue of how effective they are.

Chapter IV

Analysis on the Effectiveness of Central Bank Intervention on Foreign Exchange Volatility in Myanmar

This chapter briefly highlights the methods and procedures that were used in carrying out the study. It includes the following; CBM intervention through FX Auction, comparison of interest rate for US Treasury bill and Myanmar government bill, descriptive analysis of export and import of Myanmar.

4.1 Research Methodology

In this study, secondary data was obtained from various Monthly Bulletin, daily FX Auction announcement published by the CBM web page. The study used daily data of exchange rate traded. The interest rate for US Treasury and Myanmar Government bill, export and import data of Myanmar and interbank foreign exchange market rate are used by Bloomberg Professional Database.

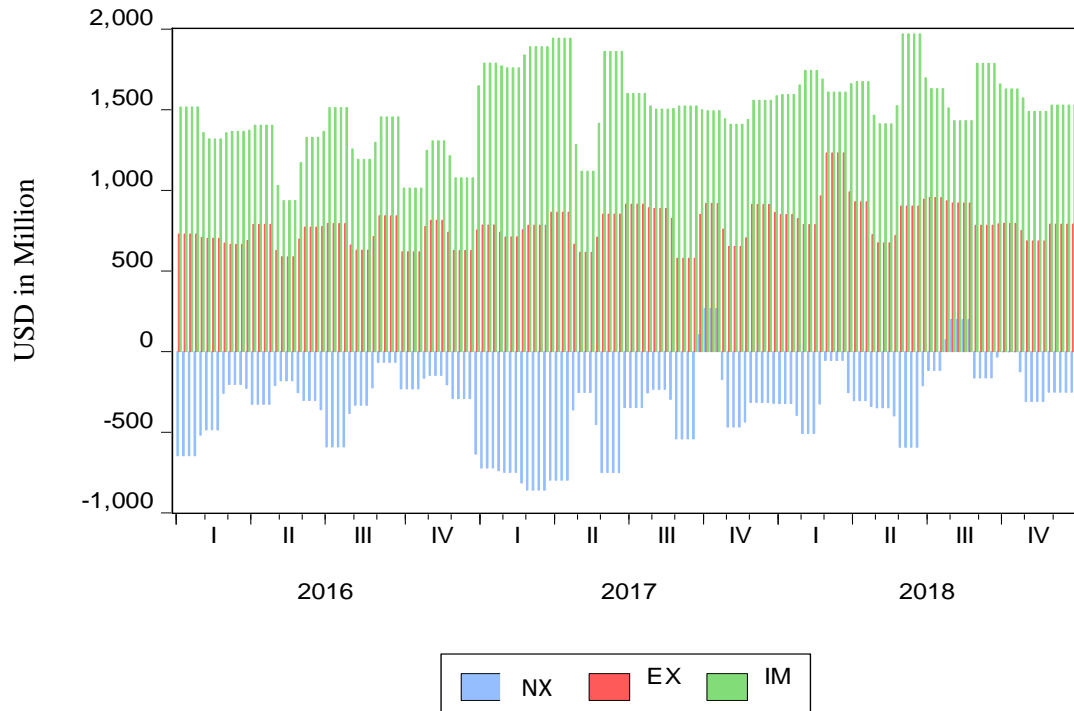
To explore the volatility of the exchange rate in Myanmar, this study employs weekly data. The data set concludes the exchange rate of MMK against USD spanning from January 2016 to December 2018 that is a total of 157 observations. Thus, observations are enough to carry out time series analysis, weekly data period starts by 2016 with the adoption of managed float exchange rate regime. To measure exchange rate volatility in this study, standard deviation of exchange rates fluctuations is measured. This study used generalized autoregressive conditional heteroscedasticity (GARCH) models pioneered by Engle (1982).

4.2 Trade Balance of Myanmar

In theoretically, excessive exchange rate volatility tends to have adverse effects on international financial flows, external trade, investment and output. More specifically, exchange rate volatility may discourage international investment flows as higher exchange rate risks reduce the expected return on these foreign investment flows. Similarly, higher exchange rate volatility increases investment risks by creating uncertainty about revenue earnings from external trade. The inclusion of the risk

premium in the costs of goods leads to higher prices which could impair the comparative advantage of these goods.

