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| RESEARCH ARTICLE

Impact of Macroeconomic Variables on Stock Market Price Levels: Evidence from the Philippines

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| ABSTRACT
The study investigates the short and long-run relationship between the Philippine Stock Exchange Index and macroeconomic variables interest rate, foreign direct investment (FDI), and exchange rate. Specifically, the paper analyzed annual secondary data from the inception of PSEi in 1985 to 2019. This study's theoretical and empirical research finds diverse perspectives on how each macroeconomic variable factors into the stock market price levels. The Philippine stock market has also grown remarkably during the past few decades. However, there is little to no comparable study in Philippine literature. So, by employing the ARDL bounds testing approach, the research adds to the body of literature by examining the macroeconomic factors influencing the growth of the Philippine stock market. The study adopted the Autoregressive Distributed Lag (ARDL) model to estimate the causality function, F-Bounds Test to establish long-run causal significance, and Error Correction Term (ECT) to determine how long until the adjustment of short-run errors to re-equilibrate to the long-run equilibrium. The results show that FDI has a positive cointegration in both the short and long run, the exchange rate has a positive cointegration both in the short and long run, and the lag of interest rate is positively significant in the short run and negatively significant in the long run.

| KEYWORDS
Stock Market, Macroeconomic Variables, Philippine Stock Exchange index (PSEi), exchange rate, FDI, interest rate, Autoregressive Distributed Lag (ARDL)

| ARTICLE INFORMATION
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1. Introduction

1.1 Background of the Study

The stock market is a vital cog of a country's economy and is a crucial driver of economic growth. It enables companies to raise capital funds by issuing company bonds and selling securities to the public. Publicly listed companies in stock exchanges use these long-term funds from diverse investors to pay for business expenses. In return, investors receive dividends and capital gains if the stock price appreciates or losses if the stock price depreciates. Companies, on the other hand, benefit from the stock market by channeling investment funds into capital expenditures, debt repayment, research and development, and other business investment decisions. This capital exchange stimulates economic growth because it greatly benefits the general public and the corporations operating within the country (Pradhan, 2018, as cited in Susanto, 2020). Therefore, the stock market becomes a determinant of greater economic efficiency because it transfers funds from people who have no productive use of their funds to people who have a productive use of that funds (Mishkin, 2019).

According to finance theory, the value of stock shares is determined by the fundamentals of the underlying companies, such as their balance sheets, income statements, and cash-flow, as well as the expected discounted value of their future yields. However, the fundamentals of a company are also affected by macroeconomic conditions, such as recessions, which can negatively impact

its performance. For example, Fahlevi (2019) notes that high inflation can depress the economy and reduce households' purchasing power, leading to lower corporate profits. Given this, Antwi and Issah (2017) argue that macroeconomic variables such as the unemployment rate, tax rates, and output are outside the control of companies and organizations. Thus, it is critical to predicting the heterogeneous effects of changes in these variables in order to provide information on real economic activity and protect the future performance of companies.

The Philippine Stock Exchange (PSE) has the potential to be an instrument of financial freedom and a means of uplifting the lives of many Filipino families. However, to the best of the authors' knowledge, there is limited research dedicated to studying the PSE, let alone the macroeconomic determinants of the PSE Index (PSEi). The existing literature indicates that the Philippine stock market is sensitive to macroeconomic factors such as changes in the gross domestic product (GDP), money supply, income levels, unemployment, inflation, exchange rates, and other macroeconomic variables (Wahyudi et al., 2017; Ho & Odhiambo, 2018; Endres, 2020). However, there is still a significant need for further research on the macroeconomic determinants of the PSEi and the relationship between the PSEi and macroeconomic variables. Therefore, this paper aims to enrich the ongoing debate on the relationship between macroeconomic variables and the stock market by investigating the short and long-run relationship between selected macroeconomic variables, specifically, interest rate, exchange rate, and foreign direct investment (FDI) towards the PSEi using Autoregressive Distributed Lag (ARDL) model. This paper will also consider strategies appropriate for managing the risks and opportunities arising from the interaction between the selected macroeconomic variables and PSEi.

1.2 Statement of the Problem

This study is dedicated to finding the answers to the following questions:

1. What is the relationship between PSEi and interest rate, FDI, and exchange rate?
2. Is there a short and long run cointegrating relationship with the dependent and independent variables?
3. How does the long-run equilibrium of the PSEi respond to the short-run shocks in the selected macroeconomic variables?

1.3 Objectives of the Study

This study aims to discuss the following objectives:

1. To examine the presence of long-run cointegration in the model.
2. To determine the short and long run relationship between the PSEi and interest rate, FDI, and exchange rate.
3. To analyze the heterogeneous effects of interest rate, FDI, and exchange rate in the short and long-run on the PSEi.

1.4 Significance of the Study

The present study on the relationship between macroeconomic variables and the PSEi is of considerable importance for several reasons. Firstly, it provides readers with a deeper understanding of the connection between macroeconomic conditions and the performance of the Philippine stock market index. By gaining insight into the impact of the selected macroeconomic variables, companies, policymakers, and investors can more accurately forecast and capitalize on the risks and opportunities associated with these variables. This, in turn, can promote the long-term development and stability of the stock market, ultimately contributing to the overall growth of the economy. Additionally, this study aims to add to the limited existing research on the PSEi and its macroeconomic determinants and Policymakers may utilize the results obtained from this study to consider short- and long-term solutions to advance stock market development in the country.

1.5 Scope and Limitation of the Study

The present study aims to investigate the relationship between the Philippines' leading macroeconomic indicators and the PSEi over the last 35 years. Given that the PSEi only started recording in 1985, the authors have utilized the annual time series data from the inception of the PSEi up until 2019. In order to avoid overfitting of the model, data inconsistencies, and gaps, the authors have chosen to exclude other macroeconomic variables from the analysis. Additionally, annual data has been used in order to eliminate severe autocorrelation problems in lower timeframes and to obtain more significant results concerning higher timeframe trends. Furthermore, the use of annual data is uncommon in the local literature, making this study even more noteworthy. The scope of this study is limited to examining the cointegrating relationship between the PSEi and interest rate, exchange rate, and FDI.

2. Literature Review

2.1 Overview

The relationship between macroeconomic variables and stock market returns and development in developing countries has been a growing area of interest for many scholars. Several published studies have investigated the long-run relationship between developing countries' macroeconomic variables and their stock market development, prominently FDI, Interest rate, and Exchange

Rate. The authors chose these three macroeconomic variables as these three have been consistently used in economic studies to describe the relationship between macroeconomic variables and foreign stock exchanges (Samman & Jamil, 2018; Susanto, 2020; Ullah & Islam, 2017; Mechri et al., 2019; Demir, 2019; Wahyudi et al., 2017; Manu & Bhaskar, 2018; Guler, 2020; and several more authors.) However, most of the studies using these three variables were either observed singularly or with a set of other variables. This study constructed a model with data from 1985 to 2019 with Philippine Stock Exchange Index as its dependent variable and FDI, interest rate, and exchange rate as its independent variables.

2.2 Foreign Direct Investments

As the world trends to become more globalized by being interconnected, capital flows among international nations have become more common. Capital flows in and out of borders in different asset classes, depending on the attractiveness of opportunities. Alfaro (2017) cited that foreign direct investments (FDI) net inflows naturally induce economic growth, yet the effect is ambiguous as it is conditional depending on local conditions. The study then emphasized the role of financial markets to ensure that the vertical supply relations of FDI and the host country turn into meaningful linkages to capitalize on these investments and turn them into benefits. Several studies have explored how FDI impacts the domestic stock market. Samman & Jamil (2018) offered evidence that FDI has a beneficial influence on stock market development in Gulf Cooperation Council nations (GCC), implying that FDI yields significance in the long-term development of stock markets in GCC nations. Asravor & Fonu (2021) described the existence of positive and negative cointegration using ARDL bound testing between the log of the money supply, inflation rate, human capital macroeconomic variables, foreign direct investment, and interest rates to the stock market return and development in Ghana. The results showed that the log of FDI was significant in Ghana's stock market return and development. Similarly, Susanto (2020) ran an autoregressive distributed lag model (ARDL) bounds testing using the exchange rate, FDI, interest rate, and inflation rate as their independent variables and the stock market returns in Indonesia as their dependent variable. The results showed that the overall model was significant and that FDI, interest rate, exchange rate, and inflation impacted the Indonesian stock market returns. He proposed that the government should attract international investors so that FDI inflows might expand and assist the economy and growth.

Qamruzzaman & Karim (2019) study used the ARDL bounds testing approach and nonlinear ARDL approach to pin the long run cointegration between FDI and exchange rate in Bangladesh. The influx of FDI can be inflated when there is a real depreciation of the host country's currency against the foreign currency. In such cases, the relationship between FDI and the exchange rate may be conflicting and may not accurately represent the true value of FDI, as it is denominated in the host country's currency. This raises concerns about whether the growth of FDI is due to an increase in actual investments or simply a result of inflated bilateral exchange rates. While FDI is crucial for the growth of a country's stock market, the impact of FDI on the economy may be difficult to accurately assess without a stable exchange rate. Previous research has also highlighted the need for regulatory and financial reform activities, such as financial market deregulation, improved corporate governance in the banking sector, and the formulation of monetary and fiscal policies based on macroeconomic analysis in order to maintain stable FDI inflows. Furthermore, it has been argued that a steady exchange rate is essential for the stability of an economy and for attracting FDI inflows.

