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| RESEARCH ARTICLE

A Time-Series Analysis of Selected Economic Indicators Affecting Inflation in the Philippines: 2003-2020

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| ABSTRACT
The Philippines is a country that has been experiencing a gradual rise in inflation in the past decades, and this affects the prices of goods and services, therefore decreasing the currency's purchasing power. The aim of this study is to analyze the relationship between Inflation and selected economic indicators, such as Unemployment Rate, Money Supply, Policy Rate, and Exchange Rate, based on time series quarterly data from the year 2003 to 2020 in the Philippines. This effect was investigated using the autoregressive distributed lag (ARDL) cointegration technique. The results showed that Inflation, which is the rate of increase in prices over a given period in the Philippines, has a significant positive relationship with the Policy rate in the short run.

| KEYWORDS
Inflation, Unemployment, Money supply, Policy rate, Exchange rate, Philippines

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1. Introduction

Inflation is commonly defined as higher prices caused by rising costs in the global market, supply chain difficulties, and labor scarcity, or by increased demand, as well as the Federal Reserve's easy monetary policy and Congress's excessive expenditure. The Philippines' annual inflation average in 2020 is 2.6 percent higher than in 2019 at 2.5 percent, and this growth rate influences the price change pace of the economy overall, according to a report from the Philippine Statistics Authority. When the prices for certain commodities impact our cost of living, economic growth can also suffer.

1.1. Background of the Study

The researchers raise the question: Do other economic factors affect inflation? In the United Kingdom, the new Keynesian Phillips curve was calculated using the Kalman filter. It was discovered that the model of unobserved components calculated from projected inflation played a crucial role in understanding inflation dynamics. (Marfatia, 2018). In another case, inflation could also occur when the amount of money circulating in the economy grows faster than the economic output of a country. Zimbabwe in 2008 was in the same circumstance when their high government debt and falling economic work necessitated creating money to resolve the short-time crisis, as this printing of money resulted in hyperinflation in November of 2008. The parallel exchange rate passes through to inflation, but the official exchange rate only passes through to inflation in the long run. It also demonstrates that exchange rate volatility has a favorable and considerable long-run influence on inflation (Osabuohien et al.,2018). The ARDL and its Error-Correcting Parametrization showed a substantial long- and short-run link between GSE market results and exchange rate. The variables were examined for long memory, and it was discovered that such quality did exist in these variables, making it a desirable trait that investors may benefit from. This is because the long-run influence of inflation and currency rates on stock market returns has been established (Kwofie & Ansah, 2018). It has been established that the presence of the Fisher Effect and a unidirectional causation relationship to the interest rate from inflation exists in the Philippines. The second period documented the rapid response of interest rates to a positive standard deviation shock to inflation, and inflation accounts for a periodic average of 4.72 percent prediction error variance of interest rates in the near term. The empirical research also confirmed that the two

variables had a substantial positive short-run and long-run association (Endres, 2020). Furthermore, it may also be stated that there is a statistically significant substantial influence of the inflation rate on the key policy rate, although the model's predictive validity might be stronger. The lack of reactivity of the main policy rate to inflation highlights the necessity for redefining monetary policy tools and revising the inflation targeting method (Kostic et al., 2020). This paper begins with a discussion of the selected economic factors and how they affect inflation in the economy. It aims to analyze selected Economic Indicators Affecting Inflation in The Philippines from 2003 to 2020.

1.2. Statement of the Problem

This paper will answer the following questions:

1. If the economic indicator, the Unemployment rate, has a short run causal relationship to Inflation.
2. If the economic indicator, Money Supply, has a short run causal relationship to Inflation.
3. If the economic indicator, Policy Rate, has a short run causal relationship to Inflation.
4. If the economic indicator, Exchange Rate, has a short run causal relationship to Inflation.

1.3 Significance of the Study

This study would be beneficial to economics students, prospective scholars, macroeconomists, investors, and the national government. For Economics Students, this paper may be supplementary material for learning more about the Philippine Economy's Inflation rate and how this would affect their everyday lives. Prospective Scholars will find this study noteworthy since the findings may be used as one of the premises if they create a paper related to Inflation. For investors, the annual Growth rate is critical. Firms will only be able to expand their profits, which would be the significant driver of stock performance if economic production rises. The National Government is facing an outstanding debt of 10.77 trillion Peso debt as of the end of March 2021. Properly controlling the economic factors affecting the Inflation rate may help the Philippine Economy reduce its debt by generating policies from studies like this.

1.4 Scope and Delimitation

This study was conducted to examine inflation in the Philippines, where it continues to an uptrend. This paper analyzes the factors that affect Inflation using the macroeconomic variables: Unemployment Rate, Policy Rate, Exchange Rate, and Money Supply (M2).

The time-series data for the Philippines's Inflation rate, Money Supply (M2), Exchange rate, and Policy rate will be retrieved from the Bangko Sentral ng Pilipinas. Their quarterly observations range from 2003 Q1 to 2020 Q4 with a total of 72 observations.

The study will be using the time series data for Money Supply (M2), and Exchange rates are measured in their logarithmic function.

The researchers began this time-series analysis to see whether there were any significant relationships between the dependent variable and the independent variables.

