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DETERMINANTS OF BALANCE OF PAYMENT FLUCTUATIONS IN THE PHILIPPINES: 1981-2019

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Abstract:
This paper identifies the determinants of the balance of payments fluctuations in the Philippines. Specifically, it presented the trends and movements of a balance of payments, interest rate, inflation rate, gross domestic product growth rate, and real exchange from 1981 to 2019. The study used Johansen Co-integration, Granger Causality, and Vector Autoregression (VAR) models to analyze this study. Johansen's Co-integration analysis revealed that the determinants of the balance of payments interest rate (IR), inflation rate (INF), an exchange rate (EX), and real GDP are rejected at a 5% significant level. On the other hand, unrestricted VAR model, there exists a relationship between the balance of payments (BOP), interest rate (IR), and inflation rate (INF). Granger causality test results revealed that BOP does not Granger cause IR and INF does not Granger cause BOP are rejected at the 5% significant level because the causality test results are significant. BOP and IR have a unidirectional relationship. Moreover, results show that there is unidirectional causality generally running from the balance of payment (BOP) to the interest rate (IR) and inflation rate (INF) to the balance of payment (BOP).

JEL: H10; H20; H30

Keywords: balance of payments, granger causality, vector autoregressive (VAR) analysis

1. Introduction

The balance of payments of a country is a record of all transactions between its residents and residents of all foreign nations. These include a country's purchases and sales of goods and services (imports and exports), interest and profit payments from a previous investment, and all capital inflows and outflows (Duasa, 2010).

The Philippines' balance of payments (BOP) position improved to a surplus in March, thanks to foreign currency deposits from the National Government and

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investments abroad by the central bank. According to data released by the Bangko Sentral ng Pilipinas (BSP) on Tuesday, the Philippines recorded a $754-million surplus last month. This significantly improved over the $73-million gap a year ago and the $157-million deficit in February.

This is the largest BoP surplus since December's $991 million surplus. "*The BoP surplus in March 2022 reflected inflows primarily from the National Government's (NG) net foreign currency deposits with the BSP and income from the BSP's foreign investments*," the central bank said in a statement. (Business World, 22 April 2022).

The balance of payments is a key indicator of a country's standing in international trade. Its state is critical in determining whether a country has enough savings and other financial transactions to cover its import consumption or whether it is producing enough economic output to cover its growth. As a result, understanding the factors influencing the balance of payments is critical. Aside from that, it aids in achieving balanced economic growth and significantly impacts the government's economic policies and the economy itself (Fieleke, 2009).

Many developing countries have a negative balance of payment accounts and face numerous difficulties in monetary operations, raising numerous questions for monetary authorities. Many other developing countries, including the Philippines, seeking to stabilize their balance of payment accounts to strengthen their macroeconomic policies (Umer et al., 2010). Thus, understanding the determinants and how each determinant affects the balance of payments fluctuation would be extremely beneficial in achieving balance-of-payments account stabilization.

Because it is difficult to identify the determinants of the balance of payments fluctuations, many researchers have used a variety of macroeconomic variables. Several variables were found to have an impact on the balance of payments. This includes exchange rate movement and domestic inflation (Nwani, 2011), as well as fiscal balance, gross domestic product (GDP), and interest rates (Eita and Gaomah, 2010). The variables used in the study were based on the research of Nwani (2011) and Eita and Gaomah (2012); (2010).

Knowing the determinants of the balance of payments fluctuations may be useful in determining the balance of payments policies that may affect the buying and selling of goods and services (imports and exports), as well as the payment of interest and profits from previous investments, as well as the country's total capital inflows and outflows. Investigating the determinants of the balance of payment fluctuations in the Philippines is thus an intriguing subject.

Furthermore, this study is groundbreaking because the country has never conducted an analytical study of the determinants of the balance of payments. This study will also be a future reference for researchers conducting related studies.

2. Objectives of the Study

The study's general objective is to know the determinants of the balance of payment fluctuations. Specifically, the study aims;

1) To present the trend of the determinants of the balance of payment fluctuations in the Philippines, namely: inflation, real GDP, exchange rate, interest rate, and
2) To test the relationship of the identified determinants to the balance of payments.

2.1 Significance of the Study

The importance of studying the balance of payment is to identify what determinants policymakers should focus on to enhance the performance of the balance of payment. As such, the study will help economic policymakers to pursue appropriate policies in line with possible factors that might have caused the movements of the balance of payment over the period.

2.2 Scope and Limitations of the Study

This study focused on determining the factors of the balance of payment fluctuations in the Philippines. It used annual time series data for the balance of payment, exchange rate, inflation, and real GDP from 1981-2019. The study used Johansen Cointegration and Vector Autoregressive (VAR) Analysis and Granger Causality Test to measure the bidirectional relationship among the variables.

3. Literature Review

3.1 An Overview of Literature Review

Relevant literature and studies related to the topic are discussed herein.

E. Weerasinghe and T. R. Perera (2019) study revealed that empirical results show that gross domestic product, import volumes, and inflation rate significantly impact the balance of trade deficit in the Sri Lankan economy. A nominal exchange rate and direct foreign investments have not affected the current situation. There is a positive relationship between the exchange rate and the trade balance, but it is not a significant factor, and recent studies do not support this result.

S. Kingia and M. E. Kingia Muba (2021): diagnostic tests revealed that the data produced unbiased results, so the ordinary least square regression was used. The study discovered that foreign direct investment and inflation rates negatively and significantly influence the balance of payment. In contrast, the exchange rate has a positive and insignificant influence, and the interest rate has an insignificant negative influence on the balance of payment.

According to a study conducted in Uganda, the average inflation rate in Uganda was 6.30%, with a standard deviation of 3.94. The inflation rate series was tested for stationarity using Augmented Dickey-Fuller for unit root at a 5% significance level and was stationary after taking the second difference. The pairwise correlation was used to test the bivariate relationship between inflation rates and the balance of payment in Uganda; inflation rates had no significant relationship with the balance of payment. Using a linear regression model, inflation rates had no significant effect on Uganda's Balance of Payments. The study concluded that net FDI inflows and real effective

exchange rates significantly impact Uganda's balance of payments. (Natukunda, Primrose Dianah, 2021).

According to A. H. Sultani and U. Faisal (2022), exports and imports, fiscal policy, money supply, inflation rate, and structural changes similarly impact the BOPs of developing countries and LDCs. In contrast, liberalization, terms of trade, FDI, exchange rate, investor confidence, stage of development, and infrastructure quality all have different impacts on their BOPs.

Nwani (2011) used annual data from 1981 to 2009 to investigate the long-run determinants of Nigerian balance of payment fluctuations using Cointegration and Error Correction Models. Trade openness, external debt burden, exchange rate movement, and domestic inflation were all non-stationary, whereas the balance of payments cointegrated with all the explanatory variables identified. Nwani concluded that fiscal deficit reduction, increased domestic production through private investment, inflation targeting, and regulated capital market integration are the solutions to Nigeria's negative balance of payment fluctuation.

Eita and Gaomah (2010) used the same methodology to conduct a similar study in Namibia. It spanned the years 1999 to 2009. In contrast to Nwani's study, the main determinants of the balance of payments were fiscal balance, GDP, and interest rate. An increase in GDP and interest rates can improve the balance of payments.

The positive effect of GDP on the balance of payments suggested that increased exports positively impact the current account and overall balance of payments. More increased export potential should be encouraged by developing new products and services. The positive impact of interest rates on the balance of payments suggested that interest rates could be used as a policy tool to maintain a favorable capital account and improve the balance of payments. An improvement in fiscal balance corresponds to an improvement in the balance of payments.

From 1975 to 2008, Adamu and Itsede (2009) investigated the monetary approach to the balance of payments in West African Monetary Zone Experience (WAMZ) countries. The variables were then estimated using the panel data estimation method. The study investigated whether excess money supply was a disturbance with both within-country and cross-country effects. The findings indicated that money played an important role in determining the balance of payments, which validated the monetary approach to the balance of payments for West African Monetary Zone Experience (WAMZ) countries. It was established that there is a strong negative relationship and the link between domestic credit and net foreign assets. Interest rates and GDP growth also significantly impacted the WAMZ balance of payment. The researcher concluded that the balance of payments could be corrected through appropriate financial programming, monetary targeting, and prudent fiscal policy implementation.