2.3 Interest Rate

The interest rate, which is the cost of borrowing capital from banks, is typically determined by the central bank through monetary policies aimed at safeguarding the economy. Changes in the interest rate can have significant impacts on the economy and stock market, as they affect the ease of repayment of loans for businesses and households. For example, lower interest rates may encourage companies to borrow and stimulate their operations, while higher interest rates may negatively impact their earnings due to increased debt repayment costs. This can have a cumulative effect on the stock market, with a decline in the performance of companies listed on the stock exchange index potentially leading to a decrease in the index itself. Therefore, there may be a negative relationship between interest rates and stock prices. Hendro & Santosa (2020) provided more profound insight into this argument. They stated that when interest rates rise, the burden on the company to satisfy its obligations or debts to banks rises, reducing corporate profits. As a result, stock prices will decline because the company's profits are affected. In addition to lower returns, the inability to secure low-interest loans for capital expansion impedes the growth of high-growth companies.

Demir (2019) found that stock market indices tend to decline as interest rates and crude oil prices rise. This suggests that increases in interest rates and crude oil prices can lead to a decrease in companies' investments and operating budgets, which in turn can reduce the market value of those companies. Similarly, Khalid and Khan (2017) found a negative relationship between interest rates and the Pakistan Stock Exchange Index (PSX). They argued that the State Bank of Pakistan's regulatory authority over monetary policy could help to strengthen the stock market by lowering the bank rate. Susanto (2020) conducted an ARDL study using the variables of interest rate, inflation rate, exchange rate, and FDI as independent variables and stock return as the dependent variable in the Indonesia Stock Exchange (IDX). The results showed that interest rate has a negative relationship with the IDX. These findings support the idea that changes in interest rates can have a negative significant impact on stock prices.

2.4 Exchange Rate

The exchange rate is a crucial factor in the development of emerging markets. According to Çakır (2021), there are two models that can be used to explore the reciprocal effects of the exchange rate and the stock market. The first is the flow-oriented exchange rate model, which posits that changes in the exchange rate, such as those caused by fluctuations in the balance of trade in a country's balance sheet, can affect the trade competitiveness of multinational enterprises (MNEs). This model suggests that when the domestic currency depreciates, domestic firms' exports increase, leading to higher earnings and a positive relationship between the exchange rate and stock market prices. The second model is the stock-oriented exchange rate approach, which proposes that a bull market in the stock market increases the demand for the currency of that particular market. This is because a strong stock market attracts capital inflows from foreign countries, which in turn increases the demand for money in the domestic currency and weakens the currency of the foreign country. Unlike the flow-oriented model, which requires the domestic currency to depreciate to boost MNE exports, the stock-oriented model requires the market to maintain its uptrend strength in order to attract capital inflows.

Wahyudi et al. (2017) researched the stock indices in ASEAN-5 countries and depicted that the exchange rate significantly impacts the aggregate stock price indices, but its effect is not prominent. The study found a negative relationship between the Philippines and Indonesia's exchange rate and stock price index. On the other hand, Kwofie and Ansah (2018) employed the ARDL bounds testing approach to assess the short and long-run link using the Ghana Stock Exchange (GSE) market returns as the dependent variable with inflation and Ghanaian currency rate as the independent variables. The results indicated a negative short and long-run cointegration between GSE market returns and currency rate (USD against the Ghanaian cedi). Sayed (2020) applied Linear ARDL and Nonlinear ARDL models to examine both symmetric and asymmetric effects of exchange rate on stock prices in the Khartoum stock exchange in the short and long run. The findings imply that the exchange rate has an unbalanced effect on stock values in the short and long run. As a result, the exchange rate and stock prices cannot be symmetric because forcing it may lead to poor economic policies. Begum and Khan (2021) found substantial evidence of an exchange rate and stock market development relationship using the ARDL and GARCH models. The results revealed that an increase in exchange rate volatility reduces stock market development in Pakistan due to the risk associated with the uncertain movement of the exchange rate. This result signifies that a stable exchange rate could be an effective policy instrument for improving the stock market performance.

2.5 Philippine Stock Exchange Index

Balaba (2017) ascertained that the PSEi is an important economic indicator to the economy. Using the real GDP as the dependent variable and PSEi and unemployment as the independent variable, Balaba (2017) found that national output rises along with PSEi. In this sense, rising stock prices and the need for job creation in both the private and public sectors motivate the Philippine economy to function well. Masangkay (2020) demonstrated that the Real GDP and PSEi price levels are not cointegrated, implying that their relationship is unstable over time. Ho & Odhiambo (2018) provided an in-depth analysis of the relationship between macroeconomic indicators such as banking sector development, inflation rate, real effective exchange rate, GDP, trade openness, and stock market liquidity, and its impact on the stock market development in the Philippines. Ho & Odhiambo (2018) revealed that trade openness has a negative long run cointegration with PSEi's market capitalization but has a short-term impact on banking sector development and the exchange rate. Endres (2020) found that the Philippine Stock Exchange Index and a collection of macroeconomic factors had a short and long-run association. Endres (2020) attributed the PSEI's tremendous increase from 1,825.09 points in January 2009 to 7,815.26 points in December 2019 to multifactor risk factors of industrial production, inflation, interest rate, foreign exchange rate, and the error term. Camba A. Jr. and Camba A (2020) used the ARDL model and the cointegration test of Johansen (1988) to conclude that financial market development (i.e., banking sector development and stock market development) has a considerable impact on economic growth in the Philippines. With the results of their study, domestic credit and stock market liquidity can be considered crucial policy variables to promote economic growth in the Philippines in the short and long run.

2.6 Synthesis

There is a growing body of empirical evidence exploring the relationship between macroeconomic variables and stock market indices. However, the impact of these variables on stock market performance may vary across countries due to differences in their economic structures and policies. Therefore, it is important to regularly investigate the link between macroeconomic variables and stock market indices in order to understand the dynamic nature of these relationships. While there have been several studies on the subject, there is a lack of research on the Philippines that uses a unique set of independent variables such as interest rates, exchange rates, and foreign direct investment (FDI), and a dependent variable such as the PSEi (Philippine Stock Exchange index), employing ARDL bounds testing to determine the short- and long-run cointegrating relationship between these variables. Additionally, this study uses annual data, which is a relatively new area of research due to the relatively short history of the PSEi. Given the insubstantial and contentious nature of existing literature on the Philippine stock market compared to other emerging and developed markets, this study aims to contribute to the growing interest in understanding the relationship between macroeconomic determinants and stock market performance.

2.7 Theoretical Framework

The theoretical foundation of this study is the Arbitrage Pricing Theory (APT) and the Efficient Markets Hypothesis (EMH). The APT, developed by Stephen Ross in the 1970s, is a hypothesis of asset pricing that predicts asset returns using a linear relationship between the asset's projected returns and the macroeconomic factors that affect the asset's risk. By using regression analysis, APT identifies and measures the significant factors affecting returns, including macroeconomic and industry-specific trends. APT's unique benefit is that it avoids assumptions regarding market efficiency or investor preferences and instead provides informed forecasts on future returns (Ross, 1980). This theory has been used in several empirical studies to link the risks of stock prices to the relationship between macroeconomic variables and their short- and long-run cointegration.

This study also adopts the investment theory of the EMH, developed by Eugene Fama and documented in his 1970 book "Efficient Capital Markets: A Review of Theory and Empirical Work." The EMH posits that financial markets are efficient and that prices reflect all available information, including both public and private information. This theory has implications for investors, as it suggests that it is impossible to consistently outperform the market through the use of fundamental or technical analysis because it is already reflected in security prices. In this study, the authors focus on the weak and semi-strong forms of the EMH. The weak form of the EMH suggests that past prices, volume, and return information are independent of future prices, while the semi-strong form posits that prices respond rapidly to any new public information that becomes available. This hypothesis suggests that fluctuations in the values of the risk factors of macroeconomic variables can impact the stock market price level in the short or long term.

2.8 Conceptual Framework

Figure 1. Conceptual Framework

3. Methodology

3.1 Econometric Model

The study employed the Autoregressive Distributed Lag (ARDL) bounds testing procedure for cointegration introduced by Pesaran (1997) and further developed by Pesaran, Shin, & Smith (1999, 2001). This method was chosen because the variables in the study were found to not cointegrate in the same order using a priori testing. The ARDL approach has several advantages over other cointegration techniques, such as those proposed by Johansen & Juselius (1990, 1992) and Johansen (1995), as it does not impose the restrictive assumption that the variables must cointegrate in the same order. Instead, the ARDL bounds test can be used with variables that integrate at order zero, one, or a mixture of both.

Furthermore, the ARDL bounds test has been shown to be robust in small samples and can be used with as few as 30 to 80 observations (Narayan, 2004 & 2005), (Wolde-Rufael, 2010), as cited in (Yakubu et al., 2015). This makes it particularly suitable for the present study, which has a sample size of 35 observations.