1.5 Definition of Terms

- **Inflation Rate** - "Headline inflation refers to the rate of change in the CPI, a measure of the average price of a standard basket of goods and services consumed by a typical family." - Bangko Sentral ng Pilipinas.
- **Unemployment** - "proportion of unemployed persons to the total labor force." -Philippine Statistics Authority
- **Money Supply/M2**- M2 is a money supply measurement that includes cash, bank deposits, and readily convertible near money. M2 is extensively observed as a measure of the money supply and anticipated inflation, as well as a target for central bank monetary policy. M2 consists of M1 and other deposits included in broad money, such as savings and time deposits.
- **Policy Rate** - The central bank policy rate (CBPR) is the interest rate that the central bank uses to implement or signal its monetary policy stance. It is most commonly set by the policy-making committees of central banks (e.g., Fed Open Market Committee). The CBPR's underlying financial instrument varies by country and is explained in the metadata. In some countries, the CBPR is the discount rate, whereas, in others, it is the repurchase agreement rate.

- **Exchange Rate** - The price of one currency in terms of another currency is known as the exchange rate. Fixed or floating exchange rates are both possible. Fixed exchange rates are determined by a country's central banks, whereas floating exchange rates are determined by the market demand and supply mechanism.

2. Literature Review

2.1 Hypothesis

As this study covers datasets from 2003 to 2020 with the variables that describe the impact of Inflation Rate; Unemployment Rate; Money Supply; Exchange Rate; Policy Rate, therefore, it is appropriate to consider the following hypotheses:

(H01) The economic indicator, Unemployment rate, does not have a short-run causal relationship to Inflation.
(HA1) There is a short-run causal relationship between unemployment and inflation.

(H02) The economic indicator, Money Supply, does not have a short-run causal relationship to Inflation.
(HA2) There is a short-run causal relationship between Money Supply and inflation.

(H03) The economic indicator, Policy Rate, does not have a short-run causal relationship to Inflation.
(HA3) There is a short-run causal relationship between Policy Rate and inflation.

(H04) The economic indicator, Exchange Rate, does not have a short-run causal relationship to Inflation.
(HA4) There is a short-run causal relationship between Exchange Rate and inflation.

2.2 Review of Related Literature

2.2.1 Inflation and Unemployment

A study from Unemployment and Inflation: Evidence of A Nonlinear Phillips Curve in The Eurozone by Ho and Iyke (2019). The constraint is addressed using 11 Eurozone nations from January 1999 to February 2017. The paper also evaluates these nations' short- and long-run Phillips curves. According to the standard Phillips curve, there is a negative link between inflation and unemployment. Numerous studies, however, have revealed temporal positive and negative connections between inflation and unemployment, leading to severe criticism of the Phillips curve. The triangle method reveals that the structure of the inflation-unemployment nexus relies on the source of its shocks, the period of lagged reactions, and the policy response. Consequently, the Phillips curve's empirical failure may well be due to the high linearity assumption on which it is based. Prior research has modeled the potential of threshold effects in the Phillips curve, but no study has demonstrated the thresholds at which the relationship in the Eurozone shifts from negative to positive. The results suggested that a Phillips curve existed in both the short and long term assuming linearity. The study also revealed that the linearity assumption in the conventional Phillips curve might be overly strong, as seen by threshold effects.

Nurudeen Abu (2019) conducted research for a paper titled Inflation and Unemployment Trade-off: A re-examination of the Phillips Curve and its Stability in Nigeria was carried out to demonstrate why price stability and full employment are crucial macroeconomic goals in any country. The Autoregressive Distributed Lag (ADL) bounds testing method is used. Other estimation techniques, such as Fully Modified Ordinary Least Squares (FMOLS), Dynamic Ordinary Least Squares (DOLS), Static Ordinary Least Squares (OLS), and Canonical Cointegrating Regression (CCR), were used to assess the consistency and robustness of the ADL bounds testing findings. The cointegration test results show that there is a long-run link between inflation and unemployment. The causality test findings using the traditional Granger causality test and the Toda and Yamamoto methodology show that there is unidirectional causation from inflation to unemployment.

Rayhanul, Nurul, and Rajibul (2018) analyze whether the Phillips curve is recognized in the Philippines between 1950 and 2017 in terms of the inflation rate, unemployment rate, annual wage rate, and GDP in "TESTING PHILLIPS CURVE TO EXAMINE THE INFLATION RATE REGARDING UNEMPLOYMENT RATE, ANNUAL WAGE RATE, AND GDP OF PHILIPPINES: 1950-2017." To assess the long-term association between the variables, an OLS (Ordinary Least Squares) model based on the Phillips curve was created. The findings imply that the Philippines' government should execute policy instruments in such a manner that GDP and annual wage rates have a positive impact on the country's unemployment rate and inflation rate.

2.2.2 Inflation and Money Supply

Dinh Doan Van (2019) did the research for a publication, Money supply and inflation influence on economic growth, to illustrate how money supply and inflation are closely associated. The economic theories of Fisher and Friedman, as well as an econometric model, are used in the study to investigate the link between money supply and inflation. According to the theory of monetary quantity, continuous increases in the money supply produce long-term inflation, while continuous increases in the money supply growth do not create inflation in the near term.

Gatot Sasongko and Andrian Dolfriandra Huruta (2018) examined the relationship between inflation and money supply in Indonesia in their paper Monetary Policy and the Causality Between Inflation and Money Supply in Indonesia. The Granger Causality model is used in this study to determine the relationship between inflation and money supply. The resulting conclusions suggest that money supply drives inflation, but not the other way around.

