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The relationship between exchange rates, trade and economic growth in the Philippine context

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Abstract. *This paper attempts to establish the relationship of between economic growth and movements in foreign exchange rates. It also tries to formulate alternative exchange rate policies that would help remove distortions in the foreign exchange rate and the relative price of products in the world market. The policies that will be recommended at the end of this paper will also focus on increasing the competitiveness of the external sector.*
It is hoped that this study will shed new light into the factors that affect economic growth in the Philippines. This paper aims to contribute to the literature on international trade and exchange rates and help inform public policy on how to deal with those issues.

Keywords: economic growth, exchange rates, trade.

JEL Classification: F14, F43.

1. Introduction

The Philippines has adopted two exchange rate regimes in the past 40 years. From the fixed exchange rate regime during the 1960s up to the early 1990s to the flexible exchange rate regime that was implemented during the Aquino Administration in 1992. The foreign exchange rate has played a big part in the economy, as it is one of the indicators of economic performance for the next month, quarter or year. Indeed, movements in the foreign exchange rate especially the United States of America (US) dollar to the Philippine peso exchange rate has been closely monitored not only by the public but most of all by the government and business and the external sector.

Distortions in the foreign exchange rate could spell growth or loss in the economy as it indicates how well the external sector will perform in the world market. The export sector that is dominated by the garments and the electronics or semi-conductor industry has been very conscious when it comes to competitiveness in their respective foreign industry counterparts. A stable export price index removes the uncertainty about the profits being realized by the export industries. Reduction in the variability of the foreign exchange rate also ensures the competitive of our domestic product in terms of its relative price with the same product in the world market.

Besides the importance of foreign exchange rate movements to the performance of the external sector, the foreign exchange rate is also important for the private and government sector in terms of their foreign currency borrowing. For the two sectors a stable foreign exchange rate means that the loans that they acquired from foreign borrowers can be easily paid.

Thus, effective exchange rate policies are very important to remove large fluctuations in the determination of foreign exchange rate. By doing so, the economy will have stable relative and domestic price level and will therefore increase the purchasing power of the domestic consumers and thus will lead to stable economic growth.

This paper attempts to establish the relationship of between economic growth and movements in the foreign exchange rates. The paper tries to formulate alternative exchange rate policies that would help remove distortions in the foreign exchange rate and thus relative price of products in the world market. The policies that will be recommended at the end of this paper will also focus on increasing the competitiveness of the external sector. The paper seeks to answer the question of how movements in the foreign exchange rate affect Philippine economic growth.

The paper thus has the following objectives: (1) analyze the trend of the foreign exchange rate and the Philippine economic growth, (2) establish the relationship between Philippine economic growth and the foreign exchange rate and (3) estimate the effects of nominal foreign exchange rate movements on economic growth.

For some years now, the Philippines have been undertaken several exchange rate adjustment programs during the fixed exchange rate regime period. This adjustment program attempts to stimulate economic activity by devaluating the peso at some specific level. However, this exchange rate policy that was strongly supported during the fixed

exchange rate period became unpopular as economic growth during that period declined. What made matters worst are the loans conditionalities of the International Monetary Fund (IMF) and the World Bank (WB) that advocates the devaluation-induced economic growth. It is for this reason that we would like to conduct the study to have a clear understanding of what the relationship of foreign exchange rate movements to economic performance. In this way, the Philippine government particularly the *Bangko Sentral ng Pilipinas* (BSP) could implement effective exchange rate policies that help promote economic growth. The estimate of the net effect of movements in the foreign exchange rate also gives policy-makers an overview of its impact on economic performance.

2. Review of Related Literature

The literature review for this paper starts with the discussion of the history of the movements in the exchange rate during the time when the Philippines adopted a fixed exchange rate regime. The first part also explains those factors that have greatly affected and influenced the fluctuations in the foreign exchange rate. The next discussion extensively tackles the economic performance of the Philippine economy in from the 1970s up to the early 1990s. A brief description of the economic structure of the Philippine economy is also included to facilitate a better understanding of the fluctuations in economic performance. After which, the structure of the external sector particularly the export sector is analyzed.