Kantidas (undated) in Bangladesh took a similar approach to Adamu and Itsede. From 1975 to 1995, he used the Monetary Approach to examine the balance of payments using Ordinary Least Squares (OLS). The variables used were the gross domestic product (GDP), interest rate, and inflation rate. The findings revealed that Bangladesh's reserve flow experience has been broadly consistent with monetary theory regarding the balance

of payments. The findings strongly suggested that Bangladesh's monetary authorities can achieve their desired stock of international reserves for any given demand for money by controlling domestic credit.

Duasa (2010) examined the Malaysian balance of payments from 1980 to 2008 using the Keynesian (KA) and Monetary Approaches (MA). After that, the variables were estimated using the Almon or Polynomial Distributed Lag (PDL) models. The variables used were real GDP, interest rate, and exchange rate. In support of the Keynesian Approach, the results showed that GDP has shorter lags in the trade balance equation. The Monetary Approach, on the other hand, is supported by interest rates and exchange rates. The study examined the two theories on Malaysian balance of payments using the correctness of the regressor sign test and the speed adjustment test.

4. Methodology

4.1 Theoretical Framework

Numerous competing balance-of-payments theories provide distinct explanations for how the determinants of balance-of-payments (BOP) could lead to BOP equilibrium and disequilibrium.

The Monetary Approach (MA) to the Balance of Payments (BOP) focuses on the monetary aspects of the BOP. It is based on the simple idea that disequilibrium in the money market causes the balance of payment surplus or deficit. Money market disequilibrium is a critical factor causing the balance of payments disequilibrium. In contrast, money market equilibrium is assumed to be determined by real income, domestic interest rate, and domestic inflation rate. The equilibrium balance of payments (BOP) is assumed to be determined by real income, relative import prices, the difference between the domestic interest rate and the sum of the foreign interest rate, and the expected change in the exchange rate. These identified macro-variables will significantly impact the country's balance of payments.

The Purchasing Power Parity Approach, one of the determinations of the balance of payments equilibrium, is the movement of the exchange rate, and the exchange rate, along with the Balance of Payments Approach, reflects the transactions in the balance of payments current and financial accounts (Eitman et al., 2010).

On the other hand, the Keynesian Absorption Approach suggests that an increase in domestic spending would induce domestic absorption and thus import expansion, resulting in current account imbalances. According to Machup (1960), the current account will deteriorate if devaluation increases domestic absorption relative to GDP.

In traditional models of international trade, trade openness benefits the balance of payments. In other words, trade openness improves the balance of payments situation.

4.2 Conceptual Framework

Figure 1 shows the study's conceptual framework following the theories outlined above. The determinants of the balance of payment fluctuations are inflation rate, interest rate, exchange rate, and gross domestic.

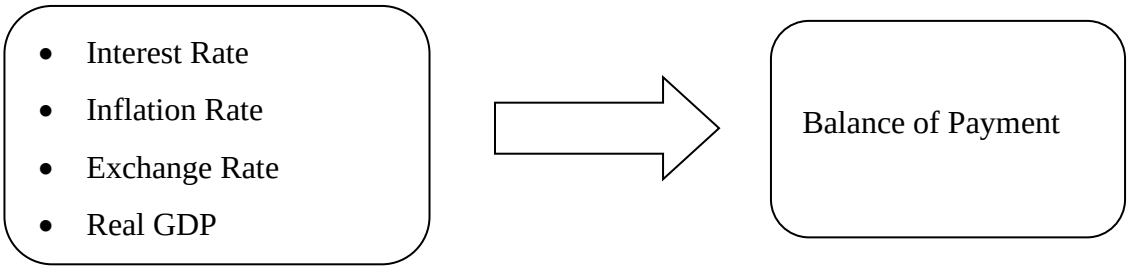


Figure 1: Possible Determinants of the Balance of Payment Fluctuations in the Philippines

4.3 Data Source

The study used annual data on the balance of payments from the Bangko Sentral ng Pilipinas (BSP); real GDP growth rate and inflation rate were obtained from www.nationmaster.com and World Bank Database, exchange rate, and interest rate from the World Bank Database, Philippine Statistical Yearbook (PSY) and National Statistical Coordination Board (NSCB). The period covered by the study is from 1981 until 2019.

4.4 Statistical Tools

The main tool used in this study is time series analysis; a brief background is presented in the succeeding sections.

A. Time Series Analysis

Time series analysis refers to methods that aim to understand the underlying theory behind a sequence of observations ordered in time or to forecast the identified pattern based on past events (www.statsoft.com).

Time series analysis has two primary goals: the first is to identify the nature of the phenomenon based on the sequence of observations, and the second is to forecast or predict the future values of the variable. These objectives necessitate identifying and formally describing the observed time series data pattern. Once the pattern is established, it can be interpreted and integrated with other data, and the results can be used in some investigative phenomena (www.statsoft.com).

To avoid erroneous results, such as a very high R2 but insignificant estimates, it is necessary to know whether the variables are stationary or not when performing time series analysis (Warr, 2009).

- **Test for Stationarity**

To avoid erroneous results, it is critical to know whether the variables in a time series analysis are stationary or not before estimating any relationship between them (War, 2009). Estimation based on non-stationary variables may result in spurious regression if very high R2 values are obtained, but parameter estimates are insignificant.

A stochastic process Y_t is stationary if it satisfies the following requirements:

1) $E\{Y_t\} = 0$ is independent of t.
2) $Var\{Y_t\} = \delta^2$ is a finite, positive constant, independent of t.

3) $Cov\{Y_t, Y_{t-k}\} = \delta$ the covariance between any two terms of the series is a function only of the distance between them.

Assumptions (1) and (2) imply that the means and variances are constant over time, whereas condition (3) implies that the covariance between observations is determined solely by their distance apart rather than by the time of occurrence (Greene, 2000). If one or more of the conditions are not met, the series is non-stationary, and performing regression analysis may yield erroneous results.

- **Testing for Unit Roots**

A standard unit root test on each variable is required as the first step in performing the estimation process. The Augmented Dickey-Fuller (ADF) method was used to test for the presence of unit roots in this study's data series. The specification is:

$$\Delta Y_t = \beta_1 + \beta_2 + \delta Y_{t-1} + \alpha_i \Sigma \Delta Y_{t-1} + \varepsilon_t$$

Where ε_t is a white noise error term, the error term is assumed to be independent and identically distributed. Dickey and Fuller (1981) proposed the ADF test for dealing with the AR process in variables (Dickey and Fuller, 1979). If the ADF test rejects the null hypothesis, the series is stationary and lacks a unit root. If the ADF test fails to reject the null hypothesis and indicates the presence of a unit root, the series is non-stationary, and "smoothing" of data is required, which one method is differencing.

- **Differencing**

Differencing means obtaining the differences between periods so that the first difference is stationary. The order of integration is the number of times this must be done to achieve stationarity. If the data series are found to be integrated after p differencing (i.e., series become stationary after p differencing), then the series is integrated of order I. (p). The cointegration process is then carried out, meaning we can express one variable as a linear combination of the other (Saunders et al., 2001).

- **Lag Length Determination**

The Akaike Information Criterion (AIC) and Schwarz Bayesian Criterion (SBC) could be used to determine the appropriate lag length in the VAR model (SBC). The main idea behind AIC is to choose the model with the lowest negative likelihood, as measured by the number of parameters. Alternatively, the Schwarz Bayesian Criterion (Schwarz, 1978) is a popular information criterion. SBC, unlike AIC, is calculated within a Bayesian framework as an estimate of the Bayes factor for two competing models.

Both AIC and SBC aim to identify good models, even if they differ in their exact definition of a good model. In this case, we will choose the model with the lowest AIC and SBC value (Enders, 1995). The AIC and SBC equations are given below:

$$AIC = Blog\ I\Sigma I + 2N$$
$$SBC = Blog\ I\Sigma I + Blog\ (T)$$

where:
IΣI = the determinants of the variance/covariance matrix of the residuals;
N = total number of the parameters estimated in all equations; and
T = the number of usable observations.