The model is given as follows:

$$\Delta PSEi_t = \beta_0 + \sum_{i=n}^{n} \beta_{1i} \Delta PSEi_{t-i} + \sum_{i=n}^{n} \beta_{2i} \Delta INT_{t-i} + \sum_{i=n}^{n} \beta_{3i} \Delta FDI_{t-i} + \sum_{i=n}^{n} \beta_{4i} \Delta RER_{t-i} + \delta_1 PSEi_{t-n} + \delta_2 INT_{t-n} + \delta_3 FDI_{t-n} + \delta_4 RER_{t-n} + \varepsilon_t$$

Where ε is the white-noise error term, β is the short-run coefficients, and δ is the long-run coefficients of the model. Δ represents the first difference operator, t indicates the time period, and n is the maximum number of lags in the model. The variables PSEi, INT, FDI, and RER are in first-differenced form and are denoted as the Philippine Stock Exchange index, interest rate, Foreign Direct Investment net inflows, and Real Effective Exchange Rate, respectively. The model used Akaike Information Criterion (AIC) to determine the optimum number of lags.

The model is required to follow the hypothesis of cointegration in which if the model is found to be cointegrated in the long-run using the F-bounds test, it will present accurate long-run form to establish long-run significance, and if there is no long-run cointegration, the study will simply follow the ARDL-ECM model to establish short-run significance

Thus the authors present the null hypothesis of no long-run cointegration as:

$$H_0: \delta_1 = \delta_2 = \delta_3 = \delta_4 = 0$$

And the authors present the alternative hypothesis of the presence of long-run cointegration as:

$$H_1: \delta_1 \neq \delta_2 \neq \delta_3 \neq \delta_4 \neq 0$$

The null hypothesis suggests that the authors will not reject the null if there is no level of relationship between the dependent and independent variables, while the alternative hypothesis suggests that there exists a level of relationship between the dependent and independent variables.

The F bound test is used to determine long-run cointegration among the dependent and independent variables. If the F-statistic is lesser than the lower-bound critical value, then the null hypothesis will not be rejected, and if the F-statistic is greater than the upper-bound critical value, then the alternative hypothesis will be accepted. In cases in which the F-statistic falls in between the lower and upper-bound critical values, the relationship becomes inconclusive. If the variables are cointegrated, then the study will estimate the short-run behaviour of the coefficients of the variables in the ECM. The Error Correction Model in this study is formulated as follows:

$$\Delta PSEi_t = \beta_0 + \sum_{i=n}^{n} \beta_{1i}\Delta(PSEi_{t-i}) + \sum_{i=n}^{n} \beta_{2i}\Delta(INT_{t-i}) + \sum_{i=n}^{n} \beta_{3i}\Delta(FDI_{t-i}) + \sum_{i=n}^{n} \beta_{4i}\Delta(RER_{t-i}) + \delta_1 ECM_{t-1} + \varepsilon_t$$

Where δ is the coefficient of the error-correction term, for ECM to be valid, δ must have a negative sign which implies the marginal rate of adjustment of the equilibrium to re-equilibrate back to its original position caused by shocks, hence why the ECM lagged by one period to represent the speed of adjustment from the equilibrium's previous period to the equilibrium's current period (Yakubu et al., 2015).

3.2 *Data Description*

The dependent variable in this study is the PSEi (Philippine Stock Exchange Index), and the independent variables were selected based on a review of the literature on the relationship between local and foreign stock exchanges and macroeconomic variables. The authors found that many macroeconomic variables are correlated with the stock market, so the authors chose the independent variables based on which ones appear most frequently in the research literature. The data for this study was obtained from various sources. The interest rate and exchange rate data were obtained from the Banko Sentral ng Pilipinas (BSP), the FDI data was collected from the World Bank database, and the PSEi annual data was gathered from Yahoo Finance.

Variable	Term	Units of Measurement	Justification
Interest Rate	INT	Percentage	Ullah, G. M. W., Islam, A., Alam, M. S., & Khan, M. K. (2017), Demir, C. (2019), Hendro, W., Santosa, U. H., & Tri, W. (2020)
Real Exchange Rate	RER	Points	Kennedy, K., & Nourzad, F. (2016), Manu, K., & Bhaskar, P. B. (2018), Guler, D. (2020).
Foreign Direct Investments	FDI	Current USD ($)	Samman, H. A., & Jamil, S. A. (2018), Qamruzzaman, Karim, S., & Wei, J. (2019)
Philippine Stock Exchange index	PSEi	Points	Balaba, J. L. (2017), Ho, S. Y., & Odhiambo, N. M. (2018), Endres, E. J. E. (2020).

1. Philippine Stock Exchange Index (PSEi) – Composed of all the top 30 companies that were included in the index from the years 1985 to 2019. Proxied by the Closing price of PSEi.

2. Exchange Rate (RER) – is a weighted average of bilateral exchange rates with the currencies of trading partners that have been adjusted for inflation or price changes. It is a gauge of the competitiveness of external prices and considers both the nominal exchange rate and inflation differences with trade partners. Proxied by the Real Effective Exchange Rate against Advanced Economies.

3. Foreign Direct Investment (FDI) – FDI net inflows are the amount of inward direct investment that non-resident investors make in the reporting economy. Proxied by FDI net inflows in a million USD.

4. Interest Rate (INT) – refers to the average of the stated high/low lending rates from universal and commercial banks (U/KB). Proxied by Bank Average Lending Rate.

3.3 Hypothesis/Propositions

This series of hypothesis testing will confirm the significance of the integration of the variables. The null hypothesis will be rejected if the p-value is > 5% confidence level, providing sufficient evidence that there is no relationship between the two variables. These are the following claims:

$\mathbf{H}_{01}$: There is no significant relationship between the PSEi and Exchange Rate in the short run.
$\mathbf{H}_{02}$: There is no significant relationship between the PSEi and FDI in the short run.
$\mathbf{H}_{03}$: There is no significant relationship between the PSEi and Interest Rate in the short run.

If the overall model displays evidence of a long-term correlation between numerous time series, long-run cointegration will be established in which variables are integrated in such a way that they cannot deviate from equilibrium over time.

$\mathbf{H}_{01}$: There is no significant relationship between the PSEi and Exchange Rate in the long run.
$\mathbf{H}_{02}$: There is no significant relationship between the PSEi and FDI in the long run.
$\mathbf{H}_{03}$: There is no significant relationship between the PSEi and Interest rate in the long run

If the p-value is < 5%, the alternative hypothesis ($\mathbf{H}_1$) will be accepted, validating that there is a significant relationship between the dependent and the independent variables.

4. Results and Discussion

4.1 Descriptive Statistic

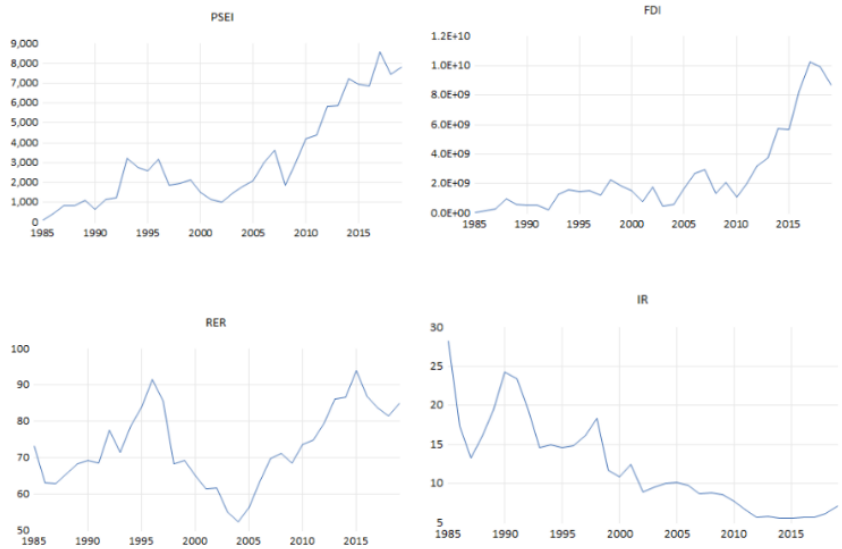

Table 2. Variable's Trend

Table 2 shows the overall trend of the variables before log transformation. Down trending, FDI, and RER exhibit a trend, while the interest rate does not. Determining the trend is essential for a critical analysis of the model's intercept, identifying outliers in shocks,

and conducting stationary testing. Trend analysis in the stock market is crucial for examining the health of the market. If the stock market is in an uptrend, it is considered bullish, which indicates that investors have confidence that stock prices will rise. Therefore, if the dependent variable, PSEi, is in an uptrend, it can be inferred that the macroeconomic variables that are down trending have a negative relationship with the PSEi. To further explore this relationship, a scatterplot is provided in Table 3.

