FISCAL DEFICIT AND ITS IMPACT ON INFLATION, CAUSALITY AND CO-INTEGRATION: THE EXPERIENCE OF MYANMAR (1988-2015)

By

Thandar Win

THESIS

Submitted to

KDI School of Public Policy and Management

In Partial Fulfillment of the Requirements

For the Degree of

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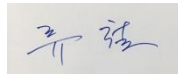
For the Degree of

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Committee in charge:

Professor Sang Moon HAHM, Supervisor _____

Professor Cheol LIU _____

Professor Tae Hee CHOI _____

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Fiscal Deficit and its Impact on Inflation, Causality and Co Integration:
The Experience of Myanmar (1988-2015)
By
Thandar Win

The main objective of this paper is to **observe the fiscal deficit and its impact on inflation for Myanmar** and examine whether fiscal deficit effect directly or indirectly on **inflation** by using an econometric model for the period 1988-2015. The fiscal deficit in Myanmar continues to deteriorate and pose the long lasting for the growth in the longer time horizon. This study tried to examine the budget deficit's impact on inflation not only in the long run but also in the short run. The long and short run estimations are investigated using Engle-Granger co-integration technique and error correction model. Two variables including Budget deficit to GDP ratio and inflation are used in this analysis. The data is collected from the Ministry of Finance and the World Bank. Through the analysis findings show that Growth in deficits positively Granger causes inflation. That's why this observation concluded that the inflation causes the budget deficit and the budget deficit causes the inflation. There is **bidirectional causal relationship** in both inflation variable and budget deficit variable and exists **a long run relationship** between budget deficit and inflation from Engle-Granger co-integration test. Therefore, monetary and fiscal policy needs to coordinate with each other for curbing the inflation.

Key words: Fiscal Deficit, Inflation, Budget Deficit Ratio to GDP, Co-integration Analysis, Granger Causality Test, Myanmar.

ACKNOWLEDGMENTS

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LIST OF ABREVIATIONS

WB	World Bank
IMF	International Monetary Fund
ECM	Error Correction Model
GDP	Gross Domestic Product
BD	Budget Deficit
I	Inflation
CBM	Central Bank of Myanmar
AIC or SIC	Akaike or Schwarz information criterion
MOPF	Ministry of Planning and Finance
ADF	Augmented Dickey-Fuller
H_0	Null hypothesis
H_1	Alternative hypothesis
HQIC	Hannan and Quinn information criterion
SBIC	Schwarz's Bayesian information criterion
VAR	Vector Autoregression
AC	Autocorrelation
PAC	Partial Autocorrelation
BGSCLM	Breusch-Godfrey serial correlation LM
LBD	Log of Budget Deficit
LI	Log of Inflation

CHAPTER ONE

INTRODUCTION

1.1   Introduction

Myanmar has a lot of potential to foster its progress and the highest living standard of the Myanmar people. Its location in one of the fasted growing regions in the globe and incorporated with its forecasted increased budget revenues from the prosperous resource region, has supplied the country with an enormous prospective for economic development and improvement over the more extended term. In its effort to realize this prospective, however, Myanmar has encountered a series of essential challenges. The first of these challenges is achieving and maintaining macroeconomic stability- a necessary building block for higher and sustained economic growth.

Economic progress is one of the crucial purposes of every civilization and economic blooming is rudimentary to economic progress. There exist numerous conditions that ascribe to economic blooming. Both Inflation and budget deficit have been identified as essential accelerators of growth.

Fiscal deficit occurs when the government spends more than the revenue it earns. To overcome the shortfall of revenue resulting from excess expenditure, funds are raised from the external and internal sources available to the government. External sources include loans from foreign agencies like the IMF and WB, while internal sources include government-issued- securities, bills and bonds. Deficit financing in Myanmar has grown in recent years.

A substantial portion of the fiscal deficit is printing money (monetized) by the CBM. This means that the CBM purchases government issued debt securities. The financing of the

deficit place upwards pressure on the rate of interest as the government obligation securities rival private equities and debts as a result of the limited capital because of the stamping of currency or the issuing of banknotes by central banks. The part of the fiscal budget deficit, financed by taking from the Central Bank of Myanmar prompts an expansion of the money supply. The higher money supply inevitably leads to inflation. (Bhatacharya, 2009)

The Myanmar Government fiscal deficit has averaged 3.5% of GDP from 1994 until 2005. The Union fiscal deficit was equal to -3.1% of GDP in 2006 and -4.7% of GDP in 2015 (Myanmar Government Budget, 2016). Given the increasing fiscal deficit, questions need to be raised.

The primary intention of this investigation is to verify the direct and indirect effect of fiscal deficit on inflation in Myanmar and explore how impromptu expenditures have caused enormous the fiscal deficit and inflation in Myanmar. Secondly, it explores the long run correlation between these variables with the existing data.

1.2   Statement of Issue

Researchers have focused on evaluating the impact of fiscal deficit on inflation and compared it with other macroeconomic variables like the rate of interest, and exchange rate. Adesuyi and Falowo (2016) aims to test the existing ratios and distinguish which are the best for evaluating the fiscal deficit's impact on inflation. Although there is little existing research paper regarding the fiscal deficit, it has not yet given a comprehensive view on fiscal deficit evaluation. There are currently no research papers on Myanmar utilizing econometric techniques and macroeconomic data measures.

This study therefore, tries to replenish the lack of research in the area by observing the fiscal deficit and its impact on inflation for Myanmar. I will also examine whether there is a direct or indirect effect of fiscal deficit on inflation.

1.3 Objective of the Thesis

The purpose of this study is four-fold, as follows:

(i) To verify the direct or indirect effect of fiscal deficit on inflation

(ii) To explore how impromptu expenditure causes enormous fiscal deficit inflation in Myanmar

(iii) To explore for the long-run correlation between these variables in existing data

(iv) To propose an appropriate policy recommendation for course correction

1.4 Questions of Research

The analysis will undertake two critical research questions related to the impact of fiscal deficit on inflation in Myanmar:

(i) What is the relationship between the fiscal deficit and inflation in Myanmar?

(ii) How does fiscal deficit affect inflation?

1.5 Scope and Limitation of Study

This study describes inflation in Myanmar only for the period *1988-2015* due to lack of data prior to the year *1988*. This paper is also limited for relying mostly on descriptive analysis.

1.6   Organization of Paper

The research paper was arranged as follows. Chapter two presents an overview of the Myanmar budget deficit condition and its trend. Literature reviews, including hypothetical and evidence-based verification on budget deficit and its impact on inflation are presented in chapter three. Chapter four offers description, data sources, model specifications and estimation techniques. Chapter five demonstrates examinations and outcomes of a study. Finally, chapter six presents the conclusion and policy recommendations constructed on the evaluated outcomes.

CHAPTER TWO

OVERVIEW OF THE MYANMAR'S MONETARY POLICY AND

MACROECONOMIC TRENDS

2.1 Monetary Policy Management Reactions

Myanmar's financial system has been reconstructed since 1989-1990 at the commencement of the economic system that is market oriented one.

"*In order to establish a sound and efficient financial system to facilitate the operation of its market-driven economy, the relevant amendments were made to the existing laws and the following new laws were promulgated for the banking sector: The Central Bank of Myanmar Law (1990), The Financial Institutions of Myanmar Law (1990), The Agricultural and Rural Development Bank Law (1990) and The New Saving Bank Law (1990).*" (Maskay, 2010, pp. 129-130)

As CBM is the monetary authority, it conceives and executes the policy of monetary, with the following purpose:

(i)   Maintain the Myanmar currency's value

(ii)   Assist in proficient settlement procedure

(iii)   a sound financial technique is to be the liquidity, proper functioning and solvency

(iv)   Assist in proficient settlement procedure

(v)   Strengthen the monetary, credit and financial specification for stability and continuous economic growth.