B. Johansen Co-integration Test

The Johansen test can be considered a multivariate generalization of the Dickey-Fuller test. The generalization is the search for unit roots in linear combinations of variables. When there are more than two variables, the Johansen test and estimation strategy - maximum likelihood - allows for estimating all cointegrating vectors.1 If there are three variables, each with unit roots, there are at most two cointegrating vectors. In general, if there are n variables with unit roots, there can only be n 1 cointegrating vectors. All cointegrating vectors are estimated using the Johansen test. The presence of unit roots, like the Dickey-Fuller test, implies that standard asymptotic distributions do not apply.

C. Vector Autoregressive (VAR) Analysis

Vector Autoregressive (VAR) models have been shown to forecast better than simultaneous equation models by Sims (1980) and Litterman (1976, 1986). The VAR can be thought of as a method of conducting causality tests, and the study will use it to determine the significance of the variables if cointegration fails. It is an econometric model that generalizes univariate autoregressive (AR) models to capture the evolution and interdependence of multiple series. The VAR model treats all variables symmetrically, with each variable explained by its lagged values and the current and past values of the remaining variables in the model (Sims, 1980). Hence, there is no more distinction between exogenous and endogenous variables.

A VAR model describes the evolution of a set of k variables over the same sample period ($t = 1, \ldots, T$) as a linear function of only their past evolution (Watson, 1994). Using matrix notation, the multivariate VAR model in this study is represented as:

$$\begin{pmatrix} about \\ INF_t \\ IR_t \\ GDP \\ EX_t \end{pmatrix} = \begin{pmatrix} A_{10} \\ A_{20} \\ A_{30} \\ A_{40} \\ A_{50} \end{pmatrix} + \begin{pmatrix} A_{11}^{(1)} & A_{12}^{(1)} & A_{13}^{(1)} & A_{14}^{(1)} & A_{15}^{(1)} \\ A_{21}^{(1)} & A_{22}^{(1)} & A_{23}^{(1)} & A_{24}^{(1)} & A_{25}^{(1)} \\ A_{31}^{(1)} & A_{32}^{(1)} & A_{33}^{(1)} & A_{34}^{(1)} & A_{35}^{(1)} \\ A_{41}^{(1)} & A_{42}^{(1)} & A_{43}^{(1)} & A_{44}^{(1)} & A_{45}^{(1)} \\ A_{51}^{(1)} & A_{52}^{(1)} & A_{53}^{(1)} & A_{54}^{(1)} & A_{55}^{(1)} \end{pmatrix} \begin{pmatrix} about\text{-}1 \\ INF_{t-1} \\ IR_{t-1} \\ GDP_{-1} \\ EX_{t-1} \end{pmatrix}$$

$$+\ldots+ \begin{pmatrix} A_{11}^{(p)} & A_{12}^{(p)} & A_{13}^{(p)} & A_{14}^{(p)} & A_{15}^{(p)} \\ A_{21}^{(p)} & A_{22}^{(p)} & A_{23}^{(p)} & A_{24}^{(p)} & A_{25}^{(p)} \\ A_{31}^{(p)} & A_{32}^{(p)} & A_{33}^{(p)} & A_{34}^{(p)} & A_{35}^{(p)} \\ A_{41}^{(p)} & A_{42}^{(p)} & A_{43}^{(p)} & A_{44}^{(p)} & A_{45}^{(p)} \\ A_{51}^{(p)} & A_{52}^{(p)} & A_{53}^{(p)} & A_{54}^{(p)} & A_{55}^{(p)} \end{pmatrix} \begin{pmatrix} BOP_{t-p} \\ INF_{t-p} \\ IR_{t-p} \\ GDP_{-p} \\ EX_{t-p} \end{pmatrix} + \begin{pmatrix} \varepsilon_{1t} \\ \varepsilon_{2t} \\ \varepsilon_{3t} \\ \varepsilon_{4t} \\ \varepsilon_{5t} \end{pmatrix}$$

where:
t = time subscript;
BOP_t = balance of payments observed over time period t;
INF_t = inflation rate observed over time period t;
IR_t = real interest rate observed over time period t;
GDP = gross domestic product growth rate observed over time period t;
EX_t = exchange rate observed over time period t;
A_{io} = the parameters representing intercept terms;
A_{ij} = the polynomial in the lag operator;
p = leg length;
ε_t = the white noise or disturbance term.

D. Granger Causality Test

When conducting economic analysis, it is critical to understand whether changes in one variable will affect changes in other variables. The Granger causality test will be used in this study to investigate this phenomenon.

Granger's (1969, 1980) standard Granger causality test is widely used to determine whether past changes in one variable help explain current changes in other variables. The Granger causality test is a statistical hypothesis for determining whether one-time series is useful in forecasting another time series. A time series X is said to Granger-cause Y if it can be demonstrated, typically through a series of t-tests and F-tests on lagged values of X, that those X values provide statistically significant information about future Y values. *(www.wikipedia.com).* The basic idea behind this test is that if X causes Y, then changes in X occur first, followed by changes in Y. More specifically, if X Granger causes Y, then past X values can help predict Y, but the opposite may not be true.

The Granger Causality test differs from the common definition in that it measures the precedence and information provided by X in explaining the current value of Y. If X aids in the prediction of Y or if the coefficients on the lagged Xs are statistically significant, Y is said to be Granger-caused by X. It's worth noting that two-way causation is common:

X Granger causes Y, and Y Granger causes X. (www.scholarpedia.org). It is critical to understand that the phrase "X Granger causes Y" does not imply that Y is the result of X.

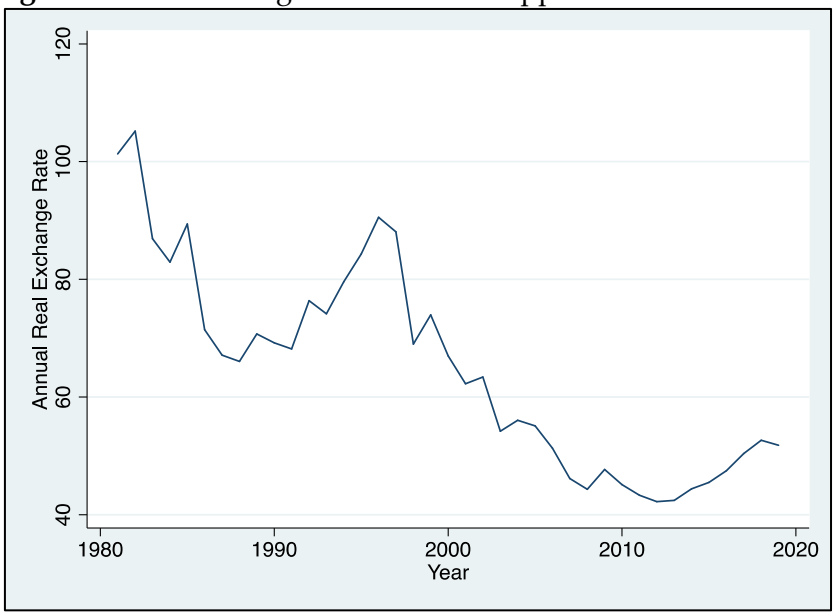
5. Result and Discussion

This section presents the study's findings and discussion. This includes graphical plots and variable trends, stationary tests, lag length determination, Co-integration Analysis, VAR estimation, and Granger test results.

5.1 The Trend of the Exchange Rate in the Philippines

Figure 2 depicts the Philippines' exchange rate trend from 1981 to 2019. The Asian economic and financial crisis caused a rapid decline in Philippine exchange rates from 1997 to 2010. The crisis affected all Asian countries studied in this study (Das, 1999). The Philippines' central bank, the Bangko Sentral ng Pilipinas (BSP), maintained a floating exchange rate system.