Effects of Money Supply and Inflation on Economic Growth in Nigeria from 1973 to 2013 by N. M. Gatawa, Akinola Abdulgafar, and M. Olarinde (2017) used time-series data from 1973 to 2013 to analyze the impact of money supply, inflation, and interest rate on economic growth in Nigeria. Within the error correction framework, the VAR Model and the Granger Causality test were applied. The VEC model results show that a wide money supply has a beneficial influence on growth, but inflation and interest rates have a negative influence on growth, particularly in the long run.

Amassoma Ditimi, Sunday Keji, and Onyedikachi Emma-Ebere (2018) did the research for the journal, The effects of money supply on inflation in Nigeria to explain the worrisome rate of inflation in Nigeria. The study's approach includes the Error Correction Model and Granger causality. The consequence is that varied economic situations are typically important determinants of inflation in Nigeria. According to the findings of the study, the money supply is not a major element that causes inflation in Nigeria.

Research for a publication by Asst. Prof. Dr. Iftkhar Mohammed Mnahi (2020), The Relationship between Inflation, Money Supply, and Exchange Rate in Iraq during the Period (2000-2016). The study's goal is to discover the nature of the link between the rate of inflation, the supply of money, and the exchange rate. The quantitative approach of multiple linear regression employing the statistical software was used in the investigation (SPSS 23). According to the study, both the money supply and the exchange rate have an influence on feeding inflation (implicit reduction) for measuring inflation than the real exchange rate. Total demand on total supply, followed by the appearance of indicators of inflation.

Yugang He (2017) did the research for a journal, A Study on the Link between Money Supply and Macroeconomic Variables in China, to investigate the relationship between the money supply (M2) and the macroeconomic variables (real GDP, inflation rate, and interest rate) in China using the vector autoregression (VAR) model. Conclusions thus imply that a rise in real GDP can lead to a rise in the money supply; similarly, a rise in the inflation rate can lead to a rise in the money supply.

Murshed, Muntasir, Amin, Sakib, and Chadni, Meem Hasin (2018) published work in the World Journal of Social Sciences titled Causality Analysis between Inflation, Budget Deficit, and Money Supply: Empirical Evidence from Bangladesh. The purpose of this research is to establish the causal links between inflation, money supply, and budget deficit in Bangladesh using data from 1980 to 2014. To determine the long-run and short-run causalities between the variables, the Granger Causality Test and Vector Error-Correction Model method was utilized. The findings are consistent with traditional economic theory, as unidirectional causation is shown to flow from the budget deficit to inflation in the short term, whereas no causation is discovered between the money supply and inflation in both the short and long runs.

2.2.3 Inflation and Policy Rate

A study by Castillo, Montoro, and Tuesta (2020) for the Journal of Macroeconomics, 'Inflation, oil price volatility, and monetary policy, was to establish an analytical link between average inflation and oil price volatility by solving the model's rational expectations equilibrium to the second order of accuracy According to the model, larger levels of average inflation are induced by higher levels of oil price volatility. We further demonstrate that when oil has poor substitutability in the production function, the more weight the central bank attaches to inflation in the policy rule, the lower the amount of average inflation. The analytical solution also shows that, for a given amount of oil price volatility, average inflation is higher when marginal costs in oil prices are convex, the Phillips Curve is convex, and the degree of relative price dispersion is greater. The model's forecast of the trajectory of inflation throughout the 1970s and 1980s is consistent with the data.

Employing Vector Autoregression, Granger Causality, Impulse Response Function, Cholesky Variance Decomposition, Johansen Cointegration, and Vector Error Correction as its methodology to deal with the relationship between interest rate and inflation in the Philippines using 204 monthly observations from January 2003 to December 2019, a study by Endres (2020) for The Dynamics Between Monetary Policy Rate and Inflation in the Philippines. The results confirmed the existence of the Fisher Effect and a unidirectional causality function to the interest rate from inflation.

A study on the role of inflation in creating the key policy rate – validation of Taylor's Rule in the case of Serbia by Alihodžić, Furtula, and Kostic (2018) intends to examine the impact of the inflation rate on the main policy rate, as well as the feasibility of employing Taylor rule under the initial conditions of low inflation Between 2007 and 2015; the inflation rate had a statistically significant influence on the key policy rate. The identical observation was evaluated for two sub-periods: 2007 to 2011 and 2012 to 2015.

Research by Anene and D'Amico (2017), A Tale of Four Tails: Inflation, the Policy Rate, Longer-Term Rates, and Stock Prices, was done to examine empirical relationships between the perceived tail-risk of inflation, the policy rate, longer-term interest rates, and equities prices in the United States The study's technique is Generalized Methods of Moments. Their concurrent shifts allow us to discern between a systematic and "exogenous" reaction to monetary-policy announcements. Furthermore, the co-movements of such tail risks are taken into consideration when calculating the amplitude and persistence of their reactions to significant shocks.

Using Generalized Methods of Moments as its approach, the research by Furtula and Kosti (2017) for Key policy rate as the main or additional instrument of inflation targeting strategy in Serbia is addressed. The purpose of this article is to assess the effectiveness of the key policy rate as a monetary policy tool, as the primary instrument has taken on a secondary role in monetary regulation in recent years. In the conditions under which the Republic of Serbia's economic and financial system operates, the transmission mechanism of monetary policy is carried out primarily through the exchange rate channel, with the interest rate channel essentially non-existent. The currency's exchange rate has a significant influence. The large influence of the single currency euro and the ECB on our country determines the large impact of the exchange rate channel.

