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Introduction

As an investor of equities in the Philippines, I would like to understand the behavior of the Philippine Stock Exchange Index (PSEI) in relation to Dow Jones Industrial Average (DJIA). I am interested on how I can use the previous day movement of DJIA to predict the stock prices in the Philippines the following day.

Data and Analysis

The scope of this project uses the daily historical closing prices of PSEI and DJIA from January 2, 2002 to December 29, 2011. Note though that the dates where the markets in either country are closed (such as on holidays) were excluded in the data to avoid distortions in our analysis.

Figure 1. Daily Closing Prices (Y2002-Y2011)
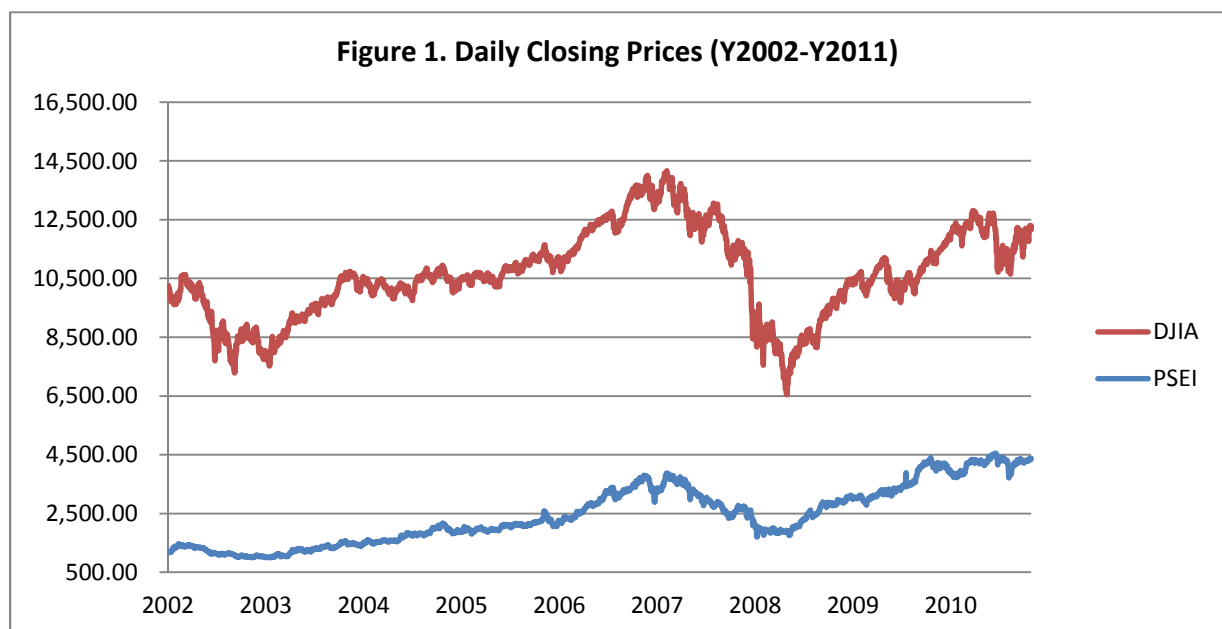
Looking closely into Figure 1 above, we can deduce that there is enough correlation between DJIA and PSEI except that fluctuations in DJIA is more visible. This is best explained by the fact DJIA averages at roughly ~10,000 while PSEI is at ~2,500 only, thus an X% movement in DJIA is more visible than the X% in PSEI.

The next figure shows a chart wherein the X-axis is DJIA while the Y-axis is PSEI. Clearly, there is a linear correlation between PSEI and DJIA, and an even more interesting story is that two distinct and parallel regression lines exist between them.