Figure 2: Real Exchange Rate in the Philippines from 1981 to 2019



Source: World Bank Database

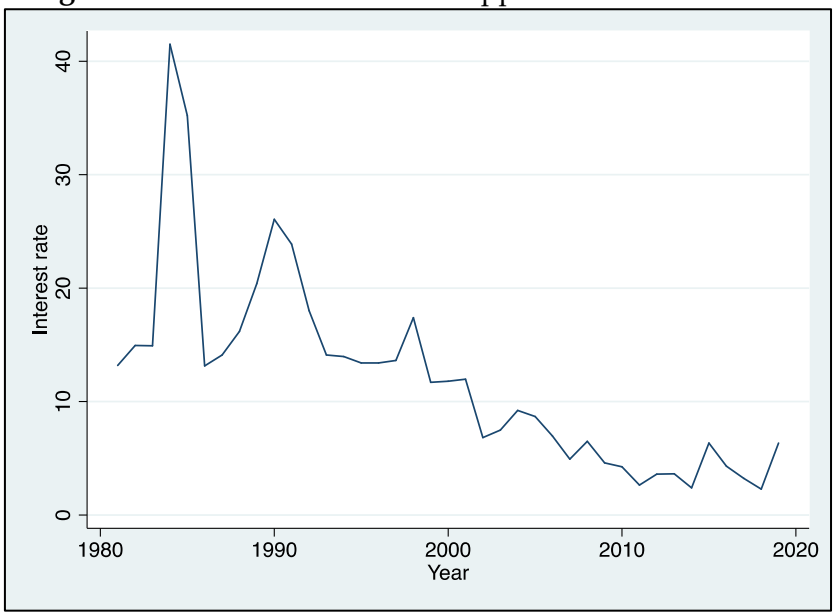
5.2 The Trend of Inflation Rate in the Philippines

The effects of inflation on an economy vary and can be both positive and negative. Inflationary effects include an increase in the opportunity cost of holding money, uncertainty about future inflation, which may discourage investment and savings, and, if inflation is rapid enough, shortages of goods as consumers begin hoarding in anticipation of future price increases. Positive effects include ensuring that central banks can adjust real interest rates (to avoid recessions) and encouraging non-monetary capital investment (www.economywatch.com).

Figure 3 depicts the Philippines' inflation rate from 1981 to 2019. Inflation is still regarded as a serious threat to macroeconomic stability (Yap, 1996). The Philippines'

modern macroeconomic history, particularly in the 1980s and 1990s, has been marked by periodic balance of payments crises accompanied by massive devaluations that resulted in high inflation because of the economic collapse in 1984-85, another recession in 1990-91, and the Asian crisis in 1998. (Lim, 2006). The economy collapsed in 1984, reaching the highest rate of inflation recorded at fifty percent, the highest peak of inflation rate in Philippine economic history (Philippine Institute for Development Studies, 1996).

Figure 3: Inflation Rate in the Philippines from 1981 to 2019

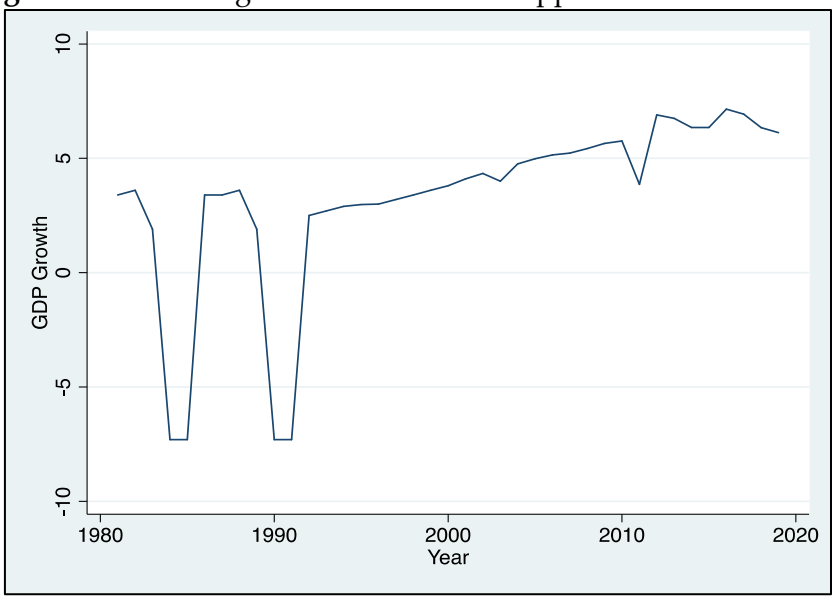


Source: www.nationmaster.com

5.3 Trend in Real Gross Domestic Product Growth Rate in the Philippines

Figure 4 shows the trend of the growth rate of the country's real gross domestic product growth rate from 1981 to 2019.

Figure 4: Real GDP growth rate in the Philippines from 1981 to 2019



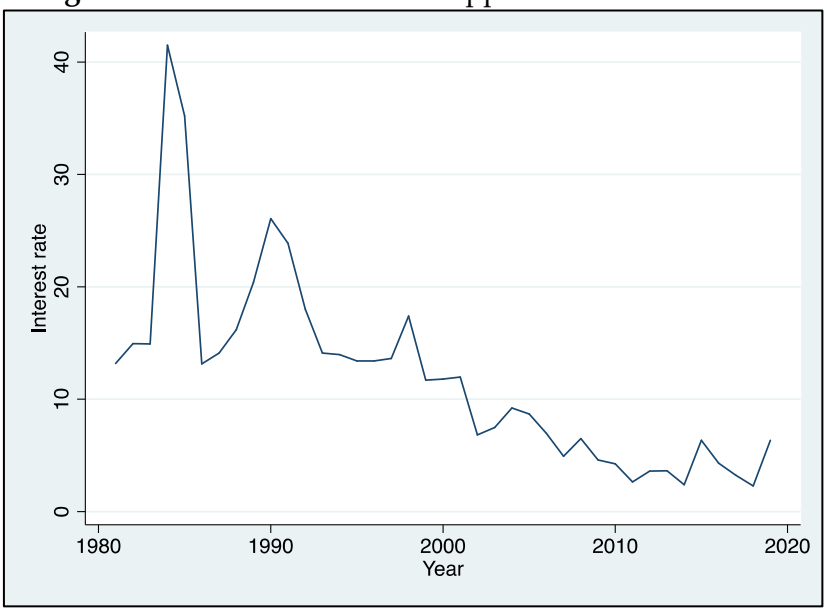
Source: www.nationmaster.com

After WWII, the Philippines was one of the richest countries in Asia, but growth slowed due to mismanagement, and political instability during the Marcos regime contributed to economic stagnation. Macroeconomic instability was evident during the country's severe recession from 1984 to 1985. During these years, real GDP grew at a -7.30% annual rate. Even during the 1997 financial crisis, the country's GDP was not significantly affected. The real growth rate of the gross domestic product in 2010 was 7.63%. This is the fastest growth rate ever recorded in the Philippines. President Gloria Macapagal Arroyo implemented a number of fiscal measures that greatly benefited the Philippine economy. During this time, the Philippines' GDP reached one of its peak levels (www.history.com/topics/world-war-ii).

5.4 Trend in Interest Rate in the Philippines

Figure 5 depicts a downward trend, albeit fluctuating, in the Philippines' interest rate. Over the last 30 years, the interest rate has ranged from a high of 41.50% in 1984 to a low of 4.26% in 2010. In the Philippines, interest rate decisions are made by the Monetary Board of the Bangko Sentral ng Pilipinas (BSP), which is committed to promoting and maintaining price stability and providing proactive leadership in establishing a strong financial system conducive to the economy's balanced and sustainable growth.

Figure 5: Interest rate in the Philippines from 1981 to 2019



Source: World Bank Database

5.5 Augmented Dickey-Fuller (ADF) Test for Unit Root

It is critical to remember that time series stationary is an important assumption in VAR analysis. To avoid spurious results and conclusions when analyzing individual data on bidirectional causality, it is necessary to test whether or not the variables are stationary (in this case, unit root). According to the University of Washington (2005), if the data is non-stationary, these time series variables exhibit trend behavior, complicating making inferences from the time-series data. Rufino (2008) also emphasized this feature of time-

series data, stating that they typically move together "*...as certain common overriding forces of growth and decline impact their behavior*" (p. 17). As a result, unit root tests are also required to apply the correct Granger Causality Test - whether to use (1) unrestricted VAR Granger or (2) Error Correction VAR Granger. The null hypothesis in the ADF Test is that the variables contain a unit root.

