A Granger Causality Analysis of the influence of debt service on the economy

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Abstract

In the 1970s, it was during this period that the Marcos administration focused on fulfilling development projects, funded through concessional loans. These loans had been extended on terms substantially more generous than market loans, concessional either through interest rates below those available on the market or by grace periods, or a combination of these. Hence, with the bloated ability of the country until the present time of his son, Ferdinand Marcos Jr., and those long-term debts, debt service has become a fundamental peg in managing the debt hole of the economy. The researchers seek to determine and investigate the influence of debt service on the Philippine economy considering this important economic variable through real exchange rates, inflation, gross domestic product, and foreign investments. In addition, the researchers will use Granger causality analysis as it detects the direct exchange of information between debt service and GDP while testing the relationship of the other economic variables such as real exchange rates, inflation, and foreign investments to the debt service of the government. Moreover, the result of the analysis shows greater implications of all the selected economic variables to the debt service in the economy; but, of all the given selected economic variables, gross domestic product shows potency in impacting the debt service to the economy. Being able to see this relationship would help policymakers become more aware of implications when the debt to GDP ratio crosses the ideal threshold when there is no strong economic backup plan. The null hypothesis indicates that total debt payment or total debt service does not granger cause the nominal gross domestic product. The researchers also identified optimal lags and thresholds for debt ceilings which contribute to the analysis. The use of nominal gross domestic product (GDP) instead of real GDP was also highlighted in the paper.

Keywords: debt service, granger causality, GDP, inflation, unemployment rate.

Background of the Study

The Philippine economy has shown significant growth in the past few years, paving the way for the road to a possible robust economy that the country hasn't seen for years, until the havoc wreaked by the COVID-19 pandemic. The health crisis triggered a series of debt borrowings for the country which needed to be addressed through a sustainable form of debt service and effective management of the growing fiscal deficit.

During the transition period of former Presidents Aquino, and Duterte in 2016, the performance of the Philippine economy achieved its goal of registering an annual average of country's Gross Domestic Product ranging from 6 to 7 percent. According to the 2016 World Economic Forum's "*Global Competitiveness Index,*" the country had a nominal GDP of 304 billion dollars, which ranked the Philippines number 10 in Asia (led by China, Japan and India), and number 36 for the rest of the world (led by USA, China and Japan). The growth trajectory continued, recording annual productivity of nominal GDP of 313 billion dollars in 2017, 346.8 billion dollars in 2018, and 377 billion dollars in 2019. The contribution of the growing local industries and sectors from agriculture, mining, manufacturing, construction, transport and commerce, trade, and services are the factors of the country's economic success in the global competitive index. This progress also showed stability in key macroeconomic indicators such as inflation, interest rates, unemployment, and poverty incidence.

In 2020, however, the COVID-19 pandemic slowed positive economic prospects globally. The Philippines' hope of sustainability for continued productivity took a downturn with the backlashes of the health pandemic, that affected not only Asia but the rest of the world. In the country, a series of lockdowns started during the second week of March 2020 and pushed the Duterte government to temporarily close its borders due to the virus scare. The restrictions took a heavy toll on economic activities with businesses starting to close down, which resulted in a decline in spending, ultimately pushing the government to provide social assistance and enact laws such as Republic Act No. 1469 or the "Bayanihan to Heal as One Act" to surmount the protracted battle against this crisis. In a series of upward economic trend, the pandemic cut it short and brought the Philippines' performance to a challenge, registering an annual economic growth of -9.5% according to *Philippine Statistical Authority (PSA).* Worst number for an Asian economy after the Asian Financial Crisis in 1997. Unemployment rose to record high of 17.6 percent in April of 2020

(psa.gov.ph), translating to 7.2 million jobless Filipinos. On the other hand, the country's central bank, the Bangko Sentral ng Pilipinas (BSP), remained focus on the goal of keeping prices stable as the country's inflation remained within target of about 2 to 4.7 percent (BSP website bsp.gov.ph) amidst the pandemic.