2.2.4 Inflation and Exchange Rate

Employing factor-augmented vector autoregression models for 55 countries, Ha, J., Stocker, M. M., and Yilmazkuday, H. (2020). found that monetary policy shocks are associated with higher exchange rate pass-through measures than other domestic shocks, whereas global shocks have widely different effects across countries. Pass-through measures tend to be lower in nations that combine flexible exchange rate regimes and credible inflation objectives, where central bank independence may substantially assist the work of stabilizing inflation by utilizing the exchange rate as a cushion against external shocks. It is indicated that exchange rate pass-through should be explored by taking into account the type of shock that causes currency fluctuations as well as national characteristics that influence price reaction.

Osabuohien, E. S. C., Obiekwe, E., Urhie, E. S., and Osabohien, R. conducted a study. (2018), Inflation rate, exchange rate volatility, and exchange rate pass-through nexus: The Nigerian experience, was conducted to explain why the Nigerian economy has been experiencing serious exchange rate fluctuations, particularly depreciation in the foreign exchange market, which has been preceded by inflation. The Generalised Auto-Regressive Conditional Heteroskedasticity (GARCH) technique was used, which was supplemented by Co-integration, Vector Error Correction Model, Variance Decomposition, and Impulse Response techniques. According to the findings, the parallel exchange rate passes through to inflation in the short run, whereas the official exchange rate only passes through to inflation in the long run. It also demonstrates that exchange rate volatility has a positive and significant long-run effect on inflation.

Research from Kwofie, C., and Ansah, R. K.'s A study of the effect of inflation and exchange rate on stock market returns in Ghana. (2018) investigated the effect of exchange rate and inflation on Ghanaian stock market returns from January 2000 to December 2013 using monthly inflation and exchange rate data obtained from the Bank of Ghana and monthly market returns computed from the GSE all-share index. This effect was investigated using the autoregressive distributed lag (ARDL) cointegration technique and the error correction parameterization of the ARDL model. The findings of this study revealed that there is a significant long-run relationship between GSE market returns and inflation. However, there was no significant short-run relationship between them.

Testing the efficiency of inflation and exchange rate forecast revisions in a changing economic environment by A. M. Iregui, H. M. Nez, and J. Otero (2021) perform a weak-form and strong-form efficiency test. We relax the individual homogeneity assumption in this paper and consider a forecasters' information set with many empirically relevant variables. According to our findings, more than half of the analysts' revisions are independent of one another (weakly efficient). Furthermore, we find that during periods of market instability, analysts use past values of inflation and exchange rate changes to revise their forecasts and a broader range of variables.

Sean, M., Pastpipatkul, P., and Boonyakunakorn, P. (2019) conducted research for a journal titled Money supply, inflation, and exchange rate movement: the case of Cambodia by Bayesian VAR approach to investigate the relationship between money supply, inflation, and exchange rate in Cambodia using the Bayesian Vector Autoregressive (BVAR) approach. This study makes use of monthly data from October 2009 to April 2018. The empirical findings show that Cambodia's money supply is dependent on its previous variable. Furthermore, the increased money supply caused the Khmer Riel's exchange rate to fall against the US dollar, resulting in an increase in inflation.

2.3 Theoretical Framework

2.3.1 Inflation and Unemployment: Augmented Phillips Curve

The Phillips curve illustrates the link between the rate of inflation and the rate of unemployment. Phillips discovered a constant inverse relationship: when unemployment was high, wages grew slowly; when unemployment was low, wages grew quickly. The

expectations-augmented Phillips curve is a key component of nearly every macroeconomic forecasting model today employed by governments and businesses. It is acknowledged by most otherwise disparate schools of macroeconomic theory. The straight line that best matches the points on the graph is the expectations-augmented Phillips curve (the regression line). It summarizes the inverse connection in broad strokes.

2.3.2 Inflation and Money Supply: Quantity Theory of Money

Under the monetarist model, Milton Friedman (1969), the father of monetarism and Nobel laureate in economics, stated that an excess supply of money in an economy leads to domestic inflation. He also claimed that inflation is everywhere and always a monetary phenomenon and that alterations in the total price level are only caused by changes in the money supply. This indicates that if the money supply grows by a given proportion, the price value will rise by the same amount. This theory also said that inflation is created by an increase in the money supply, but this is not accompanied by an increase in the economy's production.

