



## Developing a Stock Price Model Using Investment Valuation Ratios for the Financial Industry Of the Philippine Stock Market

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### Abstract

The stock market has been a very prominent subject for individuals who want to secure investments on a certain portion of a company called a stock. Thus, financial scholars and analysts give a great deal of emphasis to the study of the stock market, particularly stock price prediction. In this regard, the field has witnessed a considerable growth in financial models that help represent this market. Moreover, investment valuation ratios, commonly known as financial ratios, were shown to be a promising tool in this kind of prediction for stock market. However, there is a lack of research in the market behavior of emerging markets. In this study, with supporting financial theories used in prominent studies of the stock market, an analysis on earnings per share (EPS), price to earnings Ratio (P/E Ratio), dividend yield (DY), and price per book value ratio (P/B Ratio) were used as possible empirical predictors of the stock price. This study develops a stock price model for companies in the financial industry of the Philippine stock market. Six years of data from thirteen (13) companies in the Philippines were analyzed through a multiple linear regression using financial ratios. The regression resulted to a stock price model with the given financial ratios as the variables affecting the changes in stock price. Moreover, the model was found to be statistically significant at a 95% confidence level. In addition to this, EPS and P/E ratio was found to be the most powerful variables in the model in terms of explanatory power.

**Key Words:** Stocks, Stock Market, Stock price model, Investment Valuation Ratios

### 1. INTRODUCTION

Prediction of various variables by observing the behavior of a market had been a major focus of different studies in the field of finance and economics. The prominent goal for conducting this was for both investors and traders to have an overview of their money (in the form of stocks, bonds, and other investment instruments) and determine the benefits they would gain over the investment along with the risk accompanying the investment. However, it could be observed that a majority of these studies sets focus on highly developed markets. Less developed markets, termed by Kvint,

Vladimir (2009) as the “emerging markets”, on the other hand, were given less priority in terms of studying market behaviors. On the stand that there wasn't sufficient research on the behavior of emerging markets, particularly the Philippine Stock Market, this research aimed to develop a sufficiently accurate model on predicting the stock price in the Philippines by analyzing the market price using various investment valuation ratios as independent variables in a linear regression. Furthermore, the research aimed to determine the investment valuation ratio highly correlated with stock price and would therefore be the best predictor of it.



## 2. THEORY

For this study, the researchers, aimed to develop a model for stock price prediction in the Philippine setting. In line with this, the researchers have made use of similar models to determine which variables are needed to be employed in creating a basic model. The primary model used in this matter was the Stambaugh (1986, 1999) predictive regression model

$$r_t = \alpha + \beta x_{t-1} + \epsilon_t \quad (\text{Eq. 1})$$

The given model is a regression model establishing a certain degree of relationship between the stock price and any form of financial or investment valuation ratio.

### 2.1 EARNINGS PER SHARE (EPS)

Earnings per share are the earnings allocated by the company to each outstanding common share. It was computed using the basic formula:

$$EPS = \frac{\text{Net Income}}{\text{Weighted Avg. Outstanding Shares}} \quad (\text{Eq. 2})$$

### 2.2 PRICE TO EARNINGS RATIO (P/E RATIO)

One of the most popular financial ratio to stock returns prediction used today by many stock market watchers was Robert J. Shiller's cyclically-adjusted price-earnings (CAPE) ratio. Traditionally, the Price-Earnings (P/E) Ratio was viewed in finance as a tool to compare the growth of a company to the performance of the industry or sector the company belongs to. However, lately, there has been an increase in the use of this ratio to predict stock returns after Shiller (1996), had suggested that P/E Ratio was one of the most powerful ratios when it comes to predicting returns.

P/E Ratio was computed using the basic formula:

$$PE \text{ Ratio} = \frac{\text{Price per Share}}{\text{Earnings Per Share}} \quad (\text{Eq. 3})$$

### 2.3 DIVIDEND YIELD (DY)

Jonathan Lewellen (2002), in particular, has studied one case in the model, utilizing Dividend Yield (DY) as the financial ratio to test

how well it could predict stock returns. Although it was previously believed in accordance to the Fama and French (1988) study that DY was a weak predictor of NYSE Stock Returns, Lewellen (2002) stated that the predictive strength of this financial ratio was actually noteworthy; therefore, Dividend Yield was included as a main financial ratio observed in this paper.