With the economy slowing down, the Philippine government needed to step forward to save the country's social and economic conditions from further downward spiral. The country started to incur debt in order to arrest and mitigate the effect of the ongoing health crisis. The National Government (NG) external debt of P3.81 trillion and domestic debt of P8.87 trillion, totaled a staggering P12.7 trillion as of May 2022 (Bureau of Treasury). The domestic obligation was about 70 percent, while 30 percent originating from external borrowings. The debt balance started to balloon as borrowing became the best resort to fill the country's war chest for pandemic recovery. As debt issues and deficit recording at P215.5billion (https://www.treasury.gov.ph/?p=47841) take in the heat, the concerns for debt payments started to mount. Furthermore, according to the National Treasury, NG debt service from January to April 2022 amounted to 356.6 billion pesos with interest payments amounting to P 186.6 billion and amortization of P170 billion. The national government has established a P1.29-trillion debt repayment budget for 2021.

With the debt heating up, the researchers seek to investigate the debt servicing causal relationship with the GDP. A Granger causality analysis would help determine policy implications when faced with striking the balance between the two.

The sovereign debt of the Philippines is one of the pertinent aspects that need to be addressed in creating the nation's economic development framework. In addition, the country has an increasing trend of its external debt and debt service payment, like Malaysia, Thailand, Indonesia, and Hong Kong, among other nations in Asia. Hence, evaluating the government's external debt position and its debt service stance is necessary in projecting debt sustainability and in promoting economic development through a constructive fiscal behavior.

According to Alegado of Bloomberg (2022), the Philippines has established a loose debt ratio gap as compared to all the countries in Southeast Asia, as the country's debt increase to 238.5 billion dollars or equivalent to 12.7 trillion pesos in 2022 (exchange rate of P52 per dollar)

against the 6.4 trillion pesos debt in 2016, which shows almost twice the increase in the size of debt six years ago. In terms of the debt-to-GDP ratio, last year was a bit higher than the previous, whereas it posted 60.5 percent in 2021 as compared to the 54.6 percent in 2020. According to economic experts and the country's Bureau of Treasury and the BSP, this debt level is at a manageable standing. On the other hand, in one study of the World Bank (2013), it mentioned that a debt to GDP ratio exceeding 77% for an extended period would slow economic growth. This would generate a necessary economic precaution, considering the current elevated debt-to-GDP ratio.

Statement of the Problem

While the domestic debt is greater than our external debt (ED), concerns about increasing total debt remain a factor to consider given its vulnerabilities in terms of economic parameters that could tremendously affect it. The total external debt position of the country includes debts from public and private sector including banks and non-banks. However, the biggest share of the foreign liability records are public accounts, in which, the national government amounts to the largest liability. The fact that a resident has a current liability to a nonresident that requires payments of principal and interest in the future, the liability represents a future claim on the resources of the economy of the resident. As such, issues on exchange rate volatility, inflation, and GDP must be considered in order to support the country's debt service.

Statement of Specific Objectives

When fiscal deficit increases, demand for funds also increases to keep the economy running. This may lead to financing the deficit through borrowings which can translate to a bigger debt burden leading to slow economic growth. As the Philippines incurred a debt of around 60 percent of the GDP in 2022, this would require an examination of the effects of the total debt on the economy.

1. What is the Philippine level of debt from 1986 to 2021?
2. What is the trend of the Philippine debt service from 1986 to 2021?
3. What are the relationships of the following variables affecting debt service?

   a. Real exchange rates
   b. Inflation
   c. GDP
   d. Foreign investments
4. Is there an impact of total debt on the economic activity of the Philippines?
5. What are the policy implications on the level of debt and debt servicing the economy would be able to benefit from?

Objectives of the Study

In analyzing the issues of Philippine debt and economic growth, the researchers seek to find the causal relationship between total debt service and the level of growth and sustainability of the Philippine Economy.

Review of Related Literature

This section presents the local and international selections of concepts and variables in the study. Various studies and journals that are directly related to the given study of the researchers.

According to Dey, S.R. and Tareque, M. (2020), achieving sustainable economic growth with progress in infrastructure and poverty reduction was a "dream come true" for all the nation, but the struggle is real as the government fails to meet their desire for economic growth, especially for a developing country like Bangladesh. The target won't stop there, options and opportunities will be raised, and welcoming financial borrowings or assistance is considered the best alternative in order to maintain and provide continuity of their projects for further economic growth. In the case of Bangladesh, the country relied deeply on external debt in order to handle its saving-investment gap as well as its fiscal deficit. External borrowing shouldn't be taken as a negative issue for any country as long as it goes directly to the government expenditures, for economic growth and development; then, the commitment of the government to pay this amount of money; and lastly the government's dedication to keeping their external debts in a more manageable way.