The Philippine experience under a fixed exchange rate regime from the 1960s up to the early 1990s have had different effects on the movements of foreign exchange rates, which is defined here as the relative price of foreign currencies to our domestic currency that is the Philippine peso, particularly the Philippine peso to the United States of America (US) dollar exchange rate (also called FOREX). There are several significant nominal devaluations, during the years 1962, 1970, 1983 and 1984, and exchange rate adjustments that took place in the years 1975, 1982, 1985 and 1990 that had a major effect not only on the US dollar-Philippine peso exchange rate but also on overall economic performance.

During 1962, when the FOREX underwent major exchange rate adjustments due to balance of payments (BOP) problems and government's development strategy to liberalize the economy and promote export growth, the FOREX devaluated and it prompted the government to reduce trade restrictions to control inflationary pressures brought about by the devaluating Philippine peso (Cororaton, 1997). The attempt of the government to stabilize the general domestic price became quite successful during 1962 as the general price level increased moderately. The FOREX adjustment program of the government became successful as it increased exports by 30 percent that improved the external sector during 1963.

The devaluation during 1970 was characterized by several factors and two (2) of the major factors that contributed to the peso devaluation was (1) the foreign debt problem that emanated from the construction spending by the government and again the BOP crisis and (2) because the government did not accompany the peso devaluation by policies that could have dampen the effect of inflationary pressure during that period. What was unfortunate for the peso devaluation during that period is the conformation of the government to the World Bank (WB) and International Monetary Fund (IMF) loan conditions that had major

adverse effects on general domestic price level. Inflation was a big problem during that time because general domestic price levels rose by 20 percent. Fortunately, enough for the Gross Domestic Product (GDP) growth, it was maintained at slightly less than 5 percent.

In 1983 up to the mid 1980s, the Philippine peso experienced a series of devaluation that made a severe effect on economic performance, and it was also during this period that the series of FOREX adjustment was felt most painful. The economy contracted in real terms by a little over 14 percent and inflation became a big problem because it went as high as 50 percent during that period. The FOREX realignment and the inevitable peso devaluation was a result of a policy reaction to both international and domestic problems. Thus, FOREX adjustment during the stagflation period of the mid 1980s was not part of the development strategy of the government but was inevitable peso devaluation because of heightened and piling-up economic problems and political instability that resulted to massive capital flight.

The continuous peso devaluation during the 1980s has become the major factor that affects government's foreign debt service and annual budget allocation. The government had to shoulder foreign debts of companies that are slowly failing in line with its foreign debt-restructuring program. Thus, the government's foreign debt service takes-up a significant portion of the government's annual budget leaving less for budget allocation and therefore decreases government spending. This is a big problem for the government because when the economy slows down and they implement expansionary fiscal policy to stimulate economic activity, the effects of the expansion will only have minimal impact on the economy. The negative effects of devaluation had been one of the concerns and had been frequently debated under FOREX adjustments during the late 1980s and early 1990s.

From the history of foreign exchange rate movements and slight overview on its impact in the aggregate economy, the paper now turns to an extensive discussion of the economic performance of the Philippines from 1970 to the early 1990s. The discussion of output growth within that period starts with a brief description of the economic structure of the Philippines during the past two decades.

The economic structure of the Philippine economy portrays much of a Latin American prototype economy wherein small proportion of the labor force are employed in a capital-intensive and highly protected manufacturing sector and the large number of the labor force are employed in low-productive agricultural jobs and urban informal sectors. There has been a continuous struggle in macroeconomic stability from the 1970s up to the early 1990s wherein output growth is constrained by several factors such as foreign exchange rates, savings and fiscal deficits. The huge external debt that was accumulated within that period dictated the kind of economic policies that would be designed and implemented in the subsequent years. Some of these policies aimed at containing exchange rate movements and restricting money supply that sought to control inflation.

