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RESEARCH ARTICLE

Fiscal Policy and Stock Market Movement in the Philippines

Deborah Kim S. Sy
De La Salle University, Manila Philippines
deborahkimsy@gmail.com

The Philippine government has suffered greatly from fiscal imbalances for the past few decades. The largest fiscal deficit was recorded at PhP112 billion in 2017. Fiscal reforms led to a considerable decline of the national government debt from 52.4% of GDP in 2010 to 44.8% in 2015.

The study aims to investigate the Philippine fiscal policy and its link to asset prices, as measured by the changes in the Philippine Stock Exchange Index (PSEI). Quarterly observations from 2001 to 2017 of monetary, fiscal, and economic variables were used on a vector error correction model (VECM) to observe their long-run relationship with the stock market index.

The results indicate that policy rates, government revenue, inflation rates, and GDP influence stock prices positively, but foreign interest rates and government expenditures have a negative effect on the stock exchange in the long run. All of these are in accordance with a priori expectations except for the inflation rates. This study also confirms the existence of a long-run relationship between all of the variables and the PSEI. The empirical evidence nonetheless suggests that 28% of the deviations of the PSEI from its long-run equilibrium due to short-run shocks are corrected after a quarter. Hence, it will take about three to four quarters for the PSEI to go back to its equilibrium level.

Keywords: fiscal policy, monetary policy, Philippine stock market, the Philippines, vector error correction model

JEL Classification: C32, E44, E62, H32, H63, O11, O23

The Philippines still lags behind other countries in Asia in terms of revenue generation and public spending on education, health, and infrastructure. World Bank (2019) showed that in 2000, 15.21% of the total Philippine government expenditure was appropriated for education, but in Malaysia and Thailand, it was 21.39% and 28.36%, respectively. The Philippines allotted around 8.42% of its government expenditures on healthcare, whereas Thailand allocated 12.08%. Infrastructure spending as a percentage of gross domestic product (GDP) was at a low 1.5% compared to those of Thailand at 3.6% and Malaysia at 5.4%. Revenue of the Philippine government, on the other hand, was 14.2% of GDP, but for the Malaysian and Thai government, it was 17.5 and 15.5%.

The country had undergone several fiscal reforms since the 1980s. To reduce the burden on its budget, the government-initiated privatization programs whereby it transferred ownership of government entities to the private sector. Tax rates were also amended. Value-added tax (VAT) rate increased from 10% to 12% in 2005. Corporate income tax was subsequently reduced from 35% to 30% in 2009. According to Diokno (2010), one of the most important aspects of tax design was the administrative capacity of the government to collect taxes properly. If the government is able and information is complete, a progressive form of direct tax would be the best scheme. Otherwise, it may be better to depend more on indirect taxes.

The Philippines is increasingly dependent on financing from abroad to augment low domestic capital accumulation and obtain foreign exchange to pay for current expenditures. To this end, the country borrows more to pay for older debts in a vicious cycle of debt. Although the country's debt-to-GDP ratio improved from 2010 to 2012 due to robust economic growth, the debt-to-revenue ratio went up as high as 539% in 2004. As of March 2018, the ratio is 268.6% compared to the previous year's 273.9%.

In November 2017, a tax reform bill was passed by Congress that seeks to correct some deficiencies in the tax system to make the system simpler, fairer, and more efficient. The Tax Reform for Acceleration and Inclusion (TRAIN) law was signed by President Rodrigo Duterte in December 2017 and has already taken effect since January 2018.

As for monetary policy, its impact usually takes effect after an estimated lag of 12 to 15 months, which is in line with the typical policy horizon of one to two years (Geraats, 2006). The Banko Sentral ng Pilipinas (BSP) also announces the inflation target two years in advance and commits to achieve it over the two-year horizon. Promoting price stability is the BSP's main priority, and these targets serve as a guide for the public's expectation of future inflation for them to plan with greater certainty (BSP, n.d).

Figure 1 shows the movement of the Philippine government expenditures, inflation rate, and reverse repurchase rates through the years. Replacing the Aquino regime, the Duterte administration is currently embarking on an expansionary fiscal policy to finance the "Build, Build, Build!" program where approximately PhP9 trillion would be spent on public infrastructure and mass transportation systems from 2017 to 2022.

Inflationary pressures mid-2008 were apparent in Figure 1 as the global recession was affecting the country through the trade channels. World prices of grains and petroleum rose, which contributed to the slowdown of the GDP growth to 3.7%. As seen in the time series, it was not until the end of the crisis that policy rates had stabilized. In 2017, policy rates were kept at 3% but were increased by 50 basis points to 3.5% as of June 2018. This is due to the expectation that inflation rates are to increase by 1.5% at most as the TRAIN law takes effect. However, inflation rates rose dramatically to 6.4% in August 2018.

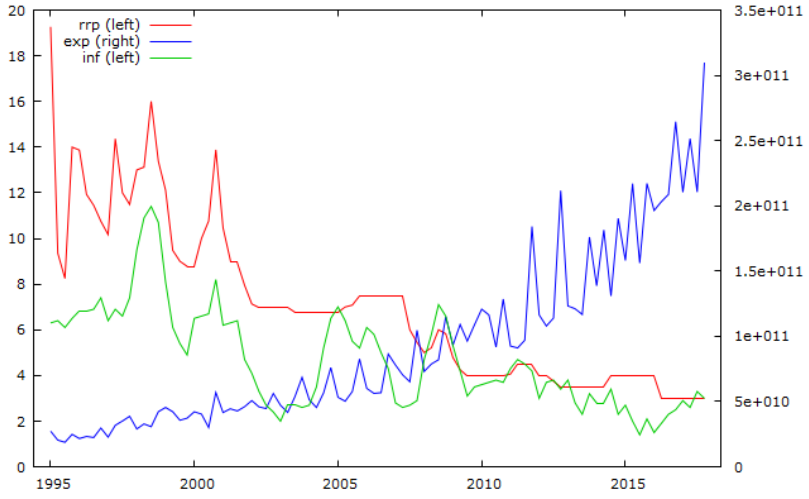

Figure 1. Time series plot of Philippine government expenditures, inflation rates, and reverse repurchase rates from 1995 to 2017. Author's calculation.