The CBM predominantly uses the interest rate policy, the reserve requirements and

the open market operations that is the monetary policy. Administering a prudential policy, the CBM is able to not only maintain macroeconomic stability but also promote domestic savings. By enforcing the following prudential requirements, the operations of banks in Myanmar are regulated by the CBM:

(i)   Minimum reserve requirements

(ii)   Control for Liquidity

(iii)   Capital Adequacy ratio

(iv)   Legal lending limit

(v)   Methods of calculation of the prudential requirement

If the monetary policy transmission channel is effective, the financial system and macroeconomic conditions will be effectively interrelated each other. The main transmission channels of monetary policy are the change of reserve requirements, the change of interest rates.

To assemble domestic savings and lessen the fiscal deficit, the CBM has issued to the public not only the 3-year and 5-year Treasury bonds, but also 2-year Treasury bonds. The 2-year Treasury bond is denominated of ten million kyats with 10.5% per annum the interest rate on 1 January, 2010.

The CBM stood by a self-governing and independent administrative body according to the Central Bank of Myanmar Law in 2013. Formerly, the Bank was under the Ministry of Finance and its principal responsibility was to finance the deficit of the government. The CBM nowadays operates as issuer of a treasury bond to be sold.

2.2 Macroeconomic Trends in Myanmar

The GDP growth rate of Myanmar inclined up 8.5% in 2014 from a revised 5.6% in 2011. In 2017, the World Bank projects GDP growth as 7.1% in the 2015-2016 FY to 6.5% in 2016-2017 FY (World Bank, 2017). The growth estimation mainly supported by increased investment; trade activities and greater exports of oil and gas, credit growth and larger tourism income. In 2008, the growth rate in Myanmar was decline to 3.6 because of the cyclone Nargis. A structure reform process was made and the economy has developed 5.6 percent in 2011. Myanmar's real GDP growth rises up 5.6% in 2011 to 8.4% in 2013 as shown in below figure.

Figure 1. Real GDP growth of Myanmar from the period FY 2003-2004 to FY 2014-2015

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014*	2015*
Growth Rate	13.8	13.6	13.6	13.1	12.0	3.6%	5.1%	5.3%	5.6%	7.3%	8.4%	8.5%	8.5%

*Estimate
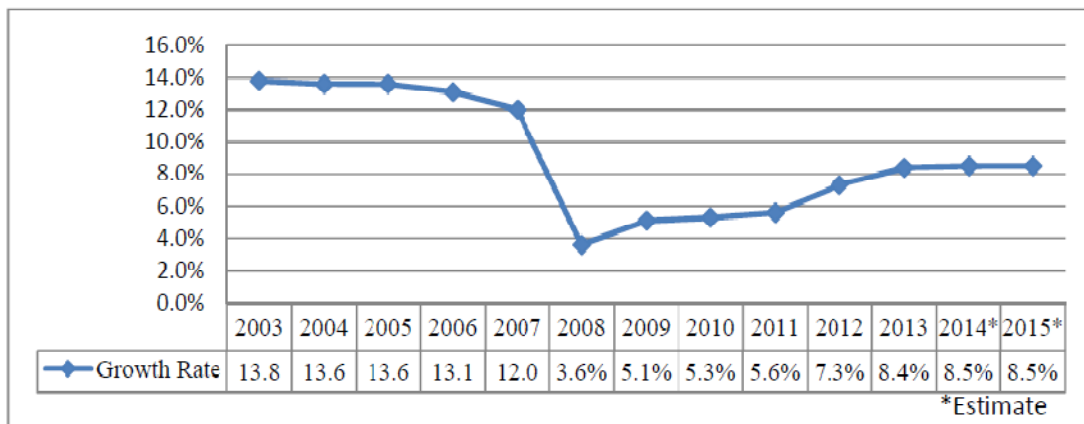
Source: IMF, World Economic Outlook database, October, 2015.

The figure 2 is shown some foreign grants and loans' situations from the periods of 2011 to 2015. After the period 2011, foreign grants and loans have tremendously been received as shown in figure 2.

Figure 2. Yearly data of Foreign Grants and Loans from the Period FY 2011-2012 to FY 2015-2016

Tax, revenue, expenditure and deficit to GDP ratio in Myanmar from the period 2011 to 2015 is shown in figure 3. "*Expenditure increased in four-year transition period although revenue increased from 13.8 percent of GDP in 2011 to 25.5 percent of GDP in 2014. The budget deficit for FY 2015-2016 was 4.9 percent of GDP and an increase of 1 percent point of GDP compared to FY 2014-2015, but also no more than 5 percent of GDP, with the government currently targeting a deficit of 5 percent to GDP, as following figure 3. According to figure 3, tax to GDP ratio was 9.0% although revenue to GDP ratio in FY 2014-2015 was 25.5 percent. In FY 2011-2012, tax to GDP ratio was extremely low 3.6% which increased to 9.0 percent in FY-2015-2016.*"(Aung Myat Kyaw, 2015, pp. 5, 6)

Figure 3. Revenue, Tax, Budget Deficit to GDP ratio, and Expenditure from the period of 2011-2015

Percent of GDP

	2011-2012 (Actural)	2012-2013 (Actural)	2013-2014 (Provisional Actural)	2014-2015 (Revised Estimate)	2015-2016 (Budget Estimate)
Tax to GDP	3.6%	6.6%	6.1%	9.0%	9.0%
Revenue to GDP	13.8%	23.7%	23.9%	25.5%	23.2%
Expenditure to GDP	17.3%	26.2%	25.2%	29.4%	28.1%
Deficit to GDP	3.5%	2.4%	1.3%	3.9%	4.9%
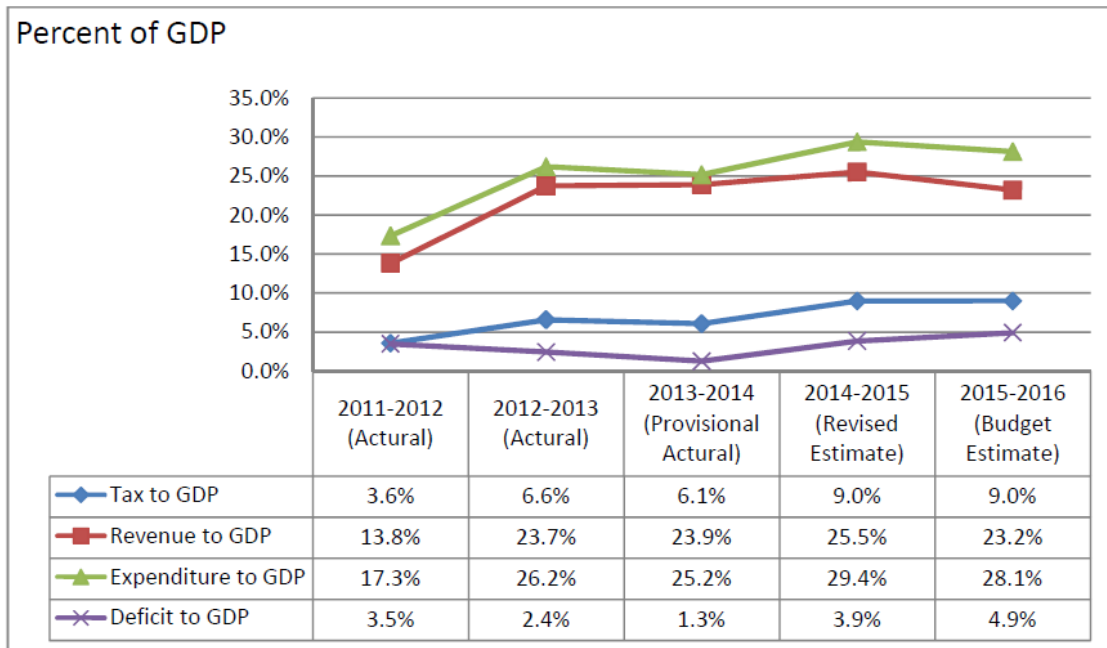
Source: Budget Department, Ministry of Finance, Myanmar

There was 34.9% of the outstanding debt to the GDP ratio in Myanmar from the period 2011. In FY 2013-2014, the outstanding debt to a GDP ratio is about 36.4%, increasing by 2.5% in preceding two years. These increasing amounts are shown in figure 4. The Union budget deficit was financed with the Treasury Bonds and Bills which is sold to the public and central bank.