The period from 1970 to 1974 was characterized by adjustments to BOP and external debt crisis that happened during the 1960s. A macroeconomic stabilization program was established to spur the recovery of the economy, and it was very successful as growth rates during the period went up to a historical high. Unfortunately, the rapid growth of the economy accelerated inflation rates went double digits, and it became worse because of the major devaluation and the first oil price shock.

After the first oil shock and the falling prices of major export commodities, the economy started to adjust with a supply-led external finance boom. The adjustment that started during 1975 was designed to expand investment by putting up import substituting industries, public infrastructure and energy programs. Real Gross National Product (GNP) growth reached 6.1 percent per annum. Growth in the agricultural and public sector also was quite high as agriculture grew by 10 percent in 1976 while public sector expenditures contributed an all time high of 9.3 percent of GNP also in the same year. GNP per capita almost doubled from US $336 to US $586 in 1979. Although there has been unprecedented growth from 1975 to 1979, the aggregate economy grew only moderately due to falling terms of trade in the agriculture, declining real wages and rising unemployment that dampened the effect of the output growth. The massive expansion of externally financed public investment accumulated created problems for the government as it increased its external debt due to this increase in infrastructure expenditure.

The 1980s can be described as a period wherein a lot of crises happened that triggered the recession during the mid 1980s. The *pre-crisis* period that happened between 1980 and 1982 experienced coinciding internal and external shocks. External shocks that hurt the economy during that time were the second oil price shock, the increase in world interest rates, recession in industrialized countries and short-term loan supply shock. The domestic that had a big impact on the crisis would be the World-Bank financial liberalization program that pushed-up domestic interest rates that created liquidity problems for many firms and banks that eventually lead to an international financial crisis in 1981.

It was unfortunate for the economy as it slowed down as GNP growth rate dropped to 1.9 percent and average growth rate at 3.6 percent in 1982. The crisis of the mid 1980s heightened as major BOP crisis emerged in the presence of falling terms of trade. The adjustments to the crisis involved moratorium on debt repayments, cuts in public expenditure and massive reduction in import volumes that lead to a fall in private investment rates. The crisis has a taken its toll on the economy as it plunges into a major recession.

The reduction in the growth of the money supply to 12.3 percent, minimal public expenditure of the government due to debt servicing to keep struggling public enterprises in business, severe drop in the industrial capacity utilization and the high interest rate policy that attempted to arrest private capital outflows and counteract the inflationary effects of devaluation resulted in a fall in real GDP by 7.3 percent in 1984. The manufacturing sector suffered the most as it showed an 11.5 and 15.8 percent decline in output for the years 1984 and 1985, respectively. Even thought the terms of trade of the agriculture sector increased, the successive devaluation pushed up average agricultural prices.

There have been desperate attempts by the government to recover the economy by strengthening the traded goods sector. The government along with the central bank implemented contractionary fiscal and monetary policies together with a series of devaluation by the central bank that resulted in the devaluation of the real effective exchange rate (REER) in 1983 and 1984. The devaluation boosted export growth and created a current account surplus in 1986 but despite all of this, the crisis immediately spread and before the economy knows it, the crisis has affected all economic sectors.

After the fall of the Marcos regime, the new government has implemented a program that would put the economy back to its feet. The government quickly pump-primed the economy by increasing current public expenditures to get the economy out of recession. Private investment slowly recovered as it is stimulated by both private and public demand expansion and enhanced import capacity. External developments such as the fall in world prices of crude oil in the 1987, helped the economy grew by over 5 percent. But despite of the recovery of the economy, net capital outflow reached $7.7 billion between 1986 and 1991, and the recovery became short-lived because of the emergence of supply bottlenecks. Inflation from a single digit number to double digits just after two years in 1989 and the coup attempts that shook business confidence created structural problems that eventually lead to political instability.