Figure (4.1) Trade Balance in Myanmar



Note: NX = Trade Balance, EX = Export, IM = Import (USD in Million)

Source: Bloomberg

Trade balance investigating if export and import performances have significant influence on exchange rate volatility, the degree of commercial liberalization and trade barriers affecting the degree of country’s trade openness, capital flow and hence, exchange rate. Some variables were excluded from this study such as inflation differentials and public debt as trials investigated the existence of multicollinearity problem. Therefore, this research is analyzed trade balance in Myanmar which is shown in figure (4.1).

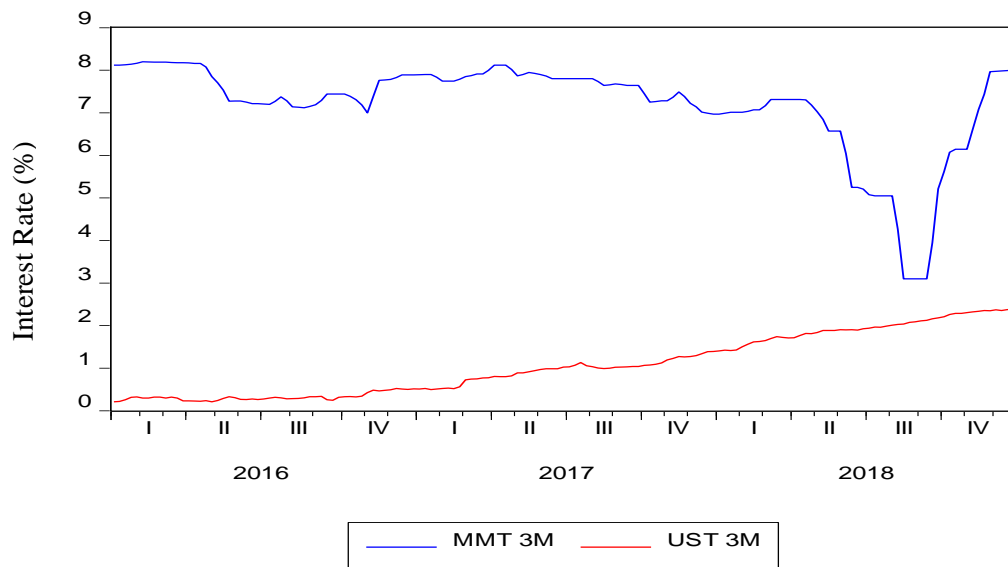
According to data from 2016 and 2018, Myanmar had trade deficit in each year. However, there was trade surplus in some quarter such as third quarter of 2017 and 2018. As per survey data, the trade deficit was reduced in 2018 when comparing with 2016 and 2017.

4.3 Interest Rate Trend of the Treasury Bill of Myanmar and US

From a theoretical standpoint, the increased in short-term interest rate causes exchange rate appreciation. The interest differential is chances for arbitragers and it induces markets to create liquidity, then raise volatility in the short period, however, it is insignificant in the longer prospect. Therefore, greater interest rate differential, more likely to increase exchange rate volatility Kocenda and Valachy, (2006).

Therefore, controlling for short-term interest rate and Comforting exchange holding are desirable while investigating the effectiveness of CBM's intervention. In this study, the interest rate for 3 months US Treasury bill and Myanmar Government bill were used to analyze how short-term interest rate will affect to exchange rate volatility. According to data, the interest rate for US Treasury bill was 0.81% to 2.41% from 2016 to 2018. With regard to Myanmar Government Bill, the interest rate was 3.1% to 7.91% from 2016 to 2018.