Figure 4. Outstanding Debt to GDP ratio in Myanmar from the period 2011 to 2015
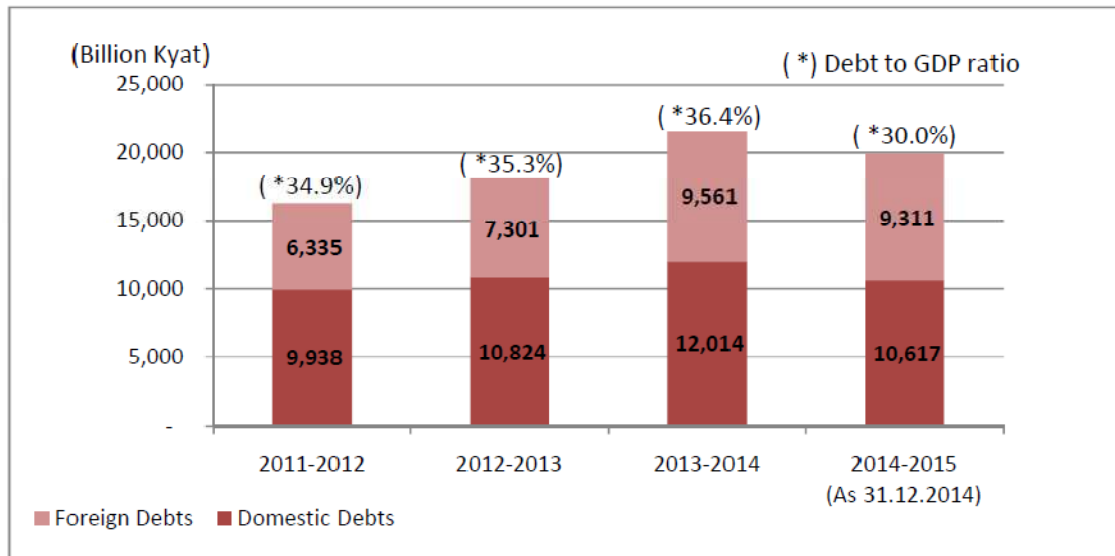
Source: Treasury Department, Ministry of Finance, Myanmar

Myanmar is trying to implement not only by developing the quick wins but also undergoing to establish the sound and efficient budgetary system and citizen budget system. The budgetary reform process is witnessing growth during transition years. The intergovernmental sharing tax scheme and grants system should be reviewed and amended. If necessary, the government budget should be transparency to be implemented.

CHAPTER THREE

LITERATURE REVIEW

Onyekachi Richard Eze and Ogiji Festus O (2016) use an empirical approach of Augmented Dickey-Fuller (ADF) co-integration analysis and an ex-post facto research design method. They took that dependent variable was used Gross Domestic Product (GDP) and independent variables were used the external source of deficit financing, methods of deficit financing, non-banking public deficit financing, and interest rates and exchange rates as regressors from years 1970-2013. The empirical outcomes proposed that economic stability was contributed to positively and meaningfully by the level of the external source of financing. Deficit financing promoted the employment level and declined the rate of inflation.

Ache, Asif and Khan (2006) examined the quantitative study of Jahansen co-integration analysis. They used the VCEM model, having CPI as the dependent variables and regressors being consolidated with fiscal deficit and total bank borrowing from the period 1973-2003. The empirical outcomes found that inflation is correlated with the fiscal disparities and with the foundations of the financing fiscal imbalances in the long run.

Chaudry, M Slam, and Naveed Ahmed (1996) employed a quantitative study. They used the OLS model, with CPI and inflation as dependent variables and foreign aid, growth of GDP, the share of the service area, public commitment, and the price of import as control variables from the period 1972-1992. Results found that inflation caused the growth of money and that "Inflation result which is being from money growth and operational components like progress, share of service areas, importation and public liability."

Viral Kumar Tiwari and Tiwari (2011) used an empirical approach by means of log linear multiple regression model. Dependent variables were the gross fiscal deficit, while inflation, money supply and government expenditure are used as regressors from the period 1970-2009. The results obtained from empirical analysis showed that government spending is related positively to financial debt and negatively to the money supply.

Hsin-Yi Lin and Hao-Pang Chu (2013) examined a quantitative study of the general ARDL (p,q) specification of the DPQR model using consumer price index as the dependent variable, and money stock (M1), GDP per capita, the exchange rate regime as the independent variables. They examined 91 countries as the main data set for the period 1960-2006. The empirical outcomes concluded that increased monetizing triggered high inflationary effects.

In addition, Rehman, Ahmed and Ali (2008) analyzed that budget deficit effect on inflation in Pakistan. They applied Augmented Dickey-Fuller test utilizing time series annual data stationarity from the period 1970-2004, and OLS technique to explore the budget deficit effect on inflation. The outcomes concluded that budget deficits are positively related to the rates of inflation but have inconsequential impact on the rates of inflation in Pakistan.

Kreiter and Paul (2010) studied inflation's dynamics in Bangladesh by using unrestricted VAR models from the period 1999-2008. *"The results suggest that the management of expectations and the mode of budget financing are the most important focus areas for future price stability efforts."* (Kreiter & Paul, 2010, pp. 1)

Tiwari Kumar, Tiwari and Pandey (2012) attempted to scrutinize the causality effect of the budget deficit, government spending, inflation, and money stock. With the use of causality analysis based on Dolado and **Lutkepohl** (DL)(1996) and the standard granger-causality approach, they analyzed and examined the test variables' causality direction. This

approach explored that government expenditure and money supply cause fiscal deficit. Money supply causes government expenditure and fiscal deficit cause money supply.

Devapriya and ICHIHHASHI (2012) investigated the relationship and causal structure between government budget deficits, inflation, and deficit financing sources for Sri Lanka, using the analysis of the time series from the period 1950-2010.The vector autoregressive (VAR) model is used. Empirical results recommended that fiscal deficits and inflation have a positive relationship. Causality analysis explored a bi-directional causal structure among inflation and fiscal deficits in Sri Lanka. Domestic borrowings affected inflation more positively than foreign borrowings.

Abdul, Tariq Rabbia, and BibiNazia (2014) conducted a quantitative study of price level theory for Pakistan. They used an autoregressive lag model from the period 1972-2012. The empirical outcomes explored whether fiscal deficit is a major determining factor of price level. They also used independent such as the rate of interest, government and private borrowing. Remolona Eli H. (2002), on the other hand, examined how were deficits financed in the recent year and proposed a rule to be financed in the future.

Catao and Terrones (2005) considered broader data and incorporated a new modeling method. They used data of 107 countries from the period of 1960 to 2001. The actual outcome is that the fiscal deficit and inflation are a strongly positive relation each other in the developing countries which have high inflation.

Onwe (2014) used the Ex-post facto research design (regression analysis). He inspected the consequences of budget deficit financing to be stable for the economy of Nigeria from the period 1970-2013. Empirical results revealed that the exterior source of budget deficit financing, a public financing source of budget deficit and foreign exchange rate have strong and positive consequences of economic stability. Methods of budget deficit

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financing, such as bank loans and interest rates, have negative consequences on economic stability for Nigeria.