The economy faced another BOP crisis towards the latter part of 1990 due to rising oil prices and Iraq's invasion of Kuwait. Severe energy crisis because of fiscal constraint with public investment in infrastructure cutbacks and the biggest volcanic eruption worsened and dampened the predicted economic recovery towards the end of 1991. The GNP growth average during the period was merely 1.8 percent but was below 1 percent in 1991-1992.

The government pursued trade and foreign exchange rate liberalization in order to spur growth in the external sector. The new government was elected in 1992 and promised drastic measures to address the energy crisis, but unfortunately economic activity remained paralyzed throughout most of the year. Economic performance slowed down due inadequate external finance and structural problems of the Philippine economy.

In analyzing the performance of the external sector or trade in response to changes in the foreign of a particular economy especially those of developing countries, both level and variability of the exchange rate must be considered. Short-term variability of the exchange rate poses uncertainty and risk in participating in international trade and thus will lead to a reduction in the volume of goods traded, as it will cause uncertainty in the profits that firms will earn in the long run. The structure of the export sector as well is an important factor in analyzing the impact of exchange rate variability on trade flows.

The Philippines has a lopsided structure in terms of the country's export sector. Mainly it is dominated by two non-traditional manufacturing industries: (1) the electronics or semi-conductor and the garments industries. The two industries capture more than half of total export receipts that has existed since the 1980s. Despite of the fact that these two industries generate a sizeable export receipt their contribution to total export earnings has always been marginal. These emanates from the nature or the way these two industries produce they're output since both of these industries import their inputs to production. The garments industry has been a very inefficient and uncompetitive local textile industry in the world market and thus for them to compete with the foreign textile industries, they import raw materials to improve prices and raise quality. On the other hand, the electronics industry does not have a local producer to supply for the input requirements of the industry. Unfortunately for the traditional exports sector that is the coconut industry, it has generally been in a dismal stage. Despite the impressive growth of the coconut export and it being a major net export earner, generally all agricultural or resource-based exports have not been performing well.

The turbulent years of the foreign exchange rate and the economic performance of the Philippine economy has raised concerns over the kind of economic adjustments that the government implements and adopts in order to enhance overall economic growth. Based on the article written by Nunnenkamp et. al. (1990), economic adjustment programs for developing countries like the Philippines, should focus on three important factors to help improve the economy: a viable BOP, low inflation and reduction in the distortions on relative prices or the foreign exchange rate. The three factors that were pointed out is the economic adjustment program supported by the IMF however it has become unpopular because of its limited success in improving the economies of developing countries. Although the empirical evidence shows that the current account, BOP and inflation have improved, it was accompanied by a decline in the economic growth rate of developing countries.

The culprit being blamed for the adverse effects on economic growth of the program is the devaluation-induced expenditure switching that they say is an important stimulus to economic growth. It is no wonder that the idea of the devaluation-induced expenditure switching has been frequently attacked for several reasons because of its adverse effect on economic growth. Since devaluation is likely to result in higher domestic price level, aggregate demand may decrease because of a negative real balance effect. Moreover, if devaluation results in higher domestic interest rates, it discourages private investment because of higher cost of borrowing thus decreasing aggregate demand. Devaluations have negative fiscal implications in the presence of a large public foreign currency debt, as it requires expenditure cutting by the government especially in the presence of rising fiscal imbalances that may worsen the inflationary and domestic interest rate increasing effect of devaluations.

There are also various supply-side effects that could possibly add to the contractionary effects of devaluations. A contractionary shift in the supply curve for domestically produced goods may be due to increases in factors of production, higher costs for imported inputs and working-capital costs. Increases in production costs may respond to the degree of substitutability between different factors of production, increases in financing costs for labor and imported inputs and higher costs working capital because of a rise in loan-interest rate that may follow devaluation.