Table 1: Summary of Results of Augmented Dickey-Fuller (ADF) Unit Root Test

Variables	Log (level)	Log First-Difference
Balance of payment	-0.3791341	-0.144078*
Exchange rate	-0.1030094	-0.1513079*
Interest rate	0.1334028	-0.2954297*
Inflation	0.0854561	-0.7171569*
GDP growth	0.2992862	-0.4554079*

Note: *statistically significant at 5%

The Table 1 above displays the ADF test statistics. The Stata results are presented in Appendix A, where values are deemed statistically significant if the test statistics fall below the critical level of 5%. To avoid erroneous results, the Granger Test should take this into account. Furthermore, the log at first difference results for all the variables in question (balance of payments, exchange rate, interest rate, inflation, and GDP growth) is statistically significant, so the null hypothesis is rejected. As a result, variables are stationary.

5.6 Johansen Co-integration Test

Similarly, by examining whether the data is co-integrated, this test tends to cater to the strictness of the Granger Causality Test. However, in this case, the test also looks at the long-term relationship between the variables in the study. The co-integration test is also important in determining which type of Granger Test to use and avoiding spurious results in time-series data when the data is not related in the long run. However, the optimal number of lags must be determined before running the Johansen Co-integration Test command in Stata (as shown in Table 2)

Table 3 provides a summary of the presence of co-integration at the data level. The null hypothesis is rejected for the level data on exchange rate-balance of payment, interest rate-balance of payment, inflation-balance of payment, and GDP growth-balance of payment, indicating that all concerned variables have a long-run relationship and data are co-integrated.

Table 2: Summary of Results of Johansen Co-integration Test

Variable	Trace Stat	5% Critical Value	Hypothesis No Co-integration
Exchange rate	9.7037	15.41	Reject
Interest rate	9.8935	15.41	Reject
Inflation	9.9149	15.41	Reject
GDP growth	9.5549	15.41	Reject

Note: Full Stata Results of this test are in Appendix C.

5.7 Lag Length Determination

The determination of the lag length is a critical component in the specification of a VAR model. To select an appropriate p, the series must go through the lag length specification in the VAR lag order selection criteria. Choosing the incorrect lag length would result in inconsistent results because the accuracy forecasts from VAR models differ significantly for different lag lengths. Table 2 shows that the Likelihood Ratio (LR) and the Akaike Information Criterion (AIC) all chose VAR of order 2. The lag length selection results show that the variables of the balance of payments, interest rate, inflation rate, gross domestic product growth rate, and real exchange rate have an effect on the current values of a balance of payments, interest rate, inflation rate, gross domestic product growth rate, and real exchange rate over the last two years.

Table 3: VAR Lag Order Selection Criteria

Lag	LR	FPO	AIC
0		71.6773	71.7541
1	128.16	1.1e+24*	69.565
2	50.926*	1.20E+24	69.5399*

Note: * 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

5.8 VAR Analysis

We performed Vector Autoregression (VAR) analysis after determining We performed Vector Autoregression (VAR) analysis after determining the stationary properties of the series and the appropriate lag length. VAR can capture underlying statistical interdependence between exogenous and endogenous variables. It is based primarily on the assumption of concurrent interactions between these variables.

As shown in Table 4, using the unrestricted VAR Granger framework, the macroeconomic variables considered in this study included the balance of payments (BOP), interest rate (IR), inflation rate (INF), GDP growth rate (GDP), and real exchange rate (EX). Appendix D shows the VAR estimation outputs and standard errors. The results were obtained using Stata package version 14.0. The estimates among the macroeconomic variables in the unrestricted VAR model can then be used to explain the effect of one variable on another and the effect of past values (two years ago) on another.

The estimates among the macroeconomic variables under the unrestricted VAR model can then be used to explain the effect of each variable on another and the effect of one variable's past values (two years before) on another. Results of this study revealed that the selected macroeconomic variables explained the variability in BOP between 61% to 67%. The exchange rate explains 96% of the variability in the previous values of the variables. In comparison, the interest rate explains 95% of the variability in the previous values, and the real gross domestic product explains 83% of the variability in the previous values of the variables.

As shown in Appendix D, the balance of payment was positively affected by last year's exchange rate (-1) and its own lagged values interest rate (-3), indicating that there is evidence that the value of the variable three years ago has a direct effect to the current values of a balance of payment does the balance of payment also affect the past (-1) one year value of interest rates. Subsequently, the present inflation rate of the country can be negatively affected by the previous year's balance of payment (-1). Moreover, the results showed that the real gross domestic product could affect the balance of payments (-3) four years ago.

Table 4: Utilization of Data and Granger Causality Test Methods

Conditionality	**Granger Causality Method/ Data**	**Causality Applicability**
Level X and Y data are stationary and have co-integration	Unrestricted VAR Granger/ Level of Data	IR-BOP INF-BOP EX-BOP GDP-BOP
Level X and Y are not stationary but have cointegration	Error Correction VAR Granger/ Level of Data	None
Level X and Y are stationary but have no co-integration	Unrestricted VAR Granger/ Level of Data	None

Table 5: Granger Causality Test Results

Null Hypothesis	**Chi-square**	**Probability**	**Inference**
BOP does not cause EX	11.56	0.172	Accept
EX does not cause BOP	1.4764	0.478	Accept
BOP does not IR	16.77	0.033	Reject
IR does not cause BOP	-	-	No inference*
BP does not INF	10.781	0.214	Accept
INF does not cause BOP	4.304	0.038	Reject
BOP does not cause GDP	8.7672	0.362	Accept
GDP does not cost BOP	-	-	No inference*
No inference - means no "freedom" to vary, no way to affirm or reject the model.			

Table 5 shows the Granger causality test results for the unrestricted VAR model. At the 5% significance level, the results indicate the direction of the causal relationship between the BOP and its determinants: the inflation rate, interest rate, exchange rate, and GDP. The results of the Granger Causality test are shown in Table 5. The null hypotheses that BOP does not Granger cause IR and INF dose does not Granger cause BOP are rejected at the 5% significant level because the causality test results are significant. BOP and IR have a unidirectional relationship. It implies that IR can explain the past values of the BOP. It can be deduced that an increase in either BOP will generate momentum, causing the variables to rise over time. However, the relationship between INF and BOP was statistically significant and unidirectional. This means that INF values in the past can help predict BOP values in the past and can help forecast current BOP values. However, BOP

does not Granger cause EX, EX does not Granger cause BOP, BOP does not Granger cause INF, and BOP does not Granger cause GDP are accepted at a 5% significance level, indicating that the variables do not have a significant relationship. The study's results also confirm the results of the study conducted by Natukunda, Primrose Dianah (2021), A. H. Sultani, and U. Faisal (2022).

6. Conclusions and Recommendations

6.1 Conclusion

The relationship between macroeconomic variables in the Philippines, such as determinants of the balance of payment fluctuations, was examined in this paper. Annual data from 1981 to 2019 were used in the study. To avoid spurious regression problems, standard time series measures were performed first to statistically test the properties of the data series using Stata 14.0. The Johansen Co-integration test is used in this study to test the long-term relationship between variables and determine which VAR model should be used. Under the VAR model, the unrestricted Vector Autoregression (VAR) analysis was used to examine the relationships between economic variables and estimate the important parameters of the VAR equation. To determine the direction of causality of the variables, the Granger causality test was performed using the VAR 2 model at the 5% significance level. Results revealed that the selected macroeconomic variables explained the variability in BOP between 61% to 67%. The exchange rate explains 96% of the variability in the previous values of the variables. In comparison, the interest rate explains 95% of the variability in the previous values, and the real gross domestic product explains 83% of the variability in the previous values of the variables.

Based on the Johansen Co-integration analysis results, the study discovered that the significant determinants of the balance of payment fluctuations were exchange rate, interest rate, inflation, and GDP to play direct roles in determining BOP in the Philippines in the long run.