Onyango (2013) analyzed the determining factor of budget deficit financing in Kenya. 10 years analyzed data (2003 to 2012) are used to represent the sample size. He applied the Multivariate Linear regression model. The empirical outcomes concluded that debts and budget deficit have a direct relationship. However, the government revenue, debt amenity, and government spending are strongly determining factors of fiscal budget deficit in Kenya.

Solomon and Wet (2004) noted that in Tanzania, the budget deficit and inflation are correlated each other. They used the co-integration method that affects the causal link among the fiscal deficit and the inflation rate. Though, they could not disprove that budget deficit effect deeply on inflation in Tanzania according to the long-run monetary neutrality assumption.

CHAPTER FOUR

METHODOLOGY

4.1   Data Source and Type

Data on inflation was obtained as an annual data from the World Bank Group. The budget deficit to GDP ratio is picked up from the MOPF, Myanmar. All of them are utilized as secondary data using time series from the period 1988-2016.

Using the time series data, co-integrated of long-lasting correlation between budget deficit and inflation were analyzed. To know whether there has a unit root in the variables or not, the ADF was utilized.

4.2.   Economic Model Specification

To inspect whether there exist the relationship among budget deficit and inflation of Myanmar, ordinary time series econometric model approach was used, tested with two steps. At the level, most in time series data were non-stationary, but at the first differences, they were suitably constituted with stationary. Non-stationary data cannot be used in analyzing the time series empirical data. If the analysis may be used with non-static variables, spurious regression outcomes, from which further inference is incomprehensible, will be achieved. Therefore, a two-step ordinary time series econometric model approach is superior to differentiate among stationary and non-stationary variables.

The response of budget deficit changes in macroeconomic variables depends primarily whether those changes are transitory or permanent. Therefore, it is imperative that this decomposition is undertaken in the context of econometric estimation. Here the author

outlines an econometric model that distinguishes between the permanent or transitory component of the inflation and budget deficit.

4.3 Granger Causality Test

"Granger causality (Granger, 1969) analyses to what extent the change of past values of one variable accounts for later variation of other variables. Therefore, Granger causality exists between variables y_t and x_t if by using the past values of variable y_t, the variable x_t can be predicted with better accuracy, and relating to a case when past values of variables y_t are not being used, with an assumption that other variables stay unchanged." *(Gelo, 2009, pp. 330)*

Granger causality analysis typically examines two variables together to check their interaction. To check for Granger causality, all of possible permutations of two variables is together analyzed whether to be interact with each other.

"All of the possible permutations of the two variables are:

- *Unidirectional Granger causality from variables y_t to variables x_t ,*

- *Unidirectional Granger causality from variables x_t to variables y_t ,*

- *Bidirectional causality,*

- *No causality."* *(Gelo, 2009, pp. 330)*

The data are stationary is the common statement of the model in all possible cases. In Random Process, Stationary variables can be disguised that the analytical feature of the process unchanged with occasion. *"If not, the Granger causality on non-stationary time data can lead to false causal relation."* (*Gelo, 2009, pp. 330*)

Granger Causality test necessitates the following regression is expected:

$$y_t = \alpha_0 + \sum_{i=1}^{T} \alpha_{1i}\, y_{t-1} + \sum_{j=1}^{T} \alpha_{2j}\, x_{t-1} + \varepsilon_t$$

Where is $\quad 0 \leq i, j \leq T$

Gives the best results of the equation:

$$y_t = \beta_0 + \sum_{i=1}^{T} \beta_{1i}\, y_{t-1} + \varepsilon_t$$

Where is $\quad \sum_{j=1}^{T} \alpha_{2j}\, x_{t-1} = 0$ (the null hypothesis, H0).

Testing:

H$_0$: $\beta_0 = \beta_1 = \ldots = \beta_i = 0$

H$_1$: not H$_0$ is a test that x_t does not Granger-cause y_t.

Similarly, **H$_0$:** $\delta_0 = \delta_1 = \ldots = \delta_i = 0$

H$_1$: not H$_0$ is a test that y_t does, not Granger-cause x_t..

In each case, if there is a Granger causality between the variables, the null hypothesis will be rejected (Awe,pg-7, 2012,). If the null hypothesis is rejected where $\beta_0 = \beta_1 = \ldots = \beta_i = 0$, then Granger causality x_t causes variables y_t.

The analysis of the stationary of the raw variables has been tested. The co-integration between them has been done the Granger test for getting valid outcomes. If the variables are not co-integrated, the test is valid in line with the Granger (1986). The examination of lag length is the second important element. In order to get results of the Granger causality, the Lag length selection is essential in time series regression. If the true lag length is smaller than the selected lag length, the irrelevant lags in the calculation cause the evaluation to be ineffective and haven't provided the estimated outcomes.

4.4   Testing of "Unit Root"

The first pace of the strategy of empirical analysis includes determining the order of integration of the time series utilized in the examination by using stationary (or testing of unit root). The main objective of unit roots testing gets the researchers to determine the difference process and trend stationary processes. The test is examined whether the data sequences are stationary or not.

The ADF test is used to trial for unit root from the period 1988-2015. The minimum AIC criterion is determined based upon the maximum lag length. The ADF test relies on rejecting H_0 and there has a unit root and the series are non-stationary, if the p-value is more than 5%. The test is used with and without a trend (t) for each of the series. The general form of ADF test is projected by the following regression (Kassa, 2012, pp.47):

$$\Delta Y_t = \alpha_1 + \beta Y_{t-1} + \mu_t \text{------------------------------------(4.1)}$$

$$\Delta Y_t = \alpha_1 + \alpha_{2t} + \beta Y_{t-1} + \mu_t \text{----------------------------(4.2)}$$

Where t mean the variable of time or trend. The equation (4.1) includes a drift, and equation (4.2) introduces both a drift and a time trend. The null hypothesis is $\beta=0$, it is meaning that there exists in a unit root. The null hypothesis (H_0) is consequently a time series is non-stationary (has a unit root) against the alternative hypothesis (H_1) is stationary (deterministic trend).

If the variables are truly co-integrated, the outstanding sequence shapes this condition is tried for unit roots employing Augmented Dickey Fuller test. If the outstanding sequence is stationary, the null hypothesis is rejected, and therefore there is co-integrated of order (1, 1) in the series.

Engle and Granger (1987) expected a forthright evaluation regardless of whether two I (1) variables are co-integrated of a similar request. By definition, of integration requires that the variables be coordinated of a similar request. In this way, the initial stage in the examination is to guarantee every variable to decide the integration's order of the variable.

4.5 Co-Integration Test

"There are two common methods for testing co-integration and estimating the relationship among co-integrated variables. These are the Engle and Granger (1987) two-step procedure and the Johansen's (1988) maximum likelihood methods." (Kassa and Demissie, ISSN 2277-1166, pp.101)

The co-integration condition evaluated by the OLS technique is given as:

$$Y_t = a_0 + a_1 x_{ti} + Z_t$$

Where Y_t and x_t is the budget deficit and inflation.

The DF test can be performed on the residuals to determine their order of integration. If the residuals haven't happened to be white noise, the ADF test could be employed instead. The following equations are used for testing whether the residuals (U2) from the co-integration regression, is to be stationary or not:

$$(DF) \quad \Delta Z + V_{t_t} = \propto + \beta_0 Z_{t-1} + V_t$$

$$(ADF) \quad \Delta Z_t = \propto + \beta_0 Z_{t-1} + \sum_{i=1}^{k} \beta_1 \Delta Z_{t-1} + V_t$$

where Z_t is the residual by using the OLS method.

If b has come out with a negative sign and the critical value according to the Fuller's table is more enormous than the calculated DF or ADF statistics, the alternative hypothesis is

accepted. If the null hypothesis of non-stationarity is rejected and the variables are not co-integrated then the standard Granger causality test is to be suitable.