Nunnenkamp et. al. (1990), estimated a basic multiple regression model in order to establish the relationship between real exchange rate and economic growth. Besides the annual changes in real effective exchange rate as one of the independent variables of the model, his paper also introduced other variables to account for economic policy measures. These variables that he included are: (1) the growth impact of external shocks that is represented by the developing country's terms of trade, (2) pre-devaluation differences in economic growth, which indicates monetary surprise shocks and (3) percentage share of government expenditure in GDP. The summary of the results of the regression suggests that the growth effect of real devaluation is not justified. The result says that the growth impact of real devaluation depends on structural characteristics of the economies being considered. But even though there is no clear evidence of the contractionary effects of devaluation in the set of 42 developing countries, for which the Philippines is included, the degree of exchange rate volatility exhibits a significantly negative impact on economic

growth. Despite the rejection of contractionary devaluation for the pooled regression for the overall example, it supports the view that exchange rate policies involve cost in terms of forgone growth.

Estimates also indicate that short-term adjustment measures are not sufficient to restore economic growth in developing countries. Hence, structural reform packages should aim at reducing the uncertainty of monetary and exchange rate policies as this would strengthen the supply responsiveness to changes in relative prices. Openness towards world markets, a critical review of external trade policies especially in developing countries with severe foreign debts and overcoming persistent and comprehensive import substitution policies would reverse the adverse effect of domestic currency devaluation.

Parikh (2006) examined the effect of liberalization on the trade deficits, growth and current accounts of developing countries. Using a panel data set of 42 countries, he found out that trade liberalization encouraged growth in most countries, but that growth has a negative effect on the trade balance.

Abendin and Duan (2021) looked at the effect of the digital economy and international trade in Africa. Using a dataset of 53 countries for the period 2000-2018 and a variety of estimation models, they found that trade has a positive effect on growth.

Keho (2017) examined the impact of trade openness on the economic growth of Coted d'Ivoire from 1965 to 2014. He found that in both the short and long run, trade openness has contributed positively to economic growth and capital formation.

Conrad and Jagessar (2018) studied the effect of exchange rate movements and misalignments on the economic growth of Trinidad and Tobago for the period 1960-2016. They discovered that both exchange rate appreciation and misalignments have a negative effect on economic growth.

Jawaid and Waheed (2011) studied the effect of terms of trade on economic growth. Using a dataset of 94 developing and developed countries and five-year averages from 2004 to 2008, they found that terms of trade have a positive effect on economic growth. They also discovered that the volatility of the terms of trade also has a positive result on economic growth.

Shahzad et al. (2023) aimed to investigate the role of terms of trade, labor force and capital on economic growth in the United States. Using time series data for the period 1980-2021 they showed that terms of trade had a negative and significant effect on economic growth while labor force, capital and economic growth had favorable long and short run relationships.

3. Theoretical Framework

This section provides the framework on which theoretical assumptions underlie the propositions that guide the explanation of the study. In cases of exchange rates wherein movements and fluctuations (appreciation, depreciation) play significant roles in assessing an economy's growth, it is important to note that in our analysis we see the exchange rates behavior in the short run and in the long run. In our analysis in the long run, it is noteworthy

to include relative price levels, tariffs and quotas preference for domestic versus foreign goods and productivity wherein by holding the other constant, we can see how these affect the exchange rate that will eventually lead us to an assumption in the long run theory. The relative price levels in the long run discusses that a rise in a country's price level (relative to foreign price level) causes its currency to depreciate and fall in the country's relative price level causes its currency to appreciate. When the price of a certain good rises, holding the prices of foreign goods constant, the demand for that good falls and depreciation of the currency happens. But since prices are relative, the goods can still well. On tariffs and quotas, this causes a currency to appreciate in the long run because of the restrictions imposed on entering goods; domestic goods of a particular country can thus sell well. For the preferences for domestic versus foreign goods, increased demand for a country's exports causes it currency to appreciate in the long run conversely, increased demand for imports causes the domestic currency to depreciate. Finally, there's productivity wherein if a country becomes more productive relative to other countries the currency appreciates in the long run. Businesses can lower the prices of domestic goods relative to foreign goods and still be profitable. As demand for domestic goods rise, domestic currency appreciates (Mishkin, 2022).

