Macroeconomic Estimation of Selected Philippine Stock Market Indices

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ABSTRACT

The study used a panel data of macroeconomic factors to estimate the determinants of performance of selected Philippine stock market indices. Monthly time-series data of macroeconomic variables (Philippine peso-dollar exchange, gold reserves, consumer price index, wholesale price index, investments and OFW remittances) and stock market returns of the banking and financial sector (FIN), holdings sector (HDG) and Philippine Stock Composite Index (PSEi) for a period covering January 2006 to December 2012. The multiple regression model was used to determine the significant macroeconomic factors that predict the returns of each stock market. Results revealed that of the three regression models derived predicting stock market indices, peso-dollar exchange rates; gold reserves and consumer price index significantly determine most of the stock market returns. As an implication, the macroeconomic determinants that were found to explain the stock market returns may guide foreign and local investors as well as industries and companies in present and future investment decisions.

Keywords: *macroeconomics, stock markets, panel data estimation, Philippines*

INTRODUCTION

The study on the stock market movements and how sector is fast becoming important and contributing largeit is link with macroeconomic forces has become percentage to the economy growth of countries around the globe. Early empirical studies have shown that there is indeed a relationship between macroeconomic variables and stock returns (Fama, 1981), and have shown that stock markets and stock market development are being increasingly important for promoting economic growth in emerging marking markets (Cheng, 1995; Ajayi & Mougoue, 1996; Goswami & Jung, 1997; Basabi & Mukherjee, 2002; Beenstock & Chan, 1988; Babar, et al., 2010).

Philippines have recently experienced an eye-opening 7.8 percent growth in GDP during the first quarter of 2013. The country continues to experience robust Gross Domestic product growth, primarily driven by the manufacturing and construction industries, accompanied by vigorous financial intermediation and inter-regional trade. In addition, the economy experienced dynamic financial and interregional trade which opened more investment opportunities for individuals and local businesses with the aid of proper government regulations monitored by the Aquino administration (Cariño, Ong, & Orbeta, 2013). Today, the country has a stock market that is, in terms of stock market returns, affected by overall macroeconomic activities driven by various sectors of the economy. On the other hand, a survey reported that only 1.0 percent of the Filipinos said that they own any stock (Social Weather Stations, 2009). This is consistent with the number of investor accounts opened in stockbrokerage firms, as earlier cited that approximately, only half of 1.0 percent of the country's population is stock market investors, which is equivalent to 525,850 accounts. This number could be lower as there are some investors that have accounts in other brokers and thus counted several times. This pales in comparison to the US, where a reported estimate of 50 percent of the population has investments in the stock market through various products that their exchanges offer.

Other countries in Asia, such as Hong Kong, Malaysia and Singapore, also have higher investor bases that represent 35.7 percent, 12.5 percent and 12.0 percent of their respective populations. There is a possibility that the size of these countries' economies, combined with the higher level of sophistication and product diversity of their stock markets, have driven up their investor participation (Crisostomo, Padilla, & Visda, 2013).

The response of the returns of stock markets to changes in the macroeconomy cannot be holistically determined in general because it varies across countries. Nevertheless, since the markets are inherently linked to some of the economic variables, weaknesses in the macroeconomic environment, poor policymaking and implementation even in a single emerging market may be transmitted to other markets in today's global market place. For common people, knowing the nature of impact of these macroeconomic variables towards the different stock markets may be of great advantage in light of better understanding on investments and economic activities. This study considers the analyses on how macroeconomic indicators affect returns of selected stock markets in the Philippines, including how these macroeconomic indicators drive stock market returns to behave the way they do. By looking at these relationships, this research suggests that macroeconomic indicators and stock yields influence one another.