Figure (4.2) Interest Rate Trend of the Treasury Bill of Myanmar and US



Note: MMT3M = Myanmar Treasury Bill 3 months

UST3M – US Treasury Bill 3 months

Source: Central Bank of Myanmar and US Treasury Department

Although short-term interest rate of US Treasury bill was accelerating from 2016 to 2018, Myanmar Government Bill rate was stable along 2016 to 2018. However, according to data, the interest rate of Myanmar bill had seasonal effect as the interest rate

at third Quarter for each year was lower than other quarters because MMK liquidity was high in this period by banks. Figure (4.2) shows the comparison between interest rate trend of US treasury bill and Myanmar government bill.

4.4 Analysis of Central Bank Intervention on Foreign Exchange Rate Volatility

A country's currency is more valuable when interest rate is high. From a foreign investor's perspective, saving or investing in that country is more likely to yield better returns. Thus, this would increase the demand for that country's currency. To take advantage of the high rates offered, they would move their funds there. When demand for a currency is high, it is said to be appreciated. A strong currency exchange rate is good for its importers and bad for its exporters. In addition, increase in the interest rate of the home currency will increase the number of home currency deposits. Thus, it means the demand for home currency will increase. These situations lead to an appreciation of domestic currency relative to foreign currency.

When the domestic exchange rate appreciates, residents will purchase more goods from abroad country because the foreign good is cheaper for them. As a result, the size of import will increase whereas the quantity of export will decrease. In this context, the trade balance is the relationship between nation's export and import of merchandise over a period of time. Trade balance is export less import. A trade balance is trade surplus when the export is more than import and the trade balance is deficit when import is more than export. As a result, the value of exchange rate decrease while demand for currency also reduce.

In a free market, the equilibrium of exchange rate occurs when quantity of demand is equal the quantity of supply of the foreign currency. The factors cause the supply and demand of exchange rate change is economies variables such as export, import, domestic and foreign income, internal political stability, inflation, the overall balance of trade, gross domestic product (GDP) and government debt are equally important.

Therefore, to explore the volatility of the exchange rate in Myanmar, Central Bank intervention in foreign exchange market is not enough to determine. Thus, this study is considered the interest rate and trade balance as influencing variables.

4.6.1 Unit Root Test

Many economic and financial time series show trending behavior or non-stationarity in the mean. When the data are trending, then some form of trend removal is required. Unit root tests can be used to decide when trending data should be first differenced or regressed on deterministic functions of time to render the data stationary.

Table (4.1) Unit Root Test Statistics

Variable	Level		1st Difference		Critical Value		
	ADF	Prob	ADF	Prob	1 % Level	5 % Level	10 % Level
ERM	-1.7677731	0.7157	-8.927104 *	0.0000	-4.018349	-3.439075	-3.143887
NSALE	-4.647162 *	0.0002	-17.53181 *	0.0000	-3.473096	-2.880211	-2.576805
NX	-2.940909 **	0.0431	-9.271102 *	0.0000	-3.473672	-2.880463	-2.576939
IRD	-1.74692	0.4057	-6.644884 *	0.0000	-3.472813	-2.880088	-2.576739

Note: * Result is significant at 1% level. ** Result is significant at 5% level

ADF: Augmented Dickey–Fuller

Source: Calculating data by using eview (Data is from CBM and Bloomberg)

To investigate whether the variables are stationary and to determine the order of integration of the variables, the augmented Dickey– Fuller (ADF) test is employed. Variables are tested in both level and 1st difference forms, with intercept The ADF test results in Table (4.1) strongly reject the null hypothesis of a unit root (variables are stationary) for 1st difference. The evidence of unit root test shows that return on net sale and trade balance are stationary at level while on exchange rate, net sale, trade balance and interest rate differential are stationary at first difference at 1% level of significance.

4.6.2 GARCH Estimation of the Exchange Rate Volatility

This study employs weekly data from January 2016 to December 2018 that is a total of 157 observations. Thus, weekly data period starts by 2016 with the adoption of managed float exchange rate regime. Most recent empirical studies are modeling

volatility by adopting the use of generalized autoregressive conditional heteroscedasticity (GARCH) models pioneered by Engle (1982). Since then volatility can be estimated using time series econometric techniques. GARCH family is used by many researchers worldwide, demonstrating that there exists temporal clustering in the variances of the exchange rate changes. Following these previous studies, this work applies GARCH analysis to model the exchange rate volatility and how effective the Central Bank actions throughout study period 2016-2018.

