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THE RELEVANCY OF EXCHANGE RATE REGIME IN MYANMAR

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THE RELEVANCY OF EXCHANGE RATE REGIME IN MYANMAR

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I hereby certify that the content of the dissertation is wholly my own work unless otherwise referenced or acknowledged. Information from sources is referenced with original comments and ideas of the writer herself.

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4 Ph.D. Ba-4

ABSTRACT

The role of a country's exchange rate regime plays a very important role in shaping a country's economic situation. To evaluate the relevancy of exchange rate regime in Myanmar, this paper analyzes two issues. The first one is examining the exchange rate misalignment, and the second one is analyzing the exchange rate pass through to domestic prices. Both analyses use the data for the period spanning from 2013 through 2020. Firstly, when examining the exchange rate misalignment, this study estimates the equilibrium exchange rate by using Vector Error Correction Model (VECM) model with three independent variables: net foreign asset, government expenditure and credit to private sector, and dependent variable is nominal effective exchange rate. NEER was misaligned from the equilibrium exchange rate, with the total misalignment period around 51.9 % of the period during 2013-2020. The large misalignment was in 2017, 2018 and 2020, mainly caused by natural disasters and global pandemic. It means that the exchange rate system adopted during the study period has challenges to absorb the external shock. Secondly, the study estimates the exchange rate pass-through effect to domestic prices using Vector Autoregression Model (VAR) model with five independent variables: import price, inflation, currency in circulation, output gap and oil price, and dependent variable inflation. The result of the impulse response test does not show any ERPT effect in the first year after shock, but there is small effect of ERPT in the second year after shock and the average ERPT is 0.03, indicating that 3% of the change in exchange rate is transmitted into import price. In the second year, the average ERPT to consumer prices is 0.32, meaning that 32% of the exchange rate shock is transmitted to consumer prices. Therefore, the relevancy of managed floating exchange rate regime in Myanmar during 2013-2020 was neutral to be in line with the macroeconomic situation. However, the significant misalignments observed in 2015 and 2020 were predominantly caused by natural disasters and the global pandemic. This study suggests that accumulating foreign exchange reserve to intervene the market and sufficient strengthening financial market development for effective monetary policy transmission channel to stabilize the inflation rate, being consistent among the monetary and fiscal policies and exchange rate policy and sufficient financing to investors and

traders to help improve trade facilitation are main policy agendas for Myanmar for the managed floating exchange rate regime (intermediate regime) more effective in its implementation. Like other open economies, it is also suggested for Myanmar to adopt more flexible exchange rate regime rather than fixed exchange rate regime in order to absorb external shocks.

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey Fuller
AIC	Akaike information criterion
AREAER	Annual Report on Exchange Arrangements and Exchange Restrictions
BEER	Behavioural Equilibrium Exchange Rate
CBM	Central Bank of Myanmar
CIC	Currency in Circulation
CPI	Consumer Price Index
CSO	Central Statistical Organization
ECM	Error Correction Model
ECT	Error Correction Term
ENEER	Equilibrium Nominal Effective Exchange Rate
ERR	Exchange Rate Regime
ERPT	Exchange Rate Pass-through
EXR	Exchange Rate
FCDs	Foreign Currency Deposits
FEER	Fundamental Equilibrium Exchange Rate
FPE	Final Prediction Error
FX	Foreign Exchange
FY	Financial Year
GARCH	Generalized Auto Regressive Conditional Heteroskedasticity
GDP	Gross Domestic Product
HQ	Hannan-Quinn information criterion
IFS	International Financial Statistics
IMF	International Monetary Fund
IMP	Import Price Index
LM	Lagrange Multiplier
LR	Likelihood Ratio
INF	Inflation Rate

LOP	Law of One Price
MA	Moving Averages
MCP	Multiple Currency Practice
MMK	Myanmar Kyat
NER	Nominal Exchange Rate
NEER	Nominal Effective Exchange Rate
NFA	Net Foreign Assets
NTB	Non-tariff Barriers
OCA	Optimal Currency Area
OECD	Organization for Economic Cooperation and Development
PTM	Pricing to Market
PPI	Producer Price Index
PPP	Purchasing Power Parity
QFS	Quarterly Financial Statistics
RER	Real Exchange Rate
REER	Real Effective Exchange Rate
SDR	Special Drawing Rights
SIC	Schwarz Information Criterion
TOT	Terms of Trade
TNT	Trade and Trade
VAR	Vector Auto Regression
VECM	Vector Error-correction Model

CHAPTER I
INTRODUCTION

The exchange rate regime has a significant role in influencing achieving a country's main economic objectives, such as high economic growth, price stability and financial stability (Frenkel, 1999). The exchange rate regime is the system in which the central bank manages the exchange rates of its own currency against the other countries' currencies.

There are two main types of exchange rate systems: fixed exchange rate system and floating exchange rate system. There are intermediate regimes in between. Under the framework of a fixed exchange rate regime, a certain fixed parity or band of the exchange rate of the currency of a country against the single currency of another country or a basket of currencies of other countries is maintained. Under the floating exchange rate regime, the demand for and supply of the currency in the market determines the exchange rate of the currency of a country against the other currencies.

Each country adopts one of these categories of exchange rate systems. Each category of exchange rate regime has its own advantages and disadvantages. When the countries choose an exchange rate regime, they have to take those advantages and disadvantages into consideration. The main major benefit of a fixed regime is credibility (low inflation), and the main advantage of floating exchange rate regime is flexibility (economic growth). If there is a trade-off between policy priority of low inflation and economic growth, the choice of exchange rate regime will be a trade-off between fixed exchange rate regime and floating exchange rate regime.

Moreover, choosing either a fixed or floating exchange rate regime is associated with whether real or nominal shocks faced by a country. For example, when a country faces a nominal shock, such as a change in money demand, a fixed exchange rate system may be appropriate. However, when faced with real shocks, flexible exchange rates are

useful to prevent the economy (Friedman, 1953). The more opened the economy, the more likely risks exposure from external shocks, and the more appropriate the flexible exchange rate is to mitigate the risks arising from the external shocks. Choosing appropriate exchange rate regime should be in line with a country's own situation and changing time.

Myanmar transitioned its economic system from a closed-door economic system (1962-1988) to market-oriented economic system in 1990. However, mainly due to cumulative adverse effects from inappropriate economic policies, economic growth fell from 4.9% in 1962-1965 to -1.7% during 1986-88 (Myat Thein, 2002). During this period, Myanmar implemented a fixed exchange rate system pegged to the Special Drawing Rights - SDR issued by the International Monetary Fund to its members.

After transitioning to market-oriented economic system, the government implemented various reform measures, and improved the regulatory environment by enacting and revising many laws and regulations, such as Foreign Investment Law and Central Bank of Myanmar Law. However, Myanmar still adopted the fixed exchange rate system until 2012 even though Myanmar became to open its economy. To maintain a fixed exchange rate, a country should have sufficient foreign exchange reserves. As Myanmar did not have enough reserves, it can be suggested that the fixed exchange rate regime was not corresponding to the situation of Myanmar economy.

Given that situation, the government made restrictions on foreign exchange transactions and trade, which resulted in parallel exchange rates. Myanmar's perception of fear to devalue Myanmar Kyat became an obstacle to the economy, especially trade and investment.

In 2011, the government implemented various economic reforms with tremendous momentum. Amongst others, Myanmar transitioned from a fixed exchange rate regime to a managed floating exchange rate regime in April 2012. To support for implementation, the Central Bank of Myanmar revised the Central Bank of Myanmar Law, the Financial Institution Law and enacted the Foreign Exchange Management Law with the technical assistance from the World Bank and the International Monetary Fund.

The performance of the exchange rate regime should be periodically assessed so that it can be revised or reversed if it is not appropriate. As such, with the view that the

need to implement an appropriate exchange rate regime is important, whether managed floating exchange rate regime is appropriate for Myanmar ‘s economy should be evaluated. To this end, this research intends to evaluate whether the managed floating exchange rate regime is relevant for Myanmar or not.

1.1 Rationale of the Study

Myanmar reclassified its exchange rate regime from fixed exchange rate regime[1] pegged to the IMF’s Special Drawing Rights (SDR) at 8.50847 Kyats per SDR, to manage floating in April 2012 so that the new exchange rate regime would be in line with the tremendous economic reform measures started in 2011.

While there is limited foreign exchange reserves required to maintain a fixed parity and to pay for the important import items, the restrictions on foreign exchange transactions and trade. It led to several exchange rates in the domestic market consisting of an official exchange rate and several informal market exchange rates depending on the types of transactions. A multiple exchange rate regime refers to a regime in which there are two or more exchange rates used for different transactions and different purposes (Hori and Wong, 2008). According to Hori and Wong (2008), Myanmar’s multiple exchange rate regime created the public and private sector external transactions and caused various distortions and incurring high costs for participants. It means that the fixed exchange rate system is not compatible with the post-transitioned market economic system.

It is very important that the exchange rate system needs to be in line with the characteristics and circumstances of that country because the sustained inappropriate exchange rate regimes can lead to the misallocation of resources of the country. Inefficient allocation of resources can lead to price instability, financial instability, and

[1]Under fixed exchange rate regime adopted until 2012 in Myanmar, the exchange rate between Myanmar Kyat and SDR in March 2012 was 8.50847 Kyats per SDR, and the value of U.S. dollar per SDR for the same period was 1.5443 U.S. dollar per SDR. Therefore, the cross rate between Kyats and U.S. dollar, under fixed exchange rate regime, was 6.4012 Kyats per U.S. dollar. As such the official cross rates between Kyats and other currencies were calculated and announced by the Myanmar Foreign Trade Bank (MFTB) every day.

economic downturn. As such, this paper intends to evaluate whether the managed floating exchange rate regime adopted in 2012 was relevant with the economic situation in Myanmar during the period between 2013 through 2020.

1.2 Problem Statement and Research Questions

From 1977 to 2012, Myanmar implemented the fixed exchange rate system pegged to the SDR at 8.50847 Kyats per SDR. Under the fixed exchange rate system, maintaining the fixed parity is required to have enough foreign exchange reserves. However, Myanmar did not have sufficient foreign exchange reserves to defend the fixed parity. On the other hand, to resolve the shortage of foreign exchange in one way, as stated earlier, the government made restrictions on foreign exchange transactions and trade. These restrictions led to several exchange rates for different transactions and different purposes, which in turn caused misallocation of resources. And this long-lasting misallocation of resources inevitably led to the deterioration of the economic situation in Myanmar, which was because the fixed exchange rate regime implemented for more than 30 years was not compatible with the economic situation of Myanmar.

Hence, in the future, it is paramount to avoid such a huge loss that Myanmar experienced before. In this respect, it is necessary to evaluate the managed floating exchange rate regime which was implemented in 2012. However, it is not found yet the study on this topic by Myanmar institutions. This study will fill this gap and evaluate the relevancy of the managed floating exchange rate regime by examining the exchange rate misalignment and exchange rate pass-through effect to domestic prices in Myanmr.

To analyze the relevancy of the managed floating exchange rate regime adopted in 2012 in Myanmar, the study focuses on the following questions:

1. What are the equilibrium exchange rates? And are the exchange rates significantly misaligned with the equilibrium exchange rates?
2. What is the effect of exchange rate pass-through to inflation in Myanmar?
3. Whether the managed floating exchange regime is relevant for the macroeconomic situation in Myanmar or not?

1.3 Objectives of the Study

To answer the above questions, the study makes this study formulated the following objectives:

1. to estimate the equilibrium exchange rate in Myanmar and find out the magnitude of the misalignment.
2. to estimate the extent and speed of the impact of exchange rate changes on domestic prices.
3. to evaluate the relevancy of a managed floating regime.

1.4 Methods of Study

The empirical study consists of two parts: firstly, to estimate the equilibrium exchange rate and identify the misalignments, and secondly, to estimate the pass-through effect of the exchange rate on domestic prices. Both parts of empirical studies use the secondary data from the various sources, such as international financial institutions, the Central Bank of Myanmar, and the Central Statistical Organization of Myanmar, and internet sources, for the period from 2013 to 2020.

Despite several approaches to find equilibrium exchange rate, the data constraints in Myanmar limits the use of one of these approaches for estimating equilibrium exchange rate for Myanmar. Therefore, this study follows the single-equation reduced-form model for estimating equilibrium exchange rate developed by Edwards (1988), Elbadawi (1994) and Baffes, Elbadawi which are relevant for developing countries and allow the countries to include specific variable in the Model specification. To estimate the equilibrium exchange rate for Myanmar, single-equation reduced-form model is employed and the variables of nominal effective exchange rate, net foreign asset, government expenditure and private sector credit growth are used for the period 2013-2020. The estimation process includes unit root test for stationarity, lag length selection, cointegration test, Vector Error Correction Model (VECM) for long run estimation, residual tests (serial correlation and normality) for robustness check and followed by short run estimation by using ordinary least squares (OLS). With the use of the long-run estimates, the equilibrium exchange rates for Myanmar are estimated, then misalignment

is calculated as the difference between actual exchange rate and equilibrium exchange rates. Then discussion of misalignment is followed in chapter 3.

And the chapter estimates the exchange rate pass-through effect on inflation in Myanmar. To estimate the pass-through effect, employed the Vector Autoregression Approach, and used six variables: inflation, exchange rate, import price index, currency in circulation, output gap and world oil price for the period 2013-2020. The estimation process includes unit root test for stationarity, lag length selection, exploring exchange rate pass-through effect and residual tests (serial correlation and normality). Then the discussion of exchange rate pass-through is followed in chapter 4.

1.5 Scope and Limitation of the Study

As Myanmar adopted the managed floating exchange rate regime in April 2012, most of the data relevant for this study are available only after the mid-2012, and thus, the study chooses period from 2013 through 2020. Amongst three price indices in domestic price chain, producer price index is not available in Myanmar, thus, only import price index and consumer price index are used to analyze the level and speed of exchange rate pass-through effect to domestic prices.

1. 6 Organization Structure

This study consists of five chapters. Following the introductory chapter, chapter 2 defines the various exchange rate rates and exchange rate systems. This is followed by a description of the advantages and disadvantages of exchange rate regimes and the determinants of the exchange rate regime. Chapter 3 firstly presents the evolution of exchange rate regime in Myanmar. It also examines the concept of equilibrium exchange rates and exchange rate misalignment; and discusses measures of equilibrium exchange rates. And followed by the empirical study of estimating the equilibrium exchange rate. After obtaining the equilibrium exchange rate, exchange rate misalignment is calculated by differentiating the actual rate and equilibrium rate. Chapter 4 states the theories of causes of inflation and examines factors affecting inflation in Myanmar. Then chapter analyzes the movement and sources of inflation in Myanmar. The last part of the chapter

analyzes the exchange rate pass-through effect to inflation in Myanmar. Chapter 5 concludes by stating findings and suggestions. It also states possible further studies.

CHAPTER II
LITERATURE REVIEW

This chapter reviews the literature on exchange rate regime. First, definitions of exchange rates and exchange rate regime are stated, followed by types of exchange rate regimes, advantages and disadvantages of exchange rate regimes, factors determining the exchange rate regime. And then the empirical literature on relevancy of exchange rate regime is reviewed. Lastly, it reviews the conceptual framework for the study.

2.1 Definitions of Exchange Rates and Exchange Rate Regimes

In this section, the various types of exchange rates, including nominal exchange rate, real exchange rate, nominal effective exchange rate, and real effective exchange rate are explored.

(a) Nominal Exchange Rates

The nominal exchange rate refers to the rate at which one country's currency can be exchanged for another country's currency. It can also be seen as the price of one country's currency in terms of another country's currency. Specifically, the bilateral nominal exchange rate (NER) measures the amount of domestic currency required to obtain a unit of foreign currency. This can be mathematically represented by the equation:

$$\text{Nominal Exchange Rate} = \frac{\text{domestic currency}}{\text{foreign currency}} \qquad (2.1)$$

Usually, the nominal exchange rate is quoted in terms of the domestic currency. In equation 2.1, it represents how much domestic currency is needed to purchase one unit of foreign currency. The direction in which a currency is appreciating or depreciating depends on how the exchange rate is expressed or quoted. According to equation 2.1, when the quoted exchange rates are smaller, it implies that less domestic currency is required to acquire one unit of foreign currency. This indicates that the domestic currency

is appreciating while the foreign currency is depreciating. Conversely, an increase in NER signifies depreciation of the domestic currency in relation to other currencies, while a decrease reflects appreciation in nominal terms.

(b) Nominal Effective Exchange Rates

The measurement of a currency's performance against multiple currencies is crucial for foreign trade. It is therefore important to consider how a currency moves against various currencies. For example, the Myanmar Kyat (MMK) may depreciate against the US dollar and UK pound sterling but appreciate against other currencies. To assess the performance of MMK on a broader scale, the nominal effective exchange rate (NEER) can be calculated.

When calculating NEER, certain currencies hold more importance than others. In the case of MMK, it is essential to evaluate its performance against the US dollar since most transactions in Myanmar are settled in USD. By using NEER on a trade-weighted basis, how MMK has performed against the main trading partners' currencies can be determined.

The nominal effective exchange rate is used to gauge the price of a national currency relative to its trading partners' currencies. This comprehensive approach helps provide a more thorough assessment of a currency's performance beyond just one specific exchange rate.

The nominal effective exchange rate, which is a weighted average of indexed bilateral exchange rates, represents the value of a domestic currency relative to its trading partners. The weights assigned to each trading partner correspond to the importance of their trade relationship with the nation. Typically, the index is set at 100 in a specific year as a reference for trade weight. If the nominal effective exchange rate increases by 10 percent from that year, the index will be 110; conversely, if it decreases by 10 percent, it will be 90. However, it's important to note that changes in the nominal exchange rate and nominal effective exchange rate do not provide information about changes in purchasing power or the competitiveness of goods produced within a country during a given period.

(c) Real Exchange Rates

NER does not consider the purchasing power of both currencies in two countries. A real exchange rate can be used to measure the change in purchasing power of a currency over a certain period. According to equation 2.1, the real exchange rate is inflation adjusted nominal exchange rate between two countries.

$$RER = NER \times \frac{P}{P^*} \qquad (2.2)$$

where RER represents the bilateral real exchange rate between foreign currency and domestic currency, and NER stands for nominal exchange rates, P is the domestic inflation, and $P^*$is the inflation in the foreign country.

(d) Real Effective Exchange Rates

Real effective exchange rates (REER) are used to assess international trade competitiveness. The calculation for REER is expressed as follows:

$$REER = \prod_{i=1}^{n} RER_i^{w_i} \qquad (2.3)$$

In this equation, REER represents the real effective exchange rate of the domestic currency. n represents trading partners of a country; $RER_i^{w_i}$ refers to the real exchange rate with the i^{th} country; and w_i represents the trade weight for country (where i= 1.....n). It's important to note that $\sum_{i=1}^{n} w = 1$.

When REER is depreciated, the competitiveness of a country relative to its trading partner increases. Likewise, an appreciation is a decline in international trade competitiveness. Additionally, measurements of real exchange rates and real effective exchange rates can be implemented to evaluate any degree of misalignment in the domestic currency when compared with its medium to long-term equilibrium. Furthermore, there are instances where the real effective exchange rate is used to examine the Balassa-Samuelson effect as well.

2.2 Types of Exchange Rate Regimes

The Bretton-Woods system, which operated prior to the 1970's, was a fixed exchange rate regime where countries pegged their currencies to the US dollar and gold. This system lasted for 25 years but eventually broke down in 1971. Despite its collapse, fixed exchange rate regimes remained popular among many countries. However, since then, most economies have been transitioning towards flexible exchange rate regimes, where market forces determine the exchange rates.

There are two main types of exchange rate regimes: floating and fixed. In a floating regime, the market determines the exchange rate without any government intervention. On the other hand, in a fixed regime, authorities set the exchange rate. Many countries adopt intermediate regimes that fall between these extremes and offer varying degrees of flexibility. In this subsection, different types of regimes by the IMF and de-jure versus de-facto classifications of exchange rate regimes are discussed.

2.2.1 Different Types of Exchange Rate Regime by the IMF

The IMF classified members' countries de facto exchange rate arrangements since 1989. To better reflect the members' countries' situation, in 2009, the IMF reclassified members' de facto exchange rate arrangements based on three key principles. Firstly, it aims to capture the actual outcome of exchange rate policies, rather than relying on announced or intended arrangements. Secondly, it avoids making judgments on the appropriateness of monetary policies or the choice of exchange rate arrangement. Lastly, it takes a backward-looking approach, describing past policies without implying future intentions. Based on this framework, the revised IMF classification includes three main categories: hard pegs, soft pegs, and floating regimes. Hard pegs encompass arrangements with no separate legal tender and currency board arrangements. Soft pegs include conventional pegged arrangements, pegged rates within horizontal bands, stabilized arrangements, and crawling pegs. Floating regimes consist of managed floating and free floating. Each regime has its distinctive characteristics as follows:

(a) Exchange Arrangement with No Separate Legal Tender

Under an exchange arrangement with no separate legal tender, a monetary authority circulates another country's currency as the sole legal tender (formal dollarization), or members of a currency union share the same legal tender. In this case, domestic monetary policy control is entirely surrendered by the monetary authority.

(b) Currency Board Arrangement

In this framework, the monetary authority has a clear legislative obligation to exchange domestic currency for a specific foreign currency at a fixed exchange rate. This requires the issuing of domestic currency backed entirely by foreign assets and obtained exclusively through foreign hard currency. As a result, the traditional functions of central banks, including monetary control and lender-of-last-resort, are relinquished in favor of strict adherence to the rules of the arrangement. While there may be limited flexibility, discretion in implementing monetary policy is greatly constrained.

(c) Conventional Pegged Arrangement

The central bank officially establishes a fixed exchange rate for its currency, either to another currency or a group of currencies, and maintains this fixed parity through various interventions. These interventions can be direct, such as buying or selling foreign exchange in the market, or indirect, such as using interest rate policies related to the exchange rate or implementing regulations on foreign exchange. Moral suasion and intervention by other public institutions may also be used to control foreign exchange activity. The exchange rate is allowed to fluctuate within tight ranges of less than ±1% around a central rate, or the spot market's maximum and minimum values must remain within a narrow margin of 2% for at least six months.

(d) Stabilized Arrangement

The stabilized (peg-like) arrangement does not signify a firm commitment by the monetary authorities to a specific policy. It simply means that the exchange rate in the spot market is required to stay within a 2% margin for a duration of six months or longer, and it is not fluctuating freely.

(e) Crawling Peg

The exchange rate of the currency can be adjusted in small increments at a fixed rate or in response to changes in specific quantitative indicators. These could include past differences in inflation compared to major trading partners or variations between the inflation target and expected inflation among trading partners. The incremental rate can be set to generate changes in the exchange rate that account for inflation (backward looking), or it can be set beforehand at a fixed rate and/or below projected differences in inflation (forward looking).

(f) Crawl-like Arrangement

To maintain stability, the exchange rate must adhere to a strict range of 2% in relation to a statistically determined trend for a minimum period of six months. It cannot be classified as floating due to these constraints.

(g) Pegged Exchange Rate

The exchange rate is kept within specific boundaries, with fluctuations limited to a range of at least ±1% around a fixed central rate.

(h) Floating

The foreign exchange market is primarily driven by market forces and does not adhere to a predetermined exchange rate path or target. In order to mitigate excessive fluctuations in the exchange rate, monetary authorities may choose to intervene directly or indirectly. They make these decisions based on various indicators such as balance of payments position, international reserves, and parallel market developments. By doing so, they aim to moderate the pace of change in the exchange rate and maintain stability.

(i) Free Floating

In this framework, interventions are rare and only implemented when there is a need to address market disruptions. The exchange rate system can be characterized as free floating if official reports indicate that intervention has been infrequent, with no

more than three occurrences in the past six months, each lasting for a maximum of three business days.

(j) Other Managed Arrangement

This category falls under the residual classification, which is utilized when the exchange rate arrangement does not align with the criteria of any other categories. The distinguishing feature of this arrangement is the frequent and unpredictable changes in policies that can be categorized under it.

2.2.2 De-jure versus De-facto Classification

Each member country of the International Monetary Fund (IMF) is obligated to officially declare an Exchange Rate Regime (ERR) and provide the relevant information to the IMF. This declaration is known as the de jure classification of exchange rate regime. The de jure classification is valuable in conveying insights about future policy decisions and influencing expectations and outcomes (Ghosh, Gulde and Wolf, 2002).

However, an actual exchange rate system in an economy can become different from de jure regime, and this situation generates de facto regime. It has been widely acknowledged that there is often a disconnect between the stated exchange rate policy (de jure) and the actual exchange rate regime in practice (de facto). This discrepancy not only undermines the credibility of monetary authorities, but also hampers the effectiveness of implementing monetary policy instruments. Additionally, it complicates the analysis of exchange rate regimes. As a result, researchers have developed a classification system based on the actual behaviors of countries' monetary authorities and their exchange rates rather than relying solely on declarations from IMF members. This approach, known as the de facto classification of exchange rate regime, provides a more accurate understanding of how these regimes function.

The gap between de jure and de facto exchange rate regimes can be attributed to two main factors: fear of floating and fear of pegging. These fears stem from concerns about potential negative impacts on the economy. Countries with weak institutions often struggle to maintain their officially declared exchange rate regime.

In practice, many monetary authorities deviate significantly from their announced de-jure fixed exchange rate regime. For instance, some economies may officially report their exchange rate regime as a peg but frequently resort to devaluations to enhance competitiveness.

The exchange rate regime exhibited characteristics of a flexible system rather than a pegged one, which has been referred to as "fear of pegging." It was noted that certain countries with officially pegged exchange rate regimes still had a reluctance to relinquish domestic autonomy and frequently adjusted their parity, displaying a "fear of pegging" (Levy-Yeyati & Sturzenegger, 2003). On the other hand, some economies officially classified their exchange rate regime as flexible according to de jure classification. These countries relied on interest-rate adjustments and changes in reserves to limit fluctuations in the exchange rate, indicating a "fear of floating" (Calvo and Reinhart, 2002). The phenomenon of "fear of floating" occurs when countries declare to adopt a floating exchange rate regime but, in practice, use a less flexible exchange rate regime. This belief is particularly strong when there is substantial foreign debt or high dollarization. Developing countries often experience this fear due to concerns about trade disruptions caused by exchange rate volatility and the high Exchange Rate Pass-Through (ERPT) effect on domestic prices (Calvo & Reinhart, 2000).