On the other hand, external borrowing has uncertainties thru economic shocks, various crises, and the possibility of corruption. Based on their literature, their further studies showed a good impact between external debt and growth, whereas in most studies they've encountered., the majority

said that there is an impact between those two as it creates economic stress and unresolved cases. In addition, the researcher found out that the main aspect of study was the opportunity to know the impact of external debt on economic policy and growth of the economy; on the other hand, it was identified that MEP is comprised of monetary policy, fiscal policy, and trade policy.

Moreover, according to Shari S. and Oliver S. (2022), that borrowing has become the major mechanism in the least Developing Countries (LDCs). A free enterprise economy like our country, the Philippines, is linked with an international capitalist system. The LDCs are mostly and thus exposed to its instabilities and weaknesses, which makes them less priority and a bigger burden. It is also the mechanism wherein the inflow of loans is always exceeded by the outflow of loan repayments, amortizations, and interest. Finally, it is the medium by which the industrialized countries export goods and services to LDCs whose economies may not necessarily have the capacity to absorb them.

Reinhart, Reinhart, and Rogoff (2012) call the deterioration of the economy due to an increase in public debts a public debt overhang. The sudden decrease in economic growth in indebted countries was caused by debt overhangs. Moreover, due to excessive debt overhang, private investments are restrained and the compensation of the debt service of some countries are so large that prospects for a return to growth paths are very much impossible to see, even if the governments were to apply hard adjustment programs. It was pointed out that a debt overhang creates opposing incentive effects on economic growth in the long run. (https://core.ac.uk/download/pdf/6462848.pdf). Because of this, a country's external debt would impose a negative effect on investment.

The debt service is supposed to have an undesirable effect on economic growth. According to the IMF (2018), the current higher global interest rates could divert considerable budget resources to debt servicing from critical growth-enhancing infrastructure and social services; placing low-income and emerging economies at great risk. Rockerbie (1996), Afxentiou (1993), and Cunningham (1993) state that when a nation has a significant debt problem, the manner in which labor and capital will be abused in the production process is compelled to be impacted by the need to service that debt. On the other hand, Yien, Abdullah, and Azam (2017) confirmed with Granger causality the relationship between debt and exchange rate, as evidenced by Malaysia.

Theoretical Framework / Philosophical Underpinning

Fiscal theory

According to Buchanan (1999), any analysis of the government's fiscal account must take into account the two-sided nature of the equation. Therefore, examining a change in taxes without also considering the corresponding changes on the expenditure side is not methodologically feasible. This approach ensures that the quality of money remains constant throughout the analysis.

When it comes to securing monetary resources, borrowing is just one option available to the government. Typically, the government uses these resources to purchase tangible assets, except when it issues anti-inflationary debt. Borrowing is a substitute for taxation, and there are only three possible ways to fund public expenditure: taxes, loans, or currency inflation. To analyze the consequences of debt issuance, it's necessary to compare its effects with those of taxes or inflation.

When considering fiscal options, it may be more beneficial to evaluate the full range of alternatives available. Debt creation is just one possible option to avoid increased taxation, currency inflation, or cuts in spending. Without issuing debt, the only way to find public expenditure is through tax hikes or inflation. Therefore, it's inappropriate to assume that taxes, money supply, and government expenditure hikes or inflation. Therefore, it's inappropriate to assume that taxes, money, supply, and government expenditure remain constant when analyzing debt issuance. These factors are subject to change based on the chosen fiscal alternatives.

The national debt is the total amount of borrowing accumulated by the government that is still outstanding. It is the total amount that the government owes to individuals and institutions. The national debt is regarded as the level contained in the bulk of expenses. Each year, as the government borrows more, the amount it borrows is the current borrowing. However, at the same time, the government pays off some of its debt each year.

Debt overhang theory

Early literatures view debt as seen to be contributing positively to growth (Modigliani, 1961; Solberg 1988). However, views on debt overhangs prevailed. Krugmam (1988) defines debt overhang as a situation

as one in which the expected repayment on foreign debt falls short of the contractual value of debt. Borensztein (1990) raises the concern of the effect due to debt overhang of past accumulated foreign debts on investment.