Statement of the Problem

This research study primarily sought to estimate the performance of selected stock markets in the Philippines as influenced by several macroeconomic variables in a period covering January 2006 to December 2012. Specifically, it sought answers to the following inquiries:

1. What is the descriptive profile of the macroeconomic factors of the Philippines, which include Philippine peso-dollar exchange, gold reserves, consumer price index, wholesale price index, investments and Overseas Filipino Workers (OFW) remittances?
2. What is the descriptive profile of the banking and financial (FIN) sector, holdings (HDG) sector and the standard Philippine Stock Market Composite Index (PSEi)?
3. What are the significant macroeconomic determinants of each of the selected Philippine stock market indices?

FRAMEWORK

The Arbitrage Pricing Theory (APT) links macroeconomic indicators and stock market returns. This theory assumes that multiple factors explain asset returns (Chen, 1983). This theory explains how risk factors affect asset prices; therefore, APT can explain how changes in macroeconomic performance of a country can increase or decrease systemic risks that alter stock returns (i.e. both current and expected stock returns). The APT has been exploited by several studies to link the state of a macroeconomic environment to stock market returns, and these studies mostly model short run relationship among macroeconomic variables and stock prices, assuming trend stationarity.

In addition to APT, the study anchors on the Efficient Market Hypothesis (EMH). The EMH supports the Random Walk Hypothesis, which implies that price fluctuations represent random variations that have nothing to do with previous prices. In practical terms, the idea behind the Random Walk Hypothesis revolves around the unpredictability of stock prices. In other words, stock prices today reflect performances of firms today, which are affected by external noises such as news broadcasts, and stock prices tomorrow reflect performances of firms tomorrow, which may or may not have similar noises.

The unpredictability of happenings within the country makes stock prices random and unpredictable; therefore, prices fully reflect all known information under an efficient market.

Because of this, uninformed investors have equal advantage over informed investors, which qualify the definition of efficient markets.

The use of the regression model lies on the idea that determining variables have individual effects of several explanatory variables on a single dependent variable. In this study, the estimation follows:

$$Y_{it} = \beta_{0it} + \beta_{1it}exch_{it} + \beta_{2it}gold_{it} + \beta_{3it}CPI_{it} + \beta_{4it}WPI_{it} + \beta_{5it}FDI_{it} + \beta_{6it}remit_{it} + \varepsilon$$

where
Y	=	stock market's performance
exch	=	peso-dollar exchange rate
gold	=	gold reserves
CPI	=	Consumer Price Index
WPI	=	Wholesale Price Index
FDI	=	foreign direct investments
remit	=	OFW remittances
ε	=	error term

The most important explanatory variables are those that account for a significant proportion of the variation on the stock market performance between the studied periods. The joint effect of several variables can be considered in the same model, giving a much more powerful conclusion than simple correlation between stock market performance and one other variable. The direction of magnitude of the specific effect of any variable is given by the coefficient estimate. This estimate gives the impact of each variable on the stock market performance if all other variables are held constant.

METHODS

Research Design

The study used a descriptive-causative type of research under the quantitative design, since it attempted to determine which of the macroeconomic factors significantly determine the performance of the Philippine stock markets, both in the sectoral and overall perspective.

Sources of Data

The researcher used secondary data to conduct the study. The researcher gathered the reports from the *Bangko Sentral ng Pilipinas* website for the monthly data of the macroeconomic factors (Philippine peso-US dollar exchange rate, gold reserves, Consumer Price Index, Wholesale Price Index, investments and overseas Filipino workers' (OFW) remittances) for a period of January 2006 to December 2012. On the other hand, the data for the stock market indices was gathered from the same website for the same period.

Procedure of the Study

In conducting the study, the researcher downloaded a monthly panel data of the macroeconomic factors, which include peso-dollar exchange, gold reserves, consumer price index, wholesale price index, investments and OFW remittances, from the *Bangko Sentral ng Pilipinas* website, www.bsp.gov.ph.

For the stock market indices, the researchers gathered three of the seven indices, namely the PSE Composite Index (PSEi), PSE Financials Index (FIN) and the PSE Holding Firms Index (HDG)

from the same website. The PSEi is the main index of the PSE, while the remaining indices are sector indices based on a company's main source of revenue.