Numerous studies have been conducted on de facto exchange rate regimes, with notable contributions from Ghosh, Gulde, Ostry, Wolf (1997), Ghosh, Gulde, Wolf (2002), Shambaugh (2004), Reinhart, Rogoff (2004), and Levy-Yeyati, Sturzenegger (2001, 2003, 2005, 2016, 2021). The IMF has also developed its own de facto classification (Habermeier et al., 2009). Tavlas, Dellas, Stockman (2008) have provided a comprehensive review of the methodologies employed in these studies. There are two groups. The first group builds upon the IMF's de jure exchange rate regime classifications and makes corrections or revisions by taking the factors, such as judgment calls, parallel market developments, exchange rate volatility, nominal effective rates (NERs), inflation, among others, into consideration. On the other hand, the pure de facto approach independently constructs de facto exchange rate regimes. The emergence of numerous studies and diverse methodologies reflect the importance of understanding and analyzing de facto exchange rate regimes. These efforts contribute to our knowledge of

international monetary economics and help policymakers make informed decisions regarding their countries' exchange rate policies.

While the International Monetary Fund (IMF) categorizes exchange rate regimes (ERRs) into ten groups, Levy-Yeyati and Sturzenegger's (2016) approach distinguishes between fixes, intermediates, and floating. Reinhart and Rogoff (2004) propose a taxonomy that is even broader than the IMF's but not fully aligned with it. For this study, the "traditional" de facto classification by the IMF is utilized as it aligns most closely with the de jure classification. The IMF's classification is based on statistical data and expert opinions. Levy-Yeyati and Sturzenegger (2016) employ a purely statistical approach, considering both exchange rate volatility and foreign exchange reserves volatility. Reinhart and Rogoff (2004) utilize sophisticated statistical methods that enable a more detailed classification compared to other approaches.

The decision to utilize the IMF de facto classification is supported by two key factors. Firstly, this classification does not rely solely on statistical data, but instead focuses on analyzing the appropriateness of monetary policy actions in relation to the de jure regime. This approach allows for a comprehensive assessment that goes beyond simply evaluating exchange rate movements. Secondly, this classification successfully categorizes a wide range of exchange rate arrangements, including intermediate regimes that may not be captured by other classifications that only differentiate between floats and fixes (Bleaney, Tian and Yin, 2016). However, it is important to note that this classification relies on judgements made by IMF officials, which may lead some individuals to view it as less reliable due to a perceived lack of transparency in its methodology. Additionally, there are residual categories within this classification that encompass exchange rate regimes not classified within the basic classes[2]. This abundance of residual categories could potentially weaken the robustness of the classification. Furthermore, its concurrence with the de jure classification raises concerns about its level of strictness.

The classification developed by Levy-Yeyati and Sturzenegger (2016) is based on the analysis of country clusters using three criteria. These criteria include the volatility of

[2] It is a common problem of most de facto classifications, but independent ones (for example, Levy-Yeyati and Sturzenegger, 2016) disengage from the usage of residual categories and classify those regimes ad-hoc.

the exchange rate, the volatility of changes in the exchange rate, and the volatility of reserves. Exchange rate regimes are classified as fixed when they exhibit low volatility in exchange rates but high volatility in reserves. Floating regimes exhibit low volatility in reserves but have a volatile exchange rate. Intermediate regimes fall somewhere between these two classifications. This approach has become popular due to its relative simplicity and ability to capture actual exchange rate policy behavior. However, it should be noted that this statistical-based approach may differ from other de facto classifications such as those proposed by Eichengreen and Razo-Garcia (2012) or Bleaney, Tian, and Yin (2016). While Levy-Yeyati and Sturzenegger's classification accurately captures de facto exchange rate regimes based on actual developments in exchange rates, it may struggle with more detailed classifications (e.g., those provided by the IMF) or cases where the behavior of reserves and exchange rates does not fit within their statistical framework[3] (Levy-Yeyati and Sturzenegger, 2016).

Another classification of exchange rate regimes can be very complex, with various approaches taken by different researchers. One notable study conducted by Reinhart and Rogoff in 2004, and later updated by Ilzetzki, Reinhart, and Rogoff in 2019, provides a comprehensive taxonomy of exchange rate regimes. According to their framework, an exchange rate regime is considered as "peg" when 80% of observations fall within the range ±0.01, while it is classified as "band" when 80% of observations are within the range ±0.02.

It is worth noting that the International Monetary Fund (IMF) has its own approach to classifying exchange rate regimes, dividing them into 10 categories. On the other hand, some researchers use only three categories, while others employ 14 de facto exchange rate regimes. Developing countries commonly exhibit gaps in their exchange rate arrangements compared to developed nations which are more likely to adhere to their official exchange rate regime.

Despite providing alternative perspectives on exchange rate classifications compared to de jure frameworks, these studies have limitations including data issues, definition concerns regarding monetary policy's role, reliance on judgment calls, missing

[3] For example, when de jure floating expresses low volatility not due to monetary authorities' interventions, but solely because of the supply-demand equilibrium.

observations, and varying coding methodologies. The different de facto classifications are with limited consistency among themselves Frankel and Wei (2008). Despite the limitations, these de facto classifications provide a more accurate reflection of actual exchange rate regimes than de jure classifications.

Table 2.1 presents the classification of actual de facto exchange rate regime identified in the AREAER from 2013 to 2020 for IMF member countries. It is important to note that these classifications may differ from officially announced arrangements.

Table (2.1) Number of Countries Adopting De facto Exchange Rate Regimes

	Types of Exchange Rate Regimes	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
(1)	No separate legal tender	13	13	13	14	13	13	13	13
(2)	Currency board	12	12	11	11	11	11	11	10
(3)	Conventional peg	45	44	44	44	43	43	41	39
(4)	Stabilized arrangement	19	21	22	18	24	27	23	23
(5)	Crawling peg	2	2	3	3	3	3	3	3
(6)	Crawl-like arrangement	15	15	20	10	10	15	23	23
(7)	Pegged EXR within bands	1	1	1	1	1	1	0	0
(8)	Floating	35	36	37	40	38	35	32	32
(9)	Free Floating	30	29	30	31	31	31	31	31
(10)	Other managed arrangements	19	18	10	20	18	13	15	15
Total		**191**	**191**	**191**	**192**	**192**	**192**	**192**	**189**
Categories of EXRR									
Hard peg regimes (1+2)		25	25	24	25	24	24	24	23
Soft peg regimes (3+4+5+6+7)		82	83	90	76	81	89	90	88
Floating regimes (8+9)		65	65	67	71	69	66	63	63
Other managed arrangements (10)		19	18	10	20	18	13	15	15
Total		**191**	**191**	**191**	**192**	**192**	**192**	**192**	**189**

Source: Data compiled from AREAER 2014-2020, the IMF.

According to Table 2.1, the number of countries that have implemented soft peg exchange rate regimes has risen from 82 in 2013 to 88 in 2020. Conversely, the number of countries utilizing floating exchange rate regimes has decreased from 65 in 2013 to 63 in 2020. Likewise, the number of hard peg exchange regimes the countries adopt decreased from 25 in 2013 to 23 in 2020.

2.3 Advantages and Disadvantages of Exchange Rate Regimes

In practice, countries often adopt exchange rate regimes that fall somewhere between a fixed exchange rate and a floating exchange rate. The fixed exchange rate regime offers the advantage of providing a reliable benchmark to control inflation. On the other hand, the flexible exchange rate regime allows for greater independence in monetary policy. When choosing between these two regimes, policymakers must consider the trade-off between exchange rate flexibility and central bank credibility. The different exchange rate regimes can be divided into four groups: pure floating regime, managed floating regime, soft peg regime (including crawling band, crawling peg, and fixed peg), and hard peg regime (consisting of currency board and dollarization).

(a) Hard Peg Regime

The hard peg regime is characterized by maximum credibility among market participants and is less prone to currency crises. However, it limits the country's ability to conduct independent monetary policy, which can help reduce inflationary pressures. Subordination to another country's monetary policy may not always be advantageous. In addition, there is minimal seigniorage in a currency board system and no seigniorage in dollarization. One downside of this regime is that the central bank loses its role as lender of last resort, increasing the likelihood of liquidity crises.

(b) Soft Peg Regime

The high inflation countries can employ this regime to effectively reduce inflation by managing public expectations. Furthermore, the credible peg ensures stability and competitiveness, fostering investment and international trade. This regime becomes particularly favorable for countries with limited financial instruments and markets that

hinder the implementation of market-based monetary policies. However, it is important to note that once a country adopts a pegged exchange rate regime and opens itself to international capital markets, it becomes more susceptible to currency crises, such as debt crises, sudden halts in capital inflows, or banking crises. Speculative attacks and external shocks pose significant risks, but they are largely mitigated through adjustments in the real sector. Adequate foreign exchange reserves are necessary to preserve the soft peg exchange rate.

(c) Floating Regime

On the other hand, in a floating exchange rate regime with limited flexibility, an economy has some ability to absorb external shocks to a certain extent. If this regime is credible, it ensures stability in the exchange rate and enhances international competitiveness while reducing vulnerability to currency crises. However advantageous this may be, there may be uncertainty and lack of credibility due to undisclosed intervention criteria in managed floating regimes. The central bank's active involvement in maintaining exchange rate stability may require substantial international reserves.

(d) Free Floating Regime

Due to its reliance on market forces, the floating exchange rate regime efficiently allocates resources in response to adverse shocks, reducing the potential for speculator profits and the likelihood of currency crises. As a result, central banks have minimal intervention in this system, leading to higher international reserves. The flexibility of this exchange rate regime allows for independent monetary policy decisions, ensuring that external flows do not impact monetary aggregates. However, it is important to note that the foreign exchange market may still experience volatility and risk of overshooting. These fluctuations can create uncertainty among market participants and drive them to hedge against such uncertainty using derivative instruments like forwards, futures, or options, which may come with costs. Additionally, discretionary monetary policies that allow for depreciation of the exchange rate could lead to inflationary pressures.

2.4 Factors Determining Exchange Rate Regimes

The choice of exchange rate regime can be explained through three main approaches: optimal currency area, view from financial aspect, and view from political aspect.

(a) Optimal Currency Area (OCA)

The Optimal Currency Area Theory (OCA) explores the criteria for countries to abandon their own currencies and form a successful currency union Mundell (1961). An OCA is a geographic region where members maintain a fixed rate while using a flexible rate with other countries. This arrangement aims to maximize economic efficiency. Mundell (1961) identifies factors such as price flexibility, labor mobility and the kind of economic shocks as important for an OCA. McKinnon (1963) adds additional factors like economy size, openness, and trade integration between member countries.

Over time, more factors influencing exchange rate regime choices have been discovered through research. Tavlas (1993) provides a comprehensive list of factors that contribute to the similarity of inflation, exchange rate, diversified products, market integration, fiscal integration.

Mundell (1961) claims that fixed exchange rate regimes are more effective among countries with higher factor or labor mobility. This would help resolve the unemployment issue in country A without requiring an adjustment in exchange rates. Therefore, when countries have labor mobility and price-wage flexibility, it reduces the necessity for each country to have its own exchange rate.

(b) View from Financial Aspect

From a financial perspective, financial integration is closely linked to the approach "impossible trinity" approach. A fixed exchange rate arrangement is more likely appropriate for countries with high levels of dollarization and currency mismatches (Hausmann, Gavin, Pages-Serra, Stein (1999), and Calvo and Reinhart (2000)). Countries with large foreign liabilities tend to favor pegged exchange rate regimes as a means of mitigating solvency risks associated with currency devaluation.

(c) View from Political Aspect

In terms of politics, some argue that countries with weak institutional credibility would choose a fixed exchange rate regime. As indicated by Levy-Yeyati et al. (2006), some countries use a pegged exchange rate to compensate for a lack of credibility in their nominal and institutional policies.

Casiraghi, M. et al. (2022) combined the criteria of these three approaches into three groups: macroeconomic initial conditions, characteristics of the economy and types of shocks to the economy. Each group consists of as follows: "Macroeconomic initial conditions include level of inflation, size of external imbalances, foreign exchange reserves, financial system vulnerabilities, fiscal position and other macroeconomic policies; characteristics of the economy includes size of the economy, openness diversification of exports and output, trade and political integration, flexibility of labor markets, mobility of capital, dollarization and financial system development; and types of shocks to the economy includes real shocks and volatile capital flows" (Casiraghi, M. et al., p. 9).

2.5 Empirical Studies on the Relevancy of the Exchange Rate Regimes

The previous studies have identified factors that impact this decision, including economic size, openness, misalignment of exchange rates, pass-through effects, level of dollarization, nature of economic shocks, trade integration, foreign currency reserves, central bank's independence and credibility and political stability.

Selecting the appropriate exchange rate regime has significant consequences for an open economy. It affects various aspects such as economic activities, trade in goods and services, capital flows, inflation levels, balance of payments, and other macroeconomic variables. The most suitable choice depends on specific circumstances unique to each country. Factors include trade openness levels, financial market development, prevailing macroeconomic conditions background, institutional environment characteristics, and political conditions within the country. Additionally, policy makers' preferences greatly influence the prioritization of primary policy objectives. It is widely acknowledged that there is no one-size-fits-all exchange rate regime that is suitable for every country at all times (Frankel, 1999). As a country's

circumstances change over time, it becomes necessary to adopt the appropriate exchange rate system based on the evolving situation.

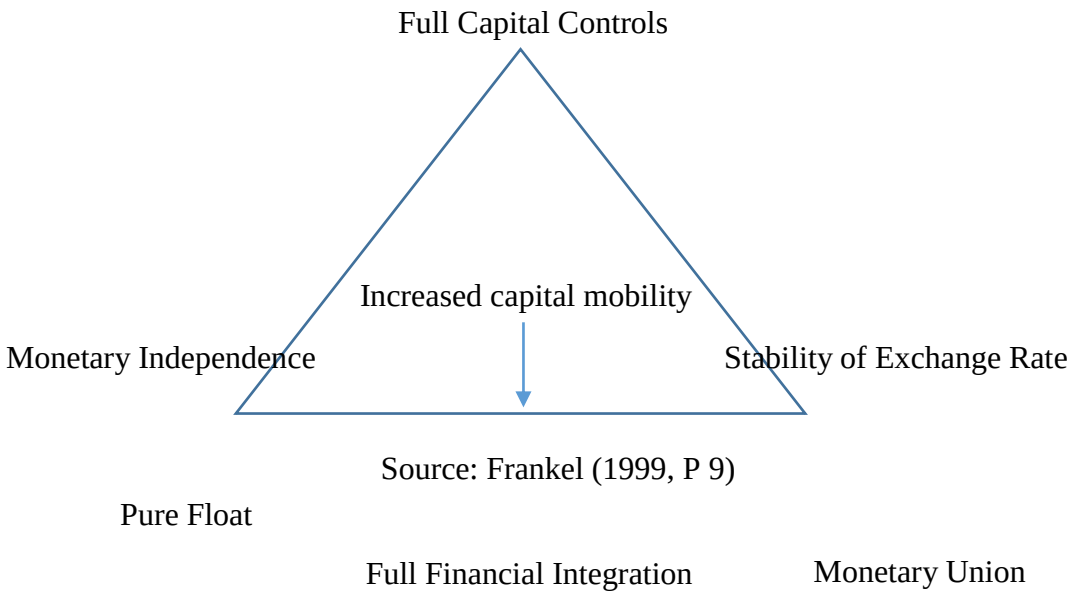
The consensus around the 1990s-2000s is the bipolar view of exchange rate regimes. According to this perspective, intermediate regimes are deemed unsustainable, and countries move towards either end of the exchange rate spectrum. Summers (2000) elaborates on this viewpoint that for economies with access to global capital markets, choosing an appropriate exchange rate regime increasingly will be moving away from pegged but adjustable fixed rates towards two possible corners: flexible exchange rates or a fixed rate with a commitment.

According to proponents of the bipolar view, countries with intermediate exchange rate regimes in the 1990s were more susceptible to currency crises. As a result, they argue that countries should either adopt a fixed regime or completely float regime amidst increased global financial integration. However, recent literature suggests a decline in the number of countries with intermediate regimes and an increase in pure floats and hard pegs. Fischer's study from 2001 revealed the number of countries with intermediate regimes decreased in 1999 comparing to that in 1991. Nevertheless, these results face challenges as Fisher solely relied on de jure exchange rate regimes. On the other hand, studies that employed de facto classifications found no evidence supporting the bipolar hypothesis, such as Benassy-Quere (1999), Bubula&Otker-Robe (2002), and Rogoff et al. (2004).

In contrast, Husain et al.'s study from 2005 showed that intermediate exchange rate regimes remained prevalent. In addition, he discovered that only a small number of middle-income economies were aligning with the extreme polar positions.

Frankel (1999) stated the concept of the impossible trinity in which a nation cannot simultaneously pursue the stability of exchange rate, monetary independence, and full financial integration.

Figure (2.1) Impossible Trinity



Source: Frankel (1999, P 9)

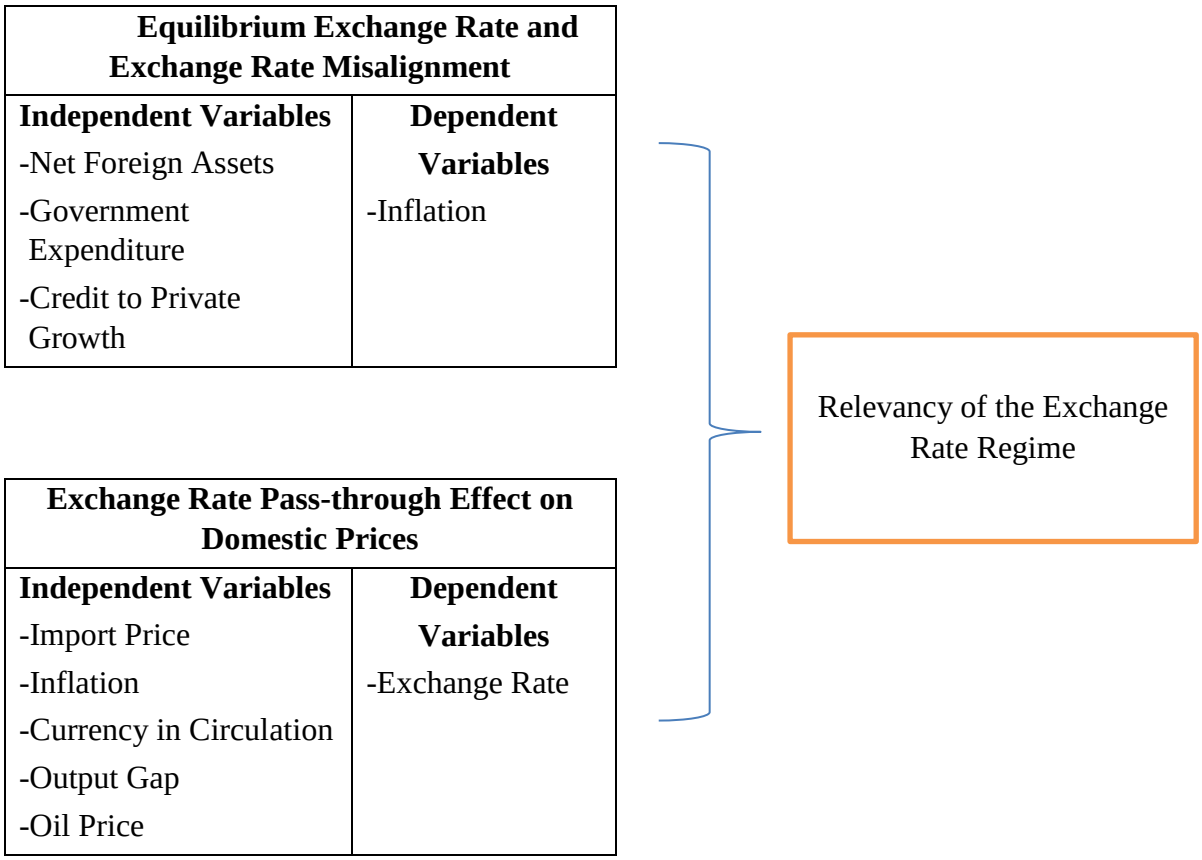
In Figure 2.1, it is illustrated that a country can choose a fixed exchange rate regime with full capital controls and monetary independence. However, a pure float is appropriate when there is greater capital mobility and financial integration. A can join with a monetary union if it prefers the stability of exchange rate and full financial integration.

However, Frankel (1999) highlights that even under perfect capital mobility, countries can opt for an intermediate solution between floating and joining a monetary union. Moreover, Frankel (2011) identifies nine characteristics of adopting a fixed regime versus a more flexible one for individual countries. These include small size and openness, presence of major-currency partner with significant bilateral trade and investment activities, symmetry of shocks, labor mobility, countercyclical fiscal transfers, countercyclical remittances, political willingness to relinquish some monetary sovereignty, level of financial development and origin of shocks.

2.6 The Conceptual Framework

The conceptual framework is depicted in Figure 2.2. The conceptual framework for analyzing the relevancy of exchange rate regime is then discussed.

Figure (2.2) Conceptual Framework for Relevancy of the Exchange Rate Regime in Myanmar (2013-2020)



Source: own compilation

To evaluate the relevancy of the exchange rate regime in Myanmar, two analyses are conducted. The first one examines the exchange rate misalignment, and the second one analyzes the exchange rate pass through on domestic prices. Both analyses use the data for the period spanning from 2013 through 2020.

When examining the exchange rate misalignment, the study estimates the equilibrium exchange rate by using Vector Error Correction Model (VECM) with three independent variables: net foreign asset, government expenditure and credit to private sector, and dependent variable is nominal effective exchange rate. Then, identify the exchange rate misalignment by differentiating the exchange rate in practice and

equilibrium exchange rate. If the exchange rate misalignment is out of the IMF threshold limit of +/- 5%, it can be considered as a significant misalignment. If the exchange rate misalignment is significant and sustained, the adopted exchange rate regime is not in line with the circumstances of the country and needs to be reviewed.

Secondly, the study estimates the exchange rate pass-through effect on domestic prices using Vector Autoregression Model (VAR) with five independent variables: import price, inflation, currency in circulation, output gap and oil price, and dependent variable is inflation. If the degree and speed of exchange rate pass-through is high and sustained, and if the adopted exchange rate regime would not be consistent with the circumstances of the country's economy.

If the results of both analyses indicate that the adopted exchange rate regime is not in line with the adopted exchange rate regime, the exchange rate regime needs to be thoroughly reviewed and, if necessary, the regime should be revised or reversed.

CHAPTER III
EQUILIBRIUM EXCHANGE RATES AND EXCHANGE RATE MISALIGNMENT IN MYANMAR

The exchange rate plays a crucial role in a globally interconnected world. It is crucial for an economy to analyze the behavior of the exchange rates and determine if it aligns with its long-run equilibrium exchange rate. Prolonged deviations from the equilibrium exchange rates can lead to misalignments. Exchange rate misalignment occurs when there is a disparity between the exchange rate in practice and the equilibrium exchange rate. According to Edwards (1989), such misalignments can have detrimental effects on an economy, including resource misallocation, capital flight, and inefficiencies in trade activities[4]. Furthermore, it should be noted that overvaluation may cause currency crises, while under-valuations may lead to an overheated economy (Siregar & Rajan, 2006).

Although misalignments can occur more in countries with fixed regimes than in countries with flexible regimes. (Coudert & Couharde (2009), Hoffmann (2007). The root causes of these misalignments largely stem from weak macroeconomic fundamentals.

There are various methods for measuring the equilibrium exchange rate (EER). Driver and Westaway (2004) emphasize that the choice of methodology significantly impacts ERER estimation. Therefore, it is advisable to employ multiple approaches when measuring ERER. However, due to data limitations in Myanmar, empirical analysis for exploring exchange rate misalignment for Myanmar uses a single-equation reduced-form model based on equilibrium exchange rate models developed by Edwards (1988),

[4]When countries face exchange rate misalignments, especially when the RER is overvalued in a fixed exchange rate regime, there is greater loss of international reserves. As a result, governments may impose trade taxes and other barriers to trade, which will create inefficiencies.

Elbadawi (1994), and Baffes et al. (1999). Cointegration and error correction modeling techniques will be employed to capture the long-run determinants of REER.

3.1 Evolution of Exchange Rate Regimes in Myanmar

Until 2012, Myanmar had implemented a fixed exchange rate regime. And it transitioned to a managed floating exchange rate regime in 2012. This section examines the evolution of the exchange rate regime in Myanmar. During the period from 1964 to 1988, Myanmar operated under a centralized planned economic system where the state monopolized and controlled various sectors. The exchange rate was pegged to the Special Drawing Right (SDR). After leaving the sterling area in 1972, Myanmar adopted a fixed exchange rate regime in 1977. The special drawing right (SDR) of the International Monetary Fund (IMF) was pegged at 8.50847 kyats per SDR (about 5.35 kyats per U.S. dollar), allowing for valuation differences within a margin of +/- 2 percent.

This fixed exchange rate was primarily used for fiscal accounting and foreign exchange transactions in the public sector. Public sector exporters have a legal obligation to surrender their entire export proceeds to the government, which are then used exclusively for public sector imports and the accumulation of foreign exchange reserves. To comply with this requirement, public entities such as ministries and state economic enterprises must surrender 100% of their export earnings to the state budget at the official exchange rate. Subsequently, the central government allocates foreign exchange expenses to these public entities from the state budget (Kubo, 2013a).

As a result of various administrative controls imposed by the government, multiple exchange rates emerged within the private sector. A multiple exchange rate system refers to an arrangement where different exchange rates are utilized for settling various types of transactions (Masahiro Hori and Yu Ching Wong, 2008). Public sector transactions were conducted using the official exchange rate, while a parallel market developed in the private sector. This division between public and private sectors created a segmented foreign exchange market (Hori and Wang, 2012).

The gap between the official USD exchange rate and the informal USD exchange rate in the parallel market widened significantly. Consequently, a parallel exchange rate market emerged. According to Gray (2021), when there is a sustained difference between

the official and parallel rates, it typically affects price levels in the overall economy based on the parallel market's exchange rate. The use of multiple and parallel exchange rates in the private sector, resulting from a fixed exchange rate with exchange restrictions, can be summarized in the following sub-sections.

3.1.1 Exchange Rate Regimes in Myanmar

Under a fixed exchange rate regime, international transactions have more certainty and can help stabilize inflation. However, it may hinder timely adjustments to internal and external shocks. Hori and Wang (2008) found that the multiple exchange rate system creates various economic distortions in Myanmar. They estimated that the total efficiency loss caused by this system was around 14-17% of GDP in 2006/07. U Myint (2011) also emphasized the importance of unifying the multiple exchange rates and removing restrictions on current account transactions to reform Myanmar's exchange rate system and align it with regional and international practices. Since 2010, Myanmar has implemented significant reforms, including the enacting of Foreign Exchange Management Law in 2012 and revisions to the Central Bank of Myanmar Law in 2013. To be in line with these reforms, Myanmar transitioned from a fixed exchange rate regime pegged to the Special Drawing Rights (SDR) of the IMF to a managed floating exchange rate regime in April 2012.

The new Foreign Exchange Management Law, along with its associated rules, has removed all restrictions on transactions in the current account of the country's balance of payments. This includes import and export transactions of goods and services. The aim is to eliminate multi-currency practices and allow the Central Bank of Myanmar to implement monetary and exchange rate policies independently.