2.3.3 Inflation and Policy Rate: Taylor's Rule

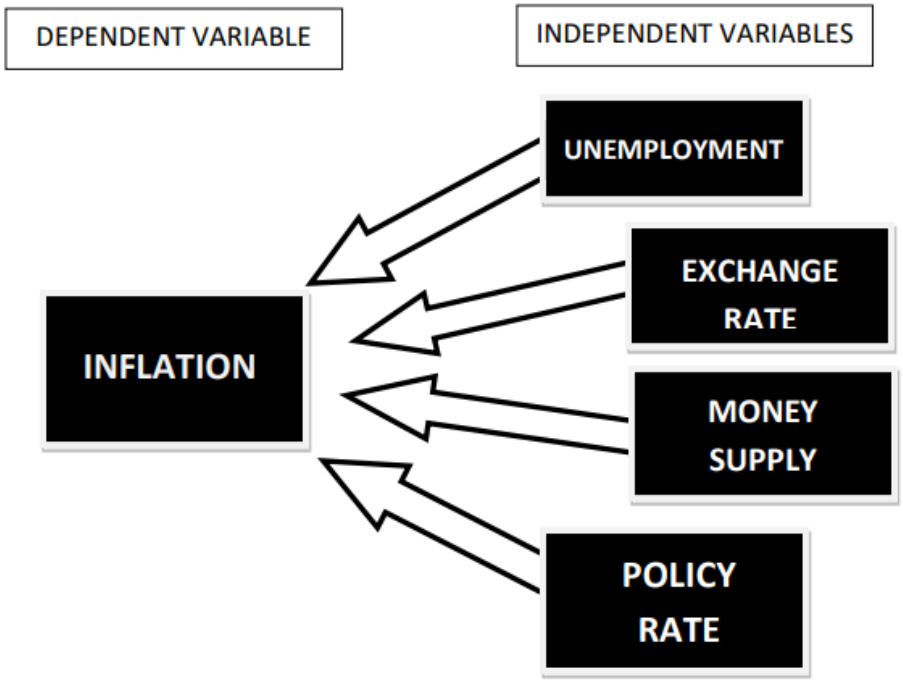
Taylor's rule is an econometric model that describes the relationship between Central Bank operating targets and inflation and GDP growth rates. The Taylor rule has been interpreted as a forecasting tool for the Central bank as well as a fixed rule policy to guide monetary policy in response to changes in economic conditions. The rule is a formula that relates the Government's operating target for short-term interest rates to two factors: the difference between actual and desired inflation rates and the difference between real and desired GDP growth rates. Taylor's rule states that when inflation or GDP growth rates are higher than desired, the Federal Reserve should raise interest rates.

2.3.4 Inflation and Exchange Rate: Purchasing power parity

The rate at which one country's money must be changed into another country's currency to purchase the same quantity of goods and services in each country. In its most straightforward approach, the PPP claims that, in the long term, changes in exchange rates among nations tend to reflect changes in relative price levels.

2.4 Conceptual Framework

The flow of this study is represented by the structure below.



This illustrates how the given independent variables: Unemployment, Money Supply, Policy Rate, and Exchange Rate, affect Inflation in the Philippines through the process of Autoregressive Distributed Lag.

2.5 Synthesis

Dinh Doan Van (2019) did the research for a publication, Money supply and inflation influence on economic growth, to illustrate how money supply and inflation are closely associated. Under otherwise normal economic conditions, inflation can occur if the money supply expands faster than economic production. Inflation, defined as the rate at which the average price of goods or services rises over time, may be influenced by variables other than the money supply.

Stamatiou and Dritsaki (2018) undertook research, Inflation, Unemployment, and the NAIRU in Poland, to analyze the link between inflation and unemployment rate in Poland from 1992 to 2017, using the Phillips curve as a framework. The Phillips curve depicts the inverse connection between inflation and unemployment. Low unemployment is associated with higher inflation, whereas high unemployment is associated with lower inflation and even deflation. This relationship makes logical sense from a logical perspective. Suna Korkmaz and Muzhgan Abdullazade (2017) examined if there is a link between the inflation rate and unemployment in their thesis The Causal Relationship Between Unemployment and Inflation in G6 Countries. When unemployment is low, more consumers have more money to spend on things. Inflation is distinguished from deflation, which happens when the buying power of money rises but prices fall.

In a study, the An Analysis on Forecasting Inflation Rate in the Philippines: A Recurrent Neural Network Method Approach by Jackie D. Urrutia et al. (2021); In this study, the researchers investigated the behavior of the Inflation Rate(y) and its economic components, such as Import (x1), Export (x2), Money Supply (x3), Gross Domestic Product (x4), Gross National Product (x5), Expenditure (x6), and Exchange Rate (x7) in the Philippines. The researchers analyzed the outcomes of Multiple Linear Regression and Recurrent Neural Network (RNN) simulations in MATLAB to see which of these two models would be better at projecting inflation rates. The study discovered that Multilayered Recurrent Neural Network Beats Multiple Linear Regression in forecasting inflation rate. The researchers determined that the Multilayered Recurrent Neural Network surpasses Multiple Linear Regression in predicting the Philippines' inflation rate after comparing the prediction effectiveness of the two approaches.

Islam, R., Abdul Ghani, A. B., Mahyudin, E., & Manickam, N. (2017) for International Journal of Economics and Financial Issues, Determinants of factors that affecting inflation in Malaysia was conducted to explain determinants of factors that affect inflation in Malaysia. The quantitative technique is employed in this work, and the econometric model is used to determine the relationship between the dependent and independent variables. In this study, there are two types of models: mathematical models and econometric models. The autocorrelation, multicollinearity, and heteroscedasticity have all been examined in this study. Inflationary pressures can have a detrimental influence on a country.

Research from the DETERMINANTS OF INFLATION IN GCC COUNTRIES by Alsheikh, D., & Rana, F. (2021) determined the influence of GDP and money supply on inflation level in GCC countries. In simple terms, a linear regression model was developed by fitting a line through the generation of scatter plots of paired observations. One variable was displayed on the x- and y-axes in the regression model. GDP and money supply were the independent variables, whereas the inflation rate was the dependent variable. The results demonstrated that the money supply had an influence on inflation, which was a general tendency in most nations. As a result, the inflation indicators indicated were validated as the oil price. Furthermore, GDP rose, causing inflation to rise in the UAE, whose economy is heavily reliant on hydrocarbons as compared to other GCC nations.

A study by Monfared, S. S., & Akın, F. (2017), The relationship between exchange rates and inflation: The case of Iran, was conducted to examine the link between the exchange rate and inflation using time series data and the Hendry General to Specific Modeling approach and the Vector Autoregression (VAR) model. The Hendry model reveals that there is a direct association between the exchange rate and inflation. Inflation rises in response to an increase in foreign currency rates. According to the findings, both the money supply and the exchange rate have a favorable effect on inflation. The money supply has a stronger impact on inflation than the exchange rate.