In this paper, I examine how fiscal shocks influence the Philippine stock market, notwithstanding the eminent fiscal lag effects that occur in government policy-making. In addition, I also integrate several macroeconomic aggregates with fiscal policy and examine their long-term effects on the Philippine stock market by using a vector error correction model (VECM) framework in which the interaction of the variables can be analyzed.

The rest of this paper is as follows: Section 2 re-examines the findings of other studies related to fiscal policy and their link to economic activity. Section 3 presents the data used, and Section 4 expounds on the econometric methodology and empirical analysis. Lastly, Section 5 provides some insights as well as the conclusion of the paper.

Review of Related Literature

In the Philippines, the interaction of monetary and fiscal policy has largely depended on the structural adjustments and reformation of government and financial institutions (Halcon & De Leon, 2004), which make the management of these policy instruments difficult. Although monetary and fiscal policies are implemented by two different entities, they are far from being independent. Results of Guinigundo (2012) implied that the Philippine government and the BSP had coordinated their policy actions so that policy sterilization is avoided.

The effect of fiscal policy has received less attention despite the theoretical basis of how it can be used to resuscitate an economy from a slump in contrast to a large number of empirical studies on the effects of monetary policy on economic activity. This was because macroeconomic variables reacted more to monetary policy and that monetary policy changes took effect faster (Guinigundo, 2012). Therefore, fiscal policy has been overlooked in representing policy actions that affect stock returns. In theory, the impact of fiscal policy depends on whether one takes a Keynesian, classical or Ricardian view.

The Keynesian school of thought insisted that increasing government spending enhances aggregate demand in times of economic distress and, in turn, potentially driving stock prices higher. Classical theory considered potential crowding-out effects due to the increasing government demand for loanable funds and the decreasing supply of the funds available for the productive sectors such as the stock market (Chatziantoniou, Duffy, & Filis, 2013). Barro (1979) disproved both with his Ricardian equivalence proposition, stating that fiscal policy was deemed ineffective and that it would not affect stock markets.

Auerbach (2005) claimed that fiscal adjustment promoted short-term output growth, especially after financial crises. He further claimed that it could be active and responsive to economic conditions, and that policy lags did not seem to impede the use of discretionary policy for stabilization (Auerbach, 2005). In fact, fiscal policy could have a large rapid impact on economic activity through its direct effects on government spending and output. Auerbach (2005) further added that fiscal policy was sometimes counterproductive at economic stabilization depending on the country's circumstances and the identification of the restrictions. Discretionary fiscal policy, then, was taken much more into consideration to stabilize economies because the typical monetary stance was expansionary during and after crises, which often resulted in liquidity traps. Taylor (2000) also added that once monetary policy follows a well-designed interest rate rule, fiscal policy should be limited to minimizing distortions and to letting automatic stabilizers work.

Econometric Model

Early forms of the error correction model (ECM) have occurred since 1964 (Harris, 1995). The model makes use of the concept of cointegration that was developed by Engle and Granger (1987).

Using the VECM, Bekhet and Othman (2012) found long-run relationships among the Malaysian stock index, fiscal and monetary tools, and that monetary tools worked faster than fiscal tools. Thanh, Thuy, Anh, Thi and Truong (2017) confirmed that both monetary policy and fiscal policy in Vietnam not only affected the stock market on their own but also impacted the stock market through their interaction.

In the Philippine setting, Guinigundo (2012) showed that Philippine public spending had been cyclical, and it needed to adopt a more countercyclical stance to support the economy against countercyclical spending shocks. Halcon and De Leon (2004) reported that the Philippine fiscal policy possessed long-run effects on real growth rather than monetary policy. Given that the basic foundations on monetary and fiscal frameworks are still being adjusted, it is likely that real growth is profoundly influenced by fiscal actions

(i.e., budget management, tax collection, and revenue generation) rather than monetary actions (i.e., interest regulation and price stability).

To my knowledge, there has never been a study that assessed the long-run relationships of fiscal and monetary policies with the Philippine Stock Exchange Index using the VECM approach. Hence, this is the first paper to 1) obtain quantitative indicators that can be used to confirm the long-run relationships of the variables; and 2) identify how the policy tools, together with macroeconomic variables such as GDP and inflation rates, affect the Philippine stock market index. The time period covers major events, including the global economic downturn of 2001 and the recent global financial crisis in 2008.

Data

In this study, I use quarterly data from 2001 to 2017 to accurately capture the timing of fiscal adjustments and consider seven variables to represent different segments of the economy. These were obtained from the BSP, Philippine Statistics Authority (PSA), Bureau of Treasury (BoT), and Philippine Stock Exchange (PSE).

Foreign interest rates will be proxied by the interest rates of the United States, it being the largest economy at the time. This is also because the fortune of a small economy like the Philippines will most likely be driven by large economies due to globalization (Di Giovanni & Shambaugh, 2008).

In the literature, government expenditures, rather than government revenues, were mostly used as the fiscal variable. Changes in government spending, rather than changes in the tax rate, were generally associated with government debt because the debt was normally managed through prudent spending so as to preserve a stable and reasonable tax rate over time (Choi & Devereux, 2006). In the study by Alesina and Ardagna (2010), they discovered that tax cuts were more expansionary than spending increases in fiscal stimuli, but spending cuts were more contractionary than tax increases in fiscal stabilization. Considering that both revenues and spending may affect the economy, I use **government revenue** from taxes (dlrev, in million PhP) and productive **government expenditures** (dlexp, in million PhP), which is calculated by deducting interest payments from government expenditures. Because deficit is calculated as government revenue less expenditures, it will not be used in the study to avoid multicollinearity. The variables have been adjusted for seasonality.