The Granger Causality test results revealed that the relationship between variables BOP and IR is unidirectional. This means that real IR can explain past BOP values. Furthermore, the relationship between INF and BOP is unidirectional. This means that past INF values can be used to forecast current balance of payments values.

6.2 Recommendation

In the Philippines, the interest rate has a significant relationship to the balance of payments, while the balance of payment has a significant relationship to the inflation rate. This means any changes in interest rate could influence the balance of payments, while changes in the balance of payment would also influence the inflation rate. As the results reveal policy implications for the Philippines, given that we have discovered that balance of payment does not cause each other's, but the balance of payment causes interest rate and balance of payment causes inflation rate. The government could focus on developing policies relating to the balance of payments considering interest rate as factors that can influence it and the balance of payments influence inflation rate to put

the Philippines economy on the path of sustainable growth and development as well as reduce the balance of payment fluctuations; it is recommended that government encourages to put policies on managing interest rate to improve balance payments and control the inflation rate. A country with a balance of payments surplus will likely export a lot. Furthermore, the government and residents are savers, providing sufficient capital to fund this production and even lend to other countries. This is an excellent scenario for boosting economic growth in the short term. However, in the long run, this country must encourage its citizens to spend more and create a larger domestic market. This will keep it from becoming overly reliant on export-driven growth. (economy.about.com). Researcher also suggest for future researcher to analyze the impact of qualitative variable of BOP to be investigated.

Conflict of Interest Statement

The authors declare no conflicts of interest.

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Appendix A: Augmented Dickey-Fuller Test Result

dfuller BOP, drift lags(1) regress

Augmented Dickey-Fuller test for unit root Number of obs = 37

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-2.179	-2.441	-1.691	-1.307

p-value for Z(t) = 0.0182

D.BOP	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
BOP						
L1.	-.3791341	.173999	-2.18	0.036	-.7327427	-.0255255
LD.	-.144078	.1858106	-0.78	0.443	-.5216905	.2335346
_cons	7.57e+08	7.42e+08	1.02	0.315	-7.51e+08	2.26e+09

dfuller EX, drift lags(1) regress

Augmented Dickey-Fuller test for unit root Number of obs = 37

Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	
Z(t)	-2.521	-2.441	-1.691	-1.307

p-value for Z(t) = 0.0083

D.EX	Coef.	Std. Err.	t	P>|t|	[95% Conf. Interval]	
EX						
L1.	-.1513079	.0600262	-2.52	0.017	-.2732959	-.0293199
LD.	-.1030094	.1550028	-0.66	0.511	-.4180131	.2119942
_cons	8.130314	3.990781	2.04	0.049	.020071	16.24056

dfuller IR, drift lags(1) regress

Augmented Dickey-Fuller test for unit root Number of obs = 37

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-2.369	-2.441	-1.691	-1.307

p-value for Z(t) = 0.0118

D.IR	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
IR						
L1.	-.2954297	.1246872	-2.37	0.024	-.5488246	-.0420348
LD.	.1334028	1729415	0.77	0.446	-.2180565	.4848621
_cons	3.381167	1.828299	1.85	0.073	-.3343835	7.096718

dfuller INF, drift lags(1) regress

Augmented Dickey-Fuller test for unit root Number of obs = 37

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-3.618	-2.441	-1.691	-1.307

p-value for Z(t) = 0.0005

D.INF	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
INF						
L1.	-.7171569	.1982273	-3.62	0.001	-1.120003	-.3143106
LD.	.0854561	.1716769	0.50	0.622	-.2634334	.4343456
_cons	5.91965	2.205974	2.68	0.011	1.436571	10.40273

dfuller GDP, drift lags(1) regress

Augmented Dickey-Fuller test for unit root Number of obs = 37

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value
Z(t)	-3.270	-2.441	-1.691	-1.307

p-value for Z(t) = 0.0012

D.GDP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
GDP						
L1.	-.4554079	.139251	-3.27	0.002	-.7384	-.1724157
LD.	.2992862	.1654736	1.81	0.079	-.0369965	.635569
_cons	1.480831	.655336	2.26	0.030	.1490281	2.812634

Appendix B: Lag Length Determinants

varsoc BOP EX IR INF GDP, maxlag(2)

Selection-order criteria
Sample: 1983 - 2019 Number of obs. = 37

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-1321.03				9.3e+24	71.6773	71.7541	71.895
1	-1256.95	128.16	25	0.000	1.1e+24*	69.565	70.0254*	70.8711*
2	-1231.49	50.926*	25	0.002	1.2e+24	69.5399*	70.3842	71.9345

Endogenous: BOP EX IR INF GDP
Exogenous: _cons

Appendix C: Johansen Co-integration Test

vecrank BOP EX, lag(1)

Johansen tests for cointegration
Trend: constant Number of obs. = 38
Sample: 1982 - 2019 Lags = 1

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	2	-1018.9995	.	9.7037*	15.41
1	5	-1014.1477	0.22536	0.0000	3.76
2	6	-1014.1477	0.00000		

vecrank BOP IR, lag(1)

Johansen tests for cointegration
Trend: constant Number of obs. = 38
Sample: 1982 - 2019 Lags = 1

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	2	-1018.443	.	9.8935*	15.41
1	5	-1013.4962	0.22922	0.0000	3.76
2	6	-1013.4962	0.00000		

vecrank BOP INF, lag(1)

Johansen tests for cointegration
Trend: constant Number of obs. = 38
Sample: 1982 - 2019 Lags = 1

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	2	-1036.1931	.	9.9149*	15.41
1	5	-1031.2356	0.22966	0.0000	3.76
2	6	-1031.2356	0.00000		

vecrank BOP GDP, lag(1)

Johansen tests for cointegration
Trend: constant Number of obs = 38
Sample: 1982 - 2019 Lags = 1

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	2	-993.71191	.	9.5549*	15.41
1	5	-988.93447	0.22232	0.0000	3.76
2	6	-988.93447	0.00000		

Appendix D: VAR Analysis and Granger Test

var BOP EX, lag(1/8)

Vector autoregression

Sample: 1989 - 2019 Number of obs = 31
Log likelihood = -804.7645 AIC = 54.11384
FPE = 1.43e+21 HQIC = 54.62652
Det(Sigma_ml) = 1.21e+20 SBIC = 55.6866

Equation	Parms	RMSE	R-sq	chi2	P>chi2
BOP	17	4.2e+09	0.6362	54.2029	0.0000
EX	17	5.84746	0.9258	216.2952	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
BOP |						
BOP |						
L1. |	-.0528769	.1885571	-0.28	0.779	-.422442	.3166882
L2. |	.0798308	.2081389	0.38	0.701	-.328114.	.4877756
L3. |	.4488511	.2014895	2.23	0.026*	.0539389	.8437633
L4. |	.2443297	.2658943	0.92	0.358	-.2768135	.7654729
L5. |	-.0840195	.2522427	-0.33	0.739	-.5784061	.410367
L6. |	-.778784	.2170965	-3.59	0.000	-1.204285	.3532826
L7. |	-.5125178	.2883773	-1.78	0.076	-1.077727	.0526914
L8. |	-.5629846	.2861998	-1.97	0.049	-1.123926	.0020433
EX |						
L1. |	-1.45e+08	1.23e+08	-1.18	0.239	-3.87e+08	9.63e+07
L2. |	5.05e+07	1.70e+08	0.30	0.766	2.83e+08	3.84e+08
L3. |	6114143	1.45e+08	0.04	0.966	-2.78e+08	2.91e+08
L4. |	-3.95e+07	1.29e+08	-0.31	0.759	-2.92e+08	2.13e+08
L5. |	2.33e+07	1.23e+08	0.19	0.850	-2.18e+08	2.64e+08
L6. |	-1.40e+07	1.16e+08	-0.12	0.904	-2.41e+08	2.13e+08
L7. |	-1.06e+08	1.18e+08	-0.90	0.368	-3.38e+08	1.25e+08