If the variables are co-integrated, the residuals from the equilibrium relapse can be utilized to evaluate the model of error correction. In this case, the discretionary slack length should be utilized since the model of the error correction has been resolved to utilize SBC standard.

"Relation between these variables can be described by the VAR models, In this case, is possible that variable x_t influences y_t that y_t influencesx_t, as well as there exists mutually influence of these variables, or that these variables are non dependent of each other." (Gelo, 2009, pp.333).

Granger causality test has made into the estimation of the subsequent VAR model (Johansen 1991, 1995):

$$y_t = a_1 + \sum_{i=1}^{n} \beta_0 \, x_{t-i} + \sum_{j=1}^{m} \gamma_j \, y_{t-j} + e_{1t}$$

$$x_t = a_2 + \sum_{i=1}^{n} \theta_i \, x_{t-i} + \sum_{j=1}^{m} \delta_j \, y_{t-j} + e_{2t}$$

with the assumption is that there is being interrelated and white noise. All the variables must have unit roots with 5% of significance. If the variable becomes non-stationary, they will be differentiated.

To test Granger causality, the following hypothesis has utilized:

H_0........$\sum_{i=1}^{n} \beta_i = 0$, x_t does not influence y_t

H_1........$\sum_{i=1}^{n} \beta_i \neq 0$, x_t influences y_t

4.6   Serial Correlation

Serial correlation is the interrelationship of a variable with itself over sequential time intervals. Technical psychiatrists utilize serial correlation to decide how properly the former price of a security anticipates the future price. Serial correlation (likewise called Autocorrelation) is where error terms within a time series transfer starting with one period then onto the next.

In other words, the error for one time period a is corresponded with the error in consequent time period b. Serial correlation are frequently observed in reiterating patterns, when the level of the variable effects its following level.

4.6.1   Consequences of Ignoring Serial Correlation

(i)   OLS coefficients are still unbiased and consistent but inefficient (if no lagged dependent on the RHS as an explanatory variable, if present, OLS is biased and inconsistent)

(ii)   Forecasts inefficient (again if lagged dependent variable on the RHS, biased also)

(iii)   Variances of coefficients biased and tests are invalid

(iv)   R-square will overestimate the fit, indicating a better fit than actually present, and t values imply significance when in essence insignificant coefficients.

4.6.2   Testing for Serial correlation. There are four testing for serial correlation. They are Durbin Watson Statistic, BGSCLM test, correlograms and Q-statistics, and Durbin's h-test (Stata command: durbina). BGSCLM test, correlograms and Q-statistics are applied in this paper to test whether the model has the serial correlation or not.

4.6.1.1 *Breusch-Godfrey serial correlation LM test (BGSCLM test).* The BGSCLM test is used as shown table 5.7. LM test may be applied for AR (1) and superior serial correlation's orders like AR (2), AR (3) etc.

E.g., $\mu_1 = \rho_1 \mu_{t-1} + \rho_2 \mu_{t-2} + \rho_3 \mu_{t-3} + \varepsilon_t$ ⟶ AR (3) structure

The null hypothesis is that $\rho_1 = \rho_2 = \rho_3 = 0$ when testing AR (3) structure.

4.6.1.2 *Correlogram and q-statistics of residual test.* Correlogram and Q-statistics is utilized to check there has serial correlation within the regression equation. If there has a serial correlation in the regression equation, the suitable AR or MA terms for errors will be introduced to be eliminated serial correlation.

The H_0 is that there is free from serial correlation with a residual if p-value is more than 5%. The H_1 is that serial correlation exists in the residual according to correlograms and Q-statistics. If the p-value is not less than 5%, we accept the H_0. Therefore, this regression equation has been free from the serial correlation and there is equal to zero of AC and PAC at all lags. If the p-value is less than 5%, we accept H_1 and there is serial correlation in this equation.

CHAPTER FIVE

EMPIRICAL RESULTS AND DISCUSSIONS

The data has been analyzed by using software EViews 9.5 Student Lite. The empirical outcomes include analysis using graphs representations, outputs table, were examined with **four** sub-sections. This section includes preliminary analysis using graph analysis, the stationary test for each variable, stationary test followed by co-integration results, pairwise Granger causality analysis and serial correlation analysis.

5.1   Lag Selection Criteria and Preliminary Analysis

The time series data trends were scrutinized and sketched in the shape of the diagrams before trying to test stationary. The variables initiated for rising in the trend of levels. That's why the first difference has been shown in figure 5. The trend of first difference looks to be co-integrated.
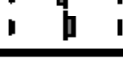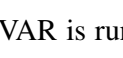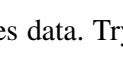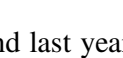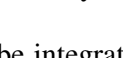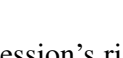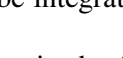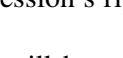
Figure 5. Variable trends at first difference
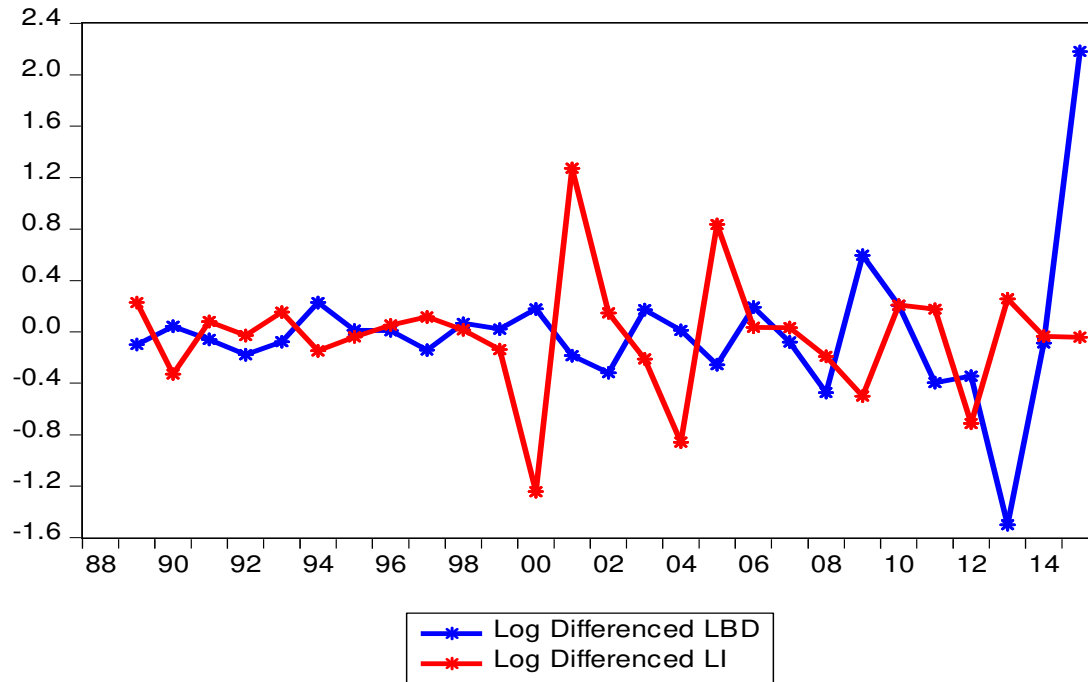
Autocorrelation function (ACF) is tested that a variable and its previous values has a correlation using the command correlogram. ACF is tested with the length of lag 12 according to AIC or SIC. As the autocorrelations at different lags drift at about zero, it is similar with a white noise time series' correlogram. The **Table 1** is shown as a stationary time series' correlogram. It can be concluded that variable LI and LBD is stationary.