GARCH (1,1) model is used to investigate volatility characteristics using weekly data (January 2016 to December 2018). In order to analyze Central Bank intervention on exchange rate volatility by contributing of two exogenous variables: interest rate differentials and trade balance by using the generalized autoregressive conditional heteroskedasticity (GARCH) process which is often used by financial modeling professionals because it provides a more realistic condition to predict the prices and rates of financial instruments. GARCH (1,1) model for the weekly data is as follows;

$$\text{erm} = c_1 + c_2 \text{NSALE}_{t-1} + \varepsilon_t \quad (1)$$

Where,

- erm = the log of average weekly interbank rate (MMK/USD)
- c_1 = the constant term
- NSALE = the difference between sale and purchase of USD in Auction
- c_2 = coefficient of the lagged of NSALE_{t-1}
- ε_t = the error term

erm is calculated by log of weekly exchange rate which indicates the volatility of exchange rate and NSALE is sale less purchase in FX Auction by CBM from private banks. Residual derived from mean Equation (1) is used in forming variance Equation (2), for the variance equation. The model specification of this study is as follows:

$$\sigma_t^2 = \alpha + \beta_1 \varepsilon_{t-1}^2 + \beta_2 \sigma_{t-1}^2 + \gamma_1 \text{IRD} + \gamma_2 \text{NX} \quad (2)$$

- σ_t^2 = the volatility of exchange rate in Myanmar
- α , = the constant term of the variance equation

ε^2_{t-1}	=	the lagged squared residual derived from Equation (1)
σ_{t-1}^2	=	the lagged conditional variance
IRD	=	the difference between Myanmar and US interest rates of 3-month treasury bills
NX	=	the difference between merchandized value of exports and merchandized value of imports in Myanmar (calculated in billion USD)
β_1 and β_2	=	coefficients of ε^2_{t-1} and of σ_{t-1}^2 respectively
γ_1 and γ_2	=	coefficients of IRD and EID

According to equation (2), IRD is the difference between Myanmar and US interest rates of 3-month treasury bill and NX is net export or trade balance of Myanmar which is calculated by export less import USD in million.

The result is shown in Table (4.2) and detail information was provided in annex (2). The coefficient of NSALE (Net Sale) is positive and it seems if there is more CBM intervention through FX Auction, there is more exchange rate volatility in Myanmar. However, insignificantly positive sign proves that CBM intervention in FE market does not influence on exchange rate volatility. It is because FX auction is just a mechanism for setting reference exchange rate.

Table (4.2) GARCH Estimation of the Exchange Rate Volatility

Variables	Coefficient	Prob.
C	7.214214*	0.0000
NSALE	8.73E-10	0.8971
NX	2.14E-06**	0.0381
IRD	-0.000248**	0.0365

Dependent Variable: ERM

Note: * Significant at 1% level, ** Significant at 5% level

Source: Calculating data by using eview (Data is from CBM and Bloomberg)

The coefficient of IRD is negative and it is significant. Theoretically, in the country where is liberalized capital mobilization, when interest rate differential is high, it leads to high exchange rate volatility. However, in this study, the results found that high interest rate difference causes low exchange rate volatility. It is because Myanmar does not have perfect capital mobilization. In addition, domestic and foreign investors do not response based on sensitivity of interest rate. The reasons are investors from Myanmar may invest within countries as domestic interest rate is higher than foreign interest rate and foreign investors may not be interested to invest in less attractive financial markets.

With regard to net export, the coefficient of NX is positive and it is statistically significant. It is important to note that increase in trade performance tends to lead increase in volatility. It is noteworthy that exchange rate volatility reflects a small swing in exchange rate movement because of managed float exchange rate regime adopted in Myanmar.