L8.	-3.09e+07	1.02e+08	-0.30	0.762	-2.31e+08	1.70e+08
_cons	2.10e+10	6.65e+09	3.15	0.002	7.93e+09	3.40e+10
EX						
BOP						
L1.	2.28e-11	2.64e-10	0.09	0.931	-4.94e-10	5.39e-10
L2.	-5.52e-10	2.91e-10	-1.90	0.058	-1.12e-09	1.82e-11
L3.	5.36e-10	2.82e-10	1.90	0.057	-1.61e-11	1.09e-09
L4.	-4.06e-11	3.72e-10	-0.11	0.913	-7.69e-10	6.88e-10
L5.	4.91e-10	3.53e-10	1.39	0.163	-2.00e-10	1.18e-09
L6.	-9.08e-11	3.03e-10	-0.30	0.765	-6.85e-10	5.04e-10
L7.	-1.56e-10	4.03e-10	-0.39	0.698	-9.46e-10	6.34e-10
L8.	-4.82e-10	4.00e-10	-1.20	0.229	-1.27e-09	3.02e-10
EX						
L1.	1.138776	.1721688	6.61	0.000*	.8013317	1.476221
L2.	-.2128669	.2374731	-0.90	0.370	-.6783057	.2525718
L3.	.2511676	.2028246	1.24	0.216	-.1463613	.6486965
L4.	-.3065957	.1799705	-1.70	0.088	-.6593314	.04614
L5.	.2022486	.1718958	1.18	0.239	-.134661	.5391583
L6.	-.4933928	.1620946	-3.04	0.002	-.8110923	-.1756933
L7.	.5498744	.1649854	3.33	0.001	.226509	.8732399
L8.	-.1920108	.1428914	-1.34	0.179	-.4720729	.0880513
_cons	3.569873	9.28908	0.38	0.701	-14.63639	21.77613

vargranger

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
BOP	EX	11.56	8	0.172
BOP	ALL	11.56	8	0.172
EX	BOP	1.4764	2	0.478
EX	ALL	1.4764	2	0.478

var BOP INF, lag(1/8)

Vector autoregression

Sample: 1989 - 2019 Number of obs = 31
Log likelihood = -770.1184 AIC = 51.87861
FPE = 1.52e+20 HQIC = 52.39129
Det(Sigma_ml) = 1.30e+19 SBIC = 53.45137

Equation	Parms	RMSE	R-sq	chi2	P>chi2
BOP	17	3.9e+09	0.6758	64.63306	0.0000
IR	17	2.01996	0.9540	283.3978	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]	
BOP						
BOP						
L1.	-.067387	.2105923	-0.32	0.749	-.4801404	.3453664
L2.	.0447445	.206893	0.22	0.829	-.3607584	.4502474
L3.	.7383111	.2190154	3.37	0.001*	.3090487	1.167573
L4.	.4167656	.3010548	1.38	0.166	-.173291	1.006822
L5.	.2065697	.2601248	0.79	0.427	-.3032655	.716405
L6.	-.854462	.2098399	-4.07	0.000	-1.265741	-.4431833
L7.	-.7914501	.3353232	-2.36	0.018	-1.448672	-.1342286
L8.	-.7227583	.3310503	-2.18	0.029	-1.371605	-.0739116
IR						
L1.	-7.09e+07	3.19e+08	-0.22	0.824	-6.96e+08	5.55e+08
L2.	4.32e+08	3.46e+08	1.25	0.211	-2.45e+08	1.11e+09
L3.	-6.41e+08	3.05e+08	-2.10	0.035*	-1.24e+09	-4.38e+07
L4.	3.68e+08	2.92e+08	1.26	0.208	-2.05e+08	9.41e+08
L5.	-5.36e+08	2.20e+08	-2.44	0.015	-9.66e+08	-1.05e+08
L6.	2.09e+08	2.02e+08	1.03	0.302	-1.87e+08	6.04e+08
L7.	-2.03e+08	1.56e+08	-1.30	0.194	-5.09e+08	1.03e+08
L8.	9.92e+07	1.53e+08	0.65	0.518	-2.02e+08	4.00e+08
_cons	7.72e+09	2.87e+09	2.69	0.007	2.09e+09	1.34e+10
IR						
BOP						
L1.	-2.76e-10	1.08e-10	-2.57	0.010*	-4.87e-10	-6.53e-11
L2.	1.56e-10	1.06e-10	1.47	0.142	-5.18e-11	3.63e-10
L3.	-8.28e-12	1.12e-10	-0.07	0.941	-2.28e-10	2.11e-10
L4.	1.59e-10	1.54e-10	1.03	0.301	-1.43e-10	4.61e-10
L5.	3.06e-10	1.33e-10	2.30	0.021	4.54e-11	5.67e-10
L6.	1.29e-10	1.07e-10	1.21	0.228	-8.10e-11	3.40e-10
L7.	-3.08e-10	1.71e-10	-1.80	0.073	-6.44e-10	2.82e-11
L8.	-2.08e-10	1.69e-10	-1.23	0.220	-5.40e-10	1.24e-10
IR						
L1.	.4340074	.1632208	2.66	0.008*	.1141006	.7539143
L2.	.1649477	.1767127	0.93	0.351	-.1814028	.5112982
L3.	.0366215	.1559438	0.23	0.814	-.2690226	.3422657
L4.	-.1878525	.1494871	-1.26	0.209	-.4808417	.1051368
L5.	.3531944	.1123994	3.14	0.002	.1328956	.5734932
L6.	.0240671	.103289	0.23	0.816	-.1783755	.2265098
L7.	.1449632	.0798825	1.81	0.070	-.0116036	.30153
L8.	-.029104	.0784729	-0.37	0.711	-.1829081	.1247001
_cons	-1.358104	1.469557	-0.92	0.355	-4.238383	1.522176

vargranger

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
BOP	IR	16.77	8	0.033
BOP	ALL	16.77	8	0.033
IR	BOP	.	0	.
IR	ALL	.	0	.

var BOP INF, lag(1/8)

Vector autoregression

Sample: 1989 - 2019 Number of obs = 31
Log likelihood = -790.3032 AIC = 53.18085
FPE = 5.61e+20 HQIC = 53.69353
Det(Sigma_ml) = 4.77e+19 SBIC = 54.75361

Equation	Parms	RMSE	R-sq	chi2	P>chi2
BOP	17	4.2e+09	0.6294	52.64459	0.0000
INF	17	3.68484	0.6664	22.84489	0.1179

	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
BOP						
BOP						
L1.	-.1815167	.2132871	-0.85	0.395	-.5995518	.2365184
L2.	.2165524	.2431218	0.89	0.373	-.2599575	.6930624
L3.	.7715652	.2444753	.16	0.002*	.2924023	1.250728
L4.	.7278354	.3444773	2.11	0.035	.0526722	1.402999
L5.	.1857928	.3353235	0.55	0.580	-.4714292	.8430147
L6.	-.8400417	.2386517	-3.52	0.000	-1.30779	-.372293
L7.	-.9664907	.3888017	-2.49	0.013	-1.728528	-.2044534
L8.	-.8286852	.3724938	-2.22	0.026	-1.55876	-.0986107
INF						
L1.	4.49e+07	2.07e+08	0.22	0.828	-3.62e+08	4.51e+08
L2.	-4.55e+07	1.84e+08	-0.25	0.805	-4.06e+08	3.15e+08
L3.	-9.33e+07	1.81e+08	-0.52	0.605	-4.47e+08	2.61e+08
L4.	-1.32e+08	1.77e+08	-0.74	0.456	-4.78e+08	2.15e+08
L5.	-1.48e+08	8.57e+07	-1.73	0.083	-3.16e+08	1.95e+07
L6.	-1.32e+08	7.40e+07	-1.78	0.075	-2.77e+08	1.34e+07
L7.	-3.07e+07	7.11e+07	-0.43	0.666	-1.70e+08	1.09e+08
L8.	4.78e+07	8.69e+07	0.55	0.582	-1.22e+08	2.18e+08
_cons	6.73e+09	2.69e+09	2.51	0.012	1.47e+09	1.20e+10