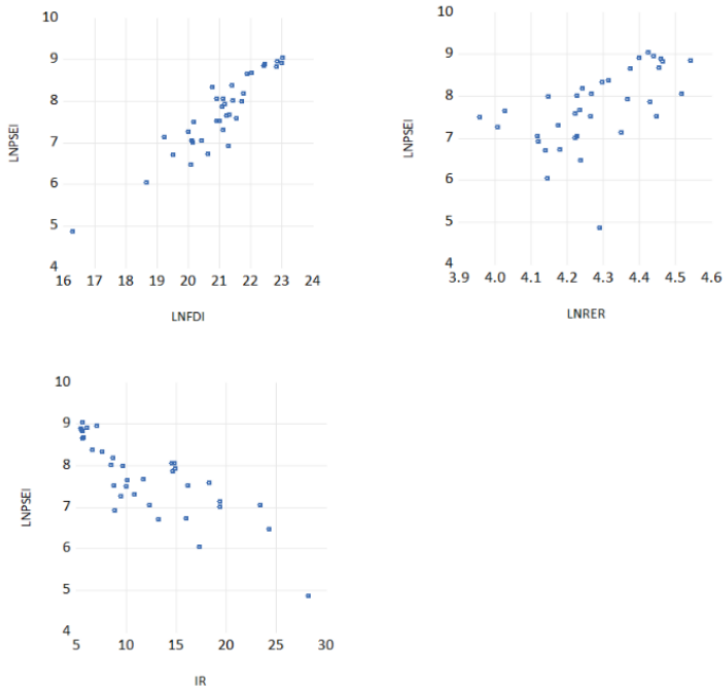

Table 3. Variable's Scatterplot

4.1.1 Summary Statistics

Summary Statistics

	PSEi	FDI	RER	IR
MEAN	3137.526	$2,536,251,371.343	72.970	12.165
MAXIMUM	8558.420	$10,256,442,399.000	94.045	28.233
STD. DEVIATION	2427.049	$2,811,398,541.156	10.680	5.952
SKEWNESS	0.864	1.658	0.110	0.881
KURTOSIS	2.465	4.612	2.176	3.092
JARQUE-BERA	4.774	19.826	1.06	4.541
PROBABILITY VALUE	0.092	0	0.588	0.103

Table 4. Summary Statistics

Summary statistics are useful for parametric and non-parametric tests, providing information on measures of central tendency, dispersion, and normality. The Jarque-Bera (JB) statistic is also shown to test the normality of the error terms, with a probability value indicating the likelihood of obtaining normality. If the probability value of the JB statistic exceeds 0.05, the null hypothesis of non-normality is rejected. Skewness is a measure of the asymmetry of the data, with values between -0.5 and 0.5 considered to be normal. A skewness value greater than 0.5 indicates a right-tailed distribution, while values less than -0.5 indicate a left-tailed distribution. Kurtosis measures the peakiness and flatness of the data, with a normal distribution being mesokurtic (having a kurtosis value of 3). A flatter distribution is platykurtic (having a kurtosis value less than 3), while a peaked distribution is leptokurtic (having a kurtosis value greater than 3). For a rundown interpretation of summary statistics, the authors present the summary statistic of the dependent variable, PSEi. The PSEi has a mean of 3137.526 points and has grown tremendously from its minimum of 131.19 pesos to its maximum of 8558.420 pesos. It has a standard deviation of 2427 points which suggests high volatility for stock prices, but since its standard deviation did not exceed the mean, it is still within the variable's reasonable variation. It mirrors normal skewness since it is near 0 and platykurtic because its kurtosis is less than 3. Its Jarque-Bera statistic shows that its error terms are normally distributed at a 5% significance level because it has a probability value of 0.09, which is greater than 0.05. The

normality test after transformation suggests that all variables' error terms except the Real effective exchange rate are normally distributed.

4.2 Model Specification

4.2.1 Augmented-Dickey-Fuller (ADF) Test

Augmented Dickey-Fuller Test				
Variables	at Level I(0)		1*st diff.* I(1)	
	t-Statistic	P-value	t-Statistic	P-value
LNPSEI	-4.0945	0.0146	-6.5176	0.0000
INT	-4.1872	0.0177	-5.1474	0.0015
LNFDI	-5.5009	0.0004	-6.9289	0.0000
LNRER	-1.6937	0.7321	-5.034	0.0015

Notes:

All variables are significant in I(1) at 1%.

All variables are significant in I(0) and I(1) at 5% except RER at I(0).

Table 5. ADF Test for Stationarity

Table 5 shows that all variables except RER are stationary at I(0), while all are stationary at I(1). The authors tested the interest rate and the log of PSEi, RER, and FDI using the ADF test to prove that all variables are stationary at either I(0), I(1), or a combination of both. The authors chose the standard lag length of EViews 12 using the Schwarz info criterion with a maximum lag value of 8. However, all variables had 0 lag length in this test. The T-statistics shows that if the absolute value of the t-statistic is greater than 2, then the p-value will be lower than the critical value of the confidence intervals. Thus, the authors cannot reject the null hypothesis of stationarity.

Gujarati (2009) defines a time series as stationary if its mean, variance, covariance, and other characteristics are time-invariant. Stationarity tests determine whether the characteristics of the series change over time. Examining the variables using the first difference enables us to run the regression not on the raw data but on the differences of successive values of the variables. Thus, eliminating the non-stationarity of the series. Asravor and Fonu (2019) emphasized the importance of making the variables stationary at I(1) as it implies that shocks to the variables only have a temporal effect and would not lead to the presence of mean reversion and avoid inefficient results in regression analysis.

In this study, the authors have chosen to use the Autoregressive Distributed Lag (ARDL) bounds testing method to analyze the relationship between the Philippine Stock Exchange index (PSEi) and macroeconomic variables such as the interest rate, foreign direct investments and the real effective exchange rate. The ARDL approach is preferred over other methods, such as ordinary least squares (OLS) because it provides dynamic short and long-run results and is able to identify cointegrating vectors in the presence of multiple cointegrating vectors (Nkoro & Uko, 2016). Additionally, the ARDL approach allows for the inclusion of lagged values of the dependent and independent variables, which is essential for capturing the dynamics of the error term. However, the ARDL approach has certain restrictions on the order of integration of the variables used in the analysis. In particular, it requires that the variables be integrated into different orders, such that some series are stationary at the level I(0) and some are stationary at the first difference I(1). It can also be used if all variables are stationary at the first difference I(1), but not if the variables are at the second difference I(2). If these conditions are not met, it can lead to model misspecification and inconsistent and inefficient estimates. In this study, all of the variables are stationary at either I(0) or I(1), making the ARDL approach an appropriate choice for determining short and long-run cointegration between the PSEi and the macroeconomic variables.

4.2.2 Autoregressive Distributed Lag Model (ARDL)

In this case, the Akaike info criterion (AIC) was chosen for lag selection as it generates the best fit for the model. The model (1, 4, 2, 0) was chosen out of the 500 models evaluated at maximum 4 lags.

Method of Model Selection: Akaike info criterion (AIC)

Fixed regressors: C

Included Observations: 31 after adjustments

Selected Model: ARDL(1,4,2,0)

Variables	Co-efficient	Std.Error	t-Statistic	Prob.*
LNPSEI(-1)	0.001903	0.266245	-0.007149	0.9944
LNFDI	0.321094	0.108900	2.948508	0.0079
LNFDI(-1)	-0.06365	0.108064	-0.588900	0.5625
LNFDI(-2)	-0.197866	0.091995	-2.150831	0.0439
LNRER	2.085123	0.685793	-3.040453	0.0065
INT	-0.040861	0.024616	-1.659972	0.1125
INT(-1)	-0.005127	0.039255	-0.130608	0.8974
INT(-2)	-0.032304	0.035512	-0.909676	0.3738
INT(-3)	0.055865	0.033008	1.692460	0.1061
INT(-4)	-0.057402	0.021021	-2.730741	0.0129
C	-1.361045	2.594500	-0.524572	0.6056
R-squared	0.917547	Mean dependent var.		7.917511
Adjusted R-squared	0.876320	S.D. dependent var.		0.711200
S.E. of regression	0.250116	Akaike info criterion		0.337635
Sum squared resid.	1.251156	Schwarz criterion		0.846469
Log likelihood	5.766659	Hannan-Quinn criterion		0.503502
F-statistic	22.25621	Durbin-Watson stat.		1.718383
Prob (F-statistic)	0.000000			

Table 6. ARDL Test

Table 6 shows that INT, INT lags 1 to 3, and LNFDI (-1) has no significant relationship effect since its p > 0.05. On the other hand, INT (-4), LNFDI, LNFDI (-2), and RER have significant relationship effects since their p < 0.05. Their beta states that they have β = -0.057402, β = 0.321094, β = -0.197866, and β = 2.085123, respectively. The signs of the coefficients indicate that INT (-4), LNFDI, and RER are positively related to PSEi, while LNFDI (-2) is negatively related.