The data was transferred to in a spreadsheet form, then statistically-estimated. In determining which of the macroeconomic variables, singly or in combination, caused the stock market returns of the three stock market indices, multiple linear regression analysis was used. Results of the analysis were interpreted and conclusions and recommendations were given hereafter.

Data Analysis

The choice of method is based on the nature of data and research question that are used to meet the objectives of the research. The aim is to analyze the impact of macroeconomic variables and stock market returns, which requires collection of historical monthly data. Further, these numerical data have been processed and analyzed with different statistical tools to accept or reject our hypotheses which correspond to the quantitative method.

RESULTS AND DISCUSSION

Descriptive Profile of the Macroeconomic Factors

Table 1 shows the profile of the macroeconomic factors (peso-dollar exchange, gold reserves, consumer price index, wholesale price index, investments and OFW remittances) for a period covering January 2006 to December 2012. It can be gleaned that for an *n*=84 periods, the peso-dollar exchange rate has an average value of Php 45.8608. The value of gold reserves of the Philippines in million pesos is Php 5,436,875,500.00. The consumer price index is 4.68 while the wholesale price index is 198.01. The average value of the foreign direct investments in million pesos is Php 39,301,170,000.00. Lastly, OFW remittances averaged to USD 8,853,173,800.00.

Table 1. Descriptive Profile of the Macroeconomic Factors Used in the Estimation from January 2006 to December 2012

Macroeconomic Variables	Minimum	Maximum	Mean	Standard Deviation
EXCH	40.6711	53.1567	45.8608	3.1650
GOLD	2612.17	11043.33	5436.8755	2413.9033
CPI	1.7	10.5	4.68	2.0075
WPI	168.3	227.1	198.01	18.2844
FDI	17117.26	68616.16	39301.17	16776.2352
REMIT	916.612	20116.992	8853.1738	5113.8899

Source: Author's Own Calculations

Descriptive Profile of the Philippine Stock Markets

Table 2 shows the profile of the Philippine stock markets, represented by the PSEi Composite Index and two (2) sectoral indices, PSE Financials Index (FIN), PSE Holding Firms Index (HDG), for a period covering January 2006 to December 2012. As shown in the table, for an *n*=84 periods, the average indices for the following indices are FIN=825.51 while HDG=2322.80. The average of the PSE Composite Index is 3420.35.

Table 2. Descriptive Statistics of Selected Stock Market Indices from January 2006 to December 2012

Stock Market Indices	Minimum	Maximum	Mean	Standard Deviation
FIN	407.60	1374.73	825.51	226.1878
HDG	860.94	5150.8	2322.80	1184.5673
PSEi	1825.09	5812.73	3420.35	1028.92

Source: Author's Own Calculations

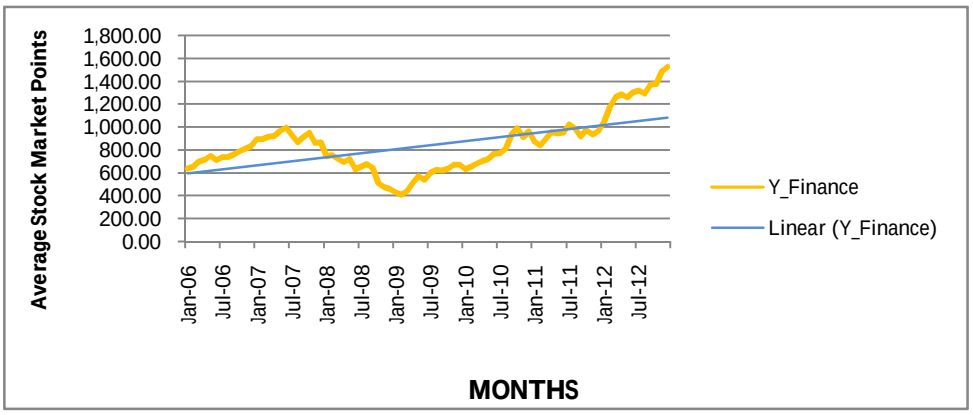

Figure 1.Time-Series Plot of the Philippine Financial Stock Index from January 2006 to December 2012