Chapter V

Conclusion

This study analyzes empirically the impact of Central Bank actions through IRD as well as trade balance on exchange rate volatility in Myanmar using GARCH framework. The main results are as follows; volatility clustering exists during study period, IRDs and trade deficits accelerates exchange rate volatility. Therefore, this chapter presents the finding, suggestion and need for further study.

5.1 Findings

After the official peg was abolished, managed float is used since April 2012. As per new mechanism, the Central Bank of Myanmar has operated daily foreign exchange auctions. These auctions have had three functions: (1) providing the CBM with a market-determined exchange rate, (2) supplying or absorbing foreign exchange in interbank market, and (3) serving as a policy instrument to intervene in the foreign exchange market.

According to analysis on data, MMK was depreciated 20.26% from 2016 to 2018. Although CBM try to stable the exchange rate, the volatility of exchange rate was continuously high in 2017 and 2018. With respect to CBM intervention on market, CBM made net purchased from private banks through FX Auction from 2016 and 2018 to control exchange rate volatility because CBM needed to absorb liquidity from FE market.

In addition, trade balance in Myanmar was deficit along 2016, 2017 and 2018. Although amount of trade deficit was high in 2016 and 2017, amount of trade deficit was declined in 2018. However, the result found that export was exceeded in first quarter of 2017 and fourth quarter of 2018. Moreover, when the interest rate differential between US and Myanmar is analyzed, differential amount is large. The result found that US treasury interest was constantly increasing and Myanmar Treasury Bill interest rate was fluctuated overtime because US is developed and stable in financial market, but, Myanmar is started trying to build financial market especially in capital market and money market.

Using daily data on auctions and exchange rates for the period 2016 – 2018, the FX auctions impacts on foreign exchange rate. The GARCH model incorporating the variables indicate that the NSALE in FX auction is positive and it is insignificant. Therefore, it can conclude that CBM intervention in FE market does not influence on exchange rate volatility and CBM intervention through FX auction made to discover the daily reference exchange rate.

Trade balance of Myanmar is positive and it is significant. It indicates that when net export of Myanmar is high, exchange rate volatility is high. Therefore, as trade deficit in Myanmar occurred along 2016 to 2018, exchange rate volatility is high. When IRD is tested whether it influenced on foreign exchange rate volatility, the coefficient was negative and it is significant. Therefore, high interest rate difference leads to low exchange rate volatility in Myanmar because capital mobilization in Myanmar is some extent and it is not fully liberalized. In addition, financial markets in Myanmar does not develop well to attract the investors.

Therefore, the effectiveness of intervention on exchange rate is more difficult to assess, since the exchange rate is more susceptible to multi-dimensional indicators and market reactions to them. In addition, the results imply that the FX auction works as a means of setting up reference exchange rate. According to this study, FX auction have caused increasing the official foreign reserves. Thus, foreign exchange auctions should be recognized as a transitory arrangement that should operate only until the interbank foreign exchange market is developed.

5.2 Suggestions

According to analysis, MMK was depreciated and the volatility of exchange rate is high and the demand for USD is high in end of year because the exchange rate fluctuation has seasonal effect. Therefore, CBM should intervene to control exchange rate volatility by injecting or absorbing foreign currency in FE market with cumulating foreign reserves of CBM.

In the economy of developed country, interest rate differential between other countries shall affect the value of currency. However, with regard to Myanmar, the interest rate differential was negative on exchange rate volatility because CBM does not

allow perfect capital mobilization and foreign investors do not interest to invest in less liquid market. Thus, when CBM liberalizes interest rate and ease on FDI flow, the interest rate differential may affect the exchange rate in Myanmar. Therefore, CBM should prepare to maintain less exchange rate volatility at that time.

With regard to trade balance in Myanmar, as domestic consumers spend more on foreign products than domestic producers sell to foreign consumers, it can cause a trade deficit. However, in Myanmar, demand for foreign currency is vary from the season. When the weather is good to conduct business, the demand for foreign currency is high. Moreover, the demand for USD is low in rainy season as farming business are run and the export agriculture products. Therefore, CBM should monitor to balance the demand and supply of foreign currency in country in order to stable exchange rate.