Table 1. *Correlogram Q Statistics between the Variables at First Difference*

Date: 09/09/17   Time: 17:21
Sample: 1988 2015
Included observations: 27

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	-0.005	-0.005	0.0006	0.980
		2	-0.384	-0.384	4.6096	0.100
		3	-0.067	-0.083	4.7550	0.191
		4	-0.223	-0.440	6.4437	0.168
		5	0.098	0.005	6.7823	0.237
		6	0.350	0.085	11.337	0.078
		7	-0.234	-0.294	13.478	0.061
		8	-0.151	-0.069	14.412	0.072
		9	0.154	-0.006	15.439	0.080
		10	0.003	0.030	15.440	0.117
		11	0.046	-0.053	15.545	0.159
		12	0.086	0.050	15.935	0.194

VAR is run on time series data. Trying to sort out the LBD, it is likely that this year's LBD and last year's LBD are interrelated each other. LBD lagged for at least one year. LBD should be integrated on the regression's right-hand side. If today values is still being affected by values in the far past, there will be needed more lags to be necessary. Firstly decide on how many lag are to be used before making regression.

Among AIC, HQIC, SBIC, Akaike's information criterion (AIC) was applied to test in this paper to know number of lags to be used. The default lags number Eviews 9.5 outcomes is 2 (two). As data set is used from the period 1988 to 2015 like using yearly, and the length of maximum lag is twelve. Therefore it is used for estimating optimal lag length in this paper. The maximum lag is one fourth (1/4) of the whole range for the data on time series variables.

5.2   Stationary Test (Unit Root Test)

The unit root test is utilized for doing the stationary analysis. So this analysis is undertaken with the ADF unit root test. The lagged difference terms are applied because of minimizing autocorrelation in the error term. The null hypothesis is that $H_{0:}$ $\beta=0$. It means that unit root exists in the series and also non-stationary. If there is falling to reject H_0, it means the unit root is included in the time series and at the levels, there is a non-stationary. In this paper, ADF test is used for checking to know whether LI and LBD have a unit root or not.

TABLE 2. *Results of ADF Unit Root Test of Time Series at Level Value*

Variables	Augmented Dickey Fuller		
	Lag Length 2		
	Constant	Constant & Trend	None
LI	-2.90	-4.84	-1.05
	(0.0579)	(0.0034)	(0.2555)
LBD	-2.65	-4.95	-1.17
	(0.0958)	(0.0026)	(0.2146)

At the level, the variables LI (Log of inflation) and LBD are non-stationary because their p-value is more than 5% at the constant and none. The first difference values were tested in order to make the variable stationary. The unit root test's outcomes are explored as follows:

Table 3. The R*esults of Unit Root Test of the Time Series at First Differences Values*

Variables	Augmented Dickey Fuller			Order of Integration
	Lag Length 2			I (1)
	Constant	Constant & Trend	None	
ΔLI	-7.25 (0.0000)	-7.36 (0.0000)	-6.76 (0.0000)	I (1)
ΔLBD	-4.87 (0.0007)	-4.57 (0.0065)	-4.89 (0.0000)	I (1)

At the level, the variables LI (Log of inflation) is non-stationary at 5% level of significance and wind up noticeably stationary at the first difference. At the first difference, the variable LBD (Log of budget deficit) and LI are stationary at 1% significance level. The variables LI and LBD are both coordinated of order 1 which legitimizes the utilization of Engle-Granger way to deal with co-combination.

From Table 3, a unit root's null hypothesis is rejected for LI and LBD at a drift term (constant). Furthermore, at one percent level of significance, the H_0 has been rejected for a lag one of LI and LBD. Therefore, it is possible to decide that with the order one I ~ (1), the budget deficit and inflation are co-integrated.

5.3   Engle-Granger Co-Integration Test

Engle and Granger (1987), Johansen (1988), Johansen and Juselius (1990), Pesaran et al (2001) are used to find out there potentially presents the long run equilibrium connection among two variables. Granger causality's main advantage is that if two variables are co-integrated each other, then either one variable must Granger cause another variable or vice-versa.

To know whether the long run stable connection within economic variables' value or not, Co-integration test may be used. If the variables are wanted to conduct co-integration, all variables must be stationary with the same degree.

The method of co-integration test using Engle-Granger is used in this study. Co-integration analysis was tested with two steps. Firstly, the regression model (OLS regression) is established. Then, the stability of error terms (a unit root test) is observed. If the error term is stationary, two variables are co-integrated with each other.

5.3.1   STEP 1: REGRESSION MODEL

Table 4. *Co-Integration Test*

Dependent Variable: LI (log of Inflation)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	1.633333	0.523515	3.119938	0.0044
LBD (Log of Budget Deficit)	0.683786	0.329805	2.073304	0.0482
R-squared		0.141874		
Adjusted R-Squared		0.108869		
Durbin-Watson Stat		1.629791		

Estimated Equation:

$$LI = C(1) + C(2)*LBD + \varepsilon_t$$

The model of Econometric:

$$\text{Log of Inflation} = 1.633333 + (0.683786 \times \text{log of budget deficit}) + \varepsilon_t$$

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After doing the regression to know budget deficit's impact on inflation, the budget deficit's coefficient is 0.683786. It is positive and extremely significant. So that the inflation definitely influences the prices in Myanmar over the period assessed and error term driven from the above regression is stationary at that level, assumes that there is long run the correlation between inflation and budget deficit. There is also extreme co-integration between inflation and budget deficit.

5.3.2   STEP 2: THE STATIONARY OF ERROR TERM

Table 5. *Residuals' Stationary Test at First Difference*

Null Hypothesis: U 2 has a unit root			
Augmented Dickey-Fuller test statistics (ADF)			
		Constant, Trend	
		t-Statistic	Prob
ADF		-6.164132	**0.0002**
Test critical values:	1%	-4.394309	
	5%	-3.612199	
	10%	-3.243079	

AIC has been used for determining the lag length. The length of lag is two (2) for both the regression equation. The results found that the residuals of the two equations are stationary because p-value is 0.0002 meaning that less than 5 percent. Therefore, budget deficit and inflation are co-integrated as seen Table 5.

Figure 6 illustrates the residuals' graph. The model's error term has no unit root and is stationary so budget deficit and inflation are co-integrated. Therefore, suitable lag length to use model criteria has been chosen 2 for determining the causality test.

Figure 6. *Graph of Residuals*

Differenced RESID01
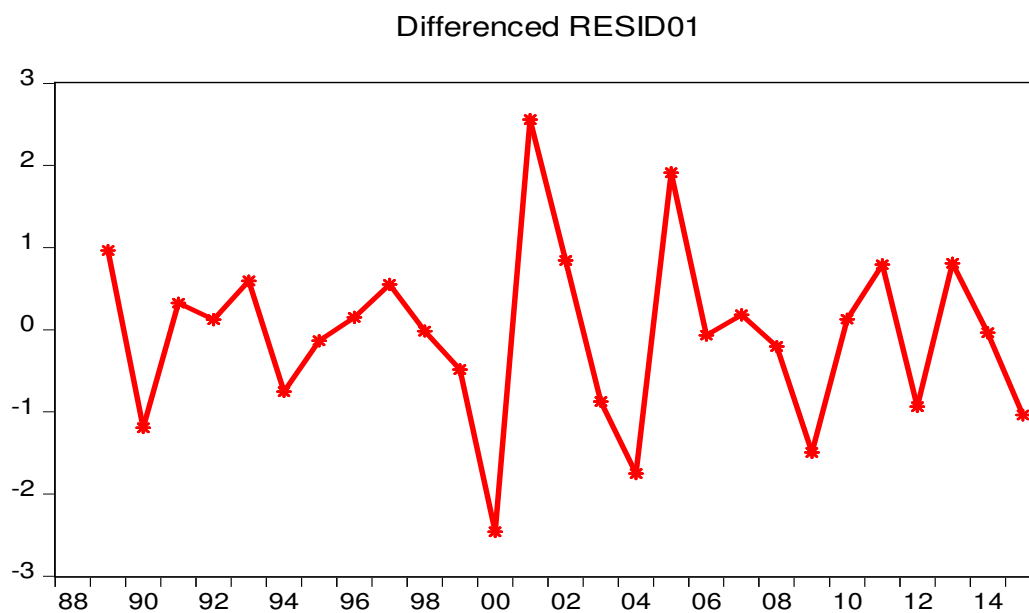
The table 6 includes inflation and budget deficit (budget deficit ratio to GDP) in the trend for the years 1988-2015.