As explained by Borenztein (1990), a debt overhang occurs when a debtor nation is unable to benefit significantly from new investments due to existing debt service obligations. The payment amount may become linked to the economic performance of the debtor nation, which means that any increase in production may be offset by a corresponding increase in debt servicing obligations.

Assuming that a country's debt level may exceed its ability to repay in the future with some likelihood, the expected debt service is expected to increase as a function of the country's output level. This means that some of the returns on domestic investments are effectively taken away by foreign creditors, and both domestic and new foreign investments are discouraged. Schclarek's (2004) research found a consistent negative correlation between debt and growth in developing nations.

Conceptual/Operational Framework

Figure 1.

General Schematic Representation of the Research

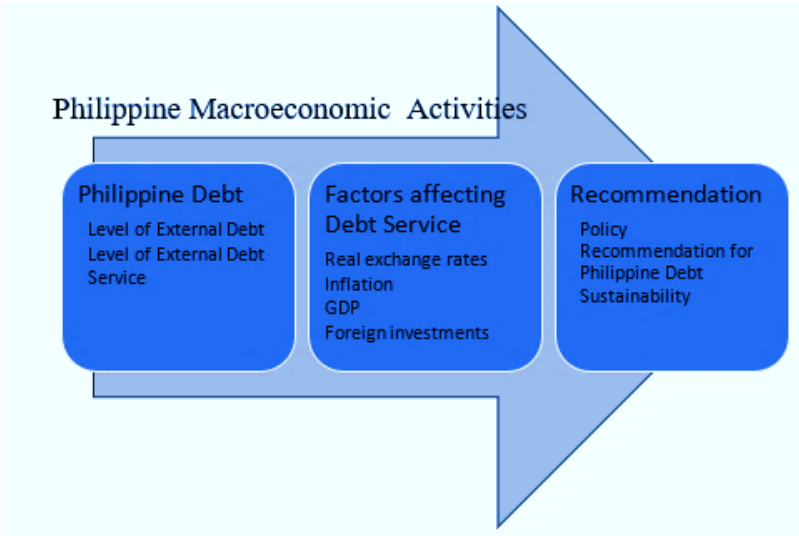


Figure 1 shows the overall discussion of the research study. Whereas the researchers will first look for the availability of the data regarding the Philippines' debt and debt service thru the various government agencies; from the Philippine Statistics Authority (PSA) to Department of Budget and Management (DBM), and Department of Finance (DOF) to create a trend analysis for an initial presentation. And then, the research will also seek the availability of data for the given factors affecting debt service; exchange rates, inflation, gross domestic product and net exports thru Philippine Statistics Authority (PSA), Department of Finance (DOF), Bangko Sentral ng Pilipinas (BSP), Philippine Stock Exchange (PSE), National Economic Development Authority (NEDA), and Bureau of Customs (BOC). After which, the researchers will utilize all the collected data for further trend analysis and by running using econometric measurement using granger causality analysis. And lastly, thru the result of the study and investigations, the researchers will finally create a policy recommendation that might contribute to further sustain the external debt service of our country.

Hypothesis

It is important to present the research paper with one basic postulate, regarding the role of external debt service to the Philippine debt sustainability.

Ho: external debt service does not affect the Philippine economic activity.
Ha: external debt service does affect the Philippine economic activity.

Methodology

This study employs the methodology of descriptive statistical research to analyze the characteristics and trends of both dependent and independent variables. Descriptive statistics are well-suited to identifying the characteristics of the variables through data and trends. Given that the dependent variable (Debt Service) and independent variables (Exchange Rates, Inflation, Gross Domestic Product (GDP), and Net Foreign Direct Investment (FDI) have experienced fluctuations over time, presenting them using summary statistics (such as mean and standard deviation) and visual aids (such as bar charts, line charts, and scatterplots) can help highlight similarities and differences in their respective trends. A regression analysis will also be performed to analyze the relationship between debt service as the dependent variable and the abovementioned independent variables.

The researchers shall conduct a time series analysis and Granger Causality analysis to check the influence of debt service on the economy. Cross-sectional studies can be problematic, and there is a shortage of research on individual countries, thus time series analysis for a single country is more dependable than cross-sectional analyses (Sezgin, 1997). Given the strict conditionalities associated with debt relief initiatives (Were, 2001), it is necessary to conduct case-by-case studies, considering the unique characteristics of each country.