In this section, the movement of exchange rates and empirical studies related to exchange rate issues after adopting a managed floating exchange rate regime are discussed.

Figure 3.1 illustrates the nominal market exchange rate and exchange rate fluctuations. Although the nominal market exchange rate depreciated in 2018, the real effective exchange rate appreciated. This is due to inflation in Myanmar being relatively higher compared to its trading partner countries.

The multi-price, two-way auction was designed to allow authorized dealers, mostly domestic banks, to competitively bid for the purchase and sale of foreign currency. The reference rate for the formal market, which serves as a benchmark for trade between authorized dealers and customers, is determined each morning to ensure efficient market transactions. This rate is set with a trading band of 0.8 percent on either side.

In 2013, the kyat experienced a significant depreciation against the dollar, trading at around 933 kyat to the dollar. This depreciation was influenced by factors such as increased import demands following eased import restrictions, seasonality in foreign exchange inflows related to agriculture, and fluctuations associated with the initial development of the foreign exchange market during a transitional period of exchange rate regimes.

Addressing this sharp depreciation presents challenges due to limited macroeconomic policy tools. In the short term, fiscal policy is the only available tool in the absence of monetary policy options; however, given substantial development needs, implementing fiscal tightening would be inappropriate. Therefore, structural policies are crucial in promoting both growth and competitiveness. To reduce the exchange rate fluctuations, the CBM intervened by selling appropriate amounts of foreign exchange reserves in the foreign exchange market.

Administrative measures implemented by the government to curb speculation against the kyat had unintended consequences. Rather than restoring balance to the foreign exchange market and boosting confidence in its currency, it further exacerbated imbalances and undermined trust among investors. The kyat in nominal term depreciated significantly from 2013 to 2014 by about 5.5 percent reaching around 985 kyats per US dollar. This was largely due to strong import demand and rising inflation pressures stemming from expansionary fiscal and monetary policies. In addition, other factors, including a strengthening US dollar and declines in natural gas prices are also attributed to the depreciation. In December 2014 the CBM altered the allocation rules which were used in daily FX auction such that limited FX was allocated based on the amount bid as opposed to price, resulting in a divergence of the auction rate or reference rate from the market rates.

Limited sales of foreign exchange cause the gap between the auction rate and the market rates were wider. Compared to 2014, the nominal exchange rate sharply depreciated in 2015 by about 18 percent to 1161 kyats per US dollar. The CBM tightened limits on cash withdrawal in 2015 to reduce USD demand and took active steps to sanction both authorized foreign currency dealers and informal market traders who were trading FX at significantly depreciated rates relative to the CBM reference rate. These measures signaled the increased FX scarcity in the formal authorized dealer market, thus putting further pressure on the credibility of the kyat. Due to the competitiveness of authorized dealers, who are required to trade foreign exchange within ±0.8 percent of the CBM reference rate, importers were forced to seek FX in the informal market, resulting in a decline in turnover with authorized dealers and legal money changers in the interbank FX market.

In order to address this issue, a priority import window was introduced in late June 2015. This allowed importers of cooking oil and fuel unrestricted access to foreign exchange at the reference rate. As a result of this exchange rate realignment, importers were able to obtain FX from the formal market and all transactions under this window were conducted at the reference rate, which has remained within 2 percent of parallel market rates since July 2015.

Despite a nominal depreciation against the dollar, the kyat has experienced moderate appreciation in real effective terms due to higher domestic inflation compared to trading partners. However, this appreciation has not been accompanied by corresponding improvements in productivity, leading to a moderate overvaluation of the real exchange rate. Between mid-2014 and March 2015, Myanmar's inflation-based REER appreciated by 3¾ percent.

Rather than using FX auctions as a price discovery mechanism, the CBM continued its limited participation auctions. Instead of relying on these auctions for setting the reference exchange rate, the CBM considered FX transaction data reported by banks. This approach resulted in a reference rate that closely aligned with informal market rates. The official reference rate for FX trading was adjusted, allowing for a wider band of (+/- 0.8 percent). As of the end of December 2017, the CBM's foreign reserves totaled US$5.2 billion, which was equivalent to about 2.9 months of prospective imports

- significantly below the level of 5-6 months which was recommended by the IMF. Reserves represented roughly 10.5 percent of broad money. Insufficient reserves underscore the necessity of maintaining a flexible exchange rate to absorb external shocks.

In 2016, Myanmar experienced a nominal effective exchange rate depreciation of approximately 2 percent while the kyat real effective exchange rate (REER) appreciated by around 7 percent due to higher domestic inflation compared to its trading partners, as cited by the IMF (2016). However, by August 2017, the kyat REER had depreciated approximately 6 percent year on year and more than13 percent since mid-2016 primarily driven by weakening against the U.S dollar according to IMF (2018). Since January 12, 2017, Myanmar has implemented a managed floating de jure exchange rate regime alongside a stabilized arrangement de facto exchange rate regime.

The discrepancy between auction rates and parallel market rates hampers efforts for an integrated and robust foreign exchange market in the long run. According to the article IV consultation report by the IMF (2017), inflationary pressures relative to Myanmar's trading partners contributed to a kyat REER appreciation by roughly 7.3 percent through September 2016. During the same period, the nominal effective exchange rate experienced a depreciation of approximately 2 percent. In 2016, there were frequent disparities between the official reference rate and market conditions, leading to significant spreads. However, in 2017, there was greater stability in the exchange rate due to corrective measures taken in response to the previous year's market correction. Additionally, a lower current account deficit and higher government securities yields supported financial flows. Although FX auctions continued with limited participation, they are no longer used as a price discovery mechanism.

Between April and December 2018, the reference rate depreciated considerably. To address this issue, the Central Bank of Myanmar (CBM) introduced guidelines on FX swaps in July 2018 to alleviate the depreciation pressures. Furthermore, in August 2018, the CBM abolished the trading band (Reference rate +/- 0.8%) in order to boost trading volume in the formal market and reduce spreads between the reference rate and informal market rates.

To prevent capital flight and speculative depreciation pressures, a strategy of asymmetric FX intervention was implemented in 2019. This approach involved buying foreign currency during inflows and selling only when necessary to maintain orderly market conditions. By doing so, it helped narrow the gap between the reference rate and market rate in the second half of 2019 while allowing for flexibility in absorbing shocks within the exchange rate system. The implementation of a one-way FX auction, guided by clear internal guidelines, is an effective solution to eliminate the multiple currency practice (MCP) that resulted from the previous multi-price auction. To ensure transparency and stability, a formal regulation outlining the new rate setting system was issued in February, 2019.

3.1.2 Empirical Studies on Issues of Exchange Rates System in Myanmar

In order to ensure the smooth functioning of economic activities, monitoring the effectiveness of the exchange rate system is crucial. If there are any undesirable impacts, appropriate policy measures must be taken to address them. KUBO (2013a) conducted an analysis on the sources of fluctuations in parallel exchange rates and policy reform in Myanmar. The goal was to determine whether exchange rate policies effectively stabilize the real exchange rate using Blanchard and Quah's (1989) structural vector autoregression model. Throughout the study, two variables were utilized - nominal effective exchange rate and real effective exchange rate. The research spanned from January 1997 to March 2012.

The analysis revealed that fluctuations in the real effective exchange rate can be attributed to both nominal shocks and real shocks. Nominal shocks can arise from monetary and exchange rate policies, such as changes in money supply or foreign exchange market intervention. However, it was found that these nominal shocks had minimal effects on the size and duration of the real effective exchange rate. To maintain the effectiveness of foreign market exchange interventions, complementary sterilization measures are necessary. Real shocks, on the other hand, encompass changes in endowments, terms of trade shocks, productivity growth, and changes in government expenditure. Overall, this research emphasizes the importance of continuously

monitoring and managing exchange rates through appropriate policy measures to ensure stable economic conditions.

Kubo, Koji (2013b) conducted a thorough investigation into the effects of transitioning from a fixed exchange rate regime to a floating exchange rate regime in April 2012. The study focused on the transmission channel of exchange rates from the formal to parallel markets using VAR analysis and analyzed 231 daily observations of exchange rates from April 2012 to March 2013. The findings of the study revealed that although the gaps between the Central Bank reference rate and parallel rates were mostly less than 2%, the Central Bank was primarily following the parallel exchange rates rather than guiding them. Based on these results, the study emphasized that as Myanmar continues to integrate into the global economy, it will face more volatile capital flows including foreign direct investments and official aid flows, highlighting an urgent need for a transmission channel for exchange rate policy to stabilize currency fluctuations.

Additionally, Kubo, Koji (2013b) explored how foreign exchange auctions impacted parallel exchange rates after transitioning from a multiple exchange rate system to a managed floating exchange rate system. The study examined daily data on auctions and exchange rates from April 2012 to July 2013.According to the study, there were several key findings. Firstly, the bi-variate VAR analysis revealed that the official reference rate did not have a causative effect on the parallel rate, while the parallel rate did impact the reference rate. This suggests that the Central Bank of Myanmar (CBM) followed the parallel rate in its decision-making. Secondly, incorporating intervention variables into the GARCH model showed that the CBM's net sales of the U.S. dollar did not have a significant impact on reducing the conditional variance of parallel rate changes. As a result, the auctions served as a modest form of intervention but incurred substantial costs for the CBM due to erosion of official foreign reserves.

Given these findings, it is crucial for a foreign exchange interbank market to be developed as a replacement for auctions. This would help mitigate costs and provide more efficient means of intervention. It is important to consider country-specific factors when evaluating fixed or flexible exchange rates as they involve tradeoffs. These factors encompass economic fundamentals, trade and investment characteristics, shocks' nature, and sources, as well as policy credibility and capacity of authorities. With evolving

economic characteristics over time, reassessment of appropriate exchange rate regimes may be necessary in future contexts.

3.2 Concepts of Equilibrium Exchange Rates and Exchange Rate Misalignment

The concept of equilibrium exchange rates is complex and can be defined in various ways. One common approach involves distinguishing between the nominal exchange rate (NER) and the real effective exchange rate (RER). Many economists favor using the RER, along with effective exchange rates, as they provide a better assessment of exchange rate misalignment, particularly in fixed rate systems. Additionally, these measures serve as indicators of a country's competitiveness.

Another aspect to consider is the use of bilateral and effective exchange rates. Since countries typically have multiple trading partners, effective exchange rates offer a more comprehensive view of a country's trade situation.

The third element related to the time frame considered. Equilibrium can be viewed as a short-term, medium-term, or long-term concept depending on the context. Driver and Westaway (2004) propose a reduced-form function for expressing the time path of the equilibrium exchange rate, e_t as:

$$e_t = \beta' Z_t + \theta' T_t + \epsilon_t \qquad (3.1)$$

where,

Z = a vector of fundamental variables that have an impact on the exchange rate in the medium- to long-term

T = a vector of transitory variables that affect the exchange rate in the short-term.

ϵ_t = random disturbances

β and θ = the vector coefficients.

The short-term equilibrium exchange rate or current equilibrium exchange rate occurs when market participants have complete information and behave rationally according to Williamson (1983), equation 3.2 can be derived from equation 3.1 as follow:

$$e_t^{ST} = \beta' Z_t + \theta' T \quad (3.2)$$

Equation 3.2 expresses the short-term equilibrium as a combination of $\beta' Z_t$, representing fundamental variables at their actual levels, and $\theta' T$ accounting for transitory variables.

Moving on to the medium-term equilibrium exchange rate, this refers to an exchange rate that achieves both internal and external balance simultaneously. Internal balance implies full employment with low inflation rates – essentially meeting the non-accelerating inflation rate of unemployment criteria. On the other hand, external balance signifies that current and future current account balances. ensuring sustainability and convergence towards equilibrium as defined by Isard (2007).

Equation 3.1 allows us to express the medium-term equilibrium exchange rate as follows:

$$e_t^{MT} = \beta' \hat{Z}_t \quad (3.3)$$

($\hat{Z}$) determines the medium-term equilibrium exchange rate. On the other hand, the long-term equilibrium exchange rate occurs at the steady-state values of fundamentals, represented by $\bar{Z}$ in equation 3.4.

$$e_t^{LT} = \beta' \bar{Z}_t \quad (3.4)$$

The exchange rate misalignment is determined by comparing the actual exchange rate to the equilibrium exchange rate. The equilibrium exchange rate can be either short-, medium-, or long-term in nature. Current misalignment refers to the discrepancy between the exchange rate and its current equilibrium level. On the other hand, total misalignment pertains to the difference between the exchange rate and its long-term equilibrium level (Clark & MacDonald, 1998).

3.3 Measures of Equilibrium Exchange Rates

There are various methods used to determine equilibrium exchange rates, both for developed and developing countries. However, according to Driver and Westaway (2004), there is no perfect mapping between different methodologies, especially when considering different time frames.

3.3.1 Purchasing Power Parity Theory

One such measure is Purchasing Power Parity (PPP). This theory is based on the Law of One Price (LOP) which states that under ideal circumstances without any barriers to trade or capital flows, identical goods sold in different countries should have the same price when expressed in a common currency. Salvatore (2001) claims that there are differences in prices between two countries, traders will engage in arbitrage by buying goods from the country with lower prices and selling them in the country with higher prices.

However, there are different costs between countries, for example, transportation costs, taxes, tariffs, duties, non-tariff barriers, and production of differentiated goods in different countries, which can lead to different prices across countries (Salvatore, 2001). These factors contribute to the failure of PPP. Nevertheless, proponents of PPP theory argue that these are short-term factors and even if PPP does not hold in the short run, it holds as an equilibrium concept in the long run (Taylor & Taylor, 2004).

Previous studies on PPP mainly focused on testing the following equation:

$$e_t = \alpha + \beta (P_t + P_t^*) + \mu \qquad (3.5)$$

where e_t is the RER at time t, P_t and P_t^* represent domestic and foreign prices, respectively, at time t, α and β refer to regression coefficients and μ is an error term (Breuer, 1994). The test for PPP generally implies a test of the restrictions of the coefficients given in equation 3.5, in which absolute PPP holds if $\alpha = 0$ and $\beta = 1$. The inadequacies of the PPP theory have prompted the advancement of more contemporary methodologies for determining equilibrium exchange rates.

3.3.2 Fundamental Equilibrium Exchange Rate

The macroeconomic balance approach serves as the foundation for several models that analyze equilibrium exchange rates. This approach defines the equilibrium exchange rate is the rate when both internal balance and external balance are achieved within the economy. Unlike the fixed point in time value seen in the PPP approach, the equilibrium exchange rate under this framework is a time-varying concept. Williamson (1983, 1994) developed FEER model focusing on developed countries.

A key point of contention within the FEER approach lies in determining a current account target that represents external economic stability. The sustainable level of the current account balance is taken to be an indication of this stability. However, pinning down what exactly qualifies as sustainable proves challenging and relies heavily on judgment. Opting for a balanced current account may appear to be an easy solution but it's often unfeasible or undesirable for most countries since there can be advantages associated with having either a surplus or deficit.

The fundamental equilibrium exchange rate (FEER) approach has a major drawback in that it heavily relies on normative assumptions regarding internal and external balance. The FEER approach is typically applied to estimate equilibrium exchange rates for developed countries.

3.3.3 Behavioral Equilibrium Exchange Rate

The Behavioral Equilibrium Exchange Rate (BEER) model is based on the empirical establishment of a long-term relationship between economic indicators and the exchange rate. This relationship serves as a baseline estimation of the equilibrium real effective exchange rate, which allows for an assessment of any misalignment in the observed REER.

Clark and MacDonald (1998) estimated the behavioural equilibrium exchange rate, using a reduced-form equation is used and considering a set of fundamental variables. In their study, for the time-varying risk premium, they employed the ratio of domestic and foreign government debt as a proxy. Additionally, they identified several long-run economic fundamentals: terms of trade (tot), the relative price of non-traded to traded goods (tnt), and net foreign assets (nfa).

By utilizing these variables, equation 3.6 expresses the BEER real exchange rate as follows:

$$BEER = (r - r*, \frac{gdebt}{gdebt*}, tot, tnt, nfa) \qquad (3.6)$$

where r and r* represent the domestic and foreign real interest rates, respectively and gdebt and gdebt* refer to the domestic government debt and foreign government debt, respectively.

3.3.4 The Equilibrium Exchange Rate Models for Developing Countries

There are several models available for estimating the equilibrium exchange rate in developed countries, but there are limited options for developing countries. In this section, some equilibrium exchange rate models for developing countries are provided.

One model developed by Edwards (1998) considers both nominal and real factors that impact the exchange rate in the short run. However, in the long run, only real or fundamental factors influence the exchange rate. This model is helpful for estimating the equilibrium exchange rate in both developing and developed countries.

Edwards' model shares similarities with the fundamental equilibrium exchange rate model (FEER). One common aspect is how they define the equilibrium exchange rate. Both models define it as a rate that aligns with internal and external equilibrium simultaneously.

In terms of normative judgement, FEER approach incorporates normative judgements when estimating the model. On the other hand, Edwards' model does not require normative judgement as it employs a reduced-form single-equation approach where variables specified in the model are endogenously determined within the system. This simplicity makes it suitable for situations like Myanmar where data availability and suitability might be limited.

Elbadawi (1994), Montiel (1999), and Baffes et al. (1999) used a reduced-form model to estimate the equilibrium exchange rate, which allows to include country-specific variables in the model specification. Their models are particularly suitable for developing countries with data limitations, as data requirements are relatively low.

Elbadawi (1994) proposes a model for the long-run equilibrium exchange rate that depends on fundamental variables such as terms of trade, trade openness, net capital inflow, total government expenditure and current government expenditure, using cointegration techniques and sustainable values of these fundamentals are derived using decomposition methods. Equation 3.7 presents the equilibrium exchange rate model as specified by Montiel (1999) and adapted by Baffes et al. (1999).

$$e^* = e^* (g_N, g_T, z, r_W, \pi_T) \qquad (3.7)$$
$$e_1 < 0 , e_2 > 0 , \quad e_3 < 0 , \quad e_5 > 0 ,$$

where,

e^* = the equilibrium exchange rate

G_N = the government spending on non-traded goods

G_T = the government spending on traded goods

z = the net foreign aid received by the government

r_w is the world interest rate

π_T is the rate of inflation in the domestic price of traded goods.

In many developing countries, the single equation approach is commonly utilized due to data limitations. This approach offers advantages such as simplicity of use and lower data requirements (Stabler, Papatheodou & Sinclair 1997).

3.3.5 Review on Empirical Studies on the Exchange Rate Misalignment

Several empirical studies have been conducted on estimating the equilibrium real exchange rate (ERER), specifically in developing countries. In his research, Edwards (1988) utilized real and fundamental variables to estimate the long-run equilibrium. His analysis included data from 12 developing countries over the period of 1965-1983. The fundamental variables considered were terms of trade (TOT), lagged capital inflows, lagged real growth (as a measure for technological progress), the ratio of government consumption to GDP, a proxy for exchange and capital controls, and country-specific dummies. Edwards discovered that countries which experienced larger deviations from

their ERER had weaker economic performance. Fiscal indiscipline was found to be a common cause for this disequilibrium.

Similarly, Elbadawi (1994) estimated long run equilibrium exchange rates and their misalignments by using cointegration techniques with data from 1967-1990 for Chile, Ghana, and India, and with fundamental variables such as TOT, a measure of openness, net capital flows relative to GDP, government spending as a share of GDP, and export growth rate. Elbadawi's findings revealed that the predicted RER misalignment indices closely aligned with periods of exchange rate overvaluation observed in Chile and Ghana. However, no significant misalignments were predicted for India, which aligned with its macroeconomic history. The study findings also reinforced the perspective that the equilibrium exchange rate is dynamic and not fixed, contrary to what the PPP model proposes.

The research conducted by Baffes et al. (1999) serves as a valuable demonstration of how to empirically estimate equilibrium exchange rates in limited datasets with data constraints. Each country was modeled individually using a single-equation econometric approach, utilizing yearly data for Côte d'Ivoire and Burkina Faso. Cointegration techniques and error correction models were employed for estimation purposes. The variables commonly utilized included net foreign assets, terms of trade, governm Yue, L.H et al. (2015) estimated the equilibrium exchange rate and the misalignment between renminbi (RMB) exchange rate and the equilibrium exchange rate, the effect of policy intervention is then examined. It is found that RMB exchange rate was misaligned from the equilibrium exchange rate, which was tapered by the People's Bank of China' official intervention, especially after 2005.

Jongwanich (2009) examines the equilibrium RER and RER misalignment and identified the impact of misalignment on export performance in eight Asian developing economies, namely, PRC, Hong Kong China, India, Indonesia, Korea, Malaysia, Singapore and Thailand, during the period 1995–2008. This study found that real exchange rate was persistently overvalued in the years leading up to Asian Financial Crisis, however, after the crisis, undervalued in PRC, Malaysia and Thailand. It is also found that RER misalignment and export performance is negatively associated. The study

suggested that real exchange rate equilibrium and misalignment should be monitored to ensure balance in the economy.

Akhtaruzzaman and Begum (2015) estimated the equilibrium real exchange rate by using macroeconomic balance approach, with Johansen (1995) cointegration method. The variables are exchange rate, terms of trade, trade openness, consumption to GDP ratio, investment to GDP ratio, and remittance, foreign aid, and debt service to total export earnings. The estimated result showed that taka was overvalued by almost 16.14 percent in FY14. Financial sector development could help strengthen the effective monetary policy transmission channel through the interest rate channel to keep lower and stabilize the inflation rate. Moreover, to make the actual exchange rate aligned to equilibrium rate monetary and fiscal policies should be consistent with exchange rate policy to make sure to narrow the gap between actual exchange rate equilibrium exchange rates.

Musa Nakorji, M. et al. (2021) examines exchange rate misalignment in Nigeria by using two variants of the PPP, absolute PPP and relative PPP, by using purchasing power parity (PPP) approach on the data spanning 2008 to 2018. The result does not support for absolute PPP approach for exchange rate determination but support for relative PPP approach. It is found that the interbank Naira to US Dollar, UK Pounds and Chinese Yuan exchange rates were overvalued in most of the period of this study but undervalued in June 2016 and 2017 during which central bank introduced the investor and exporter window. The study thus suggested that export base should be diversified for exchange rate appreciation.

Giannellis and Koukouritakis (2018) investigated whether there is the real effective exchange rates misalignment in the BRIICS countries, Brazil, Russia, India, Indonesia, China and South Africa, using panel cointegration techniques. The result implies that long-run relationship between the real effective exchange rate, the net foreign assets, the GDP differential and the real interest rate differential among countries. Moreover, adoption of free floating exchange rate regime by Brazil, Russia, India, Indonesia and South Africa and liberalization of exchange rate policy by China could lead to reduce the misalignment.

ent consumption, fiscal position, productivity, and openness. The study revealed distinct periods of exchange rate overvaluation and undervaluation for both countries.

3.4 Empirical Study of Equilibrium Exchange Rate and Exchange Rate Misalignment in Myanmar

This section examines the equilibrium exchange rate and assesses any disparities that may exist. It encompasses a theoretical framework, model specifications, variable definitions, methodology, and empirical study findings.

3.4.1 Theoretical Framework for Equilibrium Exchange Rate in Myanmar

In this section, the equilibrium exchange rate is estimated, and misalignment is identified. The estimation process follows the theoretical models of equilibrium exchange rates utilized by Elbadawi (1994), Montiel (1999), and Baffes et al. (1999). These models employ a simplified single equation approach that is commonly used in developing countries for its simplicity and less data requirements (Stabler, Papatheodou & Sinclair 1997). Additionally, this approach allows for the inclusion of individual country-specific variables in the model specification.

The theoretical models proposed by Elbadawi (1994), Montiel (1999), and Baffes et al. (1999) were thoroughly discussed in section 3.3 of this study. For clarity, the theoretical model presented by Elbadawi (1994) is restated as Equation 3.8.

$$E = f(TOT, TO, CI, TGE, CGE) \quad (3.8)$$

where,

E = equilibrium exchange rate
TOT = terms of trade
TO = trade openness of the economy
CI = net capital inflow to GDP
TGE = total government expenditure
CGE = current government expenditure

The theoretical model of equilibrium exchange rate used by Montiel (1999) and adapted by Baffes et al. (1999) is restated as follows:

$$e^* = e^* (g_N, g_T, z, r_W, \pi_T) \qquad (3.9)$$
$$e_1 < 0,\ e_2 > 0,\ e_3 < 0,\ e_5 > 0$$

where,

e^* = the equilibrium exchange rate

g_N = the government spending on non-traded goods

g_T = the government spending on traded goods

z = the net foreign aid received by the government

r_W = the world interest rate

π_T = the rate of inflation in the domestic price of traded goods

3.4.2 Model Specification for Equilibrium Exchange Rate in Myanmar

The equilibrium exchange rate for Myanmar can be determined based on the theoretical models proposed by Elbadawi (1994) in equation 3.8, and the models used by Montiel (1999) and Baffes et al. (1999) in equation 3.9. By incorporating these theoretical frameworks, the empirical model for the equilibrium exchange rate in Myanmar is formulated as follows:

$$NEER = \propto_0 NFA + \propto_2 GE + \propto_3 PCR + \epsilon \qquad (3.10)$$

where,

NEER = Nominal Effective Exchange Rate

NFA = net foreign asset

GE = government expenditure

PCR = private credit growth

3.4.3 Definitions of the Variables

The definitions of the variables in Equation 3.10 are presented in this sub-section.

(a) Nominal Effective Exchange Rate

The nominal effective exchange rate is the value of a domestic currency relative to its trading partners. The methodology for calculation of NEER for Myanmar is provided in Appendix I.

(b) Net Foreign Assets

An increase in a country's net foreign assets can have a positive impact. Net foreign assets indicate the external position of the country, and higher net foreign assets allow for increased expenditure beyond domestic income levels. This creates excess demand for both tradable and non-tradable goods, resulting in the rise of non-tradable prices and an appreciation of the NEER.

(c) Government Expenditure

The effect of an increase in government expenditure on the NEER can vary. If the increase is focused on non-tradable goods, it will lead to NEER appreciation. However, if the increase is mainly on tradable goods, especially those that lead to an increase in imports, it could contribute to a higher trade deficit. In order to maintain external equilibrium, a higher trade deficit requires a depreciation of the NEER.

(d) Private Sector Credit Growth

The variable 'credit to the private sector' is used as a proxy to reflect monetary condition. The impact of an increase in private sector credit on the Nominal Effective Exchange Rate (NEER) can vary, either positively or negatively. If there is a rapid expansion in credit to the private sector, it could stimulate domestic demand and ultimately cause inflation to rise, resulting in a depreciation of NEER. On the other hand, this rapid credit expansion may also lead to an increased demand for imports. Consequently, importers might experience shortages of foreign currency when facing a surge in import demand. This shortage could then result in an appreciation of NEER. Description of variables and expected signs are presented in Table 3.1.