Under open market operations by the BSP, the **reverse repurchase rate** (rrp) is the rate at which government securities are issued to influence the supply of money. It is also the primary instrument employed by the BSP to stabilize inflation, which is the BSP's main objective. The decision to raise or reduce the policy rates depends on the BSP's assessment of the outlook for inflation and GDP growth in the next succeeding years.

The **core inflation rate** (inf) is a measure of inflation that eliminates transitory effects on the basket of goods included in the consumer price index (CPI) that are subject to volatile price fluctuations. I use it to provide a more accurate gauge of the fundamental movements in commodity prices.

For real economic activity, I make use of seasonally-adjusted **real GDP** (dlgdp, in million PhP) as a measure of the aggregate output and income of the country. I also use quarterly closing prices from January 1, 2001, and December 31, 2017, of the Philippine Stock Exchange Index, taken on the first Wednesdays of the month or the previous business day if Wednesday is a holiday to avoid the weekend effect and the turn-of-the-month effect phenomena.

Proposed Econometric Methodology

First, I specify the underlying VAR model. After testing for stationarity and selecting the optimal lag length using the information criteria, I check for cointegration using the Johansen's test, autocorrelation using the Lagrange multiplier test, the residual normality, and stability of the model. Lastly, I produce the impulse response functions (IRFs).

The VAR approach has a desirable characteristic that it does not involve identification restrictions of any kind. It is also often characterized as a model that lacks economic content because there are no economic restrictions (Enders, 2014). A modified VAR, the structural vector autoregression (SVAR), can be used to assess the effect of unanticipated shocks to government spending and taxes (Bouakez, Chichi, & Normandin, 2014). Moreover, imposing restrictions in line with econometric theory or specific attributes of a particular country in an SVAR model (as opposed to a VAR model) helps identify the random, unanticipated,

exogenous structural component of the macroeconomic variables (or the structural shocks in reduced form residuals; Fontana, 2009).

Most of the variables are not stationary in their level forms. Thus, I obtain the first difference of the variables using the Augmented Dickey-Fuller test and find integration to the first order. However, Sims, Stock, and Watson (1990) recommended against differencing the variables as it may result in a loss of long-run information regarding the co-movements of data. Hence, I use Johansen's approach to cointegration. In cases of doing first differencing in non-stationary data series in their level forms, cointegration tests must be applied to see if there exists a long-run relationship between the variables (Engle & Granger, 1987).

Johansen's trace and eigenvalue test for cointegration displays the statistics at rank three, which do not exceed its corresponding critical values. With this, I establish that three cointegrating equations are surrounding the variables in their level forms. Despite the fact that the level variables are I(1), meaningful insights can still be obtained from them if they are cointegrated.

As cointegration is present in the model, I use VECM instead of the SVAR model. Cointegrating relations among the variables suggest not only long-term relationships but also short-term deviations from the equilibrium that are corrected in the end.

Figures 2, 3, and 4 show the time series plot of suspect variables that exhibit a long-run relationship throughout the years.

When two time-series are I(1) but cointegrated, they are non-stationary. In other words, they move in a similar way. Hence, there is a relationship between them that connects them over time.

Let y_t and θz_t be two time-series variables that are not stationary but cointegrated where θ is a coefficient that determines the relationship between y_t and z_t. If they are plotted in the same graph, it is expected that the path undertaken by y_t and z_t will be close to each other, that is, up to an error term, u_t.

Therefore, the long-term relationship is represented by

$$y_{t-1} = \theta z_{t-1} + u_t \tag{1}$$

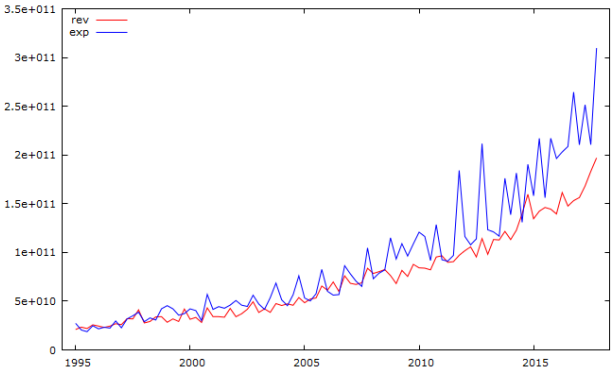

Figure 2. Time series plot of government expenditures and revenues.

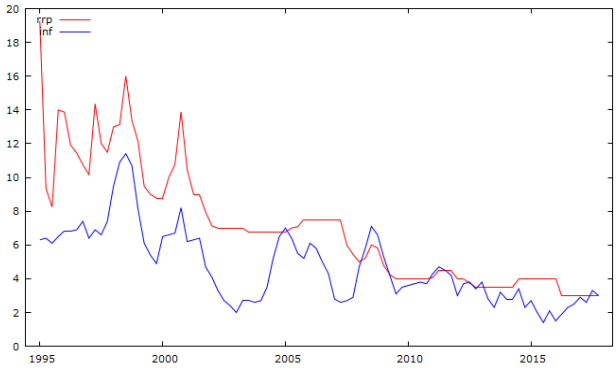

Figure 3. Time series plot of reverse repurchase rates and inflation rates.

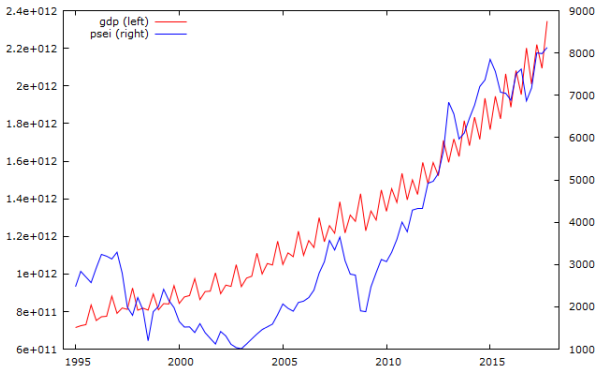

Figure 4. Time series plot of gross domestic product and Philippine Stock Exchange Index.