Data Analysis / Analytical tool

The researchers will be utilizing more secondary data enabling the run of data analysis using Granger causality. In this paper, the Granger Causality Test is used to analyze the interaction of the three selected endogenous variables of the study. This specifically includes the following steps: (1) Conduct the unit root test for all the variables; (2) describe the selection of lag order, model construct, and the robustness test; (3) measure the Granger causality of the specified variables.

The researchers obtained data from the Bureau of Treasury on the debt records; Bangko Sentral ng Pilipinas on FDIs, inflation, and exchange rates; and the Philippine Statistics Authority on FDIs.

Testing the Granger Causality Analysis

In order to achieve the research objective, this paper aims to analyze the impact of debt service on the economic activity in the Philippines, and to consider the economic viability of government spending financed through borrowings, in consideration of the elevated debt-to-GDP ratio in the country in 2022.

To establish "Granger causality," the first step is to identify patterns in the sample data. In time-series analysis, it is essential to assume that the variables under examination are stationary. As Granger causality requires covariance stationary series, an Augmented Dickey-Fuller test will conduct. Non-stationary is a characteristic of a time series that renders it nonstationary. The unit root test incorporations and ADF test. The null

hypothesis is non-stationary of non-stationary can be rejected for all series at a 5% level of confidence.

Johansen cointegration test will be performed wherein optimal lags will be identified. After running these tests, the Vector Error Correction Model approach will examine the impact of total debt payments on economic activity. The Granger Causality will only be then applied.

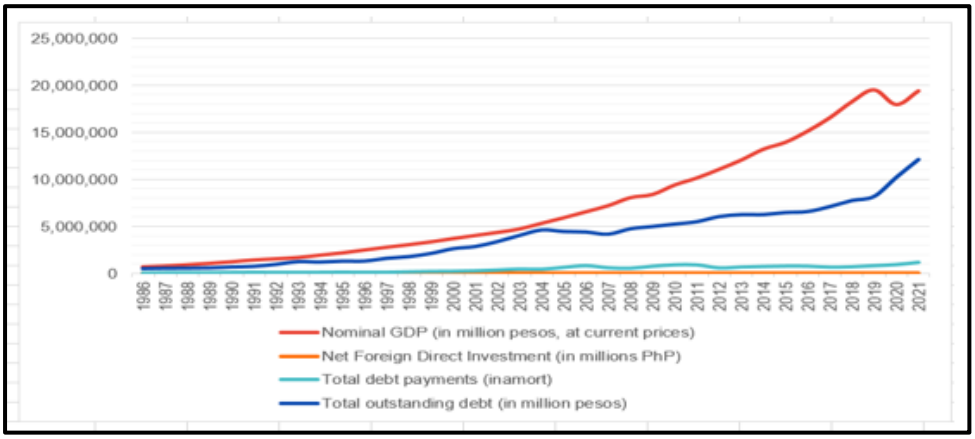
Discussion and Interpretation of Results

a. Descriptive analysis

One must ascertain the features and patterns exhibited by both the dependent and independent variables that will tell the dynamics behind debt payments and the economy. Using data from 1986 to 2021 for all the variables used, there is an increasing trend for nominal GDP, net FDIs, outstanding debt, and total debt payment as follow, over the years:

Figure 2.

Trend of macroeconomic parameters used in the study (in million pesos, 1986-2021)

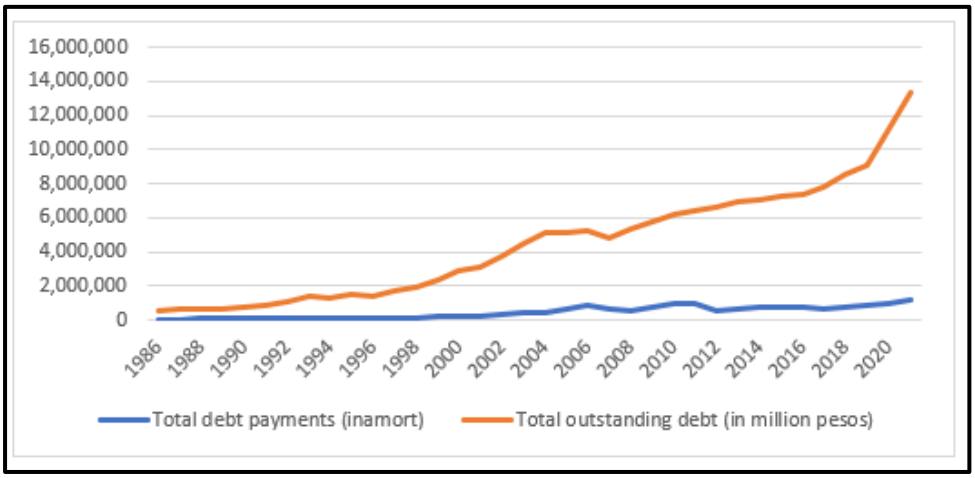


Source of data: Bureau of Treasury; Bangko Sentral ng Pilipinas; and Philippine Statistics Authority