Table (3.1) Description of Variables

Variable	Description	Expected Signs
neer	Nominal effective exchange rate	
nfa	Net foreign asset	Positive
ge	Government expenditure to GDP ratio	Positive / Negative
pcr	Private sector's credit growth	Positive / Negative

Source: Previous Studies

The empirical analysis utilizes monthly data spanning from January 2013 to December 2020. The dependent variable, in this case, is the nominal effective exchange rate, while the main determinant factors are net foreign assets, government expenditure and credit growth in the private sector.

3.4.4 Methodology

To estimate the empirical model specified in equation 3.10, this study employs the vector error correction model (VECM). The general VECM model with three variables can be expressed as follows:

$$\Delta Y_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta Y_{t-1} + \sum_{i=1}^{n} \alpha_i \Delta X_{t-1} \delta ECT_{t-1} + \varepsilon_t \quad (3.11)$$

$$ECT_{t-1} = Y_{t-1} - \beta_0 + \beta_1 X_{t-1} \quad (3.12)$$

where, Y_t refers to the dependent variable, and X_t is the independent variable. ΔECT_{t-1} represents the error correction term while ECT_{t-1} is generated by the Johansen cointegration test. β_0 , β_1 and α_i are the coefficient and δ is the coefficient of the error term. ε_t is the disturbance term.

The regression equation specified in Equation 3.10 is calculated by using the above VECM model.

3.4.5 Empirical Results

The following analytical works are conducted in the VECM model estimation process.

(a) Unit root test

(b) Lag length selection

(c) Cointegration test

(d) Vector Error Correction Model (VECM) Long Run estimation

(e) Residual tests (serial correlation and normality)

(f) Short Run Estimation Model

(a) Unit Root Test

Before proceeding with estimating the VECM model, a unit root test is conducted to ascertain whether all variables are stable or not. In the VECM approach, the variables should exhibit stability at first difference (I=1). The null hypothesis of the unit root test posits that the series contains a unit root, indicating instability. For series at their original level, rejecting the null hypothesis implies no presence of a unit root and confirms integration of order (0) or I (0). Conversely, if at level it fails to reject the null hypothesis but rejects it at first difference, it suggests lack of stability at level while confirming stability upon differentiation and integration of order (1) or I (1).

This study uses nominal effective exchange rate (neer), net foreign asset (nfa), government expenditure to GDP (ge) and private sector's credit growth (pcr). Except for ge and pcr, nfa is in the form of logarithm. This study applies the Augmented Dickey Fuller (ADF) Unit Root Test. According to Augmented Dickey Fuller (ADF) test, all variables are stable at I=1. As a result, the unrestricted VAR can be used to estimate the time series relationship between variables. All ADF Unit Root test results are presented in Table 3.2.

Table (3.2) Result of Unit Root Test

Variable	ADF Test Statistic		ADF Critical Value	Results
	Levels	First Difference		
lneer	-1.52	-5.92	-3.51	I (1)
Lnfa	-2.10	-9.14	-3.51	I (1)
ge	-0.03	-6.96	-3.52	I (1)
pcr	1.02	-13.49	-3.53	I (1)

Source: Results are obtained by applying E-view software.

(b) Optimal Lag Length Selection

After conducting the unit root test, the optimal lag length is selected for VECM estimation. The LR, FPE and AIC tests recommend lag order 4, the SC test suggests lag order 3, the HQ test suggests lag order 3. In terms of HQ criteria, this study selects lag order 3 as optimal lag length. The result of optimal lag length selection is shown in Table 3.3.

Table (3.3) Optimal Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
1	585.1344	NA	3.68e-12	-14.97722	-14.48654	-14.78112
2	648.6564	113.6709	1.06e-12	-16.22780	-15.24644	-15.83560
3	691.9570	72.92746	5.19e-13	-16.94624	-15.47420*	-16.35794*
4	709.2042	27.23243*	5.10e-13*	-16.97906*	-15.01634	-16.19466
5	715.6755	9.536544	6.72e-13	-16.72830	-14.27490	-15.74780
6	726.1916	14.39049	8.06e-13	-16.58399	-13.63991	-15.40739
7	742.2563	20.29224	8.51e-13	-16.58569	-13.15093	-15.21299

Source: Results are obtained by applying E-view software.

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

HQ: Hannan-Quinn information criterion

(c) Cointegration Test

To use the VECM, the cointegration test has to be conducted. The purpose of the cointegration test is to examine the long-term association of the dependent and independent variables. The cointegration test is conducted if the variables are stationary at the first difference I (1) and not at Level I (0). The Johansen test is applied to examine the long-term correlation between the dependent variable (lneer) and independent variables (lnfa, ge and pcr). Results in Table 3.4 show that both trace statics and the

Trace are rejected at r = 1; they are cointegrated at r = 1 at a 1% significance level. Therefore, this result suggests that there is at least one cointegrations under the null hypothesis.

Table (3.4) Johansen Cointegration Test

Unrestricted Cointegration Rank Test (Trace)			
Hypothesized No. of CE(s)	Trace Statistic	0.05 Critical Value	Prob.**
None *	85.75075	47.85613	0.0000
At most 1 *	18.15861	29.79707	0.5544
At most 2	3.733012	15.49471	0.9239
At most 3	0.022513	3.841466	0.8806

Source: Results are obtained by applying E-view software.

(d) Vector Error Correction Model (VECM) Estimation

As the result of Johansen cointegration test shows the there is a cointegration, VECM model can be proceeded. This model contributes to testing the long-run and short-term casualty of the dependent and independent variables. In this study, the nominal exchange rate is a dependent variable while net foreign asset (nfa), government expenditure to GDP (ge) and private sector's credit growth (pcr) are independent variables. The result of the VECM test indicates a long-run association between the variables as it shows that the coefficient is negative and significant. For the long-run relationship coefficient should be negative and it is significant if the p-value is less than 5 percent. Cointegration equation (long run model) is as follows:

$$\text{Lneer} = -13.772 + 1.085\ \text{lnfa} + 0.012\ \text{ge} + 33.489\ \text{pcr} \qquad (3.13)$$
$$(-3.483) \quad (0.111) \quad (-9.351)$$

The equation above represents the long-run equilibrium model, with t-statistics values displayed in parentheses. The findings of the long-run model suggest that the nominal effective exchange rate (NEER) is positively correlated with net foreign assets,

government expenditure and private sector credit in the long run. Specifically, an increase in net foreign assets, government expenditure and private sector credit growth leads to an appreciation of the NEER in the long run.

(e) The Residual Diagnostic Tests of the VECM

The results of the residual diagnostic tests of the VECM are shown in Table 3.5.

Table (3.5) The Residual Diagnostic Tests of the VECM

Serial Correlation	LM test	0.839 [0.64]
Normality	Jarque-Bera	5.98 [0.65]
Skewness		2.84 [0.58]
Kurtosis		3.14 [0.5]

Source: Results are obtained by applying E-views by applying E-view software.
The p-values are given in brackets.

The analysis of VECM results involves conducting a test for autocorrelation in the residuals following the estimation process. This test aims to determine whether there is any serial correlation present in the residuals. In this study, the LM test is used to assess autocorrelation. The outcome of the LM test suggests that there is no evidence to reject the null hypothesis of no serial correlation in the residuals, indicating that there is no serial correlation detected in the VECM results.

Additionally, this study includes a normality test for the residuals after performing VAR estimation. The result of this normality test concludes that there is insufficient evidence to reject the null hypothesis of normality. Thus, it can be inferred that the residuals derived from the VECM result satisfy the condition of normality.

(f) Short Run Estimation Model

The short run dynamics of the model can be specified by a single-equation error-correction model. The short-run error-correction model derived from the long-run relationship estimated in equation 3.13 is specified in equation 3.14:

$$\text{dlneer}_t = \beta_0 + \sum_{i=1}^{3} \beta_1 \, \text{dlneer}_{t-i} + \sum_{i=1}^{3} \beta_2 \, \text{dlfa}_{t-i} + \sum_{i=1}^{3} \beta_3 \, \text{dge}_{t-i} + \sum_{i=1}^{3} \beta_4 \, \text{dpcr}_{t-i} + \theta_{57} \text{ect}_{t-i} + \mu \quad (3.14)$$

The variables in equation 3.14 are described earlier in Table 3.1. The term ect_{t-1} refers to the error-correction term in the model and is derived from the long-run model and estimated as in equation 3.13.

Equation 3.14 is estimated with three lags using Ordinary Least Square (OLS) Method. The results of the error-correction model estimated are presented in Table 3.6 and the diagnostic tests are shown in Table 3.6. The normality assumption of the model is satisfied. The model also satisfies the assumption of no serial correlation.

Table (3.6) Short-Run Dynamics of the NEER

Dependent variable is lneer

Variable	Coefficient	Standard Error	t-Statistic	Probability
Constant	-0.001713	0.001875	-0.913341	0.3644
dlneer_{t-1}	0.239301	0.129094	1.853695	0.0683
dlneer_{t-2}	0.098046	0.130369	0.752062	0.4547
dlneer_{t-3}	0.275947	0.131800	2.093675	0.0402
dlfa_{t-1}	0.014581	0.057482	0.253658	0.8006
dlnfa_{t-2}	-0.026421	0.059438	-0.444511	0.6581
dlnfa_{t-3}	0.026402	0.058650	0.450154	0.6541
dge_{t-1}	0.045715	0.027666	1.652370	0.1033
dge_{t-2}	-0.030883	0.038846	-0.795015	0.4295
dge_{t-3}	0.007365	0.025267	0.291481	0.7716
dpcr_{t-1}	-0.585859	0.197544	-2.965712	0.0042
dpcr_{t-2}	-0.290268	0.161034	-1.802526	0.0761
dpcr_{t-3}	-0.155231	0.120241	-1.290993	0.2013
ect_{t-1}	-0.019147	0.006477	-2.956365	0.0043

Source: Results are obtained by applying E-views by applying E-view software.

Table (3.7) Diagnostic Tests of the Error-Correction Model

Serial Correlation	Breush-Godefrey LM test	0.82 [0.45]
Normality	Jarque-Bera	2.60 [0.27]

Source: Results are obtained by applying E-views by applying E-view software.

According to the results from the short-run estimation model for equilibrium exchange rate, the lagged effects of dlneer, ldge and dlpcr are significant in the short run. The error-correction term in the model is highly significant and negative.

The results indicate the significance of the error correction term in measuring the rate at which the nominal effective exchange rate (NEER) adjusts to its equilibrium level. The estimated coefficient reveals that approximately 1.91 percent of NEER deviations from equilibrium are corrected monthly. This adjustment speed tends to be higher in countries with flexible and managed exchange rate regimes, while lower in those with fixed exchange rate systems. Moreover, the negative coefficient on the error-correction term implies that an overvalued NEER will gradually align towards its equilibrium position.

The coefficient on the error-correction term can be used to derive the speed of adjustment in terms of the number of months (years) it takes to eliminate a given percentage of an exogenous shock, using the equation 3.15.

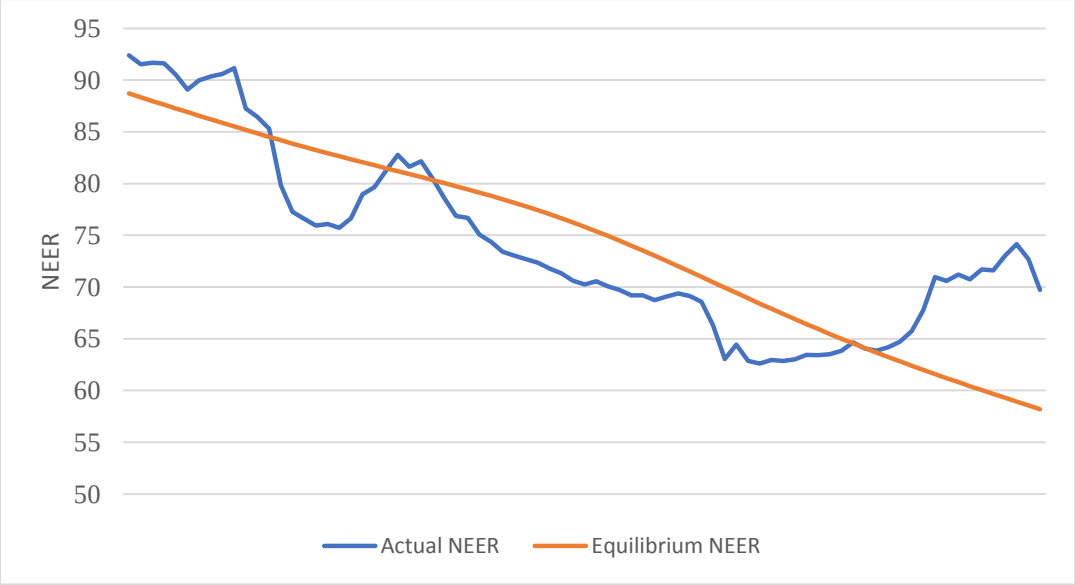
$$(1 - \alpha) = (1 - \hat{\beta})^{T} \qquad (3.15)$$

where, $\propto$ is the percentage of an exogenous shock to be eliminated, $\hat{\beta}$ is the absolute value of the error-correction term and T is the number of months. Using equation 3.16 with an error-correction term of -0.019, the average duration required to eliminate 50 percent of a shock to nominal effective exchange rate is 36.1 months, and it takes 72.3 months to eliminate 75 percent of a shock to nominal effective exchange rate.

3.4.6 Equilibrium Exchange Rate and Exchange Rate Misalignment

The long run equilibrium exchange rate model 3.14 was used to estimate and analyze the data. The fitted value of the exchange rate (neer) was then decomposed into two components: the trend part (permanent component) and the cyclical part (transitory component). This decomposition was achieved using the Hodrick-Prescott Filter method. By comparing the equilibrium nominal effective exchange rate (which represents the trend part of neer) with the actual nominal effective exchange rate, The degree of NEER misalignment can be determined. Data on exchange rate misalignment is provided in Appendix II. Figures 3.1 and 3.2 provide a visual representation of this misalignment.

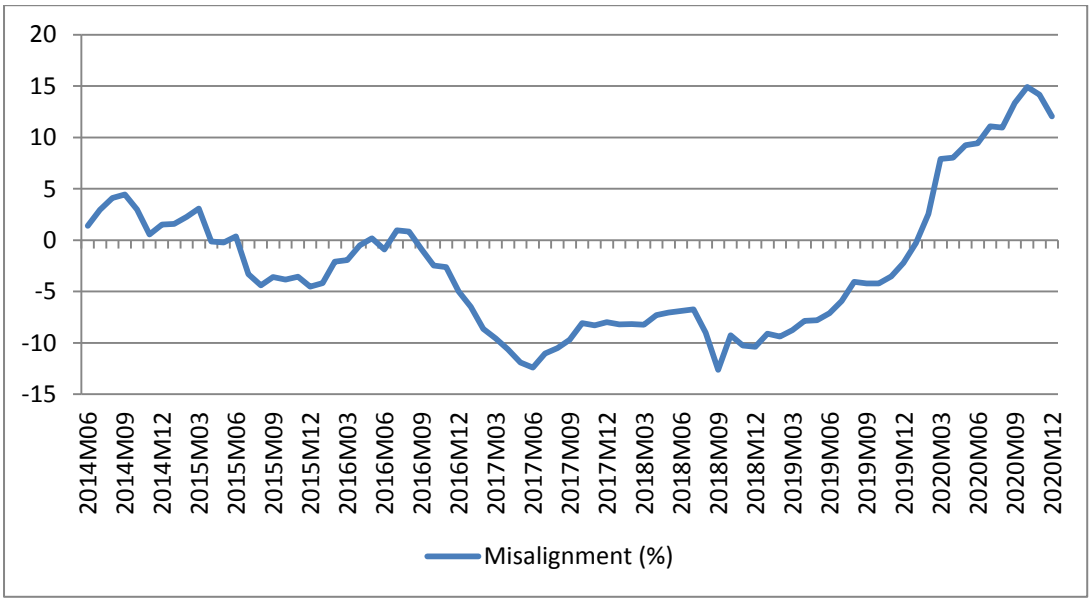
Figure (3.1) NEER and Equilibrium NEER Index (2013-2020)



Source: Quarterly Financial Statistics Bulletin, Central Bank of Myanmar

Figure 3.1 shows the nominal effective exchange rate (NEER) and equilibrium nominal effective exchange rate (ENEER). Whenever the NEER surpasses the ENEER, it signifies that the NEER is overvalued. Conversely, if the NEER falls below the ENEER, it indicates undervaluation. Figure 3.1 illustrates significant fluctuations in NEER, particularly in 2017, 2018, first half of 2019 and 2020. For a more accurate measure of NEER overvaluation or undervaluation, Figure 3.2 displays exchange rate misalignment, which represents the difference between NEER and ENEER.

Figure (3.2) Misalignment in NEER (2013-2020)



Source: Quarterly Financial Statistics Bulletin, Central Bank of Myanmar

During the period of assessment, the NEER (Nominal Effective Exchange Rate) exhibited periods of misalignment. Based on the acceptable threshold for exchange rate misalignment set by the IMF, it was observed that approximately 13.51 percent of the time, the NEER was overvalued, while 41.89 percent of the time was undervalued. In summary, there was a significant degree of misalignment in the NEER during 51.9 percent of the months from 2013 to 2020.

Figure 3.2 provides a visual representation of this misalignment during the aforementioned period. The research findings indicate that exchange rates in Myanmar experienced notable misalignments until 2020 except gaining stabilization later months of 2019 mainly due to the revision of auction rule. Consequently, when evaluating the appropriateness and compatibility of Myanmar's managed floating exchange rate regime within its economic context during this study period, it appears that further investigation is necessary.

Even though misalignment was significant, for further evidence, additional analysis is being conducted in this paper to examine how exchange rate pass-through affects domestic inflation in Myanmar—an alternative approach for assessing the appropriateness of the country's exchange rate regime.

CHAPTER IV
THE IMPACT OF EXCHANG RATE PASS-THROUGH ON TO DOMESTIC PRICES IN MYANMAR

Inflation is a phenomenon that occurs when there is a sustained increase in the overall price level of goods and services within an economy. This, in turn, reduces the value of money and its purchasing power (Gerdesmeier, 2009). The Central Bank of Myanmar (CBM) shares the same goal as other central banks worldwide, which is to maintain domestic price stability. Price stability refers to a situation where inflation remains low and stable over time. It plays a crucial role in reducing uncertainty about inflation and preventing the misallocation of resources (Hennerish, 2021).

There are various factors that contribute to upward pressure on inflation, such as increased consumption and investment by both private and public sectors, expansion of money supply, higher current account deficits and government budget deficits, elevated production costs, structural and institutional constraints within an economy, depreciation of exchange rates, and unemployment. Factors such as gross domestic product (GDP), money supply, government budget deficits, exchange rates, expected inflation rates, imported inflation rates, costs of production, structural constraints within an economy, institutional constraints, and unemployment are determinants that determine the level of inflation.

This chapter aims to identify the factors driving inflation in Myanmar. Additionally, the relevance of the exchange rate regime in Myanmar will be evaluated by examining the relationship between inflation and exchange rates. And this chapter will mainly focus on understanding the impact and speed at which changes in exchange rates influence domestic prices known as exchange rate pass through (ERPT) in Myanmar.

ERPT refers to how a country's domestic prices respond to changes in its exchange rate. It measures the percentage change in prices resulting from a 1 percent change in the exchange rate. When domestic prices fully adjust to an exchange rate

change, ERPT is considered complete with a value of 1. On the other hand, if domestic prices remain unaffected by exchange rate fluctuations, ERPT is zero. In reality, domestic prices only partially respond to exchange rate changes, leading to partial ERPT.

The extent of ERPT has important implications for determining the appropriate exchange rate regime. When ERPT is high or near complete, adopting a flexible exchange rate regime can lead to increased volatility in both the exchange rate and inflation.

This chapter is divided into four sections. Sections 4.1 and 4.2 discuss the causes of inflation and ERPT on domestic prices respectively. Section 4.3 provides a detailed analysis of inflation trends in Myanmar from 2013 to 2020. Lastly, section 4.4 presents the theoretical and empirical frameworks used in modeling inflation in Myanmar, along with an overview of the data and methodology employed. The VAR model is utilized as the econometric technique for this analysis. Then, the relationship between inflation and exchange rate can be examined by employing impulse response function and variance decomposition techniques. The findings of the analysis on how changes in the exchange rate impact domestic prices in Myanmar, specifically focusing on exchange rate pass-through is presented.

4.1 Causes of Inflation

In this section, the theoretical cause of inflation is reviewed and an overview of empirical studies on these causes is provided.

4.1.1 Causes of Inflation in Theories

There are typically two main theories that explain the occurrence of inflation: the demand-pull theory and the cost-push theory. The demand-pull theory focuses on the demand side and occurs when there is an overall increase in the demand for goods and services, surpassing their available supply. On the other hand, the cost-push theory looks at the supply side of things. It suggests that an increase in input prices, a sudden supply shock such as a natural disaster, or a depreciation in exchange rates can lead to a decrease in the supply of goods and services. As a result, this pushes up the general price level, known as cost-push inflation.

Several theories of inflation are briefly discussed as follows:

(a) The Classical and Neoclassical Theories of Inflation

The classical economists including David Hume, Adam Smith, David Ricardo, and John Stuart Mill along with neo-classical economists like Leon Walras, Alfred Marshal, Arthur C Pigou, and Irving Fisher have argued that an excess in money supply leads to an increase in inflation levels when all other factors remain constant. Fisher (1911) expressed this phenomenon using quantity identity:

$$MV = PT \tag{4.1}$$

This equation MV = PY is a fundamental concept in economics. It represents the relationship between money supply (M), velocity of money (V), price level (P), and transactions in the economy (T). In this equation, T is represented by aggregate income (Y).

In the short run, the velocity of money is assumed to be constant, as it is determined by institutional factors that change slowly and predictably. As it is difficult to measure the number of transactions in the economy, T is proxied by aggregation income, Y, which is expressed as:

$$MV = PY \tag{4.2}$$

Similarly, aggregate income (Y) is at its full employment level of output. Based on these assumptions, the price level is a function of the money supply. Therefore, equation 4.2 can be rewritten as follows:

$$P = V/Y \times M \tag{4.3}$$

This equation represents the inflation equation of the Quantity Theory of Money (QTM), and it can be expressed as follows:

$$\pi \approx (v-g) + m \tag{4.4}$$

In this context, π represents the percentage change in price level (P), v represents the percentage change in velocity of money (V), g represents the percentage change in aggregate income (Y), and m represents the percentage change in money supply (M).

Essentially, equation 4.4 illustrates that inflation is primarily influenced by changes in monetary factors, assuming zero values for both v and g variables according to Snowdon and Vane's research in 2005. According to Milton Friedman (1963), inflation is a monetary phenomenon that can be observed in all circumstances. O'Brien (1975) further elaborated on this concept by discussing the differences between classical and neoclassical economists' perspectives on the Quantity Theory of Money (QTM). The neoclassical model assumes full employment, where an increase in money supply leads to a rise in general prices while leaving real output unchanged. This implies that money is considered neutral in the neoclassical model, impacting only nominal variables such as prices, wages, and exchange rates without affecting real variables like employment or output.

On the other hand, classical economists like David Hume challenged the assumption of full employment and argued that underemployment can exist in an economy. According to Hume, due to wage and price rigidities in the short run, an increase in money supply leads to higher spending on goods and subsequently increases production. Prices eventually adjust to accommodate the increased money supply. In this context, money is not considered neutral in the short run as it has real effects due to temporary price rigidities. It is observed here that both classical and neoclassical economists agree that inflation is a monetary phenomenon; however, their interpretations differ mainly regarding assumptions about full employment and the impact of money supply on real variables.

In classical theory, it is believed that the extent of inflation is directly related to changes in the money supply. According to this perspective, an increase in the money supply will result in a proportional increase in prices. For example, if the money supply doubles, prices will also double. However, neo-classical economists challenge this idea and argue that there is not necessarily a direct correlation between increases in the money supply and price levels.

The quantity theory of money remains a valid explanation for inflation, especially in developing countries where the amount of money in circulation greatly impacts the money supply. In classical and neoclassical economics, reducing the money supply is seen as a way to control inflation. However, critics suggest that limiting the money supply may not effectively reduce inflation due to fluctuations in velocity of money, even in the short term (Ball, 2007).

(b) Traditional Keynesian Theory of Inflation

According to John Maynard Keynes (1936), the concept of classical economists was that inflation results from an increase in the money supply only when the economy reaches full employment. In other words, if the economy is operating below full employment, inflation is not solely a monetary phenomenon. Keynes (1940) developed a demand-side model of inflation based on the assumption of temporary price rigidities in the labor market. This model assumes that the economy is at full employment and that prices in the labor market are temporarily inflexible. When there is an unexpected increase in demand for goods, prices will rise and firms will experience unanticipated profits. This motivates firms to increase their investments, causing an increase in nominal wages as they compete for workers due to temporary labor market rigidity. As a result, this generates new demand in the goods market, further increasing prices. If nominal wages continue to respond with a lag to excess demand, inflation is expected to persist and lead to inflationary gaps. An inflationary gap occurs when the economy operates above its capacity or experiences excess demand. Essentially, an inflationary gap represents the difference between potential output levels at full employment and actual aggregate demand.

Keyne's equation of aggregate demand is a comprehensive measure of all spending in the economy, including consumption, investment, government spending, and net exports.

$$AD = C + I + G + (X-M) \qquad (4.5)$$

It is represented by AD (aggregate demand), with C representing expenditure for concumption, I represents investment, G representing government expenditure, X representing exports, and M representing imports. Various factors can influence an increase in aggregate demand in the economy, leading to excess demand. If aggregate demand surpasses the level of full employment output, it will result in a higher equilibrium price level and consequently create an inflation gap.

To address this inflationary gap and narrow it down, Keynes proposed implementing contractionary fiscal policies such as increasing taxes and/or reducing government spending to decrease aggregate demand. Additionally, appropriate income policies can be applied to mitigate price rigidities.

(c) Neo-Keynesian Economics or So-called Keynesian Neoclassical Synthesis

The concept of Neo-Keynesianism involves merging neo-classical economics with Keynesian economics. Prominent economists in the field, including John R. Hicks, Franco Modigliani, Klein, Samuelson, and Hansen, argue that increasing aggregate demand will result in nominal response (changes in wages and prices) but not real response (changes in output) when the economy is at full employment. The Neo-Keynesians propose a negative correlation between inflation in money wages and the level of unemployment as follows:

$$\pi = \alpha\mu \qquad (4.6)$$

The relationship between inflation and unemployment is represented by the above equation where π denotes the inflation rate and μ represents the unemployment rate. The parameter α needs to be negative to reflect the negative correlation between these two variables. This means that there is a trade-off between inflation and unemployment: when the inflation rate is high, the unemployment rate tends to be low, and vice versa. Alban W. Phillips illustrated this relationship in a graphical form, known as the Phillips Curve.