### 2.4 PRICE/BOOK VALUE RATIO (P/B RATIO)

A similar financial ratio, the Price to Book Value Ratio (P/B Ratio), had also been a focus of a large number of studies with the similar goal of predicting stock returns. Pontiff and Schall (1998), in a study motivated by the findings of Fama and French (1988), has shown that the P/B ratio of individual stocks was able to predict the stock returns and excess returns not captured by variables such as DY, this predictive ability was attributed by Pontiff and Schall to the apparent relationship between book value and future earnings.

### 2.5 EMERGING MARKETS

The apparent difference between the highly developed markets and emerging markets was also one of the main points of interest in the research. According to Bekaert and Campbell (2000), emerging markets have a significantly low correlation with the world market in terms of returns, cost of capital, beta and volatility. Furthermore, the IMF (2012) has classified the Philippine Market as an emerging market. In this regard, the research aims to take into consideration the market classification difference into developing the market trend models. These differences were attributed to the same factors considered in Bekart and Campbell's study, correlation with the world market in terms of: returns; cost of capital; beta; and volatility

## 3. METHODOLOGY

Primarily, the researchers employed various statistical tools to develop the stock price model for the Philippine Setting. Initially, a multiple linear regression model was produced



using five years of data from 13 companies, with the market price being the dependent variable and EPS, P/E Ratio, DY, and P/B Ratio being the independent variables. The multiple linear regression was done using a FORTRAN 90 program. In addition to the linear regression model, the program included r-squared, adjusted r-squared, and the f-statistic as its output. Furthermore, a similar run was done using the Quick-R statistics software to conduct an ANOVA test, determine statistical significance and validity of the produced model.

The researchers utilized the Orbis database of financial information to obtain data regarding all publicly listed companies in the Philippine Stock Market categorized as to having Financials as the nature of their business. The researchers then employed a criterion of having complete and continuous data regarding the company's financial ratios for five to six years. With this, information regarding 13 companies was used as parameters to the multiple linear regression run.

The independent and dependent variables are composed of yearly data of the following companies from 2008-2012:

1. AYALA LAND INC
2. SM PRIME HOLDINGS, INC.
3. METRO PACIFIC INVESTMENTS CORPORATION
4. MEGAWORLD CORPORATION
5. FILINVEST DEVELOPMENT CORPORATION
6. VISTA LAND & LIFESCAPES, INC
7. ROBINSON'S LAND CORPORATION
8. SHANG PROPERTIES, INC.
9. ANCHOR LAND HOLDINGS, INC.
10. CEBU HOLDINGS, INC.
11. CITYLAND DEVELOPMENT CORPORATION
12. ANGLO-PHILIPPINE HOLDINGS CORPORATION
13. KEPPEL PHILIPPINES HOLDINGS INC

#### 4. RESULTS AND DISCUSSION

The application of the Stambaugh predictive regression model to the financial industry of the Philippine Stock Market was analyzed through regression diagnostics that would test whether the said model could accurately describe the market given the data

gathered.

Table 1 Residuals

Min	IQ	Median	3Q	Max
-2.671	-0.313	0.069	0.178	3.849

As shown in Table 1, the data points used for the regression has a relatively low dispersion. This is to be expected as the researchers have limited the variables to come from the same industry. This would therefore mean that the companies would tend to have identical market movements and performance.