The researchers use nominal GDP, which is not adjusted to inflation when analyzing debt since debt is measured in current prices. As shown above, the nominal GDP continued to increase over time indicating an increase in economic activity. This was complemented by an increase, as well in the country's total outstanding debt. This demonstrates that when government resorts to debt to fund expansionary fiscal policy, debt servicing will also increase. However, the Philippines has increased its total outstanding debt, yet the average annual debt service is only 11. 59%, using the ratio of debt payment to total outstanding debts of the said periods. This eventually may raise red flags, citing the World Bank paper of a prolonged increase in the debt-to-GDP ratio that can slow down the economy, given the rate of the country's debt servicing.

Figure 3.

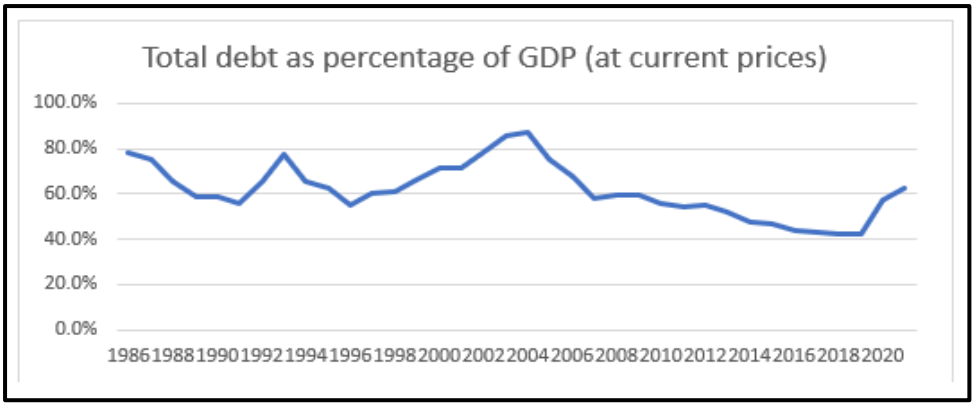
Trend of outstanding total debts and total debt payments (in million pesos, 1986-2021)



Source of data: Bureau of Treasury; Bangko Sentral ng Pilipinas; and Philippine Statistics Authority

Figure 4.

Trend total debt as percentage of nominal GDP (1986-2021)

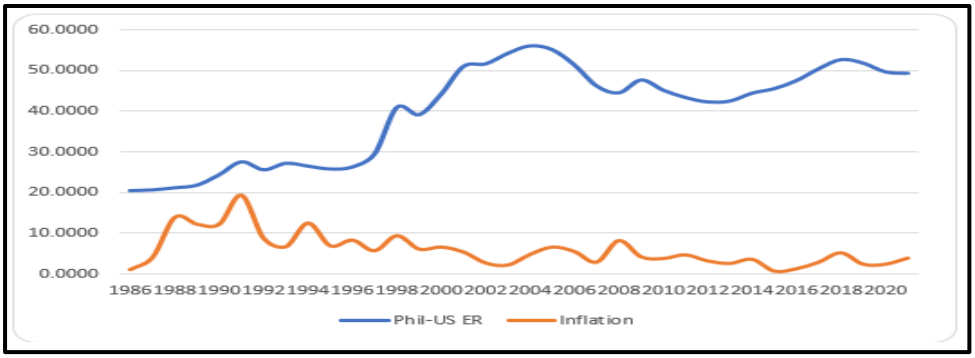


Source of data: Bureau of Treasury; Bangko Sentral ng Pilipinas; and Philippine Statistics Authority

In terms of exchange rate and inflation from the covered period, the evidence of fluctuation is ever-present. The annual average exchange rate obtained over the 36-year period is P40.05, peaking in 2004 at 56.04 pesos to a dollar then hitting 42 pesos in 2012, and 49.25 in 2021. While economic instabilities have occurred, the country was able to maintain the exchange rate at a 50pesos level. Inflation annually averaged at 5.9% recording the highest in 1991, a period of global turmoil caused by wars, at 19.3 % then 8.2% in 2008, attributing to the US mortgage bubble, and regaining 3.9% in 2021.