In equation (1), u_t has to be stationary to signify that the relationship does not change over time. If the variable deviates from this relationship in one period, such will be corrected in the succeeding periods. The number of periods depends on the speed of adjustment or λ. For instance, any unit increase in y_t higher than what was expected in the long-run relationship leads to $u_t = 1$, so it is anticipated that $y_{t-1} - y_t < 0$ in the next period and the value of y_t will be corrected downwards because it was too high in the previous period.

Taking the speed of adjustment λ into account, the equation becomes

$$\lambda(y_{t-1}) = \lambda(\theta z_{t-1} + u_t) \tag{2}$$

where λ is the coefficient that denotes information about how quickly the deviation is corrected.

The VECM, on the other hand, has the form

$$\Delta y_t = \sum_{j=1}^{k-1} \Gamma_j \Delta y_{t-j} + \Upsilon y_{t-1} + \varepsilon_t \tag{3}$$

In accordance with Johansen and Juselius (1990), the matrices Γ_j contain information about the short-run adjustment process. The term Υy_{t-1}, on the other hand, presents the error correction relationship among the series, thereby containing the information about the long-run equilibrium of the variables (Lutkepohl, 2005). The rank of the matrix Υ also reveals the number of cointegrating vectors in the model. That is, how many linearly independent equations the variables can form or how many long-run equilibrium relationships there are in the model.

As all k variables, k signifying the number of variables in the model, are I(1) but cointegrating relations exist among them, the cointegrating relation depicted by Υ with dimension k x r now has the form of

$$\Pi = \alpha\beta' \tag{4}$$

where:

α is a k x r matrix which denotes the average speed of convergence towards long-run equilibrium or the speed of adjustment to equilibrium after a short-run deviation from the long-run relationship; and

β is a k x r matrix which denotes the parameters of the cointegrating vectors.

Finally, I use the maximum likelihood estimation to compute the values of α and β.

Pre-Estimation Tests

The optimal lags, according to the selection order criteria, are two and five. Johansen (1992) proposed that the optimal lag length be selected at a stage where VAR residuals are not serially correlated with one another. However, low lag lengths may bring forth serial correlation, whereas high lag lengths may cause infinite sample bias. Hence, I decide on five lags, as indicated by the Likelihood Ratio (LR) Test and Akaike's information criterion (AIC). There is no serial autocorrelation present at lag order 5, according to the Lagrange Multiplier (LM) Test.

The stability condition is met because the modulus of the unit roots is less than one. All unit roots lie within the circle, and the specification imposes six-unit moduli. The Jarque-Bera and the Kurtosis tests indicate the normality of the residuals of all variables except for the policy rates. Non-normality of residuals of one variable is not a hindrance to the study as it would eventually be resolved by increasing the sample size.

Results

The cointegration equation generated by the VECM is as follows:

$$u_t = psei + 669.774\,fint - 825.814\,rrp - 4.65e^{-08}\,rev + 7.80e^{-08}\,exp - 0.001\,inf - 1.48e^{-08}\,gdp + 14542.46 \tag{5}$$

Normalizing the variable PSEI by Johansen's method and transposing the error term to the right-hand side, I have

$$psei = -669.774\,fint + 825.814\,rrp + 4.65e^{-08}\,rev - 7.80e^{-08}\,exp + 0.001\,inf + 1.48e^{-08}\,gdp - 14542.46 - u_t \tag{6}$$

To assess whether coefficients are statistically significant, I looked at their corresponding *p*-values generated by the VECM. I found that all of the coefficients were highly significant and different from zero at the 5% significance level. Equation (6) implies the positive relationship PSEI has with rrp, rev, inf, and GDP. On the other hand, fint and exp affect PSEI negatively in the long term.

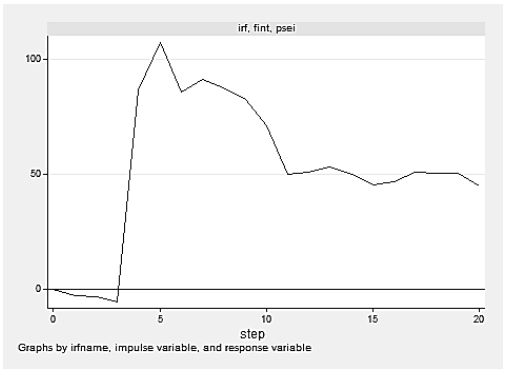

Figure 5. Response of PSEI to a shock in fint.

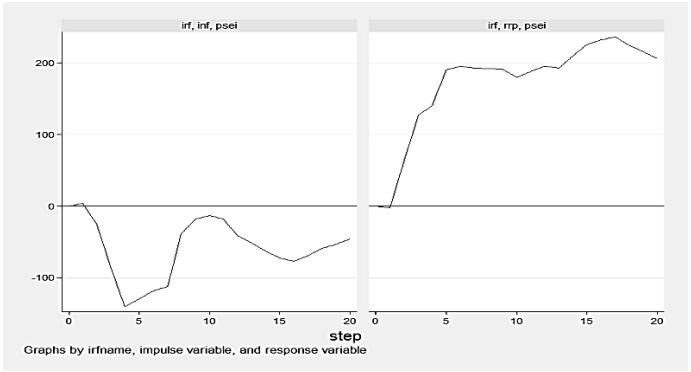

Figure 6. Response of PSEI to shock in inf and rrp.

Next, I generate the impulse response functions. These graphically represent the cointegration equations, display the path of how a variable reacts to another variable, and, ultimately, uncover their relationship over time.