The estimated beta coefficient in this model shows that a 1% increase in interest rate after four years causes PSEi to decrease by 0.057%. This result indicates that although the temporal effect of increasing the banks' interest rate has no effect for the first four years, its impact will be felt beginning in year 4. However, the impact will not be as significant as the other variables because the beta coefficient of the interest rate is relatively small. The FDI beta coefficient estimates that a 1% increase in FDI causes PSEi to rise 0.321%. However, after two years, this percentage increase in FDI causes a 0.198% decline in the PSEi. This effect means that companies only gain from FDI in the same year it is invested, but the effects are not carried on to the following year. The RER beta coefficient displays that a 1% increase in RER causes the PSEi to increase by 2.085%. This result means that companies profit from the depreciation of the Philippine peso against advanced currencies. Since our currency has become cheaper, foreign investors can buy more shares and increase their portfolio investment without incurring real additional costs.

Since the F statistics p > 0.05, the model is significant. The model managed to score an R2 of 91.7, which means that the model covers 91.7% of the variation in the model. The insignificant variables in this model include PSEi (-1), FDI (-1), INT, INT (-1), INT (-2), and INT (-3) because they failed to score t-statistic > |2| and their p > 0.05.

4.3 Error Correction Model

ECM REGRESSION

Case 3: Unrestricted Constant and No Trend

Variables	Co-efficient	Std.Error	t-Statistic	Prob.*
D(INT)	-0.040861	0.022288	-1.833332	0.0817
D(INT(-1))	0.040861	0.021539	1.571183	0.1318
D(INT(-2))	0.033841	0.019885	0.07727	0.9392
D(INT(-3))	0.001537	0.019502	2.943328	0.0080
D(LNFDI)	0.321094	0.083143	3.861949	0.0010
D(LNFDI(-1))	0.197866	0.080026	2.472508	0.0225
CointEq(-1)*	-1.001903	0.215606	-4.546925	0.0002
C	-1.361045	0.307481	-4.426438	0.0003

Table 7. Test for Error Correction Term & Short run Cointegration

In the short run, the authors can see that the growth rate of interest rate at lag 3, the growth rate of the log of FDI, and the growth rate of the log of FDI are significant. The exchange rate does not contain a lag value; if a variable has zero lags in the model, its effect on the dependent variable will be captured by the long-run coefficients in the model because the variable is already in its long-run equilibrium relationship with the independent variable, and any deviation from this equilibrium will be corrected by the independent variable in each period. Table 10 shows that the log of RER is significant in the short run. The error correction term shows the speed of converting the short run equilibrium back to its original point (long-run equilibrium). Thus, a significant error correction term confirms the existence of a stable long-run relationship. The CointEq(-1) is the error correction term which at lag 1 has a beta coefficient of -1.001903 and a p-value lower than 0.05. Nkoro and Uko (2016) stated that when the estimated value of ECT equals to -1, it means that the entire process of the adjustment occurs within the same period, indicating a complete and immediate adjustment. As a result, the annual series of the PSEi in this model is corrected at the speed of 100% by the following year. Since the series is annual, it will take 1 year for the equilibrium to be corrected, and the equilibrium will converge back to its original exactly after 1 year. On the other hand, a value higher than -2 means that the model is incorrect.

4.4 Wald Test

Wald Test

Variable	Test Statistic	Value	df	Probability
FDI	F-statistic	3.307915	(2,20)	0.0574
	Chi-square	6.615829	2	0.0366
INT	F-statistic	1.988248	(4,20)	0.1352
	Chi-square	7.95299	4	0.0933

Note: H_0= FDI t-1, FDI, and INT t-1, INT t-2, INT t-3, and INT t-4 are equal to zero.

Table 8. Wald Test for Joint Significance of Lags

The Wald Test examines the joint significance of the lagged coefficients of the independent variables. The null hypothesis of this test is that the lag variables are equal to 0, indicating that the lag variables have no joint significance to the significance of other lag variables. The authors can see in Table 8 that under 5 to 10% significance, only the FDI managed to have joint significance. On the other hand, the lags of INT have 0 joint significance under a 5% confidence level.

4.5 Cointegration Test

F-Bounds Test

Test Statistic	Value	Significance if.	I(0)	I(1)
F-statistic	4.6943	10%	2.72	3.77
k	3	5%	3.23	4.35
		2.50%	3.69	4.89
		1%	4.29	5.61

Note: H_0 = No levels of relationship

Table 9. Test for Cointegration

The cointegration test is conducted through the F-Bounds test, where the F-statistic must score higher than the upper bound value of the significance level 5% I(1) to reject the null hypothesis of no long run relationship. If the F-statistic is lower than the lower bound value of the significance level 5%, I(0), it will fail to reject the no long run relationship, and if the F-statistic lands in between the lower I(0) and I(1), the results mean that it is inconclusive. Table 9 shows that the macroeconomic variables INT, FDI, and RER have a long run cointegration with PSEi as it scored 4.69, which is higher than the 4.35 upper bound value.

Levels Equation

Case 3: Unrestricted Constant and No Trend

Variables	Co-efficient	Std.Error	t-Statistic	Prob.*
INT	-0.07928	0.018748	-4.24999	0.0004
LNFDI	0.059465	0.132207	0.449789	0.6577
LNRER	2.081162	0.420901	4.944539	0.0001

Table 10. Test for long run cointegration

The long-run relationship is described in Table 10 of the level's equation. Table 10 shows that INT and RER are significant, while FDI is insignificant. The beta coefficients of INT, FDI, and RER are β = -0.07928, p<0.05, β = 0.059465, p > 0.05, and β = 2.081162, p < 0.05.

The estimated beta coefficient in Table 11 displays that a 1% rise in the interest rate causes PSEi to decline -0.0793%. The RER beta coefficient estimates that a 1% increase in RER causes PSEi to increase by 2.081%. This result means that both interest rate and RER are cointegrated in the long run with PSEi. Interest rate is negatively related to PSEi, while RER is positively related to PSEi. Surprisingly, FDI is insignificant in the long run, which means that even though FDI is significant in the short term, its effect does not translate to an impact on the long-term performance of the Philippine stock market.

4.6 Coefficient Diagnostics (Multicollinearity)

Variance Inflation Factor

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LNPSEI(-1)	0.071	2179.572	17.35584
LNFDI	1.19E-02	2676.517	5.258659
LNFDI(-1)	0.011678	2617.481	4.774247
LNFDI(-2)	0.008463	1876.888	3.375832
LNRER	0.470313	4296.555	5.211963
INT	0.000606	47.01149	8.537474
INT(-1)	0.001541	124.6239	21.74673
INT(-2)	0.001261	104.7932	17.21849
INT(-3)	0.00109	95.22634	14.65648
INT(-4)	0.000442	44.02428	7.334462

Table 11. Test for Multicollinearity

Multicollinearity is tested using the Variance Inflation Factor (VIF) test. This test measures how the variance of an estimator is inflated by the presence of multicollinearity in the data. A VIF value greater than 10 indicates the presence of near-multicollinearity, while a VIF value of 100 indicates near-perfect multicollinearity among the variables. The results of the VIF test (presented in Table 11) show that some of the variables have a VIF value greater than 10.

The presence of multicollinearity can cause high variance in the estimated coefficients and result in inaccurate estimates for the coefficients of the correlated independent variables. It can also make the model sensitive to small changes in the data. Despite this, multicollinearity does not pose a problem in this regression as the model's R2 is high, and the regression coefficients are individually significant, as indicated by their p-values. As the purpose of this regression is prediction, multicollinearity does not pose a significant issue.

4.7 Residual Diagnostics (Autocorrelation, Heteroscedasticity, Normality of Residuals)

Residual Diagnostics

Test	Statistics	p-value	Null Hypothesis (H0)	Interpretation
Jarque-Bera	1.131564	0.5679	Normal distribution in residuals	Do not reject H_0
Breusch-Godfrey LM F-stat	1.117482	0.3488	No serial correlation	Do not reject H_0
Breusch-Pagan-Godfrey OBS*R2	11.14765	0.3461	No heteroscedasticity	Do not reject H_0

Table 12. Test for Residual Diagnostics

The residual regression displays that the model scored p > 0.05 in all the diagnostic tests, which indicates that the model is free of autocorrelation, homoscedastic, and normally distributed. The absence of autocorrelation means that there is no degree of correlation between six successive time intervals of the same variables. While the homoscedasticity assumption means that the error term or random disturbance in the relationship between the independent variables and the dependent variable is the same for all independent variables. The residuals of the model are normally distributed, which means it has a bell-shaped curve in a statistical report. It is a statistically significant probability distribution because it accurately depicts the distribution of residuals for many naturally occurring variables. These findings suggest that the model is correctly specified and can be used to make reliable predictions.

4.8 Stability Diagnostics

4.8.1 Ramsey Reset

Ramsey RESET Test

	Value	df	Probability
t-statistic	0.035712	19	0.9719
F-statistic	0.001275	(1,19)	0.9719
Likelihood ratio	0.002081	1	0.9636

Table 13. Test for Model Misspecification

The Ramsey RESET test is used to determine whether or not there is a model specification error in the regression model. Variations in the dependent variable may be incorrectly attributed to the independent variables when either important variables are omitted or unnecessary variables are included. This can lead to an increase or decrease in regression error term and skew the estimated coefficients. The model is shown to be correctly specified since it was able to reject the null hypothesis of model misspecification as its p>0.05.