However, Neo-Keynesian theories focused on demand-side factors were unable to explain stagflation, a phenomenon characterized by slow economic growth accompanied by high inflation that occurred in the late 1960s and 1970s. During this period, there was

a decline in output coupled with rising inflation rates and high levels of unemployment resulting from an increase in commodity prices, particularly oil. The first oil price shock in 1973-74 and the second oil price shock in 1978-79 led to worldwide recessionary effects and a simultaneous rise in cost-push inflation. This combination of stagnation and inflation is commonly referred to as stagflation.

(d) Monetarists

The monetarists put forth the argument that when the growth of money supply exceeds the rate of growth of national income, inflation will occur. On the other hand, if the money supply aligns with real output, inflation will not be an issue.

Notably, monetarist economists like Milton Friedman and Edmund Phelps did not support the idea of a stable long-run trade-off between unemployment and inflation rates, as proposed by neo-Keynesians. They believed that nominal money wages could not be held responsible for causing inflation, as they are determined by real variables in the labor market. According to Friedman's perspective, firms and laborers focus on real wages rather than monetary wages when setting prices.

In light of this understanding, Friedman suggested incorporating the rate of change in real wages instead of nominal money wages into the basic Phillips curve relationship. This adjustment took into account the negative correlation between nominal wage levels and unemployment rates. Additionally, it was assumed that expected inflation impacts real wages. For instance, if higher inflation is anticipated, firms and laborers are more likely to agree upon higher prices (nominal money wages). As a result, Friedman expanded on traditional Phillips curve modeling by introducing expected inflation as a determinant for changes in money wages. This modification led to the development of a modified Phillips curve model known as the expectation-augmented Phillips curve in the late 1960s. This concept can be represented in equation 4.7:

$$\pi = \alpha\mu + \beta\,\pi^{e} \qquad (4.7)$$

In equation 4.7, the relationship between inflation and unemployment is described in the short run. The parameter β represents the impact of expectations on inflation rate, while πe represents inflation expectations. If β is less than one and greater than zero

(0<β<1), there exists a long-run trade-off between inflation rate and unemployment rate. When β=1, anticipated inflation ($\pi^e = \pi$) will be equal to actual inflation in the long run, meaning there is no trade-off between unemployment and inflation in that scenario (Snowdon & Vane, 2005).

The expectation-augmented Phillips curve model argues that monetary expansion's impact on the real sector, causing unemployment to fall below its natural level, only occurs in the short run due to unanticipated inflation. However, such an increase of inflation becomes fully expected in the long run and unemployment returns to its natural rate (Aykut, 2002). Monetarists propose that the formation of inflation is backward-looking or less informed; market participants lack all available information when forming their price expectations. Expectations of future inflation are based on past behavior of inflation and referred to as adaptive expectations (Salvatore, 2001). The equation for the backward-looking or adaptive expectation-augmented Phillips curve can be expressed as follows:

$$\pi_t^e = \lambda\, \pi_{t-1} + (1- \lambda)\, \pi_{t-1}^e \qquad (4.8)$$

The coefficient of adaptation, denoted as λ, is a crucial parameter in the given equation 4.8. It specifies the degree to which expected inflation at a given time t is influenced by both actual inflation and anticipated inflation rates from the previous period (t-1). As λ approaches unity, the significance of previous actual inflation increases while the impact of previous expected inflation diminishes. Higher values of λ imply that expectations swiftly adjust to bridge any gaps between actual and expected inflation rates. This swift adjustment mechanism can account for the acceleration observed in inflation rates during the 1970s.

(e) The Structuralist View of Inflation

Now let's switch gears and delve into the Structuralist View of Inflation. According to this perspective, inflation in developing countries arises from unique structural obstacles that hamper their capacity to produce goods and services. The structuralist theory highlights that changes in economic structure give rise to alterations

in relative prices, subsequently leading to shifts in the overall price level for commodities and services (Aykut, 2002). Consequently, price pressures primarily emanate from bottlenecks within the real sector of these economies (Bernanke, 2005).

The structuralists identify three primary factors that contribute to inflationary pressures within developing countries. The first factor revolves around bottlenecks specifically within the agricultural sector, which stem from constraints on food supply prevalent in these nations. The transition of workers from the agricultural sector to the industrial and service sectors can lead to a decrease in supply in agriculture, resulting in higher food prices and an overall increase in the country's price levels (Fischer & Mayer, 1981).

Another factor that contributes to inflation is the bottleneck in foreign exchange, which occurs when there is insufficient foreign currency inflow to finance the growing demand for imports by both the private sector and the government, driven by development agendas (Fischer & Mayer, 1981).

Additionally, financial constraints play a role in causing inflation in developing countries. These countries often struggle to finance their development goals through revenue generation due to inefficient and underdeveloped tax systems and financial markets. As a result, governments often resort to deficit financing, leading to inflationary pressures on the economy (Kirkpatrick & Nixon, 1976).

Fiscal imbalances, such as high fiscal deficits, contribute significantly to domestic inflation as they facilitate excessive money growth and depreciation of exchange rates (Montiel, 1989). Based on the concept of adaptive expectations, expectation of future inflation by individuals based on inflation trends in the past. This leads to a phenomenon known as inflation inertia, where inflation does not respond quickly or abruptly to shocks. In developing countries with a history of high inflation and wage indexation, inflation inertia is considered a significant factor influencing the overall level of inflation (Loungani& Swagel, 2001).

(f) New Classical Approach

During the 1970s, a group of new classical economists emerged, including influential economists like Robert E. Lucas, Thomas J. Sargent, Neil Wallace, Robert J.

Barro, and Bennett T. McCallum. These economists diverged from the beliefs held by monetarists regarding market clearing and imperfect information.

The new classical economists argued that economic agents possess not only all past information but also current and relevant information about the economy and how it functions. They hold forward-looking price expectations and have a comprehensive understanding of the system. Consequently, when forming expectations about inflation, there are no systematic errors because all systematic determinants are considered. Only nonsystematic errors or random shocks impact the inflation rate, resulting in deviations from expected levels.

As a result of this perspective, in either the short or long run, there is no trade-off between unemployment and inflation. The assumption of a vertical Phillips curve implies that the economy continuously operates in an equilibrium state achieved through continuous market clearing within competitive markets.

The rational expectation hypothesis is encapsulated by equation 4.8:

$$\pi_t^e = \lambda\, \pi_{t-1} + (1- \lambda)\, \pi_{t-1}^e \qquad (4.8)$$

Here, η represents random errors or unanticipated policy actions. Equation 4.9 highlights that deviations in inflation rates from their expected values, as well as deviations in unemployment rates from their natural levels, occur solely due to these random errors or unanticipated policies. Additionally, it is important to note that any temporary deviations caused by errors or shocks will be factored into the pricing decisions made by economic agents in the subsequent period.

According to the rational expectations hypothesis, any announced monetary stimulus from the monetary authority will only result in inflation and will not have an impact on the real sector, even in the short term as believed by monetarists. Therefore, for the central bank to influence the real sector, it must implement a surprise or unanticipated policy that deviates from public expectations. Such a policy would lead to a short-term error in inflation expectations and consequently cause a discrepancy between employment and its natural rate (Snowdon & Vane, 2005). Thus, the central bank can only affect real output and employment if it introduces an "unanticipated price".

Conversely, if the central bank announces a low inflation target or disinflation policy ahead of time but fails to convince people that it will be implemented, this policy will not result in reduced prices. As a result, new classical economics emphasizes that price expectations are contingent upon factors such as time consistency, reputation, and policy credibility of the central bank.

Monetarists and new classical economists assert that public sector deficits primarily financed by the central bank contribute to increases in money supply (Jalil, 2011). However, it is widely acknowledged by rational economic agents that the government's promise of low inflation, particularly during election cycles, lacks credibility and is not likely to be fulfilled (Snowdon & Vane, 2005). To establish credibility and ensure consistency over time, policymakers must implement specific policy commitments such as central bank independence or a fixed exchange rate regime (Carmignani et al., 2008).

In the 1980s, a new generation of macroeconomists including Edward C. Prescott, Finn E. Kydland, and Charles I. Plosser argued that fluctuations in economic activity are primarily caused by real or aggregate supply shocks rather than monetary or aggregate demand shocks. Under the assumption of fixed aggregate demand and incorporating elements from monetarists' continuous market-clearing assumptions as well as the first generation's rational expectations theory, these second-generation economists - often referred to as real business cycle (RBC) theorists - explored how supply shocks such as process innovations, technological advancements, discoveries of new raw materials sources, changes in food and energy prices relative to other goods, climate change events, and shifts in nominal effective exchange rates affect business cycles. In equation (3.4), assuming $v=m=0$, it is important to note that persistent and negative supply-shocks ($g<0$) have the potential to cause inflation. This aligns with the viewpoint of monetarists who also believe that inflation occurs when m exceeds g, even in such cases.

The real business cycle theory posits that fluctuations in the business cycle are a result of significant changes in technology and resource availability. These factors influence productivity, leading to changes in long-term aggregate supply. It is worth noting that the RBC theory focuses on the causes of economic instability, which are attributed to changes in aggregate supply rather than changes in aggregate demand.

There are other perspectives on economic instability and inflation, including the mainstream view, the monetarist view, and the view of coordination failures. The mainstream perspective suggests that economic instability arises from price stickiness and unexpected fluctuations in either aggregate demand or aggregate supply.

On the other hand, proponents of the monetarists' view argue that macroeconomic instability is primarily caused by inappropriate monetary policy. Such instability can result in inflation, reduced employment rates, and destabilization in real output.

The view of coordination failures is based on challenges faced by firms and households when trying to reach agreement on spending decisions. For instance, if aggregate demand increases below the full-employment level, both firms and households could potentially increase their spending simultaneously to address this deficiency. However, it is often difficult for them to agree on such an increase in practice. This lack of coordination can contribute to an aggregate demand deficiency which may lead to inflation.

Critics, including economists Lawrence Summers and Mankiw, have raised concerns about the RBC theory. They argue that the theory solely focuses on supply side factors while neglecting other important factors such as changes in demand side factors that contribute to fluctuations in business cycles. Prescott's assertion that technological shocks are the primary driver of cyclical business fluctuations has also been met with criticism. Critics contend that it is difficult to identify technological shocks that lead to changes in total factor productivity. Furthermore, the RBC theory assumes money neutrality, but critics argue that money does impact real variables like output and employment during economic booms and recessions. In periods of increased money growth and inflation, output and employment tend to be high during a boom, and vice versa during a recession.

(g) New Keynesians

Starting in the late 1970s, the new Keynesians conducted extensive research on the microeconomic factors that contribute to price rigidities in order to analyze the Keynesian assumption that prices and wages are fixed in the short run.

While agreeing that inflation is still primarily a monetary phenomenon in the long run, these new Keynesian economists did not support the new classical macroeconomists' belief in "continuous market-clearing". Instead, they proposed that wage and price stickiness in the short run can be attributed to factors such as "small menu costs" or "staggered (or non-synchronized) wage and price changes".

According to this perspective, many firms find it costly to continuously adjust their prices for every demand shock they encounter—especially when faced with low inflation conditions (Mankiw 1985). Additionally," staggering", or allowing for gradual adjustments rather than immediate ones may even slow down general price level adaptation despite frequent individual price changes.

It is important to note that this concept of price rigidity does not apply to markets where prices change continuously like auction markets.

The new Keynesian economists made significant improvements upon the neo-Keynesian hypothesis by incorporating ideas such as monopolistic firms determining prices instead of accepting them passively; a rational expectations-augmented Phillips curve; recognizing both supply and demand shocks are taken as potential sources of instability; and acknowledging imperfect competition and asymmetric information (Snowdon & Vane 2005). The new Keynesian economists agree that inflation is primarily a monetary phenomenon in the long run. However, they also argue that wage and price stickiness, which prevents markets from clearing quickly in the short run, can be rationalized through various mechanisms such as staggered adjustments and small menu costs. By staggering wage changes gradually align with market conditions, for instance through long-term contracts, the pace of price adjustments may be slowed down. In imperfectly competitive markets, the menu costs serve as a barrier to frequent price changes. Firms operating under low inflation environments and seeking profit maximization often find it costly to continuously adjust their prices in response to each demand shock.

(h) New Neoclassical Synthesis

The emergence of the new neoclassical synthesis (NNS) in the 1990s brought together Keynesian and new classical economics. According to NNS, monetary shocks

play a significant role in business cycles when considering the short-term stickiness of prices, as assumed by the new Keynesian model (King, 1997). Additionally, the NNS recognizes supply shocks, such as changes in productivity or fiscal policy, and relative price shocks as factors influencing real economic activity, in line with the new classical RBC theory. Moreover, expectations are viewed as crucial to the inflation process in the NNS framework; however, they can be managed through a monetary policy rule.

(i) Modern Monetary Theory of Inflation

In accordance with the principles of modern monetary theory (MMT), public spending can be funded through the issuance of government debt or by increasing the money supply without triggering inflation (Forstater,1999 and Mosler, 1998). Central banks have the ability to create substantial amounts of money to purchase government securities, which can then be used to finance government expenditures. Stephanie Kelton (2021) defines MMT as a framework for understanding how a modern fiat currency function. Fiat currency is a legal tender designated by a government that is not backed by any precious or valuable commodity. Consequently, central banks, or monetary authorities, have the authority to print money as they see fit.

Under MMT, if an economy is operating below its full employment capacity, creating money can play a vital role in stimulating economic activity and reducing unemployment rates. However, if the economy surpasses its capacity constraints, it will result in inflation. To manage inflationary pressures, fiscal policy rather than monetary policy takes precedence. In MMT, money creation through monetary policy serves to finance public spending, while fiscal policy - including raising taxes - becomes the key tool for curbing inflation. Thus, what appears to be purely monetary policy under traditional frameworks is a blend of both fiscal and monetary policies (Tymoigne, 2016).

(j) Fiscalists' Approach to Inflation

During the 1990s, a group of fiscalists, including M. Woodoford, C. Sims, and J. Cochrane, put forth the argument that the general price level is influenced more by fiscal factors than monetary factors (McCallum, 2003). They believed that government deficits and surpluses have a significant impact on the overall price level and suggested that rule-

based monetary policies implemented by central banks alone are insufficient to maintain stable and low inflation rates.

Carlstrom and Fuerst (2000) outlined two forms of the fiscal theory: weak-form and strong-form. The weak-form fiscal theory was initially proposed by Sargent and Wallace (1981) and involves the fiscal authority determining the budget and revenue to be raised. In situations where new government bonds cannot be issued, this forces the monetary authority to generate money (seigniorage), leading to additional inflation. In this scenario, while it may appear that inflation is caused by an increase in money growth, fiscal policy actually plays a major role in driving inflation. Consequently, the weak form of fiscal policy considers fiscal policy as exogenous and money supply as endogenous (Carlstrom and Fuerst, 2000).

The weak form of fiscal policy is commonly observed in less developed countries where monetary policy is influenced by budget deficits and shocks from fiscal policies (Woodford 1998; Bildirici& Ersin, 2005). In the strong form of the fiscal policy, both fiscal and monetary policies are considered exogenous factors that independently influence price changes.

4.1.2 Survey on Empirical Studies on Causes of Inflation

This section provides an overview of a survey that examines the empirical analysis on the factors influencing inflation. political explores various determinants, including macroeconomic, political, and institutional factors that contribute to inflation. Tolasa et al (2022) conducted a comprehensive study using error correction model based on ARDL modelling to analyze the macroeconomic determinants of inflation in 25 countries from 1950 to 1984. Their findings revealed that real GDP, real effective exchange rate, and lending interest rate are significant long-term drivers of inflation. Additionally, broad money supply, real GDP, population growth, gross national saving, and previous year imports were identified as short-term drivers of inflation. Based on these results, they recommended implementing measures to reduce the real effective exchange rate and effectively utilize broad money supply for productive economic activities in order to control inflation in Ethiopia.

In another study related to inflation determinants, Iya and Aminu (2014) employed the OLS estimation method to empirically analyze the factors influencing inflation in Nigeria over the period of 1980 to 2012. They utilized the Granger Causality Test to examine the causation between inflation and its hypothesized determinants such as money supply, exchange rate, government expenditure, and interest rate. Furthermore, they employed co-integration and vector error correction techniques to assess the long-run and short-run association between price level and independent variables. The findings indicated a positive and significant relationship between money supply and interest rate with inflation; however, exchange rates and government expenditure showed a negative association with inflation. The study also concluded that there is both a long-term and short-term relationship between price level and the independent variables analyzed. The study also recommended that money supply and interest rate should be decreased, and exchange rate and government expenditure should be improved to preserve price stability. Lim and Sek (2015) conducted a study using the Error Correction Model (ECM) based on the Autoregressive Distributed Lag (ARDL) modeling to investigate the determinants of inflation in both high inflation and low inflation countries. They analyzed annual panel data from 1970 to 2011. The results showed that in low inflation countries, there is a positive relationship between money supply and the level of price and GDP growth. On the other hand, imports of goods and services had a negative and significant impact on the level of price. In high inflation countries, they found that money supply, GDP growth, and government expenditure are key factors determining the price level in the long run.

Similarly, Furrukh et al. (2016) used an autoregressive and distributed lag model (ARDL) to analyze the factors contributing to inflation in Pakistan. They examined time series data from 1972 to 2014. Their findings revealed that demand side variables such as population, government expenditure, and road infrastructure significantly affected inflation. Supply side variables including imports, electricity generation, government revenue, and external debt also exerted a significant influence on inflation in Pakistan. Furthermore, their analysis identified government expenditure, roads, imports, government revenue, and external debt as long-term causes of inflation. Additionally, inflation was found to have a negative association with foreign direct investment (FDI),

electricity generation, and population over the long term according to their investigation's outcomes. Bedada et al. (2020) conducted a comprehensive study using Johansen Cointegration methodology and Vector Error Correction approach to analyze the factors influencing inflation in Ethiopia from 1974/75 to 2014/15. The research identified that money supply, real gross domestic product, and overall budget deficit significantly contribute to the consumer's price index (CPI), both in the short run and long run.

In a similar vein, Kahssay (2017) investigated the relationship between inflation and its determinants in Ethiopia using the ordinary least square method. The analysis spanned from 1975 to 2014 and revealed that GDP has a positive and significant impact on inflation in both the short term and long term. Additionally, broad money supply, growth of consumer saving, and import of goods were found to have varying impacts on consumer price index.

Adil et al. (2023), meanwhile, employed the bound test approach to cointegration on India's data from 2006: Q3-2019:Q4. Their findings suggest that household survey-based inflation expectation, real output, narrow money aggregate, and interest rates play crucial roles as determinants of inflation in India. By considering structural and monetary factors together, they were able to explain fluctuations in inflation more comprehensively.

Overall, these studies offer valuable insights into understanding the factors behind inflation dynamics for countries like Ethiopia and India Islam et al. (2022) conducted a comprehensive study on inflation in Bangladesh using the Autoregressive Distributed Lag (ARDL) model with a bound test approach. By analyzing time series data from 1981 to 2020, they determined that gross domestic product (GDP), broad money supply (M2), export growth (XG), import growth (MG), and population growth (PG) are the primary factors influencing inflation in Bangladesh.

In a similar vein, Ture and Khazaei (2022) examined the determinants of inflation in Iran by employing a vector error correction model. Their analysis covered both short- and long-term dynamics using quarterly data from 2004 to 2021. The study identified money growth as a driver of inflation in the long term, whereas currency depreciation, fiscal deficits, and sanctions (proxied by oil exports) were found to impact inflation in both the short and long term. The researchers recommended adjusting budget deficits as a

means to reduce inflation and strengthening the inflation targeting framework for improved monetary transmission and better containment of inflation.

Shafie et al. (2021) explored the sources of inflationary pressure in Malaysia through their use of both Autoregressive Distributed Lags (ARDL) models and nonlinear ARDL models. They analyzed quarterly data from 1997 to 2018 focusing on variables such as money supply (M1, M2, M3), real GDP, and real broad effective exchange rate-RBEER. This research aimed to determine whether inflationary pressures stemmed from monetary or real sectors within Malaysia.

These studies contribute valuable insights into understanding inflation dynamics within their respective countries while utilizing advanced econometric techniques for robust analysis. It was determined that M3 serves as the most suitable proxy for measuring money supply. The study revealed a positive correlation between money supply and inflation in the short term, while also indicating that RGDP has an impact on inflation both in the short and long term. Consequently, the quantity theory of money partially supports these findings in the short term but holds true in the long run. Sanida et al (2021) conducted a comprehensive analysis using the Fixed Random Effect (FEM) approach to examine the causal relationship between exogenous variables and inflation in ASEAN countries, specifically in ASEAN-5 countries from 2011 to 2019. The study focused on variables such as inflation, consumer price index, GDP, export value, and interest rates. The findings indicated that gross domestic product and interest rate had a positive and significant impact on inflation, whereas exports had a negative and insignificant effect. Based on these results, the authors recommended further investigation by incorporating variables related to both internal and external sectors, increasing the number of observations, and employing alternative methodologies for more accurate outcomes.

In a similar vein, Salim (2021) explored the determinants of inflation in ten selected Asian countries: Bangladesh, Hong Kong, India, Indonesia, Korea, Malaysia Philippines Sri Lanka Thailand Vietnam. The study utilized various statistical approaches including pooled ordinary least square (POLS), Breush-Pagan test, Random Effect Model Hausman Fixed test and Fixed Effect Model. The variables considered were inflation rate, interest rate, gross domestic product money supply, and public expenditure. It was

revealed that while money supply emerged as the primary driver of inflation growth for these economies, the relationship between money supply-interest rate and inflation exhibited a significant negative association.

Furthermore, to analyze Vietnam's inflation determinants from 1996 to 2012.Phant (2014) employed Vector Autoregressive (VAR)and Structural VAR(SVAR) models. Such models allowed for deeper exploration of the factors affecting Vietnam's inflation dynamics on quarterly data throughout this period. The findings indicate that there is a plausible relationship between monetary policy shocks and inflation. The study demonstrates that changes in the policy interest rate have significant implications for variations in inflation, and shocks to output and prices in trading partner countries exert strong effects on inflation in Vietnam. However, it appears that international oil and rice prices do not consistently impact Vietnam's inflation.

Martin (2015) argues against the classic viewpoint put forth by Kydland and Prescott (1977), Barro and Gordon (1983), and Rogoff (1985) that central bank independence tends to mitigate inflation bias under discretionary policy. Martin emphasizes that this argument fails to consider the role of fiscal authority in shaping the overall response to institutional reform. According to Martin, if the small policy distortion made by the central bank is anticipated, it would prompt the fiscal authority to increase the deficit as a remedial measure, consequently leading to increased inflation over time.

In a separate study conducted by Jácome and Pienknagura (2022) on 17 Latin American countries spanning up to 100 years, they explored the relationship between central bank independence and inflation using a unique index of central bank independence. The empirical evidence confirms a strong negative correlation between central bank independence and inflation. It further reveals that enhancing central bank independence results in a consistent decline in inflation rates. High levels of central bank independence have been found to be associated with a decrease in the likelihood of experiencing high inflation episodes. This effect is particularly pronounced when accompanied by reductions in central bank financing for the government. These findings affirm the importance of shielding central banks from political influence, not only to combat inflationary pressure but also to ensure price stability in the medium term.

In their study, Banerjee et al (2023) utilized novel methods for panel quantile regressions with fixed effects to examine the impact of fiscal policy on inflation. They augmented an open economy Phillips curve with the fiscal balance using panel data from 21 advanced economies spanning four decades. The relationship between fiscal deficit and inflation critically depends on the prevailing fiscal-monetary policy regime.

The study concludes that under a monetary-led regime, higher deficits have an average effect on inflation that is up to five times larger compared to other regimes. Furthermore, the estimated average effect of an increase in the overall fiscal deficit on inflation varies significantly across different combinations of fiscal and monetary policy regimes examined by Banerjee et al (2023).

Interestingly, the regime characterized as "monetary-led," which features a prudent fiscal authority stabilizing debt levels alongside an independent central bank with robust legal limitations preventing lending to the public sector, exhibits the lowest inflationary impact from fiscal deficits. In a fiscal led regime, where fiscal policy is profligate and the central bank has limited lending constraints, even a one percentage point increase in the overall deficit can cause a significant rise in inflation. On average, such an increase raises the inflation rate by around 50 basis points, which is over five times higher than in a monetary led regime. This suggests that changes in policy frameworks, such as reduced fiscal discipline or increased public debt levels, may pose upside inflation risks. Similarly, if the central bank considers adopting tighter monetary policy, it could amplify the inflationary effect of fiscal stimulus.

These findings are not only applicable to advanced economies but also hold lessons for emerging market and less developed economies. The study conducted by Sargent and Wallace (1981) highlights the ineffectiveness of monetary policy in controlling inflation when the government finances large fiscal deficits without relying on taxation.

It is clear that policy frameworks play a crucial role in shaping inflation dynamics. Understanding these implications can inform policymakers' decisions and help mitigate potential risks associated with fiscal stimulus and public debt levels.

In a study by Khie (2021), a structural vector auto-regressive model was utilized to analyze the relationship between budget deficits, money growth, and inflation in

Vietnam from 1995 to 2012. The findings revealed that inflation increased in response to positive shocks in money growth, while budget deficits had no significant impact on either money growth or inflation. This empirical evidence supports the notion that fiscal and monetary policies operated independently during this period. The study recommended reducing money growth as a means of controlling inflation in Vietnam.

Anugrah et al (2017) conducted an analysis on the determinants of headline, core, and food inflation in Indonesia. Their research indicated that broad money over GDP (M2Y) had a positive and significant influence on both headline and core inflation over the long term. In the short term, headline inflation was significantly influenced by IPI, beef production, and seasonal events such as Ramadhan. Core inflation was notably affected by various factors including inflation expectations, IPI, fuel prices, global gold prices, exchange rates, and school enrolment periods. Furthermore, food price inflation was determined by both backward-looking and forward-looking expectations along with climate change and seasonal event variables. Additionally, factors such as food production, irrigation, agricultural imports, narrow money supply, and credit to the agricultural sector were all significantly linked to food price inflation. Khan and Saqib (2009) conducted a study on the effects of political instability in Pakistan, using two different models: the monetary model and the nonmonetary model. They utilized data from 1951-2007 and applied the Generalized Method of Moments. The findings indicated a positive association between measures of political instability and inflation.

Telatar et al. (2010) focused on estimating the impact of political and institutional factors on inflation. Using dynamic panel data estimation, they analyzed a sample of 39 countries from 1983-2002. The results revealed that there is a link between lower degrees of political instability and lower inflation in developed and low inflation countries. Conversely, developing and high inflation countries tend to experience higher levels of political instability.

Elbahnasawy (2022) discussed how higher inflation is associated with an increase in the size of the natural resource sector, shadow economy, and greater political instability. According to Elbahnasawy, these factors should receive increased attention when considering the causes of inflation.