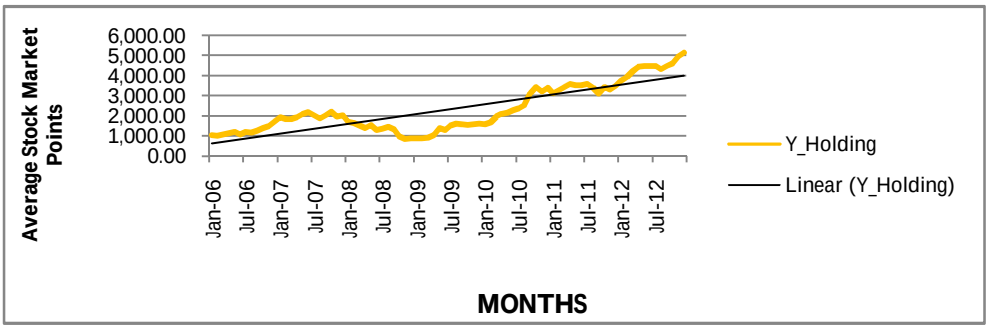

Figure 2.Time-Series Plot of the Philippine Holdings Stock Index from January 2006 to December 2012

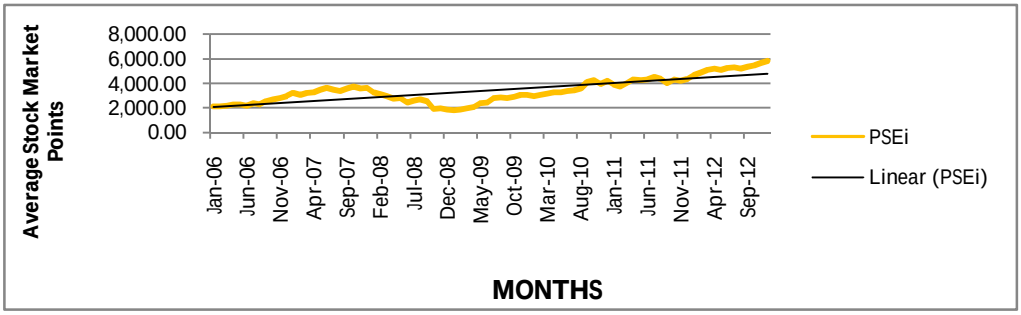

Figure 3.Time-Series Plot of the Philippine Stock Market Composite Index from January 2006 to December 2012

Also, Figures 1, 2 and 3 above illustrate the time-series plot of the stock market indices (FIN, HDG and PSEi, in orange line). The figures revealed that the stock market movement for the stock market was on an increasing trend on from year 2006, yet surprisingly decreased on the onset of year 2008. The lowest drop of the FIN stock index for the period covered was in the first quarter of 2009. This may be attributed to the global financial crisis which severely affected the country on its onset. On the onset of the end of the second quarter, the stock market returns were seen to have recovered, displaying upward trend until first quarter of 2011. The trend line of the stock market

indices were nearly closed the trend of their respective constants until the end quarter of 2011 and rose above the line in year 2012.

Macroeconomic Determinants of Stock Markets in the Philippines

Banking and Financial Stock Market. Among the chosen variables that were presented to estimate the fluctuations of the stock market index, only the peso-dollar exchange rate (EXCH), gold reserves (GOLD), and Consumer Price Index (CPI) were found to be significant. By examining their signs, shown in Table 3, EXCH and CPI are negatively related to PSE-FIN, while GOLD is positively related. To assess the individual impact of the significant variables, on the average, financial stock market will decrease by about 21.022 points in every peso increase in the peso value of the US dollar, holding other variables constant, in the same way that it will also decrease by about 28.462 points in every unit increase of the Consumer Price Index. On the other hand, financial stock market performance will increase by about 0.062 per million peso value increase of our gold reserves.