Figure 2. PSEI vs DJIA
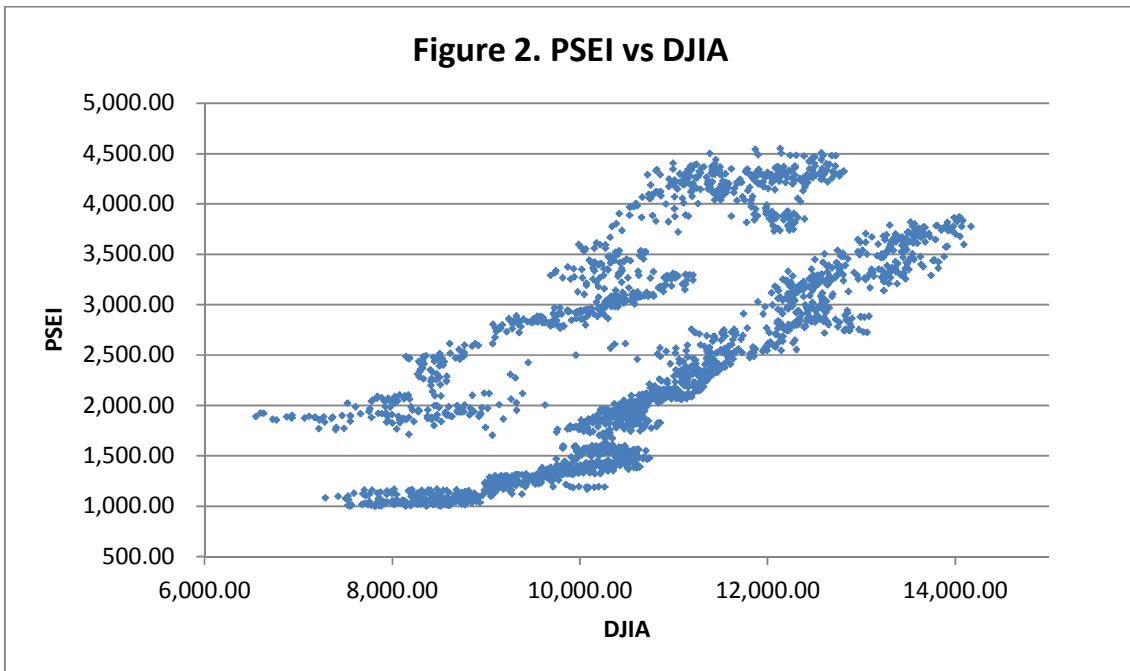
The story behind the two parallel regression lines is best explained by the recession that struck the world market in 2008 (as shown in Figure 3 below). During this year, the decrease in DJIA is more drastic than the decrease in PSEI. In particular, that year ended with DJIA at ~8500 and PSEI at ~1800. However, in August 2002 where DJIA is also at ~8500, PSEI is only at ~1100. Hence, we can look at it as a shift from point A (8500, 1100) to point B (8500, 1800) from August 2002 to December 2008 respectively, creating a shift in Y-intercept. Afterwards, the regression line from 2009-2011 intuitively have the same slope as in 2002-2007.