Table 6. *Inflation and Budget Deficit Ratio to GDP*

YEARS	INFLATION	BD
1988	25.19	8.29
1989	57.68	6.79
1990	18.54	7.38
1991	23.75	6.59
1992	21.74	4.85
1993	36.25	4.31
1994	22.08	6.27
1995	19.60	6.42
1996	23.03	6.54
1997	33.79	5.11
1998	35.83	5.71
1999	22.64	5.94
2000	2.46	8.42
2001	24.84	5.88
2002	41.51	3.63
2003	20.49	4.63
2004	3.60	4.71
2005	19.16	3.32
2006	21.30	4.28
2007	23.64	3.83
2008	13.62	2.31
2009	4.87	4.57
2010	7.04	6.47
2011	10.25	3.52
2012	3.13	2.44
2013	4.37	1.22
2014	4.17	1.20
2015	3.94	5.03

Source: World Development Indicator (1988-2015)
   Budget Department, Ministry of Planning and Finance, Myanmar

5.4   **Serial Correlation Test**

There are four tests for serial correlation: Durbin Watson Statistic, BGSCLM test, correlograms and Q-statistics, and Durbin's h-test (Stata command: durbina). BGSCLM test, correlograms and Q-statistics are used in this paper to test whether the model has the serial correlation or not.

5.4.1   BGSCLM test The table 7 explores the results of the Breusch-Godfrey serial correlation LM test. This can be applied for AR (1) and superior orders of serial correlation similar to AR (2), AR (3), etc.

Example: $\mu_1 = \rho_1 \mu_{t-1} + \rho_2 \mu_{t-2} + \rho_3 \mu_{t-3} + \varepsilon_t$ $\longrightarrow$ AR (3) structure

The null hypothesis is that $\rho_1 = \rho_2 = \rho_3 = 0$ when testing AR (3) structure.

Table 7. *Serial Correlation Test*

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	0.996599	Prob. F(2,24)	0.3839
Obs*R-squared	2.147083	Prob. Chi-Square(2)	0.3418

Test Equation:
Dependent Variable: RESID
Method: Least Squares
Date: 09/18/17   Time: 01:10
Sample: 1988 2015
Included observations: 28
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.188115	0.584591	-0.321788	0.7504
LBD	0.130359	0.377411	0.345402	0.7328
RESID(-1)	0.162069	0.214097	0.756988	0.4564
RESID(-2)	-0.278080	0.232139	-1.197903	0.2427

R-squared	0.076682	Mean dependent var	1.59E-16
Adjusted R-squared	-0.038733	S.D. dependent var	0.829779
S.E. of regression	0.045696	Akaike info criterion	2.634251
Sum squared resid	17.16486	Schwarz criterion	2.824566
Log likelihood	-32.87952	Hannan-Quinn criter.	2.692432
F-statistic	0.664399	Durbin-Watson stat	1.909559
Prob(F-statistic)	0.582073		

Dependent variable is log of inflation while the independent variable is log of budget deficit. To check the serial correlation, the H_0 is that there is free from the serial correlation in the residual and the alternative hypothesis is that there is serial correlation in the residual according to the LM test.

The results of the BGSCLM test is shown in table 7. After regressing the model, observed R-squared is 2.147083 and probability value is 34.18%. So P-value is more than 5%. The conclusion is that the H_0 has been accepted, which is why the model is free from the serial correlation.

5.4.2 Correlogram and q-statistics of residuals test. Correlogram and q-statisitcs are a mixture of visual and direct test of serial correlation. They relinquished a scheme to the series of serial correlation as well as whether there prevail serial correlation in regression identification.

The H_0 is that serial correlation is free from the residual and the H_1 is that serial correlation exists in the residual according to correlograms and q-statistics.

The results of correlogram Q-statisitcs is shown in table 8. All of the corresponding probability values are more than 5 %. That's why the H_0 cannot be rejected, and the H_1 can be rejected. Thus there is no serial corrlelation in this model. Being free from the serial correlation in this model, testing the hypothesis or forecasting can be done.

Table 8. *Correlogram and Q-Statistics*

Date: 09/18/17   Time: 04:12
Sample: 1988 2015
Included observations: 28

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob
		1	0.134	0.134	0.5608	0.454
		2	-0.198	-0.219	1.8211	0.402
		3	0.031	0.100	1.8542	0.603
		4	0.307	0.261	5.1545	0.272
		5	0.216	0.171	6.8624	0.231
		6	0.073	0.149	7.0659	0.315
		7	-0.323	-0.369	11.250	0.128
		8	-0.042	-0.035	11.325	0.184
		9	0.204	-0.020	13.157	0.156
		10	0.116	0.071	13.783	0.183
		11	-0.131	0.069	14.628	0.200
		12	0.005	0.177	14.629	0.262

5.5   Pairwise Granger Causality Test

Granger Causality test necessitates the following regression is expected:

$$y_t = \alpha_0 + \sum_{i=1}^{m} \alpha_0 \, x_{t-i} + \sum_{i=1}^{m} \beta_0 \, y_{t-i} + \mu_{1t}$$

$$x_t = \beta_0 + \sum_{i=1}^{m} \lambda_i \, y_{t-i} + \sum_{i=1}^{m} \delta_i \, x_{t-i} + \mu_{2t}$$

Testing

H_0: $\beta_0 = \beta_1 = ... = \beta_i = 0$

H_1: not H_0 is a test that X_t does not Granger-cause Y_t.

Similarly, **H_0: $\delta_0 = \delta_1 = ... = \delta_i = 0$**

H_1: not H_0 is a test that Y_t does not Granger-cause X_t.

If the H_0 fails to accept, there will be the Granger causality between the variables in each case.

To test pairwise Granger causality, the two variables are usually analyzed together since testing for the interaction to each other. *"All of the possible permutations of the two variables are:*

- *Unidirectional Granger causality from variables y_t to variables x_t,*

- *Unidirectional Granger causality from variables x_t to variables y_t,*

- *Bidirectional causality,*

- *No causality." (Gelo, 2009, pp. 330)*

Here, the Pairwise Granger-causality analysis has been shown in this study. There are two variables, x and y, in this test. Y represents budget deficit; x represents inflation.

"In general, if x impacted y, that x is a Granger cause of y, the changes of x must before the changes of y. Therefore, when do the regression analysis of y impacted on the on the other variables, if the past or lagged values of x were encompassed can significantly

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enhance the explanatory power of regression, which can be considered x is the Granger

reason of y." (Kuzu & Onder, 2014, pp. 16) The assumption of the Causality test showed in

table 9.

Table 9. *Pairwise Granger Causality Tests*

Pair Wise Granger Causality Tests			
Lags: 2			
Null Hypothesis:	Obs	F-Statistic	Probability
Budget Deficit does not Granger cause Inflation	26	4.31881	0.0269
Inflation does not Granger Cause Budget Deficit		4.49883	0.0237

Table 9 demonstrates that the inflation causes the budget deficit and the budget deficit

causes the inflation. Thus, there is **bidirectional causal relationship** from inflation to budget

deficit.

5.6   Explanations

During the period of 1988 to 2015's the average of budget deficit remains within the range 4.99% of GDP. The government has been handling the fiscal deficits in the scope of 2.0% to 6.4% of GDP since 2004 as shown in figure 7.