Shocks or innovations, as mentioned several times henceforth, are defined as the part of a variable that cannot be explained by its lagged values or by other variables in the system.

When the Federal Reserve tapering started to induce fears in emerging markets a few years back, investors reacted quickly to it by relocating their capital from the U.S. to other emerging markets such as the Philippines. This explains why shocks in the U.S. interest rates affect the Philippine stock market index positively after the third quarter in Figure 5. In the long run, however, the relationship between fint and PSEI becomes negative, as shown in equation (6) due

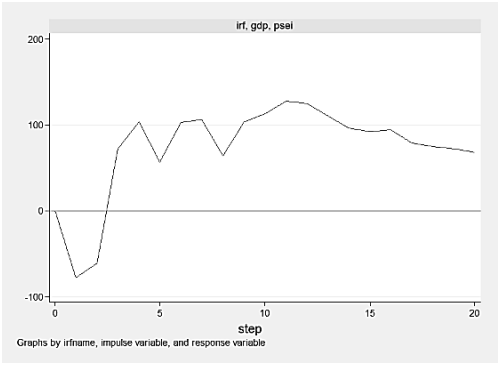

Figure 7. Response of PSEI to a shock in GDP.

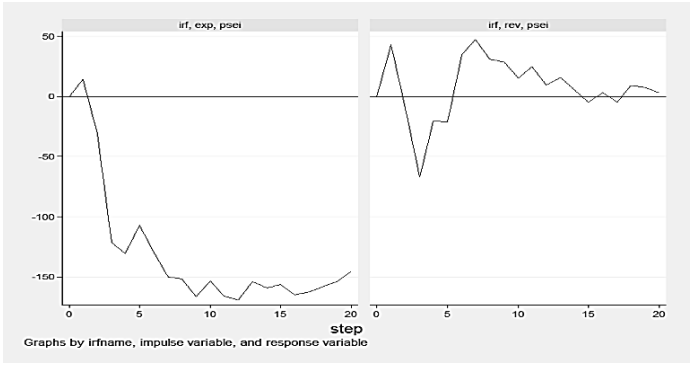

Figure 8. Response of PSEI to a shock in exp and rev.

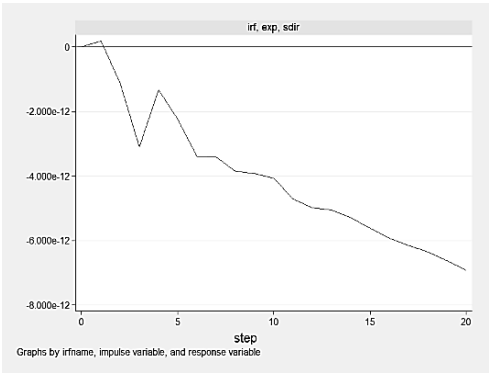

Figure 9. Response of short-term domestic interest rates to a shock in exp.

to the U.S. becoming more attractive as an investment haven.

Figure 6 shows the expected positive long-run relationship between rrp and PSEI, whereas inf surprisingly affects PSEI positively in the long run, as presented in equation (6). Stock markets usually react negatively to inflationary pressures (Fama, 1981), as seen after a quarter and a half in Figure 6. In the long run, however, the stock market is unexpectedly shown to be positively affected by shocks to inflation. Other than price instability and the drop in the value of money, unexpected inflation can also result in various economic distortions such as uncertainties in the returns of investments, higher costs of borrowing money, and higher wages.

Because of these concerns, individuals decide to deter current consumption to save or invest for future consumption. With their savings, banks are able to channel the funds for companies that need it. At the same time, investing is another option as the PSEI historically has performed favorably in the past decade by generating an average growth of 1%, compared to a hypothetical 5% increase in inflation, providing investors a long-run hedge against inflation. Both of these actions, in effect, enhance the operations of the stock market and explain the long-run positive relationship between rising inflation and the stock market.

As for monetary policy, although it may be counter-intuitive that a tight policy stance increases the stock index, it can possibly be the case in the Philippines because the BSP seldom alters the policy rates (unless there are substantial reasons to do so), and the country remains as a small open economy with little capital control. Slight movements in the policy rates, such as an increase in the rates, are able to depress stock prices at first due to negative investor sentiment on the effect of contractionary monetary policy on economic activity (Sy & Hofileña, 2014). Nevertheless, the essence of monetary tightening is to reduce the threat of impending inflationary pressures, which would be favorable to the investors in the long term. This explains how rrp positively affects PSEI over time.

As seen in Figure 7, an output shock initially causes a sharp rise in the index. However, the impact of the shock is eventually corrected, as seen in the movements of the IRF. Even though GDP has its limitations as a macroeconomic indicator, it is a satisfactory measure of production and economic activity. The results conform to the expectation that an increase in the production of goods and services will be reflected in the performance of the index as investors will be confident and optimistic about the return on their investments.

Government expenditures, in general, can be used as a direct instrument to promote aggregate demand and resuscitate an economy. This explains the upward surge of the index after a quarter in response to a shock in spending, as shown in Figure 8. At first, both local and foreign investors will be optimistic about an increase in productive government spending as these actions are deemed to boost economic activity. Yet, huge government spending, in theory, also raises interest rates as the government demands funds that would have been available for the private sector (crowding-out effect). Investors facing higher interest rates are now hesitant to continue investing, especially in the stock market. In effect, investment spending is reduced, which will eventually dampen economic activity and distress the stock market, as seen in the downward surge of the index after the second quarter.

In Figure 9, higher interest rates, as a result of higher government spending, dampen economic activity and strains the stock market. The stock market slightly recuperates due to the commitment of the Philippine government to fiscal consolidation in the long run as it vows to reduce the national debt by 2020. So far, the national debt as a proportion of GDP sustained its level at 42.1% against the target of 40.7%. However, the debt increased by 9.25% or PhP562.17 billion, partly due to currency depreciation. As of December 2017, the debt was valued at PhP 6,652.43 billion (BoT, 2019).