Figure 3. PSEI vs DJIA
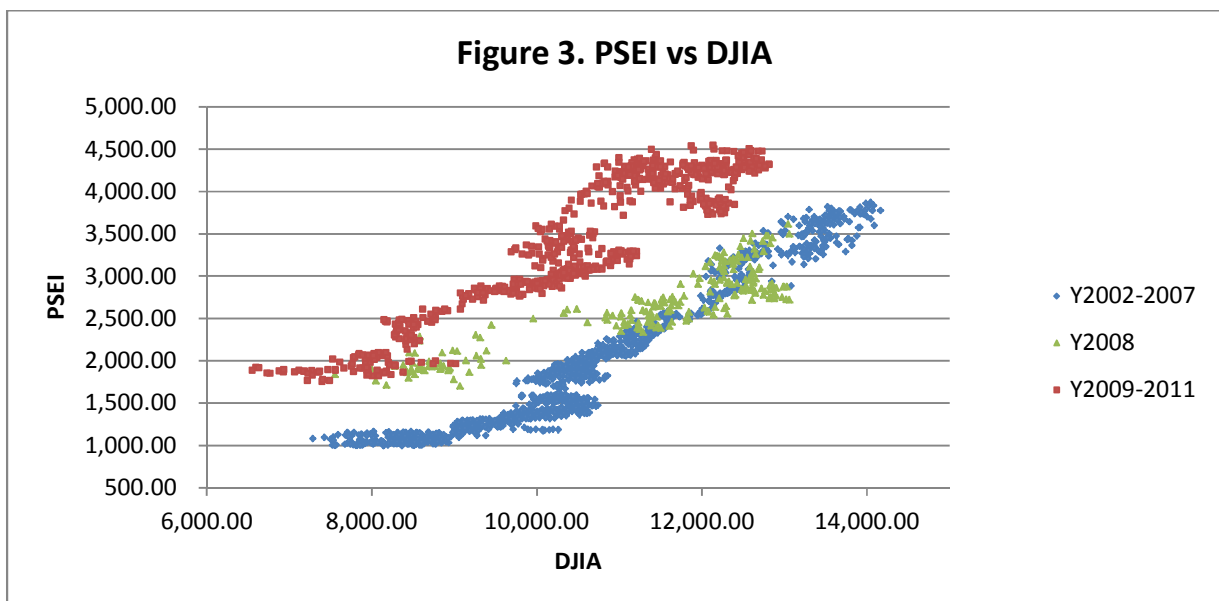
Model Construction

As shown in our analysis above, we need to segregate the regression lines into two parts: Y2002-2007 and Y2009-2011. We will ignore Y2008 as its trend is severely different from the two other time periods. Using the regression analysis tool in MS excel:

Y2002 - Y2007					
SUMMARY OUTPUT					

Regression Statistics	
Multiple R	0.95785955
R Square	0.91749492
Adjusted R Square	0.91743706
Standard Error	226.651798
Observations	1428

ANOVA

	df	SS	MS	F	Significance F
Regression	1	8.1E+08	8.1E+08	15857.8	0
Residual	1426	7.3E+07	51371		
Total	1427	8.9E+08			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-3359.873	42.657	-78.7649	0	-3443.55	-3276.2	-3443.55	-3276.2
DJIA	0.5017891	0.00398	125.928	0	0.49397	0.50961	0.49397	0.50961

Y2009 - Y2011					
SUMMARY OUTPUT					

Regression Statistics	
Multiple R	0.92817042
R Square	0.86150034
Adjusted R Square	0.86130663
Standard Error	298.836276
Observations	717

ANOVA

	df	SS	MS	F	Significance F
Regression	1	4E+08	4E+08	4447.47	0
Residual	715	6.4E+07	89303.1		
Total	716	4.6E+08			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1977.5997	81.4048	-24.2934	1.6E-95	-2137.42	-1817.78	-2137.42	-1817.78
DJIA	0.5120605	0.00768	66.6893	0	0.49699	0.52714	0.49699	0.52714

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Analysis and Conclusion

As expected, coefficients of X (DJIA) are almost equal for both time periods (0.502 and 0.512 for Y2002-2007 and Y2009-2011, respectively) with the Y-intercepts being different. In addition, the adjusted R^2 are high for both models (at 92% and 86%), which proves that DJIA is a good indicator of PSEI.

Although Y2009-2011 has less exposure and lower adjusted R^2, I would still recommend using the Y2009-2011 model to predict PSEI for 2012 onwards mainly because it is the more recent data. In addition, using the Y2002-2007 model implies that a sudden dip (by -1400) will occur from 2011 to 2012, which is absurd.

Therefore, my recommendation is to use the following formula:

$$PSEI = 0.512 \times DJIA - 1977.6$$

Appendix

Dow Jones Industrial Average:
http://finance.yahoo.com/q/hp?s=%5EDJI&a=00&b=1&c=2002&d=11&e=31&f=2011&g=d&z=66&y=0

Philippine Stock Exchange Index:
http://finance.yahoo.com/q/hp?s=PSEI.PS&a=00&b=1&c=2002&d=11&e=31&f=2011&g=d