As shown by the value of R^2, 59.8 percent of the variation of stock market performance in the financial sector is explained by the three statistically significant explanatory variables.

Table 3. Coefficient Estimates for the Performance of PSE FIN Index

Macroeconomic Factor	Estimated Coefficient	Standard Error	*t* ratio	p-value
EXCH	-21.022	8.605	-2.443	.017*
GOLD	.062	.025	2.456	.016*
CPI	-28.462	11.449	-2.486	.015*
WPI	-3.855	3.338	-1.155	.252^{ns}
FDI	.000	.005	.036	.971^{ns}
REMIT	.001	.003	.303	.762^{ns}
R^2 = .598	F = 18.584			Significance = .000

Source: Author's Own Calculations * Significant ^{ns} Not Significant

The estimated regression model for the banking and financial stock market is:

$$Y_{FIN} = 2332.87 - 21.022x_{exch} + .062x_{gold} - 28.462x_{CPI}$$

In this case, finding the peso-dollar exchange rates significant yet having negative impact on the stock returns is contrary to the findings of Ahmad, Rehman, and Raoof (2010), who observed the impact of exchange rate, among other macroeconomic variables, to the stock return in Pakistan (KSE-100). As a result of multiple regression model analysis, they found out that the change in exchange rate has a significant positive impact on stock returns. The case of the significant, positive impact of the Consumer Price Index on stock market index is similar to the findings of Ibrahim and Aziz (2003), which tested the impact of macroeconomic variables on Pakistani stock returns and later confirmed the significant and positive impact of the CPI to stock market returns. Lastly, the positive and significant impact of gold reserves to stock market was confirmed by Jaiswal and Voronina (2012), whose study showed that gold and stock returns among Brazil, Russia, India, and China are correlated, however to a low degree. Similarly, taking into account an existence of spillover effects, gold can be helpful in terms of stock prediction and vice versa.

Philippine Holdings Stock Market. Among the chosen macroeconomic variables that were presented to explain the fluctuations of the holdings stock market index, only the peso-dollar exchange rate (EXCH), gold reserves (GOLD),Consumer Price Index (CPI), and foreign direct investments (FDI) were found to be significant. By examining their signs, shown in Table 4, EXCH and CPI are negatively related to PSE-HDG, while GOLD and FDI are positively related. To assess the individual impact of the significant variables, on the average, holdings stock market will decrease by about 51.233 points in every peso increase in the peso value of the US dollar, holding other variables constant, in the same way that it will also decrease by about 116.471 points in every unit increase of the Consumer Price Index. On the other hand, holdings stock market performance will

increase by about 0.181 per million peso value increase of our gold reserves and 0.029 per million dollar increase of foreign direct investments. As shown by the value of R^2, 86.9 percent of the variation of stock market performance in the holdings sector is explained by the four statistically significant explanatory variables.

Table 4. Coefficient Estimates for the Performance of PSE HDG Index

Macroeconomic Factor	Estimated Coefficient	Standard Error	*t* ratio	p-value
EXCH	-51.233	24.238	-2.114	.038*
GOLD	.181	.071	2.541	.013*
CPI	-116.471	32.251	-3.611	.001*
WPI	-5.215	9.402	-.555	.581ns
FDI	.029	.013	2.225	.029*
REMIT	-.002	.010	-.167	.868ns
R^2 = .869	F = 83.138		Significance = .000	

Source: Author's Own Calculations * Significant ns Not Significant

The estimated regression model for the holdings stock market is:

$$Y_{HDG} = 4059.693 - 51.233x_{exch} + .181x_{gold} - 116.471x_{CPI} + 0.029x_{FDI}$$