High government revenues by means of high tax rates dampen consumption and investment spending as these are deemed a burden on consumers and investors, thereby constituting an unfavorable investment climate. The corporate tax rate in the Philippines is at 30%, whereas the personal income tax rate is 32%. Intuitively, a tax cut in developing economies such as the Philippines where the tax rates are relatively high compared to other Southeast Asian countries would dramatically stimulate demand. Hence, shocks to rev negatively impact PSEI in the long run.

Lastly, the statistically significant error correction term of -0.2793 suggests that PSEI adjusts to all of the variables in the succeeding periods and 27.93% of the discrepancy between long-term and short-term PSEI is corrected for within a quarter. This suggests that it

takes three to four quarters for the PSEI to go back to its initial equilibrium level. The negative sign of the error correction term implies that if PSEI is above its equilibrium value, the error term will definitely decrease in the next periods and revert back to zero to restore the equilibrium.

Conclusion

The study aims to explore the link between fiscal policy and stock prices in the Philippines. The goal is to determine whether a variable affects the stock market positively or negatively using a VECM after establishing the existence of a long-run relationship between the variables and the stock market.

Initially, by using the VAR, I confirm the significant relationship between reverse repurchase rates and inflation rates, expenditures and government revenues, and GDP and the stock market index. In the short run, a positive shock to the reverse repurchase rates affects inflation rates negatively after three quarters, although a government expenditure shock impacts government revenues positively after three quarters as well. Lastly, in the medium run, a positive shock to GDP has a positive effect on the stock market index and is seen after nine quarters.

The results of the VECM, on the other hand, indicate that although policy rates, government revenue, inflation, and GDP influence the stock market index positively, foreign interest rates and government expenditures have a negative effect on the index in the long run. The results are in accordance with a priori expectations except for the inflation rates.

Because of economic uncertainties brought about by unexpected inflation, individuals either save for the future or put their money in investments where inflation shocks are compensated for in the rate of return. In effect, these savings and investments boost the stock market, confirming a positive relationship between inflation and stock returns in the long run.

Slight movements in the policy rates, such as an increase in the rates, are able to depress stock prices at first due to negative investor sentiment on the effect of tight monetary policy on economic activity. However, the main reason for doing such an increase is to restrain emerging inflationary pressures, which would ultimately enhance the performance of the stock market index. This justifies the positive relationship policy rates and stock returns have.

Even though having higher interest rates as a result of higher government spending dampens economic activity and strains the stock market activity at first, the stock market is expected to recuperate due to the commitment of the Philippine government to fiscal consolidation in the long run.

Finally, it takes approximately three to four quarters for the stock index to return to its initial equilibrium value because only 28% of the deviations between the long-run and short-run PSEI are corrected in a quarter.

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Appendix

Table 1. *Augmented Dickey-Fuller Test for Unit Root*

	Test Statistic	1% Critical Value	5% Critical Value	10% Critical Value	Number of Obs
fint z(t)	-2.403	-3.563	-2.920	-2.595	62
rrp z(t)	-0.799	-3.563	-2.920	-2.595	62
exp z(t)	0.951	-4.124	-3.488	-3.173	62
rev z(t)	0.246	-4.124	-3.488	-3.173	62
gdp z(t)	1.580	-4.124	-3.488	-3.173	62
psei z(t)	-2.165	-4.124	-3.488	-3.173	62
d_fint z(t)	-2.298	-2.397	-1.674	-1.297	61
d_rrp z(t)	-3.076	-3.565	-2.921	-2.596	61
d_exp z(t)	-4.241	-4.126	-3.489	-3.173	61
d_rev z(t)	-3.977	-4.126	-3.489	-3.173	61
d_gdp z(t)	-3.702	-4.126	-3.489	-3.173	61
d_psei z(t)	-3.356	-2.397	-1.674	-1.297	61

Summary Results for the Dickey-Fuller Test		
variable	In raw form	in first differences
fint	non-stationary	stationary
rrp	non-stationary	stationary
exp	non-stationary	stationary
rev	non-stationary	stationary
gdp	non-stationary	stationary
psei	non-stationary	stationary

**fint – foreign interest rate; rrp – reverse repurchase rate; exp – government expenditures; rev - government revenue; gdp – gross domestic product; psei – Philippine Stock Exchange Index*

Table 2. *Johansen's Trace Statistics Test for Cointegration*

Trend: Constant — Number of Obs = 63
Sample: 2002q2 – 2017q4 — Lags = 5

maximum rank	parms	LL	eigenvalue	trace statistic	5% critical value
0	203	-4979.0954	.	182.4878	124.24
1	216	-4944.9293	0.66198	114.1557	94.15
2	227	-4926.3992	0.44471	77.0954	68.52
3	236	-4911.0835	0.38505	46.4640*	47.21
4	243	-4897.5910	0.34841	19.4789	29.68
5	248	-4889.7516	0.22032	3.8002	15.41
6	251	-4887.8516	0.05853	0.0002	3.76
7	252	-4887.8515	0.0000		

Table 3. *Selection Order Criteria*

Sample: 2002q2 – 2017q4 Number of Obs = 63

lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	-5567.31				1.7e+68	176.962	177.056	177.2
1	-5106.85	920.92	49	0.000	3.6e+62	163.9	164.649	165.805*
2	-5035.05	143.61	49	0.000	1.9e+62*	163.176	164.581*	166.748
3	-4989.42	91.265	49	0.000	2.4e+62	163.283	165.344	168.522
4	-4925.55	127.73	49	0.000	2.0e+62	162.811	165.527	169.717
5	-4858.28	134.55	49	0.000	2.0e+62	162.231*	165.603	170.804

Endogenous: psei fint rrp rev exp inf gdp
Exogenous: cons_

**fint – foreign interest rate; rrp – reverse repurchase rate; inf - inflation rate; exp – government expenditures; rev - government revenue; gdp – gross domestic product; psei – Philippine Stock Exchange Index*