Therefore, when CBM tends to decrease exchange rate volatility, it is highly recommended that mitigate IRDs and it is important to find solutions for trade deficit that Myanmar encounter for long time through import substitution or export promotion trade policies.

5.3 Need for Further Study

This study considered that exchange volatility is influenced by CBM intervention, trade balance and interest rate differential of Myanmar and US. However, there are other variables to be considered as the influencing factors on exchange volatility such as foreign reserve level of country, FDI, and GDP. In addition, researchers should also analyze on how will cause on exchange rate in Myanmar if capital account and interest rate are liberalized.

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Appendices

(1) Number of Transactions and Amount Intervention in FX Auction

Quarter	Purchase Times	Purchase Amount	Sale Times	Sale Amount	Intervention Times	Intervention Amount
2016	66.00	157,410,000.00	251.00	41,966,200.00	317.00	(115,443,800.00)
Qtr1	24.00	98,700,000.00	57.00	31,160,000.00	81.00	(67,540,000.00)
Qtr2	33.00	55,200,000.00	63.00	10,020,000.00	96.00	(45,180,000.00)
Qtr3	8.00	3,500,000.00	66.00	683,000.00	74.00	(2,817,000.00)
Qtr4	1.00	10,000.00	65.00	103,200.00	66.00	93,200.00
2017	30.00	122,820,000.00	118.00	13,800.00	148.00	(122,806,200.00)
Qtr1	4.00	1,810,000.00	45.00	6,200.00	49.00	(1,803,800.00)
Qtr2		-	34.00	3,700.00	34.00	3,700.00
Qtr3	9.00	25,310,000.00	23.00	2,300.00	32.00	(25,307,700.00)
Qtr4	17.00	95,700,000.00	16.00	1,600.00	33.00	(95,698,400.00)
2018	50.00	96,830,000.00	143.00	19,646,400.00	193.00	(77,183,600.00)
Qtr1	10.00	31,800,000.00	22.00	2,200.00	32.00	(31,797,800.00)
Qtr2	14.00	7,630,000.00	44.00	7,004,500.00	58.00	(625,500.00)
Qtr3	7.00	1,200,000.00	40.00	8,253,200.00	47.00	7,053,200.00
Qtr4	19.00	56,200,000.00	37.00	4,386,500.00	56.00	(51,813,500.00)
Grand Total	146.00	377,060,000.00	512.00	61,626,400.00	658.00	(315,433,600.00)

Source: Central Bank of Myanmar

(2) GARCH estimation of the exchange rate Volatility

Dependent Variable : ERM

Method : ML ARCH- Normal distribution (BFGS/Marquardt steps)

Date: 11/19/2019 Time : 22:04

Sample : 1/01/2016 12/28/2018

Included observations: 157

Failure to improve likelihood (non-zero gradients) after 32 iterations

Coefficient covariance computed using outer product of gradients

Per sample variance: back cast (parameter = 0.7)

GRACH = C(3) + C(4) *RESID (-1)^2 + C(5)* GARCH (-1)+

C(6)*EID + C(7) * IRD

Variable	Coefficient	Std. Error	z-Statistic	Prob.
C	7.214214	0.004916	1467.52	0.0000
NSALE	8.73E-10	6.75E-09	0.12936	0.8971

Variance Equation

C	0.003613	5.46E-05	66.11017	0
RESID (-1)^2	0.389673	0.237941	1.637686	0.1015
GARCH(-1)	0.208314	0.281601	0.073975	0.4595
NX	2.14E-06	1.03E-06	2.073694	0.0381
IRD	-0.000248	0.000118	-2.091325	0.0365

R-squared	-0.075343	Mean dependent var	7.194161
Adjusted R-squared	-0.08228	S.D dependent var	0.073
S.E. of regression	0.075944	Akaike info criterion	-3.389775
Sum squared resid	0.893961	Schwarz criterion	-3.253509
Log likelihood	273.0973	Hannan-Quinn criter	-3.334433
Durbin-Watson Stat	0.010745		

Source: Calculated data by using eview (Data is from CBM and Bloomberg)