A study from Determinants of Inflation in Palestine by Alareeni, B., Qdeh, N., & Lulu, M. (2018) aimed to determine the most important variables and economic elements influencing inflation rates in Palestine from 2000 to 2014 in order to assist in mitigating its consequences on the Palestinian economy Based on quarter time series data on causes of inflation in the Palestinian economy from 2000 to 2014; two statistical models were created individually for the West Bank and Gaza Strip. The findings revealed a considerable influence of (the exchange rate, the Israeli inflation rate, and the economic growth rate) on the West Bank inflation rate. Furthermore, research demonstrated a substantial influence of (the global inflation rate, unemployment rate, economic growth rate) on the inflation rate in the Gaza Strip.

3. Methodology

3.1 Research Design

This paper aims to analyze the relationship of selected economic factors affecting inflation, and these selected economic factors are named as; Unemployment Rate, Exchange Rate, Policy Rates, and Money Supply. To show the relationship between the dependent variable and the independent variables, the researchers will use correlational studies.

3.2 Measurement of the Data

3.2.1 Dependent Variable:

- Inflation (INF) - "Inflation as measured by the annual growth rate of the GDP implicit deflator shows the rate of price change in the economy. The GDP implicit deflator is the ratio of GDP in current local currency to GDP in constant local currency." - Philippine Statistics Authority. 2012 is the base year (2012=100).

3.2.2 Independent Variable:

- Unemployment Rate (UNP) - Data retrieved from the Bangko Sentral ng Pilipinas.
- Money Supply (M2) - Consists of M1 and other deposits included in broad money such as savings and time deposits. In Billion Philippine Peso, data collected from Bangko Sentral ng Pilipinas.
- Policy Rate (RRP) – The interest rate that the central bank uses to implement or signal its monetary policy stance. It is mostly set by the policy-making committees of central banks. In percent per annum.
- Exchange Rate (EXRT) – The exchange rate is the price of one currency in terms of another currency. Philippine Peso (PHP) to United States Dollars (USD).

3.2.3 Empirical Model

Equation no. 1: $INF\ t = B\ 0 + B1UNP\ t + B2EXRT\ t + B3M2\ t + B4RRP\ t + \varepsilon t$

Wherein:

INF = Inflation Rate

UNP = Unemployment rate

EXRT = Exchange Rate

M2 = Money Supply (Currency Outside Depository Corporations and Deposits)

RRP = Policy Rate

ε = Error Term

t = Time

3.3 Data Gathering Procedure

The researchers opted to use secondary time-series data. The quarterly data for Inflation Rate, Unemployment Rate, Exchange Rate, Money Supply (M2/Currency Outside Depository Corporations and Deposits), and Policy Rate were all gathered from the Bangko Sentral ng Pilipinas (BSP). Their quarterly observations range from 2003 Q1 to 2020 Q4 with a total of 72 observations. The data was compiled in Microsoft Excel and EViews Student Version Lite, a free version of EViews 11 software with limitations which is a modern econometric, statistics, and forecasting program with powerful analytical methods and a versatile, user-friendly interface, was used to regress and analyze the data.

3.4 Mode of Analysis

To estimate the equation, the methodology used in this paper is Multiple Regression Analysis using Autoregressive Distributive Lag.

These tests would be used to ensure that proper assumptions of the OLS estimation method were met but also that the coefficients measured were unbiased and accurate:

Descriptive statistics for the summary of variables and measures to be taken.

- **Augmented Dickey-Fuller Test** for the null hypothesis testing that a unit root is present in the sample.
- **Lag Order Selection Criteria** for the concerns about the notion of cointegration in time series.
- **Breusch-Godfrey Serial Correlation LM Test** for autocorrelation test for errors in the regression model.

- **Ramsey RESET Test** for the specification error if non-linear combinations of the fitted values contribute to the explanation of the response variable.
- **Jarque-Bera test** for the normality of distribution of residuals.
- **Variance Inflation Factor** for the verification of the Multicollinearity between independent variables.
- **Breusch Pagan Godfrey Test** for the linear regression model, heteroskedasticity is assumed, and the error terms are normally distributed.

4. Results and Discussion

4.1 Descriptive Statistics

Table 4.1

Variable	Mean	Median	S.D.	Min	Max	Number of obs.
INF	3.7486	3.25	2.0115	-0.1	10.3	72
UNP	7.5472	7.15	2.2731	4.5	17.6	72
LM2	5835.3472	4516.35	3488.4880	1631.3	13554	72
LEXRT	48.3265	48.0154	4.4937	40.7048	56.2821	72
RRP	4.7153	4	1.5333	2	7.5	72

Table 4.1 shows the main statistics of all the variables used in the model. Based on the mean and median, it suggests that observations for the inflation, unemployment, and policy rate are normally distributed since their mean and median are numerically close to each other. Among the five of them, exchange rate and money supply have the highest standard deviation, which indicates that observations for exchange rate and money supply are clearly volatile in relation to the other independent variables. Meanwhile, the Policy rate has the least standard deviation, which suggests that observations for inflation are the least volatile in comparison to other variables. Among all of the variables, the Money supply has the highest range, and it also indicates great volatility in its observations. There are seventy-two observations in each of the variables.