4.8.2 CUSUM Stability

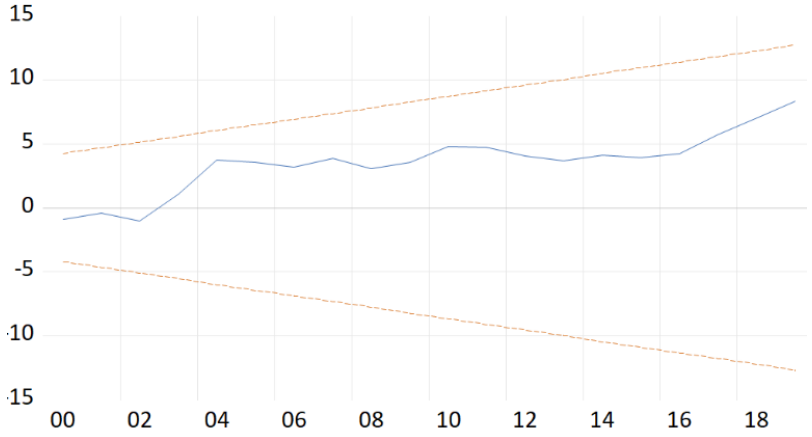

Figure 2. Test for Structural Stability

CUSUM tests are commonly used in econometrics and statistics to determine whether a regression equation of interest has structural changes (or structural breaks). It is also used to examine the stability of the regression coefficients in the form of a multiple linear regression model.) The graphic above of CUSUM shows that the series is free of instability since the line did not go beyond the 5% significance bounds. Both CUSUM and Ramsey Retest show that the model is stable over time and can be used for forecasting.

4.9 Results Analysis and Discussion

4.9.1 Interest Rates

The lag of interest rate is positively related to the PSEi in the short run, but the interest rate, in the long run, is negatively related to the PSEi price level. Using the Wald Test, the authors determined that only the interest rate at lag four is significant in the PSEi. After three years, the shocks in the growth rate of interest rate causes PSEi to decline. Fortunately, increases in interest rates are not as massive as the other variables, as an increase of 1% in an interest rate only causes PSEi to decline by 0.05% in the short run and 0.07% in the long run.

The lagged effect of interest rate is spread over four years, meaning that although firms cannot feel the positive effect of their borrowing after the rise in interest rate in the first three years, its positive effect would translate after four years. In the long run, higher interest rates increase the cost of borrowing for firms and households, leading to a reduction in spending and a decrease in demand for stocks. This, in turn, causes share prices to decline. Hendro et al. (2020) noted that higher interest rates also increase a company's burden to pay its liabilities to banks, leading to a decrease in corporate profits and dividends. As a result, investors are encouraged to withdraw their investments from the stock market and move them into safer, passive forms of investment. This further contributes to the decline in stock prices and negative sentiment towards the stock market index.

The findings of this study provide evidence that the long-run cointegration between the PSEi and the interest rate is negative. This is consistent with the findings of Khalid and Khan (2017), who studied the impact of interest rates on the Pakistan Stock Exchange (KSE 100) index. Asravor and Fonu (2021) also found evidence of a negative relationship between interest rates and the market capitalization of the Ghana Stock Exchange (GSE). These findings suggest that interest rates negatively impact not only the price level of the market index but also the total market capitalization. The short-run cointegration between the lagged values of the interest rate and the PSEi also aligns with the local literature of Endres (2020). However, the long-run cointegration between the two variables found in this study differs from Endres' findings. This difference can be attributed to the different proxies used for the interest rate, as Endres (2020) used the Overnight Reverse Repurchase Rate while this study used the Bank Average Lending Rate. Overall, the literature suggests that interest rates have a negative impact on the stock market index due to the increased cost of borrowing, which hinders business operations.

4.9.2 Foreign Direct Investments

The surprising results of the analysis of the relationship between FDI and the PSEi indicate that while there is a positive impact on the PSEi in the short run, the growth rate of FDI also has a positive impact on the PSEi after one year. The short-run impact of FDI causes a 0.32% increase for every 1% increase in FDI, and the growth rate of FDI causes another 0.20% increase for every 1% increase in FDI after one year. However, in the long run, there is no significant relationship between the two variables. This means that the positive effects observed in the short run do not carry over in the long term. The authors explained that this should not be the case, as there should be a three-directional relationship between FDI, the economy, and the stock market.

Rollon et al. (2016) posit that there is a triangular relationship between FDI, the economy, and the stock market, with FDI promoting economic growth, which in turn positively impacts the stock market. In the short run, FDI benefits the PSEi by providing capital funding, technology, and expertise, which boosts the economy and leads to higher demand for stocks. The presence of a significant positive relationship between the lag of FDI and PSEi suggests that the effects of increased FDI in the first year carry over into the following year. However, in the long run, the effects dissipate, and FDI becomes insignificant in its relationship with PSEi. Some countries found that there is no evidence of a significant relationship between FDI and economic growth because FDI can only advance economic growth under certain policy conditions (Rollon et al., 2016). These policy conditions may be difficult to attain in developing countries with weak institutional frameworks, such as the Philippines. A weak institutional framework can hinder the ability of a country to effectively utilize FDI to promote economic and market index growth. Poor planning and implementation of policies related to FDI can lead to inefficiencies and a lack of coordination, resulting in a lack of significant impact on the overall growth of the economy. Additionally, FDI may not always be directed towards sectors that are closely linked to the stock market index. Therefore, while FDI may have a positive short-run impact on the PSEi, its long-run impact may be negligible.

The authors found evidence of a positive short-term relationship, but no significant long-term relationship, between the PSEi and foreign direct investment (FDI). This aligns with the findings of Demir (2019), who observed a similar positive short-term relationship between FDI and the BIST-100 index in Turkey. However, our results contradict the findings of Samman and Jamill (2018), who found that FDI net inflows do not benefit stock markets in Gulf Cooperation Council countries in the short term but do contribute significantly to the development of these markets in the long term. Our findings are also consistent with those of Tite et al. (2022), who found no long-term relationship between FDI and the Nigerian Stock Exchange index, and Idenyi et al. (2016), who used vector error correction modelling (VECM) and Granger causality testing to conclude that there is no significant relationship between stock market growth and FDI in Nigeria. Similarly, Ho and Odhiambo (2018) found no long-term cointegration between FDI and the stock market capitalization in Malaysia.

4.9.3 Exchange Rate

The authors found that the exchange rate has the most significant positive impact on the PSEi among the variables studied. The exchange rate is significant in both the short and long run, with an estimated 2% increase in the index per 1% increase in the exchange rate. This means that a depreciation of the peso leads to an increase in the PSEi. When the peso loses value, foreign demand for goods and services increases, which benefits domestic firms in the short run as they can hire more people and increase production to earn higher profits. In the long run, however, currency depreciation makes foreign investments more expensive, which inflates the true value of foreign investments and drives up stock prices.

The depreciation of the host currency can benefit domestic firms through higher conversion rates and higher exports, which increases company profits. In the long run, since every factor of production can be variable, other firms may enter the market and increase competition, causing equilibrium to return to its original state. Despite this, the authors observed that in the Philippines, exchange rates remain to have a positive and significant relationship with the PSEi in the long run. This suggests that the relationship is driven by factors outside the control of the market. The authors found that from March 2020 to November 2022, the average foreign market share in the Philippines' total market capitalization was 19%. This affirms that foreign investors are major drivers of the PSEi. Based on the study of Amado and Choon (2020), it can be inferred that there exists a long-term correlation

between the fluctuations in the exchange rate and the stock market of Indonesia. The research has revealed that the stock market's reliance on its previous performance is linked to a long-term connection with changes in the exchange rate. Ogundipe et al. (2019) found that exchange rate volatility and foreign portfolio investments (FPI) cause significant variations in the market capitalization of Nigeria. This is because whenever the host currency depreciates, foreign investments become more expensive. A similar study by Qamruzzaman et al. (2019) found that the exchange rate positively influences inward capital flows in Bangladesh. They shared that as the currency depreciates, it inflates the value of capital flows, which increases the market index. Thus, instability in the host currency offers opportunities for foreign investors to push stock prices beyond their real value.

The findings of this study are consistent with the foreign literature of Kwofie and Ansah (2018) in Ghana, Sayed (2020) in Sudan, Guler (2020) in Turkey, and Susanto (2020) in Indonesia, which suggests that there exists a short and long-run relationship between exchange rate and the stock market index. This relationship has been found to hold for the PSEi, as the authors have discovered a significant short and long-run relationship between the exchange rate and the PSEi. Similarly, Wahyudi et al. (2017) found that the exchange rate has a positive and significant impact on the price levels of the market index in Malaysia and Thailand. They used the TARCH model to examine the relationship between the PSEi and the exchange rate, with the results indicating that the exchange rate significantly negatively affects the price levels of the PSEi. Local literature, such as the work of Ho & Odhiambo, supports the findings of this study, showing that the exchange rate has a positive short-run relationship but an insignificant long-run relationship in the stock market development of the Philippines. However, Endres (2020) argues that there is both a positive short-run relationship between the exchange rate and PSEi and a negative long-run relationship between the two variables. Despite this difference in opinion, the consensus among both foreign and local literature is that there is a significant relationship between the exchange rate and the stock market index.