Table 2 Parameter Estimates

Coefficients	Est.	Std. Error	T-value	Pr(> t )
<b>Intercept</b>	-0.707	0.297	-2.380	0.205
<b>EPS</b>	19.742	0.614	32.134	<2e-16
<b>P/E Ratio</b>	0.034	0.016	2.101	0.040
<b>DY</b>	0.020	0.069	0.286	0.776
<b>P/B Ratio</b>	0.199	0.108	1.839	0.071

Table 2 shows the run on multiple linear regressions for 65 data points, for five years data of the selected 13 companies. The said run resulted to the following multiple linear regression model:

$$Y = -0.70732 + 19.74206A + 0.03427B + 0.01979C + 0.19899D \quad (\text{Eq. 4})$$

Where

- Y is the stock price.
- A is Earnings per Share
- B is Price to Earnings Ratio
- C is Dividend yield
- D is Price/Book Value Ratio

Table 3

Residual Standard Error:	Multiple R-squared:	F-statistic:
0.9203 on 60 degrees of freedom	0.9565, Adjusted R-Squared 0.9535	329.8 on 4 and 60 DF, p value <2.2e-16

The resulting p-value of < 2.2e-16 indicates that

the regression model is statistically significant at a 95% confidence level. In addition to that, the adjusted r-squared of 0.9536 shows that 95.36% of the variability in market price could be explained by the selected factors of the model.

Table 4

	Df	Sum Sq	Mean Sq	F Value	Pr(>F)
EPS	1	1038.40	1038.40	1225.97	<2e-16
P/E Ratio	1	75.80	75.80	89.53	0.00
DY	1	0.20	0.20	0.19	0.66
P/B Ratio	1	2.90	2.90	3.38	0.07
Residuals	60	50.80	50.80	-	-

The ANOVA test also resulted into conclusions that out of the selected financial ratios, two financial ratios were shown to explain a larger part of the variability observed in stock price – EPS and P/E Ratio. Furthermore, out of the two, EPS was shown to be the most statistically significant.

Table 5 2013 Financial Ratios

TICKER	PE Ratio		DY	PB Ratio
	EPS			
ALI	0.86	40.45	0.79	3.81
SMPH	1.00	17.69	1.41	1.91
MPI	0.26	18.54	0.74	1.16
MEG	0.17	10.91	1.05	0.98
FLDC	0.29	11.33	2.03	0.58
VLL	0.31	9.31	2.55	0.94
RLC	1.09	18.39	1.89	1.68
SHNG	0.18	8.80	2.70	0.63
ALHI	0.78	11.52	1.46	2.90
CHI	0.20	17.31	2.50	1.46
CDC	0.08	9.38	2.35	0.65
KPH	0.34	0.94	5.58	0.11

Using the data on the financial ratios of the companies for the year 2013, the produced regression model was tested and yielded the following results.

Table 6 Percentage Error for 2013

Predicted Price	Actual Price	% Error
18.43009	28.45	35.21101
20.11544	17.75	13.35613
5.26944	4.79	10.10420
3.23845	2.98	8.70674
5.56174	5.31	4.68465
5.96865	5.23	14.19289
21.90925	20.14	8.78119
3.32561	3.27	1.71787
15.69318	18.28	14.16560
4.17378	4.30	-2.97835
1.34138	1.25	7.52068
6.16954	5.38	14.73134

The table shows the corresponding results from the regression of each of the 13 companies. These predicted stock prices were then compared to the actual year end stock prices through percentage error. The results confirm that when a different set of data, which would include data from a different year, the model holds a certain degree of accuracy in its predictions. However, as noted from the results of certain companies, specifically Ayala Land, Inc. (ALI), the model's predictive power falls when the company has a growth or performance that is considerably higher or lower than the industry's average.

## 5. Conclusion and Recommendations

The researchers were able to develop a stock price model using financial ratios. Tests for model validity were also able to show that the produced model was statistically significant, having a p-value less than the set critical alpha of 0.05. Further statistical tests resulted to two financial ratios, EPS and P/E Ratio, as having the greatest explanatory power out of all the selected ratios. A possible application of the model in stock price prediction would be the analysis of the stock price given the forecasted financial ratios of a certain company or the industry as a whole.

For further studies on a similar area,



the researchers recommend employing a different set of financial ratios as independent variables of the multiple linear regression. It would also be advisable for the model validity if better data on the Philippine Stock Market would be available as the researchers were limited to a specific industry in order to have a good representation of the market. Lastly, applying a different model aside from the Stambaugh predictive regression model may produce a different result from what the researchers have done.