Figure 5.

Peso to US dollar exchange rate amount and inflation rate (1986-2021)



Source of data: |Bangko Sentral ng Pilipinas and Philippine Statistics Authority

b. Regression analysis

Regression analysis is performed to analyze the relationship between the selected variables. The equation model is presented below:

$$y = \beta_0 + \beta_1 X_1 + ... + \beta_n X_n + \varepsilon$$

Wherein
Y = nominal GDP
b1 = total debt payment
b2 = inflation
b3 = exchange rate
b4 = net FDI

The researchers ran a multiple linear regression using inflation, nominal GDP, exchange rate and net FDI as predictor variables for total debt payments. The correlation coefficient is at 97% which indicates a strong relationship between the predictors and response variables. The coefficient of determination shows a 94.3 percent of the variance in the total debt payment can be explained by the independent variables. The F p value of the F statistic provides the overall significance of the regression model, which is 0.00, less than the level of significance at 5%. As a whole, this means the model is statistically significant.

Figure 6.

Regression results, time series data from 1986 to 2021

SUMMARY OUTPUT

Regression Statistics	
Multiple R	0.973645727
R Square	0.947986001
Adjusted R Square	0.941274518
Standard Error	1469235.445
Observations	36

ANOVA

	df	*SS*	*MS*	*F*	*Significance F*
Regression	4	1.22E+15	3.04906E+14	141.2483506	1.97511E-19
Residual	31	6.69E+13	2.15865E+12		
Total	35	1.29E+15			

	Coefficients	*andard Err*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 95.0%*	*Upper 95.0%*
Intercept	653555.7774	1358877	0.48095269	0.633927403	-2117893.108	3425004.663	-2117893.108	3425004.663
Inflation	-99094.74172	77004.58	-1.286868178	0.207667009	-256146.6151	57957.13168	-256146.6151	57957.13168
Phil-US ER	8950.810975	33391.59	0.268055835	0.790431992	-59151.78919	77053.41114	-59151.78919	77053.41114
Net Foreign Direct Investment	1061.892945	105.9253	10.02491957	3.01975E-11	845.8568041	1277.929087	845.8568041	1277.929087
Total debt payments (inamort)	7.761378563	1.383197	5.611189735	3.72365E-06	4.940330499	10.58242663	4.940330499	10.58242663

Based on the regression results, only the net FDI and total debt payments are the statistically significant variables. This means that for every increase in net FDI, the expected increase in nominal GDP is P1,061. Nominal GDP would also increase by 7.76 unit, for a unit increase in the total debt payments, assuming everything else constant. As FDIs are drivers of economic growth ensuring more capital spending for the country and spurring economic activities, this would correlate with capacity to pay.

On the other hand, nominal GDP was used which does not account for inflation, the result of the regression shows inflation and exchange rates do not affect the GDP, in this instance. As inflation can impact the currency of a country, it is only one factor among many economic variables that may be combined, that could influence a country's total economic output.

c. Granger Causality

The researchers performed an initial unit root test for stationarity to avoid spurious regression, which is associated with nonstationary time series models. Augmented Dickey-Fuller Unit root test on total debt payments (Total_INTAMORT) and nominal GDP. At standard level form, the result for total debt payments was not stationary, wherein the null hypotheses were accepted with an insignificant p value of 0.94. This prompted the researchers to get the first difference where stationarity was ensured having a p value of 0.0001, and second difference with a p value of 0.0000. Running nominal GDP at 2^{nd} difference also rejected the null hypothesis of having unit root, hence stationary. A time series that is stationary implies that there is no change overtime, showing that values have constant variability.

Using EViews 12 software, the results were from the researchers' computations:

Table 1a.

ADF results, total debt service second difference

Null Hypothesis: D(TOTAL_INTAMORT,2) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.198720	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(TOTAL_INTAMORT,3)
Method: Least Squares
Date: 02/11/23 Time: 22:53
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

Table 1b.