5. Summary, Conclusion and Recommendation

5.1 Summary

Summary of Short Run Results

Variable	β coefficient	p-value	Decision
Δ INT(-3)	0.057402	0.0129	There is a significant relationship with PSEi
Δ LNFDI	0.321094	0.0079	There is a significant relationship with PSEi
Δ LNFDI (-1)	0.197866	0.0439	There is a significant relationship with PSEi
LNRER	2.081162	0.0001	There is a significant relationship with PSEi

Summary of Long Run Results

Variable	β coefficient	p-value	Decision
INT	-0.079678	0.0004	There is a significant relationship with PSEi
LNFDI	0.059465	0.6577	There is no significant relationship with PSEi
LNRER	2.081162	0.0001	There is a significant relationship with PSEi

Table 13. Summary of Results

From Table 15, the Interest rate is significant in the short run, while the interest rate is significant in the long run. The FDI is significant only in the short run but not in the long run. The exchange rate is significant in both the short and long run. The interest rate has a negative relationship with PSEi, as shown in the signs, while FDI and exchange rate have a positive relationship with PSEi. However, 2 years after the increase in FDI, it causes a negative effect on the PSEi. Based on the significance of the beta coefficients, in the short run, an increase in the growth rate of interest rate at lag 3 causes a -0.057% decrease in PSEi; a percentage increase in the growth rate of FDI in year 1 causes 0.321% increase in PSEi, and at FDI (-2), causes PSEi to decrease 0.198%; a percentage increase in exchange rate causes PSEi to increase 2.081%. In the long run, based on the significance of the beta coefficients, a rise in the interest rate causes PSEi to decline -0.08%; FDI becomes insignificant; a rise in exchange rate causes PSEi to increase by 2.081%

The model is cointegrated in the long run, signifying that there is a long run relationship between the dependent and independent variables. The model is free of residual and stability errors. The error correction term in Table 7 for this model is CointEq(-1), which at lag 1 has a beta coefficient of -1.0019. The error correction term shows that minus the lag, short-run shocks caused by the independent variables present in this study will be corrected after 1 year. Thus, the authors answer the research questions:

1. The interest rate negatively impacts the PSEi, while FDI and exchange rate positively influences the PSEi.
2. The exchange rate has a positive cointegration in both the short and long run. The FDI has a positive cointegration in the short run and becomes insignificant in the long run. The lag of interest rate has a positive cointegration with PSEi in the short run but has a negative cointegration in the long run.

3. The error correction term, CointEq (-1), with B = -1.0019, $p < .05$, suggests that the presence of short-run error correction towards long-run equilibrium corrects at the speed of 100% each period, which shows that the PSEi adjust exactly 1 year after changes in interest rate, FDI, and exchange rate.

5.2 Conclusion

The impact of macroeconomic variables such as interest rate, foreign direct investment (FDI), and exchange rate on the Philippine Stock Exchange Index (PSEi) has not been extensively explored. The results of this study indicate that these variables can affect the PSEi in various ways, and the effects can be explained based on specific economic circumstances and conditions. For example, a change in interest rate has a negative effect on the PSEi due to the higher cost of borrowing, which lowers the level of economic activity. In contrast, a change in FDI has a positive effect on the PSEi by bringing in new capital that can be used to enhance the workforce and technology. Similarly, a change in the exchange rate has a positive impact on the PSEi by increasing exports and the competitiveness of domestic companies and inflating the real value of foreign investments. The findings are consistent with Arbitrage Pricing Theory, which demonstrates that macroeconomic variables represent systemic risks and have a linear relationship with asset prices. Overall, the impact of macroeconomic variables on the PSEi is a dynamic and multi-faceted issue that depends on a range of factors. Further research is necessary to fully encapsulate the relationship between macroeconomic variables and the PSEi and to develop effective policies to mitigate any negative effects and incentivize any positive effects.

5.3 Recommendation

The authors suggest that the results of this study can help policymakers formulate policies to improve the utilization of FDI and promote financial stability in order to advance the growth of the stock index. They should consider using FDI as a source of funds for fixed capital formation to improve the skills, technology, and operations of domestic firms, allowing them to remain competitive on the global stage. By increasing the attractiveness of FDI, the country can benefit from the accumulation of capital that can be reinvested to support domestic firms and the labor force.

To increase FDI inflows, the authors recommend the study of Ho and Rashid (2011). They found that economic growth and the degree of openness are significant drivers of FDI inflows. A country's level of trade openness, as measured by total trade, has a strong positive effect on attracting FDI flows. Trade openness provides new market opportunities for domestic firms, leading to increased productivity and innovation through competition. Therefore, the authors hope that policymakers consider creating policies to increase FDI net inflows and promote trade openness to foster the long-term development of stock markets and benefit businesses and individuals in the short and long run.

Since the exchange rate has the highest significant impact among the variables on the stock index in the short run, investors can use this information to make investment decisions and invest in companies that earn dollars and spend pesos. These domestic firms will earn higher corporate profits, leading to higher stock prices. In the long run, it is crucial that policymakers promote financial stability to maintain currency competitiveness. Makoni (2020) emphasized that currency depreciation and currency risks can deter capital flows due to uncertainty about returns. Therefore, preserving financial stability in the country is essential. Jacob et al. (2022) found that an increase in capital flows is an effective way to maintain financial stability. Since interest rates have a significant but small effect on the index, policymakers can use interest rates as a countercyclical tool in monetary policy to reduce currency depreciation.

The authors recommend that future researchers further study the relationship between macroeconomic variables and the stock market because there are still unknown factors that contribute to the movement of the PSEi. The authors also presented key ideas that could be explored further beyond this study, such as topics on the effective use of FDI, currency risks, and financial stability. Suppose future researchers were to use this study as their scaffold. In that case, the authors recommend that they utilize timeframes with the most accessible data to have more opportunities to experiment with macroeconomic variables.

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Appendices

Appendix A. Descriptive Statistics

	LNPSEI	INT	LNFDI	LNRER
Mean	7.708783	12.16518	21.03090	4.279517
Median	7.669948	10.14700	21.14000	4.266586
Maximum	9.054671	28.23300	23.05117	4.543770
Minimum	4.876647	5.525000	16.30042	3.959483
Std. Dev.	0.927602	5.952245	1.336007	0.147935
Skewness	-0.727791	0.881180	-1.193402	-0.158396
Kurtosis	3.784453	3.092072	5.860431	2.315071
Jarque-Bera	3.987206	4.541814	20.24007	0.830500
Probability	0.136204	0.103218	0.000040	0.660175
Sum	269.8074	425.7814	736.0816	149.7831
Sum Sq. Dev.	29.25513	1204.594	60.68709	0.744086
Observations	35	35	35	35

Appendix B. Stationary Testing

A. Interest Rate I(0)

Null Hypothesis: INT has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.187229	0.0117
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

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

B. Interest Rate I(1)

Null Hypothesis: D(INT) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 5 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.147435	0.0015
Test critical values:	1% level	-4.323979	
	5% level	-3.580622	
	10% level	-3.225334	

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

C. LNFDI I(0)

Null Hypothesis: LNFDI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.500908	0.0004
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

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

D. LNFDI I(1)

Null Hypothesis: D(LNFDI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.928861	0.0000
Test critical values:	1% level	-4.262735	
	5% level	-3.552973	
	10% level	-3.209642	

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

E. LNRER I(0)

Null Hypothesis: LNRER has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.693675	0.7321
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

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

F. LNRER I(1)

Null Hypothesis: D(LNRER) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.034043	0.0015
Test critical values:	1% level	-4.262735	
	5% level	-3.552973	
	10% level	-3.209642	

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

G. LNPSEI I(0)

Null Hypothesis: LNPSEI has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.094513	0.0146
Test critical values:	1% level	-4.252879	
	5% level	-3.548490	
	10% level	-3.207094	

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

H. LNPSEI I(1)

Null Hypothesis: D(LNPSEI) has a unit root
Exogenous: Constant, Linear Trend
Lag Length: 0 (Automatic - based on SIC, maxlag=8)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.517587	0.0000
Test critical values:	1% level	-4.262735	
	5% level	-3.552973	
	10% level	-3.209642	

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

Appendix C. ARDL Testing

Sample (adjusted): 1989 2019
Included observations: 31 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): INT LNFDI LNRER
Fixed regressors: C
Number of models evaluated: 500
Selected Model: ARDL(1, 4, 2, 0)

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
LNPSEI(-1)	-0.001903	0.266245	-0.007149	0.9944
INT	-0.040861	0.024616	-1.659972	0.1125
INT(-1)	-0.005127	0.039255	-0.130608	0.8974
INT(-2)	-0.032304	0.035512	-0.909676	0.3738
INT(-3)	0.055865	0.033008	1.692460	0.1061
INT(-4)	-0.057402	0.021021	-2.730741	0.0129
LNFDI	0.321094	0.108900	2.948508	0.0079
LNFDI(-1)	-0.063650	0.108064	-0.588998	0.5625
LNFDI(-2)	-0.197866	0.091995	-2.150831	0.0439
LNRER	2.085123	0.685793	3.040453	0.0065
C	-1.361045	2.594585	-0.524572	0.6056