INF						
BPO						
L1.	-6.01e-10	1.86e-10	-3.23	0.001*	-9.65e-10	-2.36e-10
L2.	3.46e-10	2.12e-10	1.63	0.103	-6.98e-11	7.62e-10
L3.	9.82e-11	2.13e-10	0.46	0.645	-3.20e-10	5.16e-10
L4.	6.65e-10	3.01e-10	2.21	0.027	7.55e-11	1.25e-09
L5.	-2.99e-10	2.93e-10	-1.02	0.307	-8.73e-10	2.74e-10
L6.	-4.00e-10	2.08e-10	-1.92	0.054	-8.09e-10	7.66e-12
L7.	-7.04e-10	3.39e-10	-2.07	0.038	-1.37e-09	-3.89e-11
L8.	-2.16e-11	3.25e-10	-0.07	0.947	-6.59e-10	6.15e-10
INF						
L1.	.0867075	.1809714	0.48	0.632	-.2679899	.4414049
L2.	-.0001883	.1605873	-0.00	0.999	-.3149335	.3145569
L3.	.1059505	.1576021	0.67	0.501	-.202944	.414845
L4.	-.0422624	.1541762	-0.27	0.784	-.3444421	.2599174
L5.	-.0570365	.0747379	-0.76	0.445	-.20352	.089447
L6.	.0569734	.0645924	0.88	0.378	-.0696254	.1835723
L7.	.2026331	.0620306	3.27	0.001	.0810554	.3242109
L8.	.0485113	.0757866	0.64	0.522	-.1000276	.1970502
_cons	4.570474	2.342862	1.95	0.051	-.0214498	9.162399

. vargranger

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
BOP	INF	10.781	8	0.214
BOP	ALL	10.781	8	0.214
INF	BOP	4.304	1	0.038
INF	ALL	4.304	1	0.038

var BP GDP, lag(1/8)

Vector autoregression

Sample: 1989 - 2019 Number of obs = 31
Log likelihood = -771.4019 AIC = 51.96141
FPE = 1.66e+20 HQIC = 52.47409
Det(Sigma_ml) = 1.41e+19 SBIC = 53.53417

Equation	Parms	RMSE	R-sq	chi2	P>chi2
BOP	17	4.3e+09	0.6106	48.6123	0.0000
GDP	17	1.99113	0.8347	77.02478	0.0000

	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]
BOP					

BOP						
L1.	-.0203916	.2030808	-0.10	0.920	-.4184226	.3776393
L2.	.2360897	.2145931	1.10	0.271	-.1845052	.6566845
L3.	.6264595	.208798	3.00	0.003*	.217223	1.035696
L4.	.5030992	.2911362	1.73	0.084	-.0675174	1.073716
L5.	-.0526511	.2847452	-0.18	0.853	-.6107413	.5054392
L6.	-.6989002	.215172	-3.25	0.001	-1.12063	-.2771709
L7.	-.6425246	.3190521	-2.01	0.044	-1.267855	-.0171939
L8.	-.5243745	.3373674	-1.55	0.120	-1.185602	.1368533
GDP						
L1.	-3.40e+08	3.75e+08	-0.91	0.364	-1.07e+09	3.94e+08
L2.	5.39e+07	4.62e+08	0.12	0.907	-8.52e+08	9.60e+08
L3.	2.69e+08	4.07e+08	0.66	0.508	-5.28e+08	1.07e+09
L4.	-4.26e+07	3.78e+08	-0.11	0.910	-7.83e+08	6.97e+08
L5.	4.67e+08	3.74e+08	1.25	0.211	-2.65e+08	1.20e+09
L6.	-1.79e+08	3.58e+08	-0.50	0.617	-8.80e+08	5.22e+08
L7.	5.63e+08	3.39e+08	1.66	0.096	-1.01e+08	1.23e+09
L8.	-2.49e+08	2.88e+08	-0.86	0.388	-8.14e+08	3.16e+08
_cons	1.15e+09	9.53e+08	1.21	0.228	-7.18e+08	3.02e+09
GDP						
BOP						
L1.	1.23e-10	9.34e-11	1.31	0.189	-6.03e-11	3.06e-10
L2.	6.66e-11	9.87e-11	0.68	0.500	-1.27e-10	2.60e-10
L3.	-4.30e-11	9.60e-11	-0.45	0.654	-2.31e-10	1.45e-10
L4.	-3.35e-10	1.34e-10	-2.50	0.012*	-5.97e-10	-7.20e-11
L5.	-4.59e-11	1.31e-10	-0.35	0.726	-3.03e-10	2.11e-10
L6.	1.77e-11	9.90e-11	0.18	0.858	-1.76e-10	2.12e-10
L7.	3.37e-10	1.47e-10	2.30	0.022	4.95e-11	6.25e-10
L8.	1.62e-10	1.55e-10	1.05	0.295	-1.42e-10	4.67e-10
GDP						
L1.	.7915028	.1722764	4.59	0.000*	.4538473	1.129158
L2.	-.39943	.2125424	-1.88	0.060	-.8160054	.0171455
L3.	.2787351	.1871426	1.49	0.136	-.0880578	.6455279
L4.	-.14813	.1736455	-0.85	0.394	-.488469	.1922089
L5.	.0731604	.1718959	0.43	0.670	-.2637494	.4100701
L6.	.3990372	.1644736	2.43	0.015	.0766748	.7213995
L7.	-.2537032	.155748	-1.63	0.103	-.5589636	.0515572
L8.	.1290509	.1326715	0.97	0.331	-.1309805	.3890823
_cons	.6920438	.4381816	1.58	0.114	-.1667763	1.550864

. vargranger

Granger causality Wald tests

Equation	Excluded	chi2	df	Prob > chi2
BOP	GDP	8.7672	8	0.362
BOP	ALL	8.7672	8	0.362
GDP	BOP	.	0	.

GDP	ALL	.	0	.	

Appendix E: Time Series Data used in the Analysis

Year	Balance of Payment	Exchange rate	Interest rate	Inflation rate	GDP Growth rate
1981	-547000000	101.32	13.19	11.7	3.4
1982	-1671000000	105.18	14.95	8.7	3.6
1983	-1350000000	86.91	14.92	14.2	1.9
1984	243000000	82.93	41.5	53.3	-7.3
1985	2301000000	89.41	35.21	17.6	-7.3
1986	1242000000	71.45	13.15	3	3.4
1987	-39000000	67.11	14.11	7.5	3.4
1988	593000000	66.04	16.18	9.6	3.6
1989	451000000	70.71	20.4	9	1.9
1990	-93000000	69.2	26.06	13	-7.3
1991	2103000000	68.18	23.88	16.5	-7.3
1992	1492000000	76.37	18.01	7.9	2.5
1993	-166000000	74.15	14.11	6.8	2.7
1994	1802000000	79.57	13.97	10	2.9
1995	631000000	84.3	13.4	7.6	2.98
1996	4107000000	90.53	13.41	7.7	3
1997	-3363000000	88.08	13.63	6.2	3.2
1998	1359000000	69	17.4	22.4	3.4
1999	3586000000	73.95	11.7	6.6	3.6
2000	-513000000	66.99	11.8	5.7	3.8
2001	-192000000	62.25	11.98	5.5	4.1
2002	810000000	63.41	6.82	4.2	4.34
2003	115000000	54.2	7.49	3.2	4
2004	-280000000	56.04	9.22	5.5	4.76
2005	2410000000	55.09	8.68	5.8	4.98
2006	3769000000	51.31	6.96	6.3	5.15
2007	8557000000	46.15	4.92	5.9	5.23
2008	89000000	44.32	6.49	6.4	5.43
2009	6421000000	47.68	4.59	6.8	5.65
2010	14308000000	45.11	4.26	6.5	5.76
2011	5642727681	43.31	2.64	4.72	3.86
2012	6949480669	42.23	3.61	3.03	6.9
2013	11383508584	42.45	3.63	2.58	6.75
2014	10755931842	44.4	2.4	3.6	6.35
2015	7265677953	45.5	6.34	0.67	6.35
2016	-1198874442	47.49	4.31	1.25	7.15
2017	-2968677	50.4	3.23	2.85	6.93

2018	-8877047441	52.66	2.29	5.21	6.34
2019	-3046835246	51.8	6.35	2.48	6.12

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