In the long run, there is a predictable relationship between price levels and exchange rates built by the fact that goods and services can be bought in country and another. This hypothesis of the Purchasing Power Parity (PPP) is used as a way of describing how a nation's general price level must change to reestablish some desired exchange rates given the trend and level in foreign prices. For countries with lower average rates of inflation, this hypothesis performs well for long time periods. A country seeking to keep domestic prices stable when the world is inflating, this hypothesis stands a good offer. If prices elsewhere are rising 10 percent a year, a country can keep domestic prices stable only by accepting rise of about 10 percent a year in the exchange values of their currencies in terms of inflating currencies. In pointing out this conflict between domestic price stabilization and exchange rates stabilization, the PPP theory is of reliable service (Lindert, 1991).

In the short- run determination of exchange rates, we make use of the asset markets approach to exchange rates which explains exchange rates in terms of demands and supplies of assets denominated in different currencies.

If we are to investigate the level of output in the short –run and in the long-run in our framework, a mention of inflation should be considered since it is the dynamics of prices. The supply-side of the economy is a essential part of inflation and output, that is, adjustments of prices overtime when the economy experience supply shocks. In the short-run shifts in aggregate supply and aggregate demand curves, the growth rate of money causes higher inflation and higher output, but inflation rises less than the growth rate of money and an increase in the expected rate of inflation causes higher inflation and lower output. A supply shock in the short run shifts the aggregate supply curve upward that causes higher inflation and lower outputs. On the other hand, in the long run, the growth rate of money is constant and will continue to be constant in which expectations have adjusted to the actual inflation and in which output and inflation are constant. This situation is called the "steady- state" because nothing is changing. In this state the growth rate of money on the aggregate demand side, determines the inflation rate and output on aggregate supply

side is at its potential level. Steady state relationships are useful in indicating the long run behavior of the economy (Mishkin, 2022).

Changes in real income affect the exchange rate. An effect predicted by the combination of the quantity theory (quantity theory states that in any country, the money supply is equated with the demand for money which is directly proportional to the value of GNP) and the purchasing power parity.

Suppose a country's real income shifts up to a growth path of 10 percent above the path it would otherwise have followed. This event may be due to a certain discovery of wide oil reserves in their country. The extra sale of that country's oil would call forth a new demand for holding their domestic currency as a currency to facilitate purchase of that country's oil. If the extra oil results in a 10 percent rise in its national income, the quantity theory depicts a 10 percent higher transaction demand for their currency. The 10 percent income rise should push the demand out for let's say British pounds of the stock of dollars. But this extra demand cannot be met since Britain's money stock is still just as large originally as its stock of dollars. The result, the general clamor to get pounds by borrowing them or by selling Britain goods to them will lead to a rise in the values of the pound. However, income is not an independent force that can just move by itself, so caution is still necessary.

In this example, real income was being raised for a supply -side reason- Britain's ability to supply oil. It is thus easy to believe that this would strengthen the pound, either by using the quantity theory of equation or by thinking about the extra oil exports as something the other countries would need pounds to pay for (Lindert, 1991).

We see through this how income might affect exchange rate. This would give us a view on how exchange rate on the other hand might affect income or output.

4. Model

The model that the paper will be estimating is a modified equation based on the article written by Nunnenkamp et. al. (1990). A detailed discussion of the modified equation will be presented in order to facilitate the modification of the model to be estimated by the paper. After which, the variables to undergo estimation in the modified equation will be defined and explained.