Ghanayem et al. (2023) examined the impact of political instability on inflation volatility in the Middle East and North Africa (MENA) region. They utilized GARCH, EGARCH, and TGARCH models to analyze data from 2006-2018. Research indicates that political instability in the MENA region has both positive and negative effects on inflation volatility. More specifically, the instability of the political regime leads to a significant increase in inflation volatility, whereas instability in the government reduces inflation volatility. These findings highlight the intricate relationship between political factors and economic stability within the region.

4.2. Factors Affecting Pass-Through Effect of Exchange Rate to Inflation

The term Exchange Rate Pass-Through (ERPT) refers to the percentage change in domestic prices, typically import prices, resulting from a one percent change in the exchange rate. ERPT can also refer to the percentage change in exchange rates affecting consumer prices, producer prices, or wholesale prices. Complete ERPT occurs when exchange rate changes fully impact import prices, while zero ERPT suggests no impact. In reality, countries experience partial ERPT (Menon, 1995).

The degree and speed of ERPT have implications for selecting an appropriate exchange rate regime. Flexible exchange rate regimes are often chosen due to their capacity to adjust relative prices within a country when specific real shocks occur. However, in an environment with high ERPT, maintaining a flexible exchange rate regime can result in increased volatility for both the exchange rate and inflation. Consequently, countries prioritizing price stability facing high ERPT may prefer a fixed exchange rate regime. The process of Exchange Rate Pass Through (ERPT) consists of two stages. In the first stage, any fluctuations in exchange rates are reflected in import prices. Then, in the second stage, changes in import prices are passed on to consumer prices. The extent to which exchange rate pass through occurs is influenced by various factors, which can be categorized as either macroeconomic determinants or microeconomic determinants of ERPT.

4.2.1 Macroeconomic and Microeconomic Determinants of the ERPT

The main macroeconomic determinants of the ERPT (Exchange Rate Pass-Through) can be summarized as follows:

(a) Share of imported goods

The impact of changes in import prices on consumer prices is heavily influenced by the proportion of imported goods in the domestic consumer basket.

(b) Expenditure Switching Effect

When consumers shift from imported consumer goods to domestically produced goods, or when local producers substitute imported intermediate goods for locally manufactured alternatives due to higher import prices resulting from exchange rate fluctuations and increased foreign prices, aggregate demand rises and causes upward pressure on both domestic prices and nominal wages (Bailliu & Bouakez, 2004).

(c) Inflationary Environment

Taylor (2000) states that developed countries with low inflation tend to have lower ERPT, and thus producers are hesitant to pass on the cost increases to consumers because they fear losing market share if their competitors do not follow suit. This dynamic can result in a lower ERPT.

(d) Exchange Rate Misalignment

Certain studies identified that exchange rate misalignment is a factor influencing ERPT (Goldfajn & Werlang, 2000).

(e) Uncertainty

Uncertainty surrounding exchange rate volatility and business cycles impacts firms' pricing strategies and corresponding ERPT. When changes in exchange rates persist over time, firms adjust prices margin rather than profit margins, leading to more pass-through rates. Conversely, if exchange rates exhibit lower volatility and are not persistent in nature, firms tend to adjust profit margins instead of changing prices

(McCarthy, 2000). According to Taylor (2000), if changes in exchange rates are common but temporary, firms are less inclined to pass on this change to import prices.

Business cycles also have an influence on the level of ERPT. During economic booms, firms are more willing to modify prices rather than adjusting profit margins. On the other hand, when there is excess supply in the economy, firms are less likely to raise their prices (Bailliu and Bouakez, 2004). Additionally, under an economic boom characterized by exchange rate volatility, the smaller pass-through is expected (Mann 1986).

(f) Degree of Openness

The extent of Exchange Rate Pass-Through (ERPT) is influenced by the degree of openness. Romer (1991) suggests that a more open economy is likely to experience lower inflation due to the availability of goods and services at competitively priced rates. Increased trade integration leads to lower profit margins for firms, resulting in lower prices rather than higher prices, thus reducing pass-through.

There are several microeconomic determinants that contribute to ERPT, such as, firms' pricing to market strategy, price-setting power of firms, invoice currency of exports, sunk cost and non-tariff barriers.

4.2.2 Survey on Empirical Studies of ERPT

In this sub section, some empirical studies on ERPT are presented. Degree and speed of ERPT is different across countries with time varying and with different price indices.

In terms of empirical studies on ERPT, Taylor (2000) conducted research on the United States and found that the decline in exchange rate pass-through is attributed to reduced expectations of depreciation persistence. As a result, firms establish pricing strategies based on their anticipations of future costs, often resulting in price increases.

Ito, Sasaki, and Sato (2002) examined ERPT for eight East Asian countries and discovered that Thailand experienced over 166 percent pass-through to import prices, indicating complete or even more than complete pass-through. However, the pass-through to consumer prices was only 26 percent. It is noted that since the Asian crisis,

ERPT had risen substantially due to greater economic openness and increased exchange rate volatility.

In the case of industrialized countries, McCarthy (2007) estimated that countries with a higher share of imported goods experienced a greater magnitude of ERPT. This suggests that increased reliance on imports leads to higher responsiveness of domestic prices to exchange rate fluctuations.

Özyurt's research in 2016 focused on the Euro Zone and investigated the degree and speed of ERPT to import prices. The results indicated that ERPT is partially present but declining over time, which can be attributed to slow adjustments in nominal prices as well as firms' pricing-to-market behavior.

However, it should be noted that developing countries often exhibit weaker and declining ERPT due to price rigidity and lower competition. This may result in less responsiveness of prices at least in the short run (Choudhri and Hakura, 2006; Akofio-Sowah, 2009; Razafimahefa, 2012; Lariau et al., 2016; Helmy et al., 2018).

In a study conducted by Cortinhas (2007), a recursive VAR model was utilized to analyze the extent of exchange rate pass-through to domestic prices in five ASEAN founding members. The data for this investigation covered the period from 1968 to 2001. The findings indicated that joining the currency union would be highly beneficial for Singapore, Malaysia, and Indonesia. This is because Singapore and Malaysia showed signs of an exchange rate disconnect. For Indonesia, entering the currency union could mitigate risks associated with independent monetary policy implementation. In the case of the Philippines, there was some evidence of exchange rate pass-through to inflation but not import prices, making it a less compelling case for them to join the currency union. On the other hand, Thailand experienced exchange rate pass-through on import prices. Hence, maintaining a flexible exchange rate may be favorable for enhancing their price competitiveness.

Another study by Ivohasina F. Razafimahefa (2012) adopted a VAR approach to investigate ERPT and its determinants in Sub-Saharan Africa countries from 1985 to 2008. The results indicated that exchange rate pass-through in these countries is incomplete and asymmetric. Moreover, it was observed that ERPT tends to be more significant following domestic currency depreciations compared to appreciations and has

declined since the mid-1990s. Additionally, lower levels of ERPT were found in countries characterized by lower inflationary environments, flexible exchange rates, prudent monetary policies, and sustainable fiscal policies.

Lariau and colleagues (2016) utilized the VECM approach to examine the magnitude of exchange rate pass-through (ERPT) in Angola from May 2005 to April 2015, and the VAR approach to investigate ERPT in Nigeria from January 1999 to April 2015. They discovered that in Angola, while the long-term ERPT is high, it is decreasing due to the de-dollarization of the economy. However, in the short run, ERPT is insignificant due to price distortions caused by administrative price-setting schemes. In Nigeria, ERTP is not significant overall but does have a significant impact on core inflation.

In another study conducted by Bada et al. (2016), they employed cointegration and vector error correction methodologies using data from 1995Q1 to 2015Q1 to examine the impact of exchange rate pass-through on import and consumer prices in Nigeria. Their findings indicate that exchange rate pass-through into Nigeria's CPI inflation is incomplete. Furthermore, the effect is more prominent on import prices compared to consumer prices, suggesting a decline in pass-through effect along the pricing chain.

Anh (2017) adopted a reduced-form VAR (RVAR) approach to analyze the pass-through effects of exchange rate fluctuations on domestic prices in Vietnam using data from 2008M1 to 2017M12. The results revealed that exchange rate shocks have a positive impact on price variations in Vietnam. Import prices exhibit the largest response to exchange rate shocks followed by producer prices and consumer prices.

In their study, Helmy et al. (2018) utilized the VAR approach to analyze the exchange rate pass-through (ERPT) in Egypt over a period of January 2003 to December 2011. Their findings revealed that the ERPT in Egypt is high but incomplete, and it takes time for the pass-through effects to materialize across all three categories of prices: consumer price index, producer price index, and import prices. This phenomenon can primarily be attributed to Egypt's consumer basket composition, which heavily relies on subsidized commodities and goods with administered prices.

Taking a different approach, Ha et al. (2019) employed structural factor-augmented vector-autoregressive (FAVAR) models to investigate pass-through effects

for 47 countries. Their results demonstrated that the impact of domestic and global shocks on pass-through varies depending on country characteristics. Countries with flexible exchange rate regimes and credible inflation targets tend to experience lower pass-through effects. Furthermore, the study suggests that central bank independence plays a significant role in stabilizing inflation following substantial currency movements.

Aisen et al. (2021), on the other hand, utilized an ARDL model to assess the extent of exchange rate changes affecting domestic prices in Mozambique from 2001 to 2019. The results indicated that Mozambique exhibits asymmetric, sizable, and rapid ERPT, with approximately 50% of exchange rate variations passing through to prices within six months. To mitigate these effects, the authors recommend implementing prudent macroeconomic policies aimed at achieving low and stable inflation levels. The impact of macroeconomic and microeconomic factors on Exchange Rate Pass-Through (ERPT) varies, and there isn't a consensus on the determinants and extent of ERPT. Developed countries generally experience lower levels of ERPT. The degree of pass-through differs significantly across countries and studies, as well as over different time periods. ERPT is not complete and tends to decrease along the production chain, from import price to consumer price.

If a country has characteristics such as a highly open economy, a significant contribution of imported goods in the consumer basket, invoicing imports in producer currency prices, low Price Transmission Mechanism (PTM), low trade barriers, and a fixed exchange rate regime, it is expected to have a high extent of ERPT.

4.3 Movements and Sources of Inflation in Myanmar

This sub-chapter focuses on analyzing the movements of the inflation rate and identifying the factors that contribute to inflation in Myanmar.

4.3.1 Inflation Rate Analysis in Myanmar

Over the period of analysis, Myanmar experienced two instances of significant inflation. Like other developing countries, inflation in Myanmar can be attributed to both demand-side and supply-side factors. The dynamics of inflation in Myanmar from 2013 to 2020 are illustrated in Figure 4.1.

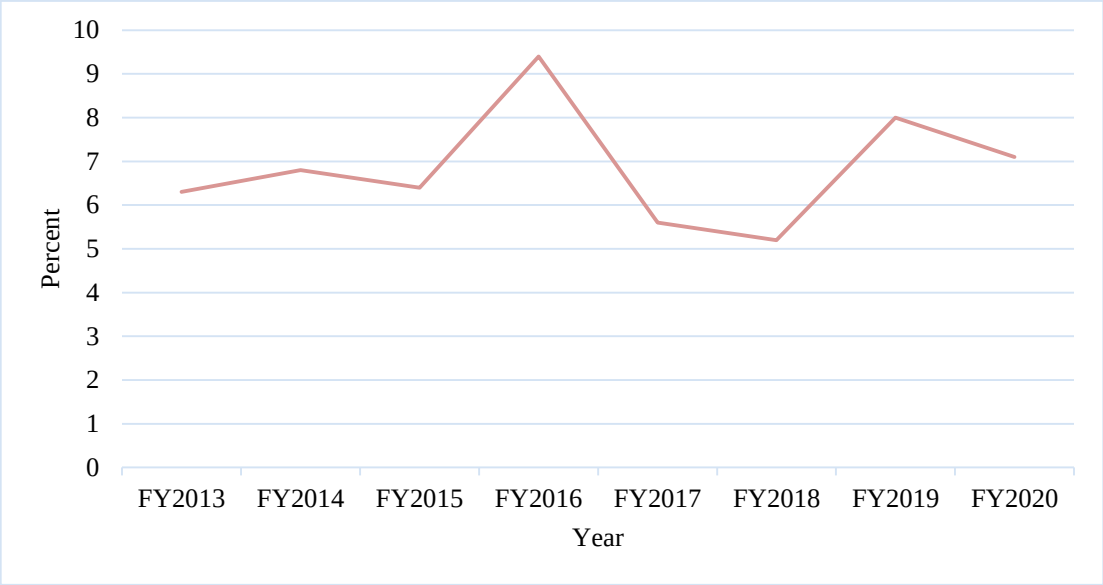


Figure (4.1) Inflation Rates in Myanmar (2013-2020)

Source: Quarterly Statistical Bulletin, Central Statistical Organization.

The inflation rate in Myanmar from 2013 to 2020 is depicted in Figure 4.1. In 2013, the inflation rate rose to 6.8 percent (year-over-year) from 6.3 percent (year-over-year). This increase can be attributed to the depreciation of the exchange rate, which occurred after transitioning from a fixed exchange rate system to a managed floating exchange rate system in 2012, as well as the rise in administered electricity prices due to demand pressure.

Despite facing depreciation pressure and an expanding current account deficit driven by strong domestic demand, there are limited monetary policy instruments available to contain inflationary pressures. Consequently, a combination of expansionary fiscal policies, money supply growth resulting from Central Bank of Myanmar's purchases of government securities, rapid credit growth (with a year-on-year credit growth of 34 percent in October 2016) and widening current account deficit caused by strong domestic demand led to an inflation increase of 9.4 percent (year-over-year) in 2016.

Even though high levels of inflation have eroded household purchasing power and negatively impacted investment and competitiveness, real economic growth remained

robust during this period. In fact, it reached approximately 8 percent in 2015 thanks to an increase in manufacturing, construction, tourism, and natural gas production.

According to the IMF's analysis using data from 2005 to 2016, several factors drive inflation in Myanmar including past inflation dynamics, reserve money supply, international food prices public sector wages, and exchange rate depreciation. An analysis of inflation reveals the influential factors driving its dynamics, including past inflation, exchange rates, and money supply. In this study period, approximately 40 percent of inflation can be attributed to past inflation trends, while exchange rate pass-through accounts for 20 percent. Additionally, international food prices and changes in money supply contribute around 7 percent and 5 percent respectively to inflation variance. Looking ahead, over the medium term, exchange rate pass-through and fluctuations in money supply will continue to impact inflation by approximately 30 percent and 25 percent respectively.

To address rising inflationary pressure, the government implemented measures such as capping central bank financing at 40 percent of domestic financing in FY 2016-17. This threshold gradually decreased thereafter. Furthermore, deposit auctions were utilized to absorb liquidity within the banking system.

Inflation moderated to a rate of 5.2 percent (year-on-year) in 2018 due to reduced monetary financing and lower food prices. However, expansionary policies subsequently increased inflation to approximately 8 percent (year-on-year) in 2019. Throughout the challenges posed by the Covid-19 pandemic in 2020, government expenditure aimed at mitigating hardship further contributed to an average inflation rate of around 7 percent (year-on-year).

4.3.2 Sources of Inflation in Myanmar

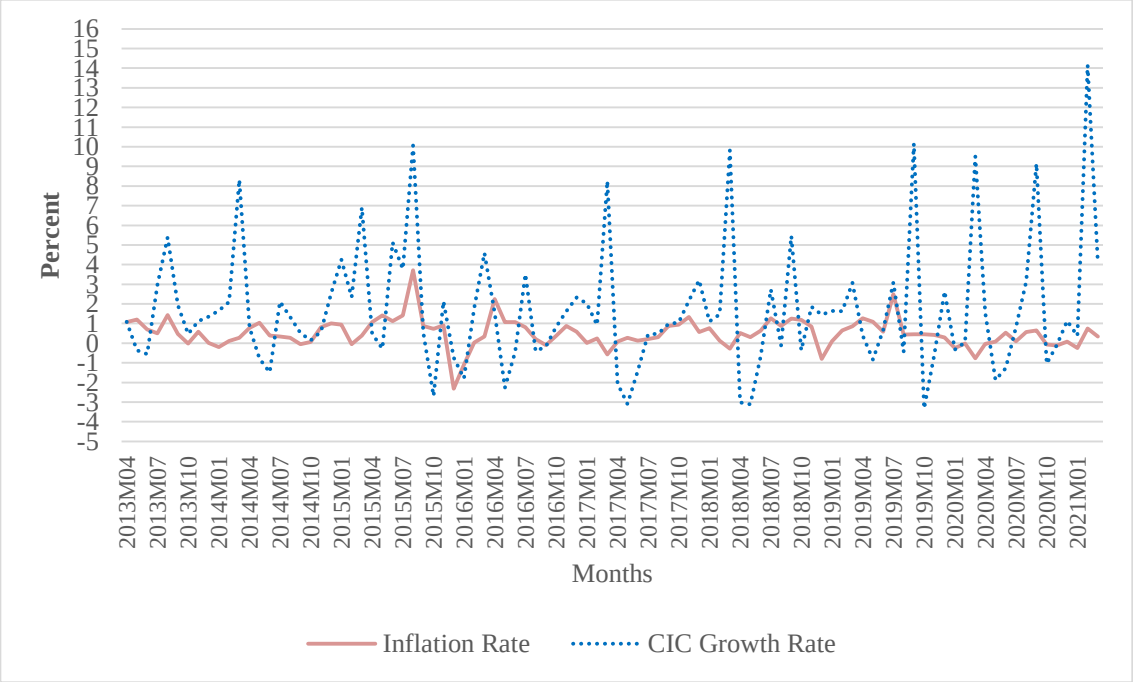
During the analysis period, the level of inflation rate is influenced by various factors. One of these factors is the depreciation of the exchange rate due to the shift from a fixed exchange rate system to a managed floating exchange rate system in 2012. Additionally, expansionary fiscal policies, central bank financing, rapid credit growth, wider current account deficits, and supply shocks resulting from natural disasters also

play a role in determining inflation. The relationship between these factors and the inflation rate is discussed below.

(a) Currency in Circulation and Inflation

According to economic theory, an increase in currency in circulation tends to lead to higher inflation. In Myanmar's case, the central bank's fiscal financing and credit provided to the private sector primarily contribute to the expansion of currency in circulation. The relationship between currency in circulation and inflation can be visualized in Figure 4.2.

Figure (4.2) Relationship between Currency in Circulation and Inflation



(2013-2020)

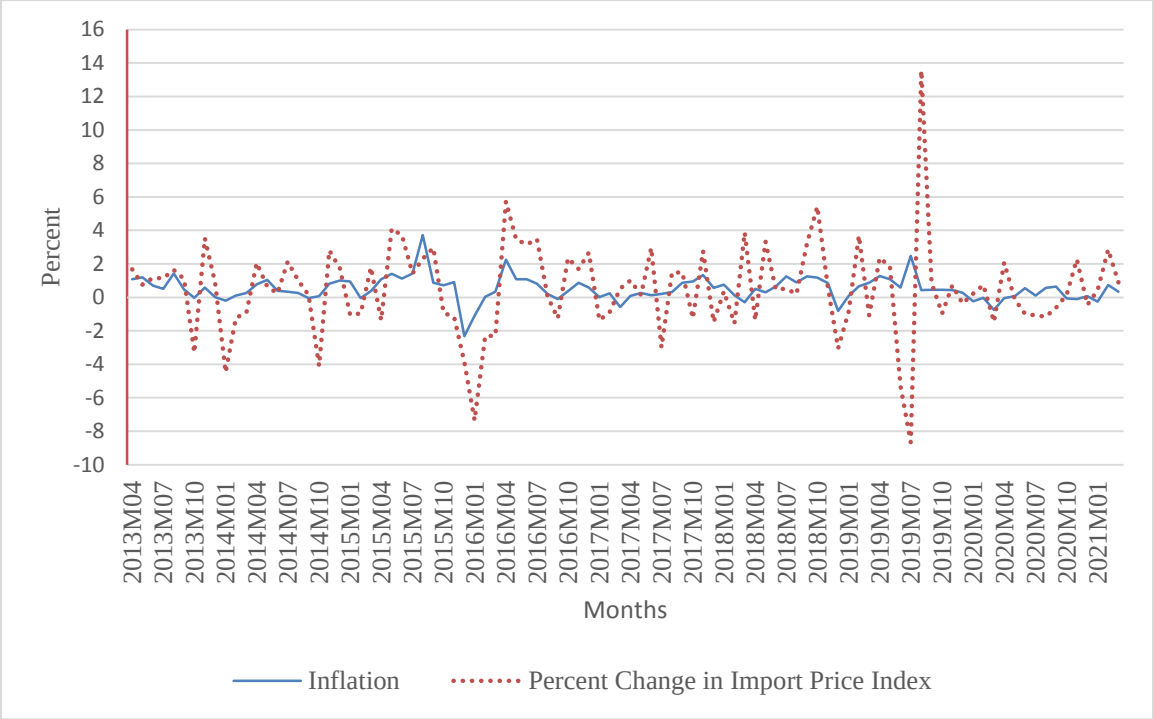
Source: Central Statistical Organization, Myanmar

The study primarily focuses on the analysis of currency in circulation for most periods. However, there are a few exceptions where other factors may come into play.

(b) Import Price and Inflation

Figure 4.3 illustrates the correlation between the percentage change in import prices and domestic inflation.

Figure (4.3) Relationship between Percent Change in Import Price Index and Inflation (2013-2020)



Source: Central Statistical Organization

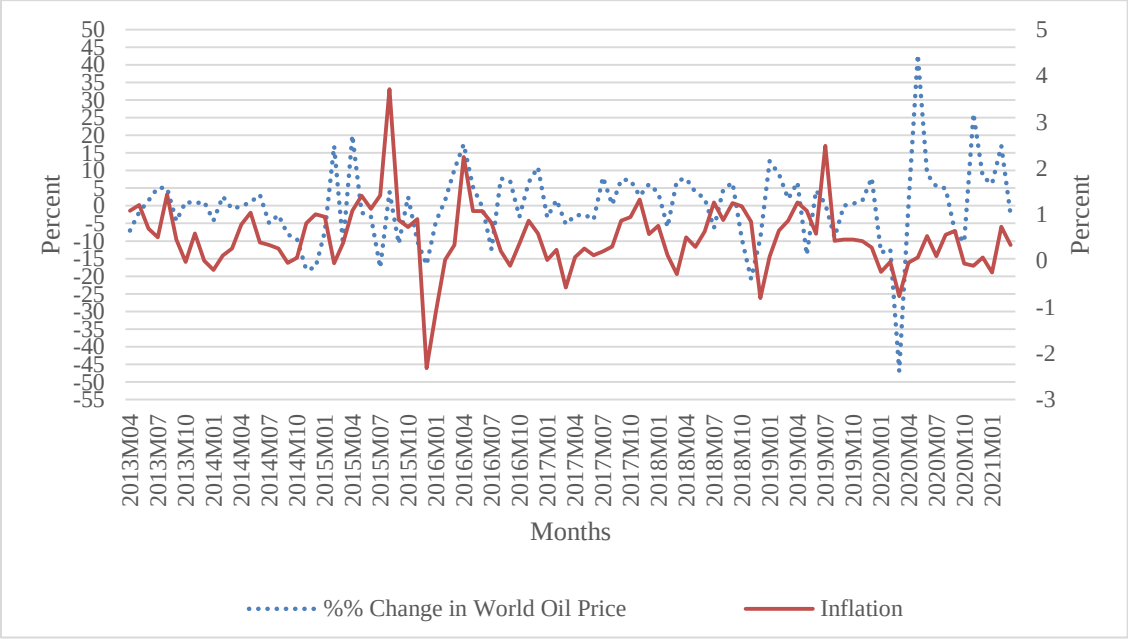
Changes in the import price index can have both direct and indirect effects on domestic inflation. When import prices are higher, the cost of final consumption goods will increase proportionally, leading to an immediate impact. Indirectly, higher import prices of production inputs will eventually affect the prices of consumable goods in the domestic market, but this may take some time. To analyze foreign price trends, the import price index is used as a proxy.

It's worth noting that the relationship between inflation and foreign prices is not always linear. Domestic inflation can be influenced by various factors, including non-tradable items in the consumption basket.

(c) Oil Price and Inflation

To further explore the relationship between international oil prices and domestic inflation, please refer to Figure 4.4.

Figure (4.4) Relationship between Oil Price and Inflation (2013-2020)



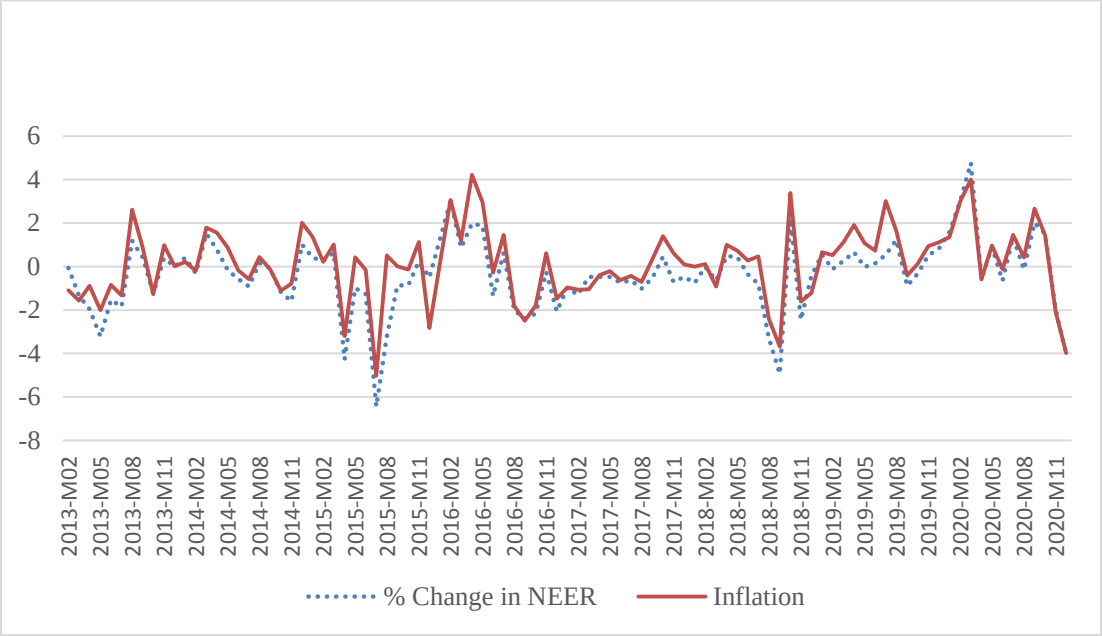
Source: Quarterly Statistical Bulletin, Central Statistical Organization

Myanmar is particularly dependent on oil imports, and oil imports largely contribute to imports in value terms. The impact of international oil price on domestic inflation are mixed, it can explain domestic inflation in most periods while some periods cannot be explained.

(d) Nominal Effective Exchange Rate and Inflation

The relationship between the nominal effective exchange rate and domestic inflation is presented in Figure 4.5.