ADF results, nominal GDP, second difference

Null Hypothesis: D(GDP_NOM,2) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.859876	0.0000
Test critical values:	1% level	-3.670170	
	5% level	-2.963972	
	10% level	-2.621007	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(GDP_NOM,3)
Method: Least Squares
Date: 02/11/23 Time: 22:55
Sample (adjusted): 1992 2021
Included observations: 30 after adjustments

With the intent of the research to do a long-run model to be able to see long-run relationships among the variables, an optimal lag has to be identified. Running a Johansen cointegration test, the resulting optimal lag was 8, using Schwarz information criteria (SIC) instead of Akaike information criteria (AIC). The results suggest that total debt service or payments and economic activity are cointegrated, meaning the variables move together in the long run.

The results below confirm the cointegration of variables at 0.05 level as indicated by the Eigenvalue and Trace statistic both at significant p values. This suggests that a long-run relationship exists between the dependent and independent variables. The Granger causality test is used to investigate the relationship between two variables and to determine if the relationship is one-way or two ways. It examines whether the past values of one variable help to predict the values of another variable. In this test, a p-value is calculated to determine if the null hypothesis can be rejected or not. If the p-value is greater than 0.05, there is no evidence to reject the null hypothesis, but if the p-value is less than 0.05, it indicates evidence to accept the alternative hypothesis.

Table 2.

Johansen cointegration test rejects the null hypothesis of no cointegration. at an optimal lag of 8.

Date: 02/11/23 Time: 23:39
Sample (adjusted): 1994 2021
Included observations: 28 after adjustments
Trend assumption: Linear deterministic trend
Series: GDP_NOM TOTAL_INTAMORT
Lags interval (in first differences): 1 to 7

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.865466	60.46795	15.49471	0.0000
At most 1 *	0.142414	4.301751	3.841465	0.0381

Trace test indicates 2 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**

Finally, running a Vector Error Correction (VEC) Granger causality, the null hypothesis is total debt service does not granger cause the nominal GDP. Using the optimal lag, results obtained show that total debt payment or total debt service rejects the null hypothesis. This means that the total debt service granger causes nominal GDP and vice versa, indicating a two-way causal relationship exists between the two variables.

Figure 8.

The Johansen cointegration test rejects the null hypothesis at an optimal lag of 8.

VEC Granger Causality/Block Exogeneity Wald Tests
Date: 02/12/23 Time: 01:04
Sample: 1986 2022
Included observations: 28

Dependent variable: D(GDP_NOM)

Excluded	Chi-sq	df	Prob.
D(TOTAL_INTAMORT)	42.30170	7	0.0000
All	42.30170	7	0.0000

Dependent variable: D(TOTAL_INTAMORT)

Excluded	Chi-sq	df	Prob.
D(GDP_NOM)	36.76667	7	0.0000
All	36.76667	7	0.0000

Taking everything into account, the results reveal a long run relationship between total debt payment and economic activity, as expressed by the nominal GDP. The error correction method also revealed significant relationship between debt payment and the economy.

Conclusion & Recommendation

After conducting all necessary presentations, interpretations, analysis and statistical tests, the researchers concluded the following:

The main objective of the paper is 1. The study was able to present the relationship of the selected variables. Running an initial linear regression analysis with the nominal GDP or measure of economic activity as the dependent variable, the predictor variables such as the total debt payment significantly affect the nominal GDP, thereby complimenting the

results of Granger causality by establishing the debt service's influence on the GDP.

The study's findings indicate that there is no evidence to support the idea that debt service causes changes in nominal GDP, as this hypothesis was rejected. Instead, the results suggest that nominal GDP is a significant determinant of debt service, which complements this research's literature reviews that a higher debt ratio would slow down economic growth, and the diversion of budget resources to debt servicing would place economies and risk.

These findings may offer insights into the rate of debt payments by the Philippines in relation to its total outstanding debt, which is a small proportion at only 11.6 percent. While debt servicing influences the GDP, debt service is likely to be increasing and might raise concerns about having higher accumulated debts. For a developing country like the Philippines, if debt exceeds its repayment ability, this will affect the country's level of output, indicating a negative relationship between debt and growth. That's why for further researchers, including more economic variables in the study is highly recommended, utilizing other methods like VAR or the Vector Autoregression, Multiple Regression Analysis and others.

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