The results were found to be consistent with the findings of Adjasi, Harvey and Agyapong (2008), who looked in the relationship between foreign exchange rate and stock markets and found out that there is a negative relationship between exchange rate and stock market returns on the long run and a positive relationship in the short run. In addition, the positive and significant impact of gold reserves to stock market was parallel to the findings of Sumner, Johnson and Soenen (2010), who also confirmed that gold reserves have certain relationship with stock returns, which, in terms of correlation, is quite low. Also, the negative impact of Consumer Price Index on holdings stock market returns is contrary to Ibrahim and Aziz (2003), who instead found significant and positive impact of the CPI to stock market returns. Lastly, the positive impact of foreign direct investments on holdings stock market returns confirms the role of FDI in the development of stock markets of developing economies to be considered very strong (Adam & Tweneboah, 2009). Adam and Tweneboah (2009) furthered that that there is triangular causal relationship between these two: (1) foreign direct investment stimulates economic growth; (2) economic growth exerts positive impact on stock market development; and (3) FDI promotes stock market development as an implication.

Philippine Stock Market Composite Index. Regression estimation was run for the PSE Composite Index (PSEi) using the same macroeconomic factors. Among the macroeconomic variables, only peso-dollar exchange rates (EXCH), gold reserves (GOLD), and Consumer Price Index (CPI) were found to be significant. By examining their signs, shown in Table 5, EXCH and CPI are negatively related to PSEi while GOLD is positively related. To assess the individual impact of the significant variables, on the average, the overall stock market will decrease by about 96.889 and 157.083 points in every unit increase of the peso value of the US dollar and the Consumer Price Index, respectively, holding other variables constant. On the other hand, stock market points will increase by about .146 per million peso increase of gold reserves. As shown by the value of R^2, 85.4 percent of the variation of stock market performance in is explained by the three statistically significant explanatory variables.

Table 5. Coefficient Estimates for the Performance of PSEi

Macroeconomic Factor	Estimated Coefficient	Standard Error	*t* ratio	p-value
EXCH	-96.889	22.315	-4.342	.000**
GOLD	.146	.066	2.234	.028*
CPI	-157.083	29.692	-5.290	.000**
WPI	-1.013	8.656	-.117	.907ns
FDI	.010	.012	.862	.391ns
REMIT	.006	.009	.700	.486ns
R^2 = .854	F = 73.328		Significance = .000	

Source: Author's Own Calculations * Significant ns Not Significant

The estimated regression model for the Philippine Stock Market Composite Index is:

$$Y_{PSEi} = 7479.785 - 96.889x_{exch} + .146x_{gold} - 157.083x_{CPI}$$

The findings for the Philippine Stock Market Composite Index is similar to the results in the banking and financial (FIN) stock market index, whose coefficients for peso-dollar exchange rates and Consumer Price Index displayed negative signs, while of gold reserves, a positive sign. Contrary to the findings of Ahmad, Rehman and Raoof (2010), the Philippine Stock Market Composite Index is negatively affected by the fluctuations of the exchange rates, which is quite the opposite from the findings in the context of Karachi Stock Index in Pakistan (KSE-100), who is positively influenced by the said macroeconomic variable. The case of the significant, positive impact of the Consumer Price Index on stock market index is similar to the findings of Ibrahim and Aziz (2003), which tested the impact of macroeconomic variables on Pakistani stock returns and later confirmed the significant and positive impact of the CPI to stock market returns. Lastly, the positive and significant impact of gold reserves to stock market was confirmed by Jaiswal and Voronina (2012), whose study showed that gold and stock returns among Brazil, Russia, India, and China are correlated, however to a low degree.

CONCLUSION

Result of the panel data estimation reveals that there are macroeconomic factors that determine the performance of the overall and per-sector category of the stock markets of the Philippines. As a whole, the peso-dollar exchange rates, the gold reserves, and the Consumer Price Index prove to be the most predominant and influential macroeconomic variables on the banking and financial (FIN) and holdings (HDG) sector as well as the Philippine Stock Market Composite Index (PSEi). In addition, foreign direct investment was also found to positively influence stock market returns under the holdings sector.

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