Figure 4.1

Figure 4.1 shows the graphs of Inflation, Unemployment, and Policy rate in their level series while the Exchange rate and Money Supply in their logarithmic series. The graphs clearly indicate that the variables are non-stationary since the lines do not look like a cardiogram. To confirm that the variables are non-stationary, Augmented Dickey-Fuller Tests were performed, and the results are already presented in further reading of this chapter.

4.2 Unit Root Test

	At 0.05% significance			
Variables	Level series	1st difference	2nd difference	Decision
Inflation	0.0009	0.0000	0.0000	Reject Ho at I(0)
Unemployment	0.0023	0.0000	0.0000	Reject Ho at I(0)
Policy Rate	0.2937	0.0000	0.0000	Reject Ho at I(1)
Log_Exchange Rate	0.7661	0.0000	0.0000	Reject Ho at I(1)
Log_M2	0.3871	0.0051	0.0000	Reject Ho at I(1)

Table 4.2 Augmented Dickey-Fuller Unit Root Test Results

The unit root test results provided in Table 4.2 above indicate that the Inflation rate and Unemployment rate of the Philippines are stationary in level series. Since p-values of the variables Policy rate, Exchange Rate, and Money Supply are greater than 0.05, the presence of unit roots in the observations of these variables causes the series to be non-stationary. To make the series stationary, the series must be in their first-difference. Policy rate, Exchange Rate, and Money supply are all stationary at the first difference. The results of the Augmented Dickey-Fuller unit root test are significant at a 1% level showing that the inflation rate and unemployment rate are I(0), whereas Policy Rate, Exchange Rate, and Money Supply are I(1). Therefore, in this paper, we ascertain that the variables Inflation rate, Unemployment rate, exchange rate, Money Supply, and Policy rate are a mixture of I (0) and I (1); hence it is possible to take on the ARDL model.

4.3 Lag Order Criteria

Table 4.3 Lag Order Selection Criteria

Lag	AIC	SC	HQ
0	9.452816	9.618699	9.518364
1	-0.749130	0.246167*	-0.355841
2	-1.250807	0.573905	-0.529776*
3	-0.882766	1.771361	0.166006
4	-0.936658	2.546883	0.439855
5	-1.088863	3.224093	0.615391
6	-1.542192*	3.600179	0.489803

4.4 Diagnostic Test

4.4.1 Serial Correlation Test

Breusch-Godfrey Serial Correlation LM Test	
F- Statistics	0.277046
Obs*R-squared	0.640526
Prob. F(2,60)	0.7590
Prob. Chi-Squared(2)	0.7260

Table 4.4 Breusch Godfrey Serial Correlation LM Test Results
***Null Hypothesis: No serial correlation at up to 2 lags*

In Table 4.4 above of this study, we provide the diagnostic test results employed in this study. We employed the Breusch–Godfrey test of serial correlation. The results show that when the Inflation rate is specified as the dependent variable, there are no serial correlation problems since the p-value is greater than 0.05, accepting the null hypothesis.

4.4.2 Specification Error Test

Ramsey's RESET test was used to confirm the bias of the model and its limitations.

Table 4.5

Hypotheses	Results
H_O : Specification is Unbiased H_A : Specification is Biased	Test statistic: F (2, 60) = 1.272801 F-critical value = df 2, 60 p-value = 0.2875

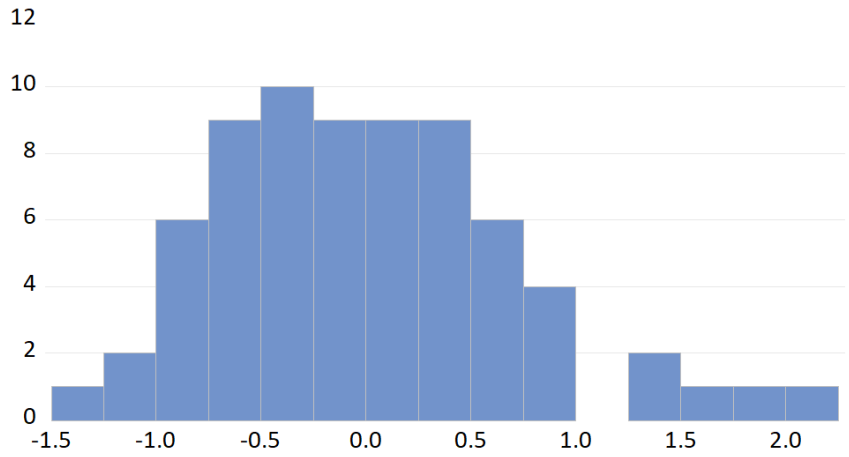
The results are shown in Table 4.6 that the F-statistic of 1.27 is less than the F-critical of (2,60), and the p-value of 0.28 is greater than 0.05; hence we do not reject the null hypothesis. The specification is adequate, and the regression model is unbiased.

4.4.3 Normality of Distribution

Table 4.6

Hypotheses	Results
H_O: Residuals are normally distributed H_A: Residuals are not normally distributed	Jarque-Bera stat = 6.548946 Probability = 0.03

Figure 4.1.2 Jarque Bera Test



In Table 4.6 above of this study, we provide the diagnostic test results employed in this study. We employed the Jarque Bera Test for the normality of distribution. The p-value is at 0.03, which is less than 0.05, rejecting the null hypothesis. This indicates that there is a non-normal distribution among variables. In Figure 4.1.2, since the right tail is longer and the mass of the distribution is on the left, this hints at a positive skew.

4.4.4 Test for Multicollinearity

VIF is used to assess the degree of correlation between the independent variables.