Table 4. *Johansen's Lagrange-Multiplier Test for Autocorrelation*

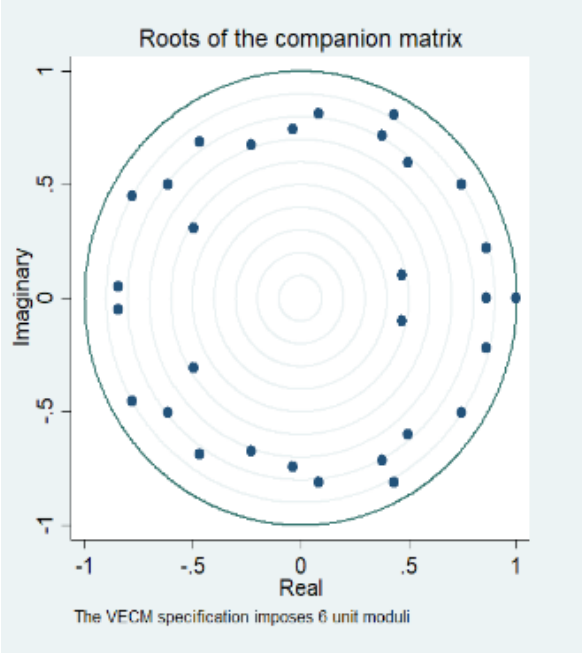
lag	chi2	df	prob>chi
1	72.8148	49	0.01523
2	70.6503	49	0.02308
3	53.0721	49	0.32010
4	49.8011	49	0.44125
5	39.4532	49	0.83315

H0: no autocorrelation at lag order

Table 5. *Test for Stability Condition of the VECM*

Eigenvalue stability condition

Eigen value	Modulus
1	1
1	1
1	1
1	1
1	1
1	1
.4310752 + .8088353i	.916537
.4310752 - .8088353i	.916537
-.7794885 + .4520025i	.90106
-.7794885 - .4520025i	.90106
.7432966 + .5021982i	.897047
.7432966 - .5021982i	.897047
.8603772 + .2193349i	.887895
.8603772 - .2193349i	.887895
.8592871	.859287
-.8434938 + .04986516i	.844966
-.8434938 - .04986516i	.844966
-.4650081 + .6871454i	.8297
-.4650081 - .6871454i	.8297
.08272801 + .8114698i	.815676
.08272801 - .8114698i	.815676
.378051 + .7149247i	.808727
.378051 - .7149247i	.808727
-.6119376 + .5021002i	.791563
-.6119376 - .5021002i	.791563
.4991751 + .5985716i	.7794
.4991751 - .5985716i	.7794
-.03254393 + .742266i	.742979
-.03254393 - .742266i	.742979
-.2252108 + .6738734i	.710511
-.2252108 - .6738734i	.710511
-.4934419 + .3060892i	.580668
-.4934419 - .3060892i	.580668
.4721475 + .1006547i	.482757
.4721475 - .1006547i	.482757



The VECM specification imposes 6 unit moduli.

Table 6. *Test for Normality of Residuals*

Jarque-Bera test

Equation	skewness	chi2	df	prob>chi2
d_psei	.01168	0.001	1	0.96982
d_fint	-.06112	0.039	1	0.84301
d_rrp	-1.0984	12.669	1	0.00037
d_rev	.28407	0.847	1	0.35731
d_exp	.24641	0.638	1	0.42460
d_inf	-.2251	0.532	1	0.46574
d_gdp	.35529	1.325	1	0.24961
ALL		16.052	7	0.02464

Skewness test

Equation	chi2	df	prob>chi2
d_psei	1.347	2	0.50990
d_fint	0.342	2	0.84293
d_rrp	102.275	2	0.00000
d_rev	2.148	2	0.34156
d_exp	0.643	2	0.72510
d_inf	0.534	2	0.76572
d_gdp	3.126	2	0.20953
ALL	110.415	14	0.00000

Kurtosis Test

Equation	**Kurtosis**	**chi2**	**df**	**prob>chi2**
d_psei	2.284	1.346	1	0.24604
d_fint	2.6605	0.303	1	0.58231
d_rrp	8.8426	89.606	1	0.00000
d_rev	2.296	1.301	1	0.25401
d_exp	2.9549	0.005	1	0.94173
d_inf	3.0264	0.002	1	0.96585
d_gdp	2.1719	1.800	1	0.17968
ALL		94.363	7	0.00000

**fint – foreign interest rate; rrp – reverse repurchase rate; inf – inflation rate; exp – government expenditures; rev - government revenue; gdp – gross domestic product; psei – Philippine Stock Exchange Index*

Table 7. *VECM Cointegrating Equations*

Cointegrating equations

Equation	parms	chi2	P>chi2
_ce1	5	146.2415	0.0000

Identification: beta is exactly identified

Johansen normalization restriction imposed

beta	coefficient	std. err.	z	P>|z|	[95% Conf. Interval]	
_ce1						
psei	1	.	.	.	.	.
fint	669.7739	85.28994	7.85	0.000	502.6087	836.9391
rrp	-825.8144	159.2209	-5.19	0.000	-1137.882	-513.7473
rev	-4.65e-08	2.36e-08	-1.97	0.049	-9.28e-08	-1.95e-10
exp	7.80e-08	9.08e-09	8.59	0.000	6.02e-08	9.58e-08
inf	-.0005908	79.61797	-0.00	1.000	-156.0489	156.0478
gdp	-1.48e-08	2.44e-09	-6.04	0.000	-1.95e-08	-9.97e-09
_cons	14542.46	.	.	.	.	.