Figure (4.5) Relationship between Percent Change in Nominal Effective Exchange Rate and Inflation (2013-2020)



Source: Central Statistical Organization, Myanmar

The domestic economy of most countries is significantly influenced by the price of oil. This is particularly true for Myanmar, as it heavily relies on oil imports which greatly contribute to the value of its imports. While the impact of international oil prices on domestic inflation varies, it can generally account for fluctuations in domestic inflation during most periods, although there may be some periods where this relationship cannot be explained.

The movement of the exchange rate is expected to be influenced by the level of inflation. In Myanmar, an increase in the price level leads to the depreciation of the Kyat against the US dollar. This is due to structural reforms that encourage importing products from abroad, resulting in an increased supply of currency.

4.4 Empirical study of Exchange Rate Pass-Through to Inflation in Myanmar

To study the relationship between exchange rate pass-through and inflation in Myanmar, Various theories and empirical evidence are analyzed. Section 4.1 discusses different theories explaining inflation under specific circumstances.

Our analysis is based on a theoretical framework that utilizes a simple model of price determination. The Purchasing Power Parity hypothesis is adopted as our model specification for studying exchange rate pass-through effects on domestic prices. According to this hypothesis, if it is assumed that PPP holds true, then the domestic price level (P) is dependent on both the nominal exchange rate (E) and foreign prices (P^f), as shown in equation 4.12:

$$P = f(E, P^f) \tag{4.12}$$

Equation 4.12 denotes how external inflation affects domestic prices; if the exchange rate depreciates or foreign prices rise, domestic prices will increase accordingly. This equation can also be expressed in natural logarithm form:

$$p_t = e_t + p_t^f \tag{4.13}$$

As per monetary theory, domestic sector prices are determined within the domestic money market, which reflects the quantity theory of money. Equation 4.14 below restates equation 4.1 within our developed framework:

$$MV = PY \tag{4.14}$$

where,

M = money supply

V = velocity of money

Y = real GDP.

While equation 4.13 is expressed in the natural logarithm and solve for prices, it is observed that the domestic prices are a function of money supply, and together with equation 4.14 in natural logarithm form, real GDP, and velocity of money.

$$p_t = m_t - y_t + \theta_t + \eta_t \tag{4.15}$$

where,

θ = time-trending velocity

η = disturbances of the velocity

Equation 4.16 presents the relationship between the overall price level in the economy and various factors.

$$p_t = f(e_t, p_t^f, m_t, y_t) \quad (4.16)$$

It states that the overall price level (p) is positively determined by the changes in NER (e), foreign prices (pf), money supply (m), but negatively related to real GDP (y). Equation 4.16 reveals that an increase in NER, foreign prices, or money supply is likely to lead to a higher price level, while an increase in real GDP will have a negative impact on inflation under the assumption of a fixed nominal GDP for a given money supply.

4.4.1 Model Specification for Inflation

McCarthy (2000) conducted a thorough analysis of the exchange rate pass-through on domestic prices in advanced countries. His model focused on the price determination process along a distribution chain, which involves the transmission of exchange rate changes to import prices (IMP), producer prices (PPI), and ultimately consumer prices (CPI). Since data on PPI is not available in Myanmar, it is excluded from the price distribution chain model. The variables included in the model are oil prices to capture foreign pressure and the output gap to represent domestic demand pressure.

Equation 4.16 includes two key variables: oil price to measure foreign pressure and output gap to capture domestic demand pressure. The market exchange rate, represented by the account transfer rate, reflects fluctuations in the exchange rate. The consumer price index provides insights into the domestic price level, while the effective import price of major trading partners and CPI contribute to understanding how pricing changes occur due to fluctuations in exchange rates. Additionally, currency in circulation is utilized as an indicator of government policy responses.

To explore the impact of exchange rate pass-through effect, empirical model specification is constructed as per the following equation.

$$INF = \beta_0 + \beta_1 EXR + \beta_2 IMP + \beta_2 CIC + \beta_2 GAP + \beta_2 OIL + \varepsilon \quad (4.17)$$

where,

INF = inflation rate

EXR =exchange rate

IMP = import price index

CIC = currency in circulation

GAP = output gap

Oil = world oil price

ε = error term

4.4.2 Definitions of Variables

In this subsection, the definitions of the variables used in equation 4.17 are presented in Table 4.1.

(a) Exchange Rate

For the exchange rate variable, NER, the rate used for transferring funds between US dollar account holders, is used. The NER is expressed in terms of Myanmar Kyat (MMK) per US dollar (USD). When NER increases, MMK depreciates, and lead to an increase in domestic prices. Conversely, a decrease in the MMK represents an appreciation of the currency and may lead to a decrease in domestic prices. All exchange rate data is obtained from the Central Bank of Myanmar. To account for seasonal effects on nominal exchange rates, the data was seasonally adjusted.

(b) Import Price Index

The import price index is calculated by transforming the export price index of our main trading partners with Myanmar with equation (4.18). This allows us to analyze fluctuations in import prices accurately.

$$IMP = \sum_{i=1}^{k} (EXP_i)^{w_i} \quad (4.18)$$

where EXPj is the export price index of trading partners i, and w_i the trade weight (import weight) of main trading partners with Myanmar. A rise in the import price index will lead to an increase in domestic prices. Like the Consumer Price Index (CPI), the Import Price Index (IMP) is also subject to seasonal variations. To account for these fluctuations, a process of seasonal adjustment is implemented to eliminate such effects. The necessary data utilized in the computation of the IMP is sourced from reputable institutions including the Central Statistical Organization (CSO), the Central Bank of Myanmar, the International Monetary Fund, and tradingeconomics.com.

(c) Consumer Price Index

The consumer price index (CPI) is utilized to measure domestic inflation, as the producer price index (PPI) is not available. CPI and domestic inflation are used interchangeably. The base period for measuring inflation is the CPI of January 2010. The inflation rate (INF) is calculated by determining the percentage change in monthly CPI. A higher CPI indicates a higher domestic price level. To eliminate any seasonal effects, the CPI is seasonally adjusted. Data on the CPI is sourced from the Central Statistical Organization (CSO).

(d) Currency in Circulation

In this study, instead of using short-term interest rates and broad money supply to capture the monetary response to CPI inflation, currency in circulation (CIC) is employed. This choice is made due to administered-set interest rates that are ineffective in responding to market situations and because Myanmar's economy heavily relies on cash transactions. In comparison to broad money, CIC more accurately reflects monetary response. A higher level of CIC corresponds to a higher domestic price level. Recognizing that monetary policy responds to seasonal matters, CIC is seasonally adjusted accordingly. Data on CIC can be accessed from the Central Bank of Myanmar.

(e) Output Gap

The output gap, employed as a proxy variable refers to the difference between real output and potential output, representing the level of real GDP in an economy. When the

real output exceeds potential output, there is a positive output gap, indicating excess demand in the economy. Conversely, a negative output gap occurs when real output falls below potential output. This can be interpreted as a shortage of demand in the economy.

Traditionally, the Hodrick-Prescott method or HP filter method is used to calculate the output gap. This involves regressing the log of industrial production indices on a constant, linear, and quadratic trend. The residuals from this regression are considered as the output gap.

In the case of seasonal effects, they are already removed through smoothing techniques applied in the HP filter method. Therefore, no further seasonal adjustments are required for the variable representing the output gap.

For this analysis, the data on real GDP from the Planning Department under the Ministry of Planning and Finance is obtained. To generate monthly GDP data from quarterly GDP data, the temporal disaggregation techniques is employed by using eview software.

(f) Oil Price

The oil price serves as an indicator of supply shocks to the economy and is used to measure changes in foreign prices. This, in turn, can impact production costs and domestic consumer price index (CPI) inflation. To track these effects, the Brent oil price is utilized. When oil prices rise, it results in higher production costs, potentially leading to an increase in domestic prices. Since oil prices are also influenced by seasonal factors, a seasonal adjustment is applied to remove this effect. The data on Brent oil price is sourced from investing.com.

Table 4.1 provides a comprehensive overview of the variables used in the model and their respective units of measurement for reference.

Table (4.1) Definitions of Variables

Variables	Definitions	Expected Signs
INF	Price level, measure by CPI (January 2012=100)	Positive
NER	Nominal exchange rate (rate for transferring fund between USD account), is expressed domestic currency per unit of foreign currency.	Positive
IMP	Import price index, which is calculated by transforming the export price index of main trading partners with Myanmar (January 2012=100)	Positive
CIC	Currency in circulation (in millions of Myanmar Kyat).	Positive
GAP	Output gap is the difference between real output and potential output, which is at the full employment capacity, which is calculated by using HP Filter method.	Positive
OIL	Brent oil price, expressed in US dollar per barrel.	Positive

Source: Previous Studies

IMP Import price index, which is calculated by transforming the export price index of main trading partners with Myanmar (January 2012=100). The Data used in the calculation of IMP is obtained from CBM, CSO, International Monetary Fund and tradingeconomics.com.

The empirical analysis in this study utilizes monthly data spanning from January 2013 to December 2020. The dependent variable chosen is the inflation rate, while the main determinant factors include the exchange rate, import price index, currency in circulation, output gap, and world oil price. These factors are carefully selected to examine their impact on the inflation rate.

4.4.3 Methodology

The methodology used in this study involves the application of the vector autoregressive (VAR) method to estimate the empirical model outlined in equation (4.17). To specify a simple VAR model with two variables, it can be expressed as follows:

$$Y_t = \beta_0 + \beta_1 Y_{t-1} + \cdots + \beta_h Y_{t-h} + \alpha_1 X_{t-1} + \cdots + \alpha_h X_{t-h} + \varepsilon_{1t} \quad (4.18)$$

$$X_t = \beta_0 + \beta_1 X_{t-1} + \cdots + \beta_h X_{t-h} + \alpha_1 Y_{t-1} + \cdots + \alpha_h Y_{t-h} + \varepsilon_{2t} \quad (4.19)$$

where h denotes the number of lags.

The above simple two variables VAR model explains that current value of Y depends on its own lags and the lags of explanatory variable(X). The above equations (3.18) and (3.19) can be expressed as follows:

$$Y_t = \mathrm{a}_1 + \sum_{i=1}^{h} \beta_i Y_{t-i} + \sum_{i=1}^{h} \lambda_i X_{t-i} + \varepsilon_{1t} \quad (4.20)$$

$$X_t = \mathrm{a}_2 + \sum_{i=1}^{h} \delta_i X_{t-i} + \sum_{i=1}^{h} \alpha_i Y_{t-i} + \varepsilon_{1t} \quad (4.21)$$

The regression equation specified in equation (4.17) is estimated based on the above VAR model.

The regression equation provided in equation (4.17) is computed by using the aforementioned VAR model.

4.4.4 Empirical Results

This study comprises of the following analytical works in the VAR model estimation process.

Unit root test

Lag length selection

VAR estimation with chosen optimal lags

Exploring exchange rate pass-through effect

Variance decomposition

Residual tests (serial correlation and normality)

(a) Unit Root Test

The stability of all variables in this study is tested using a unit root test. The null hypothesis of the test is that the series has a unit root, indicating instability. If the null

hypothesis can be rejected at the level, it means that there is no unit root and the series is integrated of order (0) or I(0). If the null hypothesis cannot be rejected at the level but can be rejected at the first difference, it suggests that the series is unstable at the level but stable at the first difference and integrated of order (1) or I (1).

In this study, the variables to be examined are the exchange rate, import price index, consumer price index, currency in circulation, world oil price, and output gap. These variables are analyzed by taking their natural logarithm and calculating their differences (expressed as D(LEXR), D(LIMP), D(LCPI), D(LCIC), and D(LOIL). The Augmented Dickey Fuller (ADF) unit root test is applied to these transformed variables. Based on the results of this test, all variables are found to be stable at the level. Therefore, an unrestricted VAR model is used to estimate their time series relationship. Detailed results of all ADF Unit Root tests can be found in Table 4.2.

Table (4.2) Result of Unit Root Test

Variable	ADF Test Statistic		ADF Critical Value	Results
	Levels	First Difference		
lexr	-2.1	-5.11	-3.50	I (1)
limp	-3.52	-9.21	-3.50	I (0), I (1)
lcpi	-0.94	-5.92	-3.50	I (1)
lcic	-0.89	-9.78	-3.50	I (1)
loil	-2.2	-8.39	-3.50	I (1)
gap	-9.58	-6.72	-3.50	I (0), I (1)

Source: Results are obtained by applying E-views by applying E-view software.

(b) Optimal Lag Length Selection

To eliminate autocorrelation, the process of selecting the optimal lag length for VAR estimation is carried out after satisfying the unit root test. The lag order suggested by the LR test is seven, while the AIC and FPE tests recommend a lag order of eight. On the other hand, both SC and HQ tests agree on a lag order of zero. Considering the AIC

criteria, this study determines that a lag order of eight is the optimal choice. The results of the lag length tests are shown in Table 4.3.

Table (4.3) Optimal Lag Length Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	939.0463	NA	2.69e-17	-21.12750	-20.95744*	-21.05902*
1	964.7820	73.07718	2.47e-17	-21.21338	-20.02294	-20.73403
2	996.8414	54.53793	2.74e-17	-21.12279	-18.91198	-20.23256
3	1033.883	57.90478	2.75e-17	-21.14675	-17.91556	-19.84565
4	1069.939	51.39000	2.91e-17	-21.14803	-16.89647	-19.43606
5	1094.814	32.02214	4.14e-17	-20.89227	-15.62033	-18.76942
6	1144.471	57.07756	3.51e-17	-21.20623	-14.91392	-18.67251
7	1208.439	64.70278*	2.31e-17	-21.84916	-14.53647	-18.90457
8	1262.984	47.64879	2.08e-17*	-22.27549*	-13.94243	-18.92002

Source: Results are obtained by applying E-views by applying E-view software.

* indicates lag order selected by the criterion

LR: sequential modified LR test statistic (each test at 5% level)

FPE: Final prediction error

AIC: Akaike information criterion

SC: Schwarz information criterion

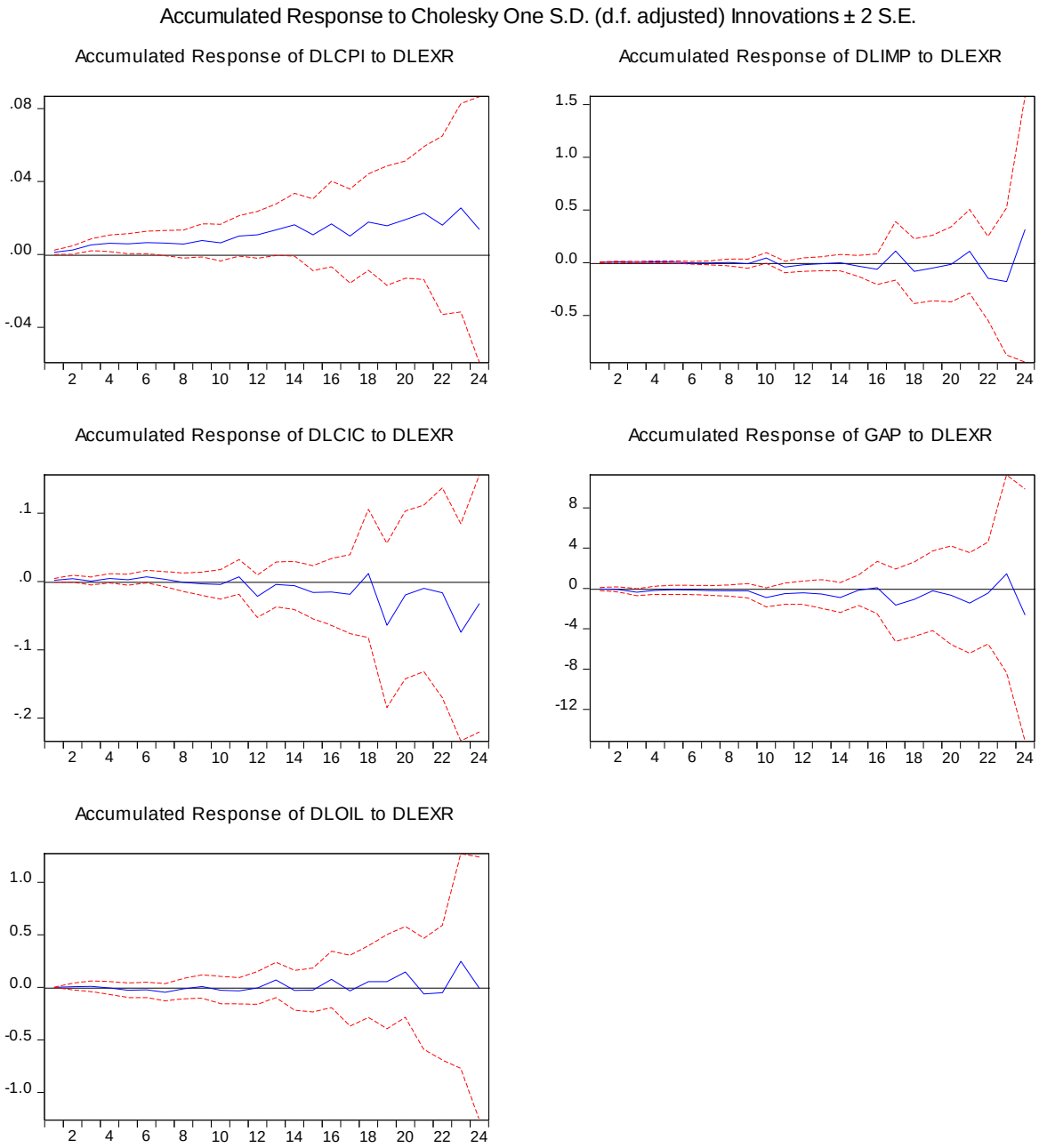
HQ: Hannan-Quinn information criterion

(c) VAR Model Estimation

The Vector Autoregressive (VAR) model incorporates five variables with eight lags for estimation purposes. These five variables (EXR, IMP, CIC, GAP, OIL) serve as endogenous variables within the model. After estimating the VAR model, an impulse response test is conducted to observe how inflation responds to shocks from the other four variables within the model. To carry out this impulse response test, the cholesky method is utilized to track how each factor impacts and transmits shocks to other factors based on their ordering. The ordered variables that respond to transmission of shock are as follows: D(LOIL), D(LEXR), D(LIMP), GAP, D(LCPI), and D(LCIC).

This study primarily focuses on examining the pass-through effect of exchange rate shocks on import price index and inflation. The accumulated impulse responses to an exchange rate shock are depicted in Figure 4.6. The analysis reveals that a one standard deviation increases in D(LEXR) results in a positive reaction of D(LCPI) following the shock. This suggests that exchange rate depreciation leads to higher levels of inflation. On the other hand, the impact on D(LIMP) is not statistically significant, indicating that exchange rate depreciation does not play a significant role in determining changes in import prices.

Figure (4.6) Impulse Responses to an Exchange Rate Shock



Source: Results are obtained by applying E-views by applying E-view software.

(d) Exchange Rate Pass-through Effect

The exchange rate pass-through effect refers to the impact of changes in the exchange rate on domestic prices. By analyzing the impulse response function, short-term

elasticities are calculated, and the pass-through coefficients are determined. To simplify the calculations, shock translation is done from "one standard deviation" to "one percent". Various studies have standardized the exchange rate shock measurement to assess the pass-through level. For instance, Leigh and Rosi (2002) used the following equation for measuring the exchange rate pass-through coefficient:

$$PT_{t,t+i} = \frac{P_{t,t+i}}{E_i}$$

Where $PT_{t,t+i}$ refers to the change in indices in period i in response to the initial shock in exchange rate and Ei represents the accumulated impact change of exchange rates to their own shocks.

Table 4.4 presents the standardized coefficients for exchange rate pass-through (ERPT). The IMP column displays the ERPT level to imports, while the CPI column shows the ERPT level to consumer prices. Interestingly, no significant ERPT effect is observed in the first year following the shock. However, a small but noticeable ERPT effect emerges in the second year, with an average of 0.03 indicating that 3% of exchange rate changes translate into import price adjustments. This suggests that firms' reactions to exchange rate shocks tend to be relatively mild over a two-year period.

In terms of consumer prices, there is a positive and modest ERPT effect observed during the first year after the shock. However, this effect becomes more pronounced during the second year. On average, 32% of exchange rate shocks are transmitted to consumer prices; thus, there is a moderate response of consumer price index (CPI) to exchange rate shocks over a two-year duration. Standardized Exchange Rate Pass-through Coefficients are provided in Appendix III.

Table (4.4) Standardized Exchange Rate Pass-through Coefficients

Period	DLIMP/Ei	DLCPI/Ei	Period	DLIMP/Ei	DLCPI/Ei
1	0.08	0.04	13	-0.22	0.28
2	0.18	0.06	14	-0.01	0.32
3	0.09	0.12	15	-0.72	0.23
4	0.15	0.13	16	-1.30	0.34
5	0.10	0.12	17	2.26	0.21
6	-0.05	0.13	18	-1.33	0.29
7	-0.05	0.12	19	-0.88	0.27
8	0.03	0.11	20	-0.34	0.41
9	-0.21	0.15	21	1.63	0.34
10	0.80	0.12	22	-2.91	0.31
11	-0.74	0.18	23	-3.39	0.48
12	-0.36	0.19	24	7.56	0.33
Average	0.00	0.12		0.03	0.32

Source: Own calculation

(e) Variance Decomposition of Inflation

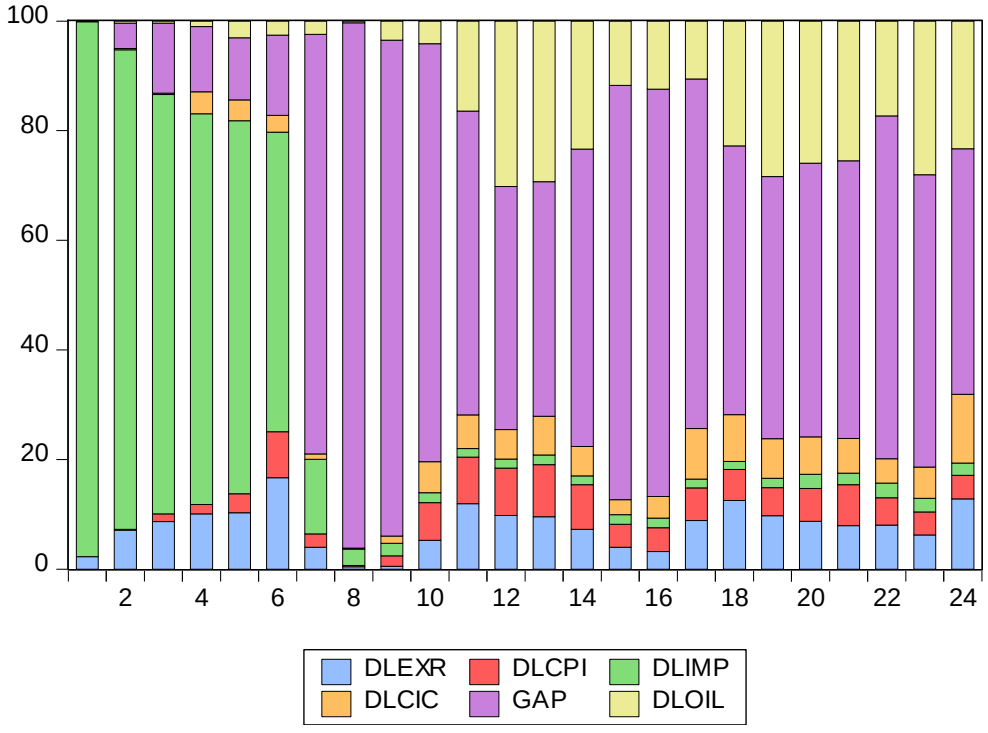
The variance decomposition test supports the findings of Taylor (2000) regarding the effects of ERPT on import prices and consumer prices. A high level of ERPT effect on import prices indicates a strong transmission effect of exchange rate shocks on import prices. If changes in the exchange rate play a significant role in the variance of import prices, then the exchange rate is an important factor in determining their movement. Therefore, it is recommended to analyze the variance decomposition of targeted variables, such as the import price index and consumer price.

For the impulse response function analysis using the Cholesky Variance Decomposition method, a 24-period timeframe is considered. The variables are ordered as follows: D(LOIL), D(LEX_RATE), D(LIMP), GAP, D(LCPI), and D(LCIC). The results for variance decomposition of D(LIMP) can be seen in Figure (4.6), while Figure (4.7) displays the results for variance decomposition of D(LCPI).

Based on the analysis, it is observed that in regard to import price (DLIMP), its variance is primarily influenced by its lagged values and output gap in the first year. In the second year, the variation in import prices is largely affected by output gap and oil price fluctuations. This implies that over a two-year period, changes in the exchange rate do not have a significant impact on variations in the import price index. The price of imports is primarily influenced by the output gap and oil prices, while changes in the exchange rate have minimal impact. When analyzing inflation, it is found that its variance is influenced by its lagged value, exchange rate, and output gap in the first year. In the second year, the variance of inflation is mainly affected by the output gap, indicating that it is the primary determinant factor. Over a two-year period, the exchange rate has a limited effect on inflation. Overall, it is commonly accepted that both the lagged value of inflation and the output gap are the main determinants of inflation in Myanmar.

Figure (4.7) Result of Variance Decomposition of DLIMP

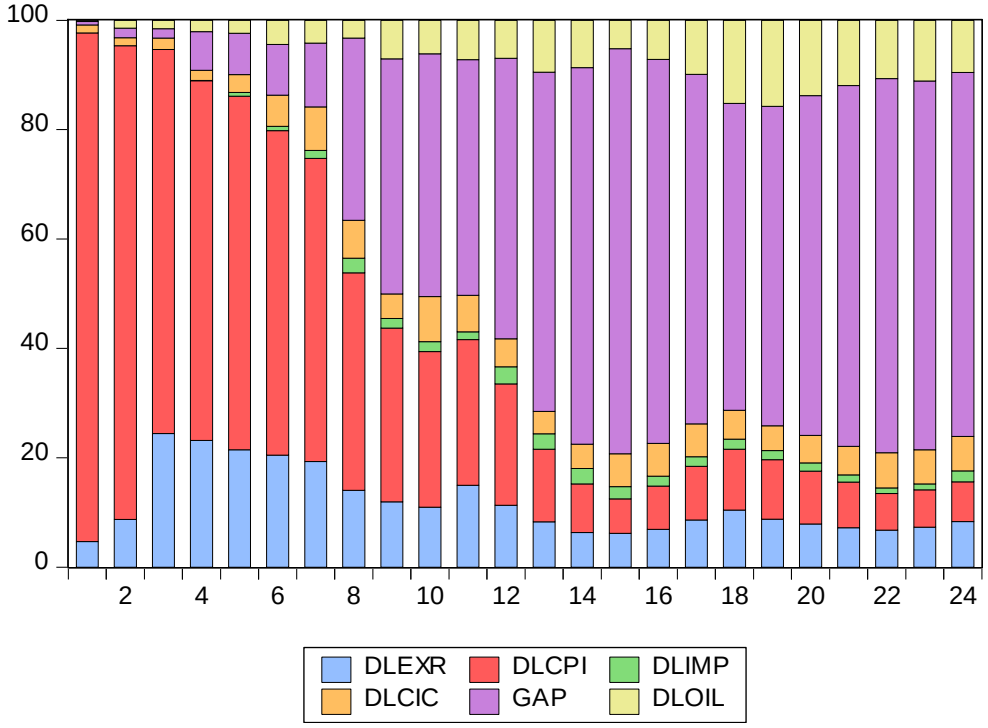
Using Cholesky (d.f. adjusted) Factors



Source: Results are obtained by applying E-views by applying E-view software.