R-squared	0.917547	Mean dependent var	7.917511
Adjusted R-squared	0.876320	S.D. dependent var	0.711200
S.E. of regression	0.250116	Akaike info criterion	0.337635
Sum squared resid	1.251156	Schwarz criterion	0.846469
Log likelihood	5.766659	Hannan-Quinn criter.	0.503502
F-statistic	22.25621	Durbin-Watson stat	1.718383
Prob(F-statistic)	0.000000		

Appendix D. Error Correction Model Regression

ARDL Error Correction Regression
Dependent Variable: D(LNPSEI)
Selected Model: ARDL(1, 4, 2, 0)
Case 3: Unrestricted Constant and No Trend
Date: 12/02/22 Time: 01:14
Sample: 1985 2019
Included observations: 31

ECM Regression
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-1.361045	0.307481	-4.426438	0.0003
D(INT)	-0.040861	0.022288	-1.833332	0.0817
D(INT(-1))	0.033841	0.021539	1.571183	0.1318
D(INT(-2))	0.001537	0.019885	0.077270	0.9392
D(INT(-3))	0.057402	0.019502	2.943328	0.0080
D(LNFDI)	0.321094	0.083143	3.861949	0.0010
D(LNFDI(-1))	0.197866	0.080026	2.472508	0.0225
CointEq(-1)*	-1.001903	0.215606	-4.646925	0.0002

R-squared	0.619621	Mean dependent var	0.071886
Adjusted R-squared	0.503854	S.D. dependent var	0.331121
S.E. of regression	0.233234	Akaike info criterion	0.144086
Sum squared resid	1.251156	Schwarz criterion	0.514148
Log likelihood	5.766659	Hannan-Quinn criter.	0.264717
F-statistic	5.352297	Durbin-Watson stat	1.718383
Prob(F-statistic)	0.000975		

* p-value incompatible with t-Bounds distribution.

Appendix E. Levels Equation

Levels Equation
Case 3: Unrestricted Constant and No Trend

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INT	-0.079678	0.018748	-4.249990	0.0004
LNFDI	0.059465	0.132207	0.449789	0.6577
LNRER	2.081162	0.420901	4.944539	0.0001

EC = LNPSEI - (-0.0797*INT + 0.0595*LNFDI + 2.0812*LNRER)

Appendix F. F-Bounds test

F-Bounds Test — Null Hypothesis: No levels relationship

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.694328	10%	2.72	3.77
k	3	5%	3.23	4.35
		2.5%	3.69	4.89
		1%	4.29	5.61

Appendix G. VIF

Variance Inflation Factors
Date: 12/02/22 Time: 01:18
Sample: 1985 2019
Included observations: 31

Variable	Coefficient Variance	Uncentered VIF	Centered VIF
LNPSEI(-1)	0.070887	2179.572	17.35584
INT	0.000606	47.01149	8.537474
INT(-1)	0.001541	124.6239	21.74673
INT(-2)	0.001261	104.7932	17.21849
INT(-3)	0.001090	95.22634	14.65648
INT(-4)	0.000442	44.02428	7.334462
LNFDI	0.011859	2676.517	5.258659
LNFDI(-1)	0.011678	2617.481	4.774247
LNFDI(-2)	0.008463	1876.888	3.375832
LNRER	0.470313	4296.555	5.211963
C	6.731869	3335.923	NA

Appendix H. Serial Correlation

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 6 lags

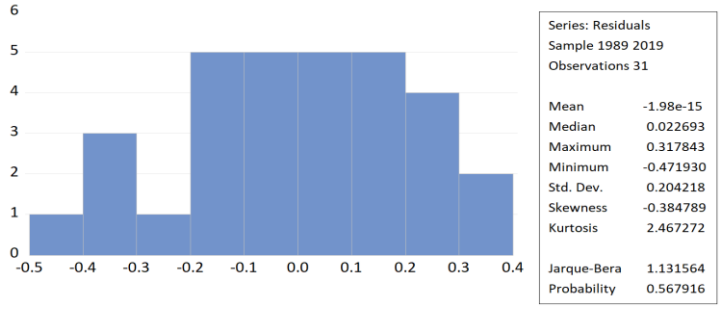
F-statistic	0.884071	Prob. F(6,14)	0.5315
Obs*R-squared	8.518109	Prob. Chi-Square(6)	0.2025

Appendix I. Breusch-Pagan-Godfrey Test for Heteroscedasticity

Heteroskedasticity Test: Breusch-Pagan-Godfrey
Null hypothesis: Homoskedasticity

F-statistic	1.123056	Prob. F(10,20)	0.3932
Obs*R-squared	11.14765	Prob. Chi-Square(10)	0.3461
Scaled explained SS	3.404085	Prob. Chi-Square(10)	0.9703

Appendix J. Jarque-Bera Normality Test

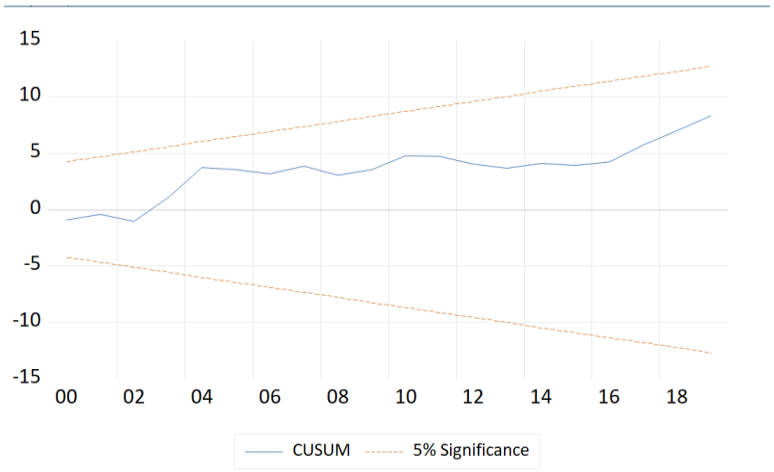


Appendix K. Ramsey Reset Test

Ramsey RESET Test
Equation: UNTITLED
Omitted Variables: Squares of fitted values
Specification: LNPSEI LNPSEI(-1) INT INT(-1) INT(-2) INT(-3) INT(-4) LNFDI LNFDI(-1) LNFDI(-2) LNRER C

	Value	df	Probability
t-statistic	0.035712	19	0.9719
F-statistic	0.001275	(1, 19)	0.9719
Likelihood ratio	0.002081	1	0.9636

Appendix L. Cusum Test



Appendix M. Computation for Foreign Market Share in Total Market Capitalization

	Total MCAP	Domestic MCAP	Difference	Foreign Market Share(in percentag
2020 March	12,049,637,746,716.10	9,778,488,012,107.09	2,271,149,734,609.01	18.85
April	12,572,697,176,671.10	10,374,501,503,256.30	2,198,195,673,414.80	17.48
May	12,525,711,680,001.00	10,411,530,781,693.00	2,114,180,898,308.00	16.88
June	13,171,215,642,404.20	10,997,165,987,573.40	2,174,049,654,830.80	16.51
July	12,954,919,454,339.80	10,561,101,079,716.60	2,393,818,374,623.20	18.48
August	13,317,388,663,309.90	10,690,604,620,963.30	2,626,784,042,346.60	19.72
September	13,088,136,106,876.20	10,670,038,359,334.30	2,418,097,747,541.90	18.48
October	14,201,952,034,535.10	11,578,365,202,885.10	2,623,586,831,650.00	18.47
November	15,182,937,669,437.60	12,568,798,959,449.50	2,614,138,709,988.10	17.22
December	16,017,008,174,655.20	13,261,005,442,094.40	2,756,002,732,560.80	17.21
2021 January	15,298,458,894,630.20	12,312,282,344,511.00	2,986,176,550,119.20	19.52
February	15,708,784,287,766.80	12,650,770,506,216.40	3,058,013,781,550.40	19.47
March	15,368,476,319,961.20	12,106,979,527,771.80	3,261,496,792,189.40	21.22
April	15,382,000,584,605.40	12,126,851,879,336.20	3,255,148,705,269.20	21.16
May	15,774,501,337,693.30	12,430,513,640,803.50	3,343,987,696,889.80	21.20
June	16,696,781,940,622.50	13,348,337,416,011.30	3,348,444,524,611.20	20.05
July	15,759,327,981,147.80	12,528,527,207,061.20	3,230,800,774,086.60	20.50
August	18,531,100,839,452.60	15,219,081,070,373.80	3,312,019,769,078.80	17.87
September	19,003,221,476,952.20	15,766,451,911,691.30	3,236,769,565,260.90	17.03
October	19,690,522,318,352.60	16,179,634,752,725.40	3,510,887,565,627.20	17.83
November	17,746,301,691,758.50	14,614,534,033,475.30	3,131,767,658,283.20	17.65
December	18,081,094,922,529.30	14,563,721,966,599.80	3,517,372,955,929.50	19.45