The regression equation that was estimated in the paper's base article is of the form:

$$Y = a + bR + dUOG + eTOT + fDY(1)$$

Where:
Y = annual real growth of GDP per capita
R = annual changes in real effective exchange rate
$EGDP$ = percentage share of government expenditure in GDP
UOG = unanticipated annual change in money supply
TOT = terms of trade shocks
DY = three-period moving average of the once, twice and thrice lagged values of the dependent variable Y

The terms of trade is given by the following equation:

$$TOT_t = \{ [(Pm_t - Pm_{(t-1)}) MV_t] - [(Px_t - Px_{(t-1)}) XV_t] \} / (X_t + M_t) \quad (2)$$

Where:
Pm = import prices by unit value
Px = export prices by unit value
MV = imports at current prices
XV = exports at current prices

The variables *EGDP* and *UOG* are introduced for economic policy measures, the growth of external shocks is accounted for by the variable *TOT* and pre-devaluation differences in economic growth represented by the variable *DY*. In addition to the growth impact of policy adjustments, the model accounts for the growth effects of factors that are beyond the control of the base articles' sample countries. Equation (1) is estimated for 48 developing countries for which pooled time-series cross-country regressions are run for 1982-1987 period using ordinary least square techniques. Regressions are also run for various sub-groups of the overall sample. In addition to equation (1), two other equations are estimated to account for lag values of the explanatory variables.

From equation (1) above, the paper has modified the equation wherein we changed the dependent variable and reduced the number of explanatory variables. The reduced form for equation (1) for which we modified for our paper is of the form:

$$RGDP_t = \alpha_1 + \beta_1 PDR_t + \beta_2 BOP_t + e_t \quad (3)$$

Where:
$RGDP_t$ = Quarterly Real GDP
PDR_t = Quarterly end period of nominal foreign exchange rate (US dollar-Ph peso exchange rate)
BOP_t = Quarterly values for BOP
e_t = stochastic error term

The model is estimated using ordinary least squares techniques for the period 2005-2025. The equation would like to estimate the impact of depreciation in the foreign exchange rate to Real GDP. The variable *BOP* is an additional variable to account for external shocks in the inflow and outflow of foreign currency in the Philippine economy.

5. Data and Methodology

The impact of the Peso-Dollar exchange rate and balance of payments (BOP) on real gross domestic product (RGDP) is examined using the following methodology:

$$RGDP_t = \alpha_1 + \beta_1 PDR_t + \beta_2 BOP_t + e_t \quad (4)$$

where $RGDP_t$ is the real gross domestic product at quarter t, PDR_t is the Peso-Dollar exchange rate at quarter *t*, BOP_t is the balance of payments at quarter t, and e_t is the error term.

The variables PDR_t and BOP_t are regressed against the dependent variable $RGDP_t$. using a vector error correction model.

The data used in this paper is on a quarterly basis. The data for the for the various variables used in this paper span a 21-year period which begins on the first quarter of 2005 and ends on the fourth and final quarter of 2025. This creates a total of 84 observations. Data on real gross domestic product (GDP), on balance of payments and the Peso-Dollar exchange rate was sourced from the *Bangko Sentral ng Pilipinas* (BSP).

Quarterly data on real gross domestic product is in millions of dollars at constant prices using 2018 as the base year (2018=100). The data on the Peso-Dollar exchange rates are the averages for the months of March, June, September and December which represent the end of the quarter from March of 2005 to December of 2025. Data on balance of payments are in millions of dollars.

6. Results

Nelson and Plosser (1982) show that the macroeconomic time series data often exhibit a unit root process and are not stationary. Results that are based on nonstationary data produce spurious results. Therefore, time series data should be tested for stationarity. I test for the stationarity of my variables by using the augmented Dickey-Fuller test. The equation for this test is

$$\Delta X_t = \alpha + \rho_t + \beta X_{t-1} + \sum_{i=1}^{n} \lambda_i \Delta X_{t-1} + \varepsilon_t (5)$$

In this equation, X is the variable under consideration, Δ is the first difference operator, t is a time trend, and ε is a stationary random error term. Table 1 gives us the results of the augmented Dickey Fuller test for unit roots. The results show that *RGDP and PDR* are not stationary at level form while *BOP* is stationary at level form. All variables are stationary in first difference form.