Figure (4.8) Result of Variance Decomposition of DLCPI

Using Cholesky (d.f. adjusted) Factors



Source: Results are obtained by applying E-views by applying E-view software.

(f) Residual Tests

The result of serial correlation test and normality test are as follows:

Serial Correlation Test

To determine if there is serial correlation between residuals in VAR results, an autocorrelation test is conducted after the VAR estimation. The LM test is utilized for this purpose and the results are provided in Table 4.5. Based on the LM test, it can be concluded that there is no evidence to reject the null hypothesis of no serial correlation in residuals. Therefore, it can be inferred that there is no serial correlation present in the residuals of VAR results.

Normality Test

Furthermore, a normality test of residuals is also conducted after the VAR estimation. The normality test results are presented in Table 4.5, indicating that there is no significant deviation from normality. Hence, it can be concluded that the residuals of VAR results satisfy the assumption of normality.

Table (4.5) Diagnostic Test for VAR Model

Serial Correlation	LM test	1.25 [0.1864]
Normality	Jarque-Bera	8.20 [0.7693]
Skewness		2.05 [0.9154]
Kurtosis		6.15 [0.4062]

Source: Results are obtained by applying E-views by applying E-view software. The p-values are given in brackets.

Robustness Check

In order to ensure the reliability of our findings, this study aims to conduct a robustness check on the baseline ERPT results. Two additional variables, namely budget deficit and interest rate (T-Bill rate) have been included in the baseline model specification.

The standardized exchange rate pass-through (ERPT) coefficients are presented in Table (4.6). It is worth noting that these ERPT results align well with the baseline findings, indicating that the baseline results remain robust even after incorporating the two new variables into the model.

Table (4.6) Standardized Exchange Rate Pass-Through Coefficients

(For Robustness Check)

Pass-Through Coefficients					
Period	DLIMP/Ei	DLCPI/Ei	Period	DLIMP/Ei	DLCPI/Ei
1	0.15	0.02	13	0.17	0.19
2	0.36	0.03	14	0.78	0.21
3	0.21	0.07	15	-1.01	0.09
4	0.34	0.05	16	-0.02	0.18
5	0.22	0.02	17	2.89	0.25
6	0.07	0.05	18	-1.48	0.16
7	0.36	0.06	19	-1.36	0.06
8	-0.06	0.06	20	0.37	0.21
9	-0.16	0.09	21	5.20	0.29
10	1.20	0.10	22	-4.77	0.13
11	-0.71	0.13	23	0.88	0.11
12	-0.20	0.08	24	5.06	0.65
Average	0.15	0.06		0.56	0.21

Source: Own Calculation

Regarding the ERPT analysis, the findings reveal that the average ERPT is 0.15 in the initial year and rises to 0.56 in the following year. This signifies that 15% of exchange rate fluctuations impact import prices during the first year, whereas 56% of exchange rate variations influence import prices during the second year.

The ERPT effect on consumer prices is initially positive but remains small during the first year after the shock. However, it becomes more considerable in the second year. Specifically, the average ERPT to consumer prices reaches 0.21 in this period, indicating that 21% of exchange rate shocks are transmitted to consumer prices. Overall, there exists a relatively moderate response from CPI to exchange rate fluctuations over a two-year timeframe.

CHAPTER V
CONCLUSION

The following section presents the conclusions and recommendations regarding the relevance of the exchange rate regime in Myanmar from 2013 to 2020. Choosing an appropriate exchange rate regime is a crucial macroeconomic policy for any country, and it should be periodically evaluated as a country's macroeconomic and structural characteristics evolve over time. This chapter draws on the analysis of the degree and speed of exchange rate pass-through to inflation, as well as an examination of exchange rate misalignment in Myanmar, to determine whether the managed floating exchange rate regime implemented during the period from 2013 to 2020 aligns with Myanmar's economic situation.

5.1 Findings

This section presents findings derived from evaluating the results of exchange rate pass-through (ERPT), assessing exchange rate misalignment, and providing an overall assessment of the relevance of the managed floating exchange rate regime in Myanmar.

(a) Findings: Exchange Rate Misalignment

During the study period from 2013 to 2020, Myanmar experienced various fluctuations in NEER misalignments. The country's currency went through periods of both undervaluation and overvaluation, with particularly volatile levels of exchange rate misalignments observed in 2017, 2018, and 2020. In 2020, the NEER became significantly overvalued after experiencing undervaluation in the previous years of 2017 and 2018. This shift can primarily be attributed to macroeconomic instability resulting from a severe economic downturn caused by the Covid-19 pandemic. This instability led to large deficits in both the current account and government budget.

To assess the suitability of the managed floating exchange regime employed in Myanmar, an equilibrium exchange rate was initially estimated using a reduced-form equation based on models proposed by Edwards (1988) and Elbadawi (1994). These models are grounded in theoretical foundations of exchange rate determination. Through a cointegration approach, a long-run relationship between NEER and a set of fundamental variables was established for Myanmar. These fundamental variables used to model the determinants of equilibrium nominal effective exchange rate (ENEER) include net foreign assets, the ratio of government expenditure to GDP, net exports to GDP ratio, and private sector credit growth. The findings indicate that in the long run, NEER is positively influenced by net foreign assets and private sector credit growth while being negatively affected by government expenditure and net exports.

The error-correction term is derived from the long-run model. The findings demonstrate that the error correction term, which measures how quickly the nominal effective exchange rate (NEER) adjusts to its equilibrium level, is statistically significant. The estimated coefficient of the error correction term indicates that approximately 1.91 percent of NEER deviations from equilibrium are corrected each month. The adjustment speed appears to be higher in countries with flexible and managed exchange rate regimes, while it is relatively lower in those with fixed exchange rate regimes. Additionally, the negative coefficient on the error-correction term suggests that it gradually adjusts overvalued NEER downwards to its equilibrium position. On average, it takes around 36.1 months to eliminate 50 percent of a shock to the nominal effective exchange rate and 72.3 months to eliminate 75 percent of such a shock.

In terms of misalignments, based on the acceptable threshold of +/- 5 percent for exchange rate misalignment set by the IMF, NEER was found to be misaligned (overvalued) for approximately 13.51 percent of the observed period and misaligned (undervalued) for around 41.89 percent. Overall, during the period from 2013-2020, NEER experienced misalignments for about 51.9 percent of the months analyzed. Furthermore, based on our estimations, exchange rate misalignments in Myanmar during the years 2017, 2018 and 2020 are identified.

Therefore, based on the measurement of exchange rate misalignment test, it is determined that the adopted managed floating exchange rate regime may not be suitable

for the economic situation in Myanmar during the study period. It is important to note, however, that this does not imply that the managed floating exchange rate regime is irrelevant for Myanmar. The paper further explores the impact of exchange rate pass-through on domestic inflation in Myanmar as another approach to assess the relevance of the exchange rate regime in Myanmar.

(a) Findings: Exchange Rate Pass-through Effect

To analyze the impact of exchange rate pass-through, a Vector Autoregressive (VAR) model is employed. with inflation as the dependent variable and five independent variables with eight lags. These variables include exchange rate, import price index, currency in circulation, output gap, and world oil price. After estimating the VAR model, an impulse response test is conducted to track the effect of shocks from the other four variables on inflation. The cholesky method is used to determine the impact from one factor to another based on the ordering: D(LOIL), D(LEXR), D(LIMP), GAP, D(LCPI), and D(LCIC).

This study primarily focuses on the pass-through effect of exchange rate shocks on the import price index and subsequent inflation. The results indicate that a one standard deviation increase in D(LEXR) leads to a positive response in D(LCPI) after the shock occurs. This suggests that depreciation in exchange rates leads to higher inflation. However, when it comes to D(LIMP), our findings show no significant response of import prices to exchange rate shocks, indicating that exchange rate depreciation does not play a clear role in determining changes in import prices. There is no evidence of any ERPT effect in the first year following the shock. However, in the second year, a small ERPT effect is observed with an average of 0.03, indicating that 3% of the exchange rate change affects import prices. This suggests that firms have relatively minor reactions to exchange rate shocks over a two-year period. On the other hand, there is a positive and small ERPT effect on consumer prices in the first year after the shock, while the impact on consumer prices becomes larger in the second year. The average ERPT to consumer prices in the second year is 0.32, meaning that 32% of the exchange rate shock translates into changes in consumer prices. Overall, the response of CPI to exchange rate shocks remains moderate over a two-year period.

To analyze these effects further, Cholesky Variance Decomposition method is used for Impulse Response Function analysis over 24 periods. The variables are ordered as follows: D(LOIL), D(LEX_RATE), D(LIMP), GAP, D(LCPI), and D(LCIC).

Based on our variance decomposition results for import price (DLIMP), it is found that its variance is largely influenced by lagged values and output gap in the first year. In the second year, however, it is primarily affected by output gap and oil prices. As observed, the exchange rate does not have a significant impact on the variance of the import price index over a two-year period. The primary factors influencing import prices are identified as the output gap and oil price, with the change in exchange rate playing a negligible role in determining fluctuations in import prices.

The analysis of inflation variance decomposition (DLCPI) reveals that in the first year, inflation is influenced by its lagged value, exchange rate, and output gap. However, in the second year, the variance of inflation is predominantly affected by the output gap, indicating that it serves as the main determining factor for inflation. Over a two-year duration, it can be concluded that fluctuations in the exchange rate have minimal impact on inflation. Consequently, it is commonly suggested that both the lagged value of inflation and output gap serve as major determinants for inflation in Myanmar.

(c) Evaluation

In this study, an evaluation of the managed floating exchange rate regime in Myanmar from 2013 to 2020 is conducted. Our analysis focused on two aspects: identifying exchange rate misalignment and analyzing the effect of exchange rate pass-through on inflation.

According to the IMF, a threshold of +/- 5 percent is considered acceptable for exchange rate misalignment. During the study period, the NEER exhibited misalignment from the equilibrium exchange rate for approximately 51.9 percent of the time. Notably, significant misalignments occurred in 2017, 2018, and 2020.

The misalignment in 2015 was primarily attributed to the economic downturn caused by Komen Cyclone in Myanmar. However, after revising the methodology for foreign exchange auctions in 2018, which involved transitioning from two-way auctions to one-way auctions, there was a regain of stability in exchange rate movement. The most

notable misalignment occurred in 2020 due to the severe economic downturn caused by Covid-19.

Empirical findings reveal that net foreign assets and private sector credit growth are significant determinants of long-run exchange rate misalignment. Additionally, NEER lag and private sector credit growth play important roles in short-run exchange rate misalignment. However, when examining the effects of exchange rate pass-through, our analysis indicates a low pass-through to both import prices and consumer prices.

Therefore, it can be concluded that, according to a misalignment of 51.9% and 32% pass-through of inflation after 2 years for the study period 2013-2020. Therefore, the relevancy of managed floating exchange rate regime in Myanmar during 2013-2020 was neutral to be in line with the macroeconomic situation. However, the significant misalignments observed in 2015 and 2020 were predominantly caused by natural disasters and the global pandemic. As a result, the exchange rate system implemented during this study faced challenges in absorbing external shocks.

5.2 Recommendations

The selection of an exchange rate regime holds significant implications for Myanmar's economy. Therefore, it is essential to periodically evaluate the performance of the exchange rate regime.

As discussed in Chapter 2, there are many factors determining choice of exchange rate regime, including OCA approach, view from financial aspect (impossible trinity approach), view from political aspect. The selection of an exchange rate regime in Myanmar is analyzed based on the framework developed by Husain (2006). This framework includes economic integration, financial integration, economic diversification, macroeconomic stabilization, central bank independence and credibility.

Economic integration can be measured by three indicators: trade concentration, trade openness and cyclical synchronicity with trade partners according to Husain (2006). As regard the trade integration or trade concentration, Myanmar’s main trading partners are Singapore, Thailand and Malaysia, accounting for 40 percent of imports in 2020, and the currency with the most weight in imports is US dollar. Therefore, in

context of trade integration, as Myanmar's trade concentration is not too much, fixed exchange rate regime would be appropriate for Myanmar.

Level of financial development has implication for choice of exchange rate regime. Adopting a floating exchange rate regime is not possible without having a developed financial market. The level of financial integration for a country can be determined by its inclusion or exclusion from the Morgan Stanley Capital International Emerging Market Index, as stated by Rogoff et al. (2004). In this regard, Myanmar is not considered integrated with international capital markets since it is not listed on the index. Additionally, the monetization ratio, which represents the ratio of money to GDP, is another measure used to assess the level of financial integration. While the low level of monetization ratio indicates less developed financial market, the monetization ratio for Myanmar is 54 percent in 2020, suggesting that a moderate level of exposure to capital flows, and therefore this supports an intermediate exchange rate regime for Myanmar.

Economic diversification is an important factor to determine the choice of exchange rate regime. The more diversified the economy, the lower the exposure of a shock to a single sector to the aggregate economy, the less need for exchange rate adjustment. If a country highly depends on one or a few commodities export, exchange rate adjustment would be necessary to cope with changes in the world commodity prices. Countries depending on one or few commodities should peg their exchange rate to the world commodity price (Frankel, 2003). The measurement of trade diversification can be assessed by analyzing a country's terms of trade and the proportion of primary goods in its GDP (Husain, 2006). In Myanmar, the share of primary exports, including agriculture, fishery, forest products, mining, and natural gas, constitutes approximately 50 percent of the GDP in 2020. This indicates that there is a limited trade diversification, thus an intermediate regime can be suitable for promoting trade diversification in Myanmar.

The primary factors influencing macroeconomic stabilization are the nature of economic shocks and the level of capital mobility. When a country is more susceptible to real shocks, such as fluctuations in terms of trade or natural disasters, it is advisable to implement a floating exchange rate regime, as suggested by Kenen (1969). On the other hand, countries experiencing nominal shocks may benefit from adopting fixed exchange

rates, since changes in money demand can be accommodated by adjustments in money supply.

The findings of the study indicate that there are several interconnected reasons for this phenomenon. One key factor is attributed to the early stage of financial sector development and an underdeveloped money market. Additionally, other sectors, particularly structural reforms, still require attention and action.

To address these issues, it is essential to foster the development of financial markets. This can be achieved by closing regulatory gaps and establishing a conducive institutional environment. Sufficient macroeconomic instruments should also be available to withstand unexpected shocks and guide policy directions effectively. Furthermore, it is crucial to ensure consistency and sequentially among exchange rate policy, trade policy, and other related policies.

In addition, it is important to prioritize the improvement of the money market and financial market to support overall economic development. This is because the exchange rate regime and exchange rate policy have a significant impact on a country's macroeconomic and financial stability. It is crucial to maintain an adequate amount of foreign exchange reserve in order to utilize it when necessary and respond effectively to both real and nominal shocks.

Likewise, maintaining an adequate level of foreign exchange reserves is very important in Myanmar, to ensure exchange rate stability. While flexible exchange rates can act as a shock absorber, countries that are highly susceptible to natural disasters are strongly advised to have sufficient reserves. Given Myanmar's vulnerability to natural disaster shocks, it is important for the country to maintain enough foreign exchange reserves to stabilize both exchange rates and domestic prices.

In addition, in order to achieve this stability and effectively respond to nominal and real shocks, it is necessary for Myanmar to enhance its monetary policy framework and upgrade monetary policy tools. Strengthening the banking sector is also vital in this regard.

Research has shown that private sector credit growth significantly influences exchange rate misalignment. Therefore, it is crucial for credit to be extended to the private sector to be targeted towards productive sectors of the economy. This approach

can contribute to a favorable external position and facilitate the accumulation of foreign exchange reserves.

In today's complex economy, where factors contributing to price instability encompass goods and services prices, wages, interest rates, and exchange rates, fiscal policy plays a significant role in stabilizing domestic prices. As such, financing by the central bank for government budget deficits should be conducted with prudence. Given that policy actions have wide-reaching consequences, it is crucial for policymakers to thoroughly contemplate and anticipate the potential impacts of any proposed policies before implementation.

Therefore, the relevancy of managed floating exchange rate regime in Myanmar during 2013-2020 was neutral to be in line with the macroeconomic situation. However, the significant misalignments observed in 2015 and 2020 were predominantly caused by natural disasters and the global pandemic. This study suggests that accumulating foreign exchange reserve to intervene and sufficient necessary, strengthening financial market development for effective monetary policy transmission channel to stabilize the inflation rate, being consistent among the monetary and fiscal policies and exchange rate policy and sufficient financing to investors and traders to help improve trade facilitation are main policy agendas for Myanmar for the managed floating exchange rate regime (intermediate regime) more effective in its implementation. Like other open economies, it is also suggested for Myanmar to adopt more flexible exchange rate regime rather than fixed exchange rate regime in order to absorb external shocks.

5.3 Further Studies

When analyzing the relevancy of exchange rate regime in Myanmar, there are still many relevant and related factors influencing the exchange rate misalignment and exchange rate pass through effect on inflation in Myanmar. Especially for identifying the equilibrium exchange rate, if more related variables, for example, terms of trade, trade openness, net capital inflow, relative price of non-traded to traded goods, interest rate differential, more accurate estimated can be obtained. Moreover, as the exchange rate regime changed from a fixed to managed floating exchange rate regime and the reliable data for the period before 2013 was not available, this study was conducted for the period

between 2013 and 2020. If more and reliable observations could be included in the study, the result would be more appropriate.

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APPENDICES

Appendix I

Methodology on determination of NEER & REER

Nominal Effective Exchange Rate (NEER) is calculated as a weighted geometric average of nominal exchange rates against main trade partner countries' currencies (see below).

$$NEER = \prod_{i=1}^{n} \left[1 / e_i \right]^{w_i}$$

Where e_i is nominal exchange rate to the i partner countries' currencies, w_i - weight of the country i in the foreign trade turnover of Myanmar, *n* - number of major trading partner countries of Myanmar.

The growth of the index means appreciation of Myanmar currency (MMK). The reduction indicates depreciation.

Real Effective Exchange Rate presents evolution of the REER index based on the CPI. It is computed as a weighted geometric average of the real exchange rates to the major trade partners' currencies (China, Thailand, Singapore, Japan, India, Malaysia, Eurozone, Indonesia, South Korea, USA, Hong Kong, UK). The formula for calculation is:

$$REER = \prod_{i=1}^{n} \left[\frac{P}{Pi} * \left(1 / e_i \right) \right]^{w_i}$$

Where e_i is nominal exchange rate to the i partner countries' currencies, w_i - weight of the country i in the foreign trade turnover of Myanmar, P and P_i - consumer price indices in Myanmar and country i, *n* - number of major trading partner countries of Myanmar.

An increase in the REER represents the real appreciation of MMK whereas decrease denotes vice versa.

The indices use weights based on trading with above mentioned countries: China (41%), Thailand (17%), Singapore (13%), Japan (7%), India (6%), Malaysia (3%), Eurozone (3%), Indonesia (3%), South Korea (3%), USA (2%), Hong Kong (1%), UK (1%).

The trade turnover with selected major trading partners covers not less than 85% of the overall Myanmar foreign trade.

Appendix (II)

Months	Actual NEER	Equilibrium NEER	Misalignment from Equilibrium NEER	Misalignment from Equilibrium NEER (%)
2014M06	92.39	88.70	3.69	4.16
2014M07	91.54	88.34	3.20	3.62
2014M08	91.69	87.98	3.71	4.22
2014M09	91.62	87.62	4.00	4.56
2014M10	90.54	87.27	3.27	3.75
2014M11	89.09	86.91	2.18	2.50
2014M12	89.99	86.56	3.43	3.96
2015M01	90.36	86.21	4.15	4.81
2015M02	90.6	85.87	4.73	5.51
2015M03	91.17	85.52	5.65	6.60
2015M04	87.27	85.18	2.09	2.45
2015M05	86.41	84.85	1.56	1.84
2015M06	85.31	84.51	0.80	0.94
2015M07	79.82	84.19	-4.37	-5.19
2015M08	77.26	83.87	-6.61	-7.88
2015M09	76.59	83.55	-6.96	-8.33
2015M10	75.93	83.24	-7.31	-8.79
2015M11	76.1	82.94	-6.84	-8.25
2015M12	75.71	82.64	-6.93	-8.39
2016M01	76.66	82.35	-5.69	-6.91
2016M02	78.98	82.06	-3.08	-3.76
2016M03	79.66	81.77	-2.11	-2.59
2016M04	81.24	81.49	-0.25	-0.31
2016M05	82.77	81.20	1.57	1.93
2016M06	81.64	80.92	0.72	0.89
2016M07	82.16	80.63	1.53	1.90
2016M08	80.5	80.34	0.16	0.20
2016M09	78.58	80.05	-1.47	-1.83
2016M10	76.87	79.75	-2.88	-3.61
2016M11	76.67	79.44	-2.77	-3.49
2016M12	75.09	79.13	-4.04	-5.11
2017M01	74.36	78.81	-4.45	-5.65
2017M02	73.39	78.48	-5.09	-6.49
2017M03	73.04	78.14	-5.10	-6.53
2017M04	72.69	77.79	-5.10	-6.56

2017M05	72.34	77.43	-5.09	-6.57
2017M06	71.8	77.05	-5.25	-6.81
2017M07	71.34	76.66	-5.32	-6.93
2017M08	70.61	76.25	-5.64	-7.39
2017M09	70.24	75.83	-5.59	-7.37
2017M10	70.56	75.39	-4.83	-6.41
2017M11	70.06	74.94	-4.88	-6.51
2017M12	69.73	74.48	-4.75	-6.37
2018M01	69.2	74.00	-4.80	-6.49
2018M02	69.19	73.52	-4.33	-5.89
2018M03	68.75	73.03	-4.28	-5.86
2018M04	69.08	72.53	-3.45	-4.75
2018M05	69.38	72.02	-2.64	-3.66
2018M06	69.13	71.50	-2.37	-3.32
2018M07	68.58	70.99	-2.41	-3.39
2018M08	66.32	70.47	-4.15	-5.89
2018M09	63.05	69.95	-6.90	-9.87
2018M10	64.44	69.43	-4.99	-7.19
2018M11	62.86	68.92	-6.06	-8.79
2018M12	62.6	68.41	-5.81	-8.49
2019M01	62.95	67.90	-4.95	-7.29
2019M02	62.87	67.40	-4.53	-6.72
2019M03	63.03	66.91	-3.88	-5.79
2019M04	63.44	66.42	-2.98	-4.49
2019M05	63.43	65.94	-2.51	-3.81
2019M06	63.52	65.47	-1.95	-2.98
2019M07	63.86	65.01	-1.15	-1.77
2019M08	64.64	64.55	0.09	0.13
2019M09	64.07	64.11	-0.04	-0.06
2019M10	63.86	63.67	0.19	0.30
2019M11	64.19	63.24	0.95	1.50
2019M12	64.72	62.82	1.90	3.02
2020M01	65.75	62.41	3.34	5.36
2020M02	67.74	62.00	5.74	9.26
2020M03	70.97	61.60	9.37	15.22
2020M04	70.58	61.20	9.38	15.32
2020M05	71.21	60.81	10.40	17.10
2020M06	70.74	60.43	10.31	17.07
2020M07	71.7	60.04	11.66	19.41
2020M08	71.6	59.67	11.93	20.00
2020M09	73.04	59.29	13.75	23.19
2020M10	74.14	58.92	15.22	25.84
2020M11	72.68	58.55	14.13	24.14
2020M12	69.73	58.18	11.55	19.85

APPENDIX III

Measuring the Pass-Through Coefficients

In order to calculate the pass-through coefficients, translation is made that one shock is equivalent to one percent shock in exchange rate. The shock in one S.D of D(LEXR) is equal to 0.018173 as measured by one standard deviation of D(LEXR). The shocks at time t=0 also leads to the change in exchange rate in period i. The change in import price index (IMP) in period I as reported in the impulse response is a result of one S.D. change of D(LEXR) at time t=0(e_i) and change in D(LEXR) at time t=i. Therefore, to break down the effect of one percent change in t=0, the accumulated changes of D(LEXR) at time t=I equal $E_i=e_i+0.016846$. Leigh and Rosi (2002) measure the pass-through coefficients as follow:

$$PT_{t,t+i} = \frac{P_{t,t+i}}{E_i}$$

Where $PT_{t,t+i}$ is change in indices in period i in response to the initial shock in exchange rate and E_i is the accumulated impact change of exchange rates to their own shocks.

Period	D(LEXR)	Ei	D(LIMP)	D(LCPI)	D(LIMP)/Ei	D(LCPI)/Ei
1	0.015815	0.03	0.002665	0.001209	0.08	0.04
2	0.021959	0.04	0.007147	0.002447	0.18	0.06
3	0.027922	0.04	0.003863	0.005284	0.09	0.12
4	0.028996	0.05	0.006971	0.006134	0.15	0.13
5	0.031756	0.05	0.00504	0.005815	0.10	0.12
6	0.032944	0.05	-0.00228	0.006537	-0.05	0.13
7	0.033908	0.05	-0.00272	0.006251	-0.05	0.12
8	0.034638	0.05	0.00141	0.005694	0.03	0.11
9	0.034731	0.05	-0.01083	0.007679	-0.21	0.15
10	0.039192	0.06	0.044551	0.006451	0.80	0.12
11	0.039676	0.06	-0.04155	0.010143	-0.74	0.18
12	0.040518	0.06	-0.02045	0.010753	-0.36	0.19
13	0.031273	0.05	-0.01082	0.013525	-0.22	0.28
14	0.033982	0.05	-0.00052	0.016312	-0.01	0.32
15	0.028988	0.05	-0.03294	0.010759	-0.72	0.23
16	0.031886	0.05	-0.06317	0.016711	-1.30	0.34
17	0.032281	0.05	0.111079	0.010079	2.26	0.21
18	0.044503	0.06	-0.08184	0.0178	-1.33	0.29
19	0.040532	0.06	-0.05067	0.015771	-0.88	0.27
20	0.029566	0.05	-0.01597	0.019105	-0.34	0.41
21	0.049069	0.07	0.107684	0.022716	1.63	0.34
22	0.034443	0.05	-0.14902	0.016064	-2.91	0.31
23	0.036333	0.05	-0.18038	0.025558	-3.39	0.48
24	0.024884	0.04	0.315575	0.013771	7.56	0.33
				Average	0.02	0.22