Table 4.7

Variables	Corresponding VIFs
INFLATION(-1)	4.845703
INFLATION(-2)	4.910515
UNP	1.920762
RRP	24.28067
RRP(-1)	20.93702
LEXRT	2.010191
LM2	5.856200

The dependent variable Inflation and independent variables Unemployment, Exchange Rate, and Money supply have a corresponding VIF that does not exceed the value of 10, indicating that they do not have a linear relationship to one another. However, the independent variable Policy Rate has a corresponding value of 24.28, exceeding the value of 10, indicating that there is multicollinearity in the variable.

4.4.5 Test for Heteroscedasticity

Breusch Pagan Godfrey Test was employed to detect heteroscedasticity in the model where the variance of the error term is not constant.

Table 4.8

Hypotheses	Results
H_O: There is no heteroscedasticity H_A: There is heteroscedasticity	p-value = 0.9625

There is no heteroscedasticity in the model; the p-value of 0.96 is greater than 0.05; thus, we accept the null hypothesis. The variance of the error terms is constant, and the model is homoscedastic.

4.5 Regression Analysis

Autoregressive Distributed Lag was employed to show the regression statistics where the Coefficient of Determination, the Regression Model, the individual significance of the coefficients, and the overall significance of the model are presented.

Table 4.9 ARDL Cointegration Test Results

Max. Lags imposed		(2,2)
SC selected lags		(2,0,1,0,0)
F-stat selected lags		4.771057
Cointegration		Yes
Critical values	Lower Bound I (0)	Upper Bound I (1)
10%	2.2	3.09
5%	2.56	3.49
1%	3.29	4.37

F-stat value is at 4.77, which is greater than the upper bound value I (1) of 3.09 at a 5% level of significance, so there exists a long run equilibrium relationship.

Table 4.10

DEPENDENT VARIABLE: INFLATION				
Variables	**Coefficient**	**Std Error**	**T-test**	**Prob.**
Short-run Association				
UNP	-0.028786	0.057279	-0.502552	0.6171
RRP	0.71158	0.298286	2.385557	0.0201
LEXRT	-0.596601	1.397539	0.380549	0.7048
LM2	0.531831	0.361919	-1.648435	0.1043
Diagnostic Test				
R-squared		0.874451		
Adjusted R-squared		0.860276		
Prob (F-statistic)		0		
Durbin Watson Stat		1.89321		

Table 4.10 shows the results for both short-run and long-run associations among variables.

Table 4.10 shows the results of short-run estimates. Only the Policy rate has a positive and significant relationship with Inflation at a 5% level of significance, while the remaining independent variables are insignificant in the short run. The results of the short-run calculation conclude that a unit increase in the Policy rate will increase the Inflation rate by 0.71%, ceteris paribus.

4.5.1 Regression Equation

INFLATION = C(1)*INFLATION(-1) + C(2)*INFLATION(-2) + C(3)*UNP + C(4)*RRP + C(5)*RRP(-1) + C(6)*LM2 + C(7)*LEXRT + C(8)

INFLATION = 1.28389543687*INFLATION(-1) - 0.555851068771*INFLATION(-2) - 0.028785622731*UNP + 0.711578148156*RRP - 0.786494591774*RRP(-1) - 0.596600543867*LM2 + 0.531831426293*LEXRT + 4.6761179322

Based on the regression equation, if all variables are equal to zero, Inflation will be equal to 4.67. A percentage increase in Unemployment will cause Inflation to decrease by 0.02 percent, ceteris paribus, and vice-versa. A percentage increase in the Policy rate will cause Imports to increase by 0.71 percent, ceteris paribus, and vice-versa. A percentage increase in the Exchange rate will cause Inflation to increase by 0.53 percent, ceteris paribus, and vice-versa. A percentage increase in Money Supply will cause Inflation to decrease by 0.59 percent, ceteris paribus, and vice-versa.

5. Conclusion

Based on Chapter IV, the findings and results are the following:

The study found that Inflation which is the rate of increase in prices over a given period of time in the Philippines has a significant positive relationship with the Policy rate in the short run.

Specifically, 87.45% of the changes in Inflation are due to the changes in the Unemployment rate, Exchange rate, Money supply, and Policy rate. These results did not concur with the definitions of the presented economic theories. Multicollinearity is present in one of the variables. The problems of heteroscedasticity and autocorrelation are nowhere to be found in the model, which indicates that the test for individual significance of the variables is reliable aside. Therefore, we conclude that the regression can be a basis for forecasting future studies.

5.1 Recommendation

5.1.1 Inflation Targeting

Inflation targeting is a dynamic and developing framework for monetary policy that must account for ongoing changes on both the local and global fronts (Guinigundo, 2017). The necessary control measures, timing for resolution, and any consequent scarring effects in the current epidemic will define the prognosis for growth and inflation in the next several years. In the midst of all the uncertainty, the inflation goal remains a critical foundation for directing the economy through the crisis and recovery periods. The inflation target is a critical guidepost for the BSP. Monetary authorities might continue to help economic recovery throughout and beyond the health crisis by maintaining a steadfast approach to low and stable inflation. Inflation targeting creates a rule-like framework wherein the central bank may respond to shocks. Because of the medium-term emphasis on inflation targeting, policymakers are not obligated to do all it takes to reach objectives on a period-by-period basis. Given the delays in monetary policy's influence, an inflation goal must be progressive. Precautionary attacks are required: action must be made before the rate of inflation begins to climb. As a result, the central bank's inflation projections are essential.

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