Table 1. *Unit Root Test*

Variable	Level	First Difference
RGDP	0.0064	-1.3729**
PDR	-0.0321	-0.9605***
BOP	-0.7333***	-7.1801***

**Significant at the 5% level
***Significant at the 1% level

Since the variables are found to be first order integrated, Johansen's (1988) cointegration test is conducted to test the long run relationship among the variables in the model. This step is conducted before estimating the model in the first difference form. This test result is presented in Table 2. The p-values in Table 2 suggest that the null hypothesis of no cointegration is rejected.

Table 2. *Johansen's Cointegration Test*

H_0	Eigenvalue	Trace test	p-value
$r = 0$	0.35531	50.411	0.0000
$r \leq 1$	0.16753	14.854	0.0610
$r \leq 2$	0.00003	0.002	0.9631

The following regression results were obtained using Gretl statistical software. Table 3 presents the estimates of equation (4). Before performing the regression, I hypothesized that both Peso-Dollar exchange rate and the balance of payments would affect the real gross domestic product. The formula we obtained from our model got mixed results. The sign of

ΔPDR is positive and significant at the 5% level in the short run (lags of 1 and 2 periods) which implies a positive relationship between the real gross domestic product (GDP) and the Peso-Dollar exchange rate. Therefore, there is a strong relationship between real gross domestic product and the Peso-Dollar exchange rate. *ΔBOP* shows a positive coefficient at t-1 and a negative coefficient at t-2. which points towards an inverse relationship with the real gross domestic product. However, the balance of payments is not statistically significant any level. Therefore, the balance of payments has minimal or negligible effect on real gross domestic product. The adjusted R-squared has a value of 0.6913 which suggests a pretty good fit for the regression equation. Therefore, the results differed from the original estimate. It turns out that only the Peso-Dollar exchange rate has a direct effect on real gross domestic product.

Table 3. *Vector Error Correction Model Estimation Results (Dependent variable: ΔRGDP)*

Variables	Coefficients standard errors in ( )
Constant	-1838.42 (3901.28)
$\Delta RGDP_{t-1}$	-0.7745*** (0.1170)
$\Delta RGDP_{t-2}$	−0.0958 (0.1160)
ΔBOP_{t-1}	0.0914 (0.2854)
ΔBOP_{t-2}	−0.0889 (0.2224)
ΔPDR_{t-1}	711.320** (353.756)
ΔPDR_{t-2}	753.407** (363.656)
Adjusted R^2	0.6913
Durbin-Watson	1.7553

*Significant at the 10% level
**Significant at the 5% level
***Significant at the 1% level

7. Conclusion

This paper presents the trend in economic performance represented by the quarterly GDP of the Philippines and the movements in the foreign exchange rate represented by the US dollar-Philippine peso exchange rate. The literature review of the paper summarized the movements in the US dollar-Philippine peso exchange rate and accounted for the exchange rate adjustments implemented by the government to devaluate the peso to spur economic growth during the mid 1980 crisis. The paper presented how the original equation used by Nunnenkamp et. al. (1990) was modified to simplify the analysis for the case when the Philippines adopted a flexible exchange rate regime during 1992.

Based on the regression results, there are several things we can conclude about the estimated relationship between Real GDP, the foreign exchange rate and the BOP: (1) there is a positive relationship between Real GDP and the US dollar-Philippine peso exchange rate, and (2) the relationship between Real GDP and the BOP is not statistically significant at least in the Philippine context. This means that a depreciation of the domestic currency stimulates

economic activity. However, these conclusions from the estimate equation are net effects of increases in one of these variables holding other variable constant.

The paper suggests that a more accurate model could be built that captures better the relationship between economic growth and movements in the foreign exchange rate. For policy-makers, the paper suggests that a critical study of the lag response of the Philippine economy is needed so that policies to stimulate economic activity can be properly implemented.

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