Figure 7. *Inflation and Budget Deficit Ratio to GDP (1988-2015)*
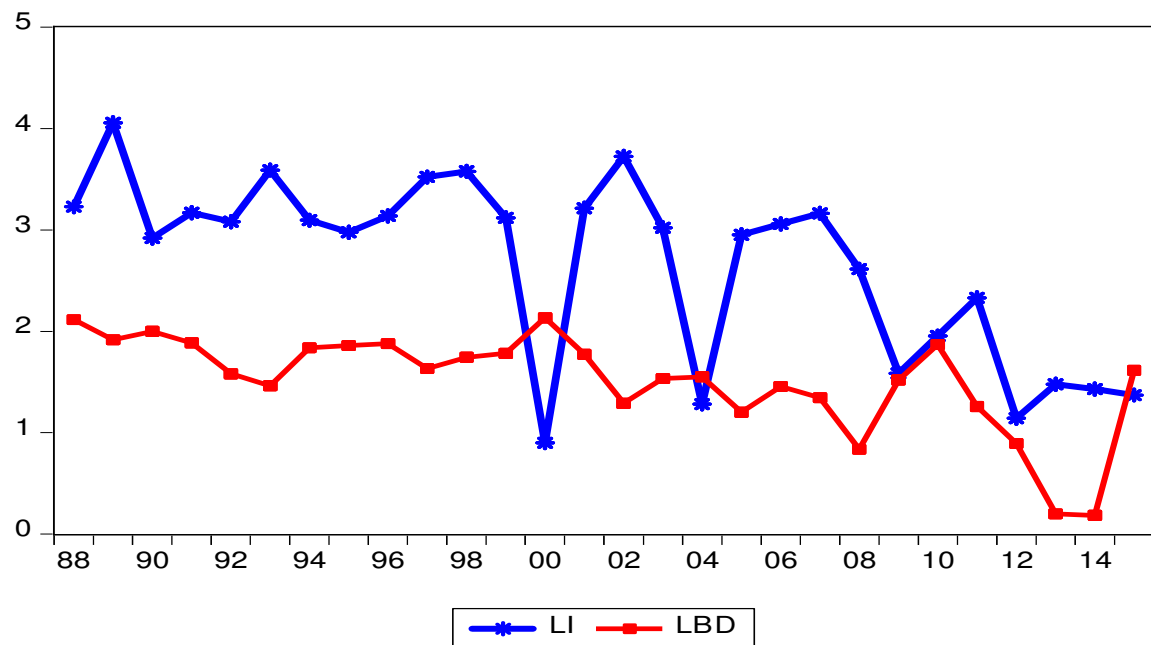
Source: World Development Indicator (1988-2015)
*   Budget Department, Ministry of Planning and Finance, Myanmar*

In 2006, as the authorities revised the consumer price index by adding new weights and additional price items, and creating the new price series, consumer price inflation has fallen down. Inflation is declined because the government's shift of partial bond financing in the budget deficit which leads to slower monetary growth, a sharp appreciation in the parallel market exchange rate, and also a fall back in international commodity prices after the commodity price surge in 2008.

In the past, the issue of monetizing the fiscal deficit is closely related to high extension in money supply outstanding which causes macroeconomic vulnerability, such as lateral foreign currency market vulnerability and long duration of very high inflation. For the beginning period in 2009, one third of the deficit has been financed from the issuance of treasury bonds to domestic banks and this has encouraged enclose the enlargement in money supply and reduced inflation to 4.88%.

The expansion in money supply also reflected to consumer price inflation through its consequence on the exchange rate. Restrictions on foreign currency holdings in Myanmar happens a parallel with market for foreign currency. A widening premium over the official fixed exchange rate started to emerge in the beginning of 1990s and by 2007 the premium was 200 times the official exchange rate, e.g. the parallel exchange rate of about 1,300 Kyat to the dollar in comparison with the official rate of about 6.4 Kyat to the dollar. The FY2012/2013 budget changed foreign currency denominated revenues and expenditures at the parallel market exchange rate of Kyat 800 to the dollar as of initially 2012.

Rebounding monetary shocks, the deflation of the parallel exchange rate sharply pursued the almost huge domestic inflation rate. The budget deficit for the FY2011/2012 is 3.52% of GDP and at 2.44% for FY2012/2013, downward from a deficit of 6.47% for FY2010/2011. The Central Bank of Myanmar, which is monetizing the deficit or printing money to pay the deficit, is buying the treasury bills from the government for financing the budget deficit.

The inflation process was caused because agricultural products of export are over-bidding, over-building of certain infrastructure facilities are over-building, and the Kyat are depreciation in the parallel market for foreign exchange. The prices of imported goods,

needed as inputs in the production process, were increased because of the depreciation of

Kyat in the parallel market for foreign exchange.

CHAPTER SIX

CONCLUSIONS AND POLICY RECOMMENDATIONS

6.1   Conclusions

This paper has examined Myanmar's budget deficit's impact on inflation for a period of 1988-2015. A time series econometric method is utilized to identify Myanmar's inflation and budget deficit. In order to realize the long run and short run causal factor, the Engle-Granger Causality methodology is utilized. The model encompasses determinants of inflation and budget deficit to GDP. It can be concluded that not only inflation and budget deficit to GDP have a long run relationship, but also both inflation and budget deficit to GDP have co-integration with each other.

This analysis finds the way to handle the problem of BD and the impact of BD on inflation. The empirical finding on the budget deficit to GDP and inflation model confirms that budget deficit to GDP is positive and a significant determinant of a country's inflation. The budget deficit to GDP was observed to be stability significant to ascertain a country's inflation, both in the long run and in the short run. The finding has observed that inflation and budget deficit to GDP has a bi-directional causality. Budget deficit creates inflation (i.e. budget deficit is the vital causal factor of inflation).

If the Government of Myanmar allows the immensity of deficits and arrears to widen, then the resulting upsurge in interest rates will force the CBM to purchase government bonds. CBM purchase government bonds and bills through open market operations to sustain the interest rates level. The consequence of this tactic is the currency supply enlarging, ultimately causing inflation to occur. In addition, when the immensity of fiscal deficit and national arrears assembled moderately, the Government's continual specification for the debt will be shattered, once the Government, through the bonds cannot be anticipated to fulfill the

outcomes, then it can only depend on seigniorage to construct for all of the budget deficit, then the same will ultimately accompany to the phenomenon of inflation in Myanmar.

6.2   Findings

The history of Myanmar has often observed that the government implements seignorage during times of fiscal anguish. Fiscal deficit is considered one of the vital causal factors of inflation. Increasing fiscal deficits is a tenacious issue encountered by Myanmar. Relating to this hypothesis, the outcomes portray that the impact of government borrowing – from the central bank- which is the major cause of the fiscal deficit, on domestic inflation is efficiently and statistically significant.

In addition, the empirical verification suggests that domestic inflation and volatility in government borrowing from Myanmar's central bank has a strong long run relationship.

In particular, it also suggests incorporating the trend consequence of government borrowing from monetary sovereignty in inflation modeling. These verdicts may eventually assist in realizing the inflation experience in Myanmar.

6.3   Policy Recommendations

Based on the determination of this study the following policy recommendations can be sketched:

- ➢ Reinforce the self-governance of the central bank and give a legal guarantee for the self-government of the central bank
- ➢ Explore the implementation of provident fiscal policy
    - ✓ Strengthen the foundation of a sound modern tax collection system
    - ✓ Modify the composition of government spending and hasten the refinement of the budget management system

- ✓ Create conditions for the gradual cutback of fiscal deficit.

➢ Access to finance is critical

- ✓ encouragement of credit to the private sector

- ✓ reducing cost of borrowing

- ✓ improving the institutional qualities

- ✓ controlling inflation

- ✓ Reducing the government budget deficit.

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