**fint – foreign interest rate; rrp – reverse repurchase rate; inf – inflation rate; exp – government expenditures; rev - government revenue; gdp – gross domestic product; psei – Philippine Stock Exchange Index*

Table 8. *Vector Autoregression Results*

Sample: 2002q2 – 2017q4 Number of obs = 63
Log Likelihood = -4949.716 AIC = 163.2291
FPE = 5.83e+63 HQIC = 165.7979
Det(Sigma_ml) = 7.04e+60 SBIC = 169.7605

Equation	parms	RMSE	R-sq	chi2	P>Chi2
psei	32	274.182	0.9931	511.9943	0.0000
rrp	32	.269333	0.9858	737.8225	0.0000
rev	32	4.7e+09	0.9932	9230.458	0.0000
exp	32	1.2e+10	0.9794	2991.409	0.0000
inf	32	.542167	0.9253	503.951	0.0000
gdp	32	1.3e+10	0.9993	92456.41	0.0000

**rrp – reverse repurchase rate; inf – inflation rate; exp – government expenditures; rev - government revenue; gdp – gross domestic product; psei – Philippine Stock Exchange Index*

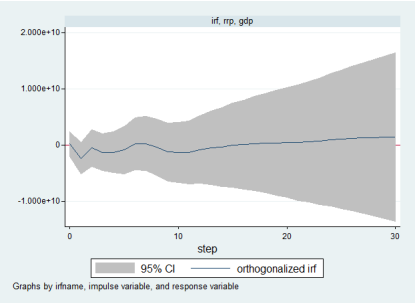


Figure 1. Response of GDP to a shock in rrp.

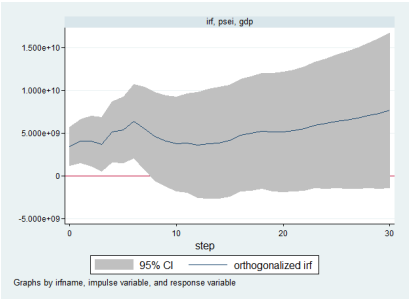


Figure 2. Response of GDP to a shock in PSEI.

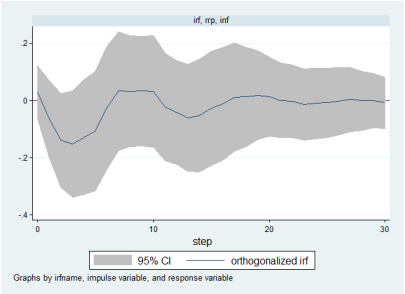


Figure 3. Response of inf to a shock in rrp.

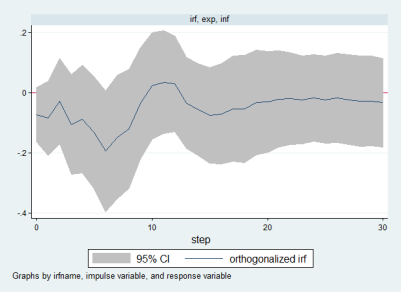


Figure 4. Response of inf to a shock in exp.

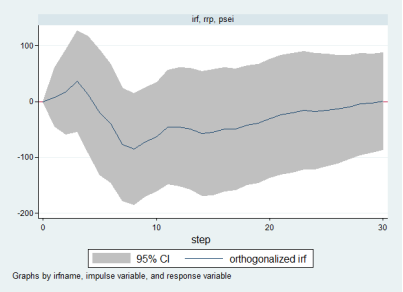


Figure 5. Response of PSEI to a shock in rrp.

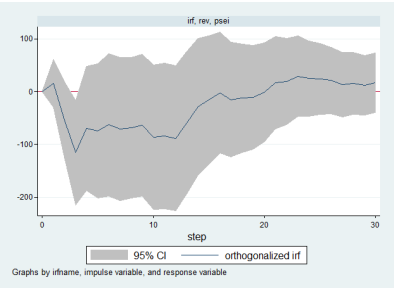


Figure 6. Response of PSEI to a shock in rev.

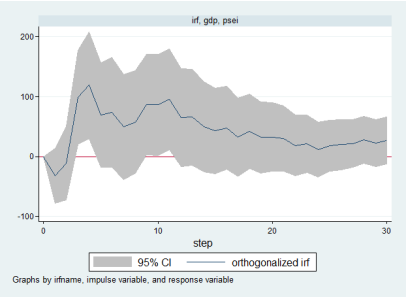


Figure 7. Response of PSEI to a shock in GDP.

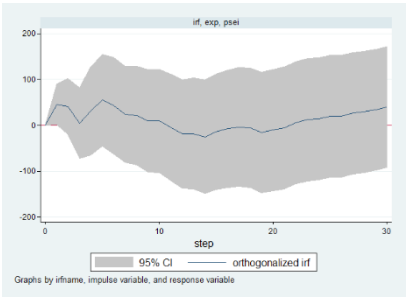


Figure 8. Response of PSEI to a shock in exp.

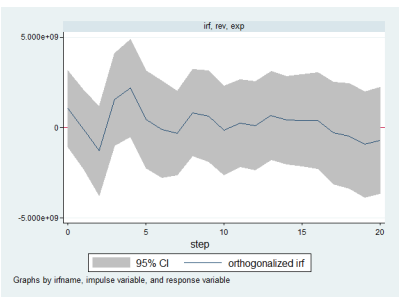


Figure 9. Response of exp to a shock in rev.

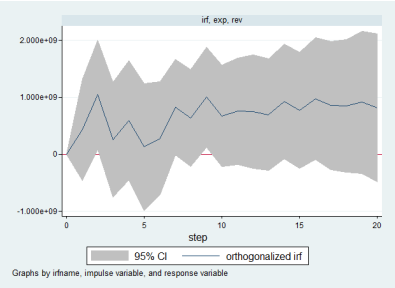


Figure 10. Response of rev to a shock in exp.

**rrp – reverse repurchase rate; inf – inflation rate; exp – government expenditures; rev - government revenue; gdp – gross domestic product; psei – Philippine Stock Exchange Index*