Stambaugh, R., 1999. Predictive regressions.  
*Journal of Financial Economics* 54, 375–421.

## 7. REFERENCES

- Bekaert, G. & Campbell, H. (2000). Foreign Speculators and Emerging Equity Markets. *The Journal of Finance*. Vol. LV No 2.
- Fama, E. & French, K. (1988). Dividend Yields and Expected Stock Returns. *Journal of Financial Economics* 22 (1988) 3-25.
- Kvint, Vladimir (2009). *The Global Emerging Market: Strategic Management and Economics*. New York, London: Routledge.
- Lewellen, J (2002). Predicting Returns with Financial Ratios. *Journal of Financial Economics* 74, 209-235
- Pontiff, J. & Schall, D. (1998). Book-to-market ratios as predictors of market returns. *Journal of Financial Economics* 49 (1998) 141-160.
- Shiller, R (1996). Price-Earnings Ratios as Forecasters of Returns: The Stock Market Outlook in 1996. Retrieved online from [http://www.econ.yale.edu/~shiller/data/pe\\_ratio.html](http://www.econ.yale.edu/~shiller/data/pe_ratio.html)
- Stambaugh, R., 1986. Bias in regressions with lagged stochastic regressors. Unpublished Manuscript, University of Chicago, Chicago, IL.



Presented at the DLSU Research Congress 2015  
 De La Salle University, Manila, Philippines  
 March 2-4, 2015

## APPENDIX

### 2008 – 2012 Stock Price and Financial Ratios

<b>Company name</b>	<b>Market Price -Year end Last Available Year</b>	<b>Price/Earnings Ratio-close Last Available Year</b>	<b>Dividend Yield - close Last available Year</b>	<b>Price/Book Value Ratio Last available Year</b>
<b>AYALA LAND INC</b>	24.75	29.07	1.20	3.03
<b>SM PRIME HOLDINGS, INC.</b>	14.68	15.69	1.84	1.54
<b>METRO PACIFIC INVESTMENTS CORPORATION</b>	4.32	15.60	0.86	0.99
<b>MEGAWORLD CORPORATION</b>	3.24	10.70	1.07	0.94
<b>FILINVEST DEVELOPMENT CORPORATION</b>	4.40	7.93	2.75	0.40
<b>VISTA LAND &amp; LIFESCAPES, INC.</b>	5.20	8.77	1.96	0.92
<b>ROBINSON'S LAND CORPORATION</b>	20.60	18.87	1.75	1.71
<b>SHANG PROPERTIES, INC.</b>	3.27	7.75	3.36	0.63
<b>ANCHOR LAND HOLDINGS, INC.</b>	14.10	8.85	1.35	1.94
<b>CEBU HOLDINGS INC</b>	5.73	21.96	1.92	1.86
<b>CITYLAND DEVELOPMENT CORPORATION</b>	1.04	8.36	2.74	0.58
<b>ANGLO-PHILIPPINE HOLDINGS CORPORATION</b>	1.93	10.90	3.08	0.81
<b>KEPPEL PHILIPPINES HOLDINGS INC</b>	4.80	27.45	2.39	0.26



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Market Price-year end Year - 1	Price/Earnings Ratio - close Year - 1	Dividend Yield - close Year - 1	Price/ Book Value Ratio Year - 1	Market Price - Year end Year - 2	Price/Earnings Ratio - close Year - 2
26.45	40.45	0.79	3.81	15.16	27.89
16.50	17.69	1.41	1.91	13.30	20.41
4.45	18.54	0.74	1.16	3.66	17.79
2.77	10.91	1.05	0.98	1.70	5.43
4.94	11.33	2.03	0.58	3.35	8.47
4.86	9.31	2.55	0.94	2.84	6.84
19.04	18.39	1.89	1.68	11.30	11.64
3.04	8.80	2.70	0.63	2.19	9.87
17.00	11.52	1.46	2.90	18.30	7.36
4.00	17.31	2.50	1.46	2.50	11.31
1.16	9.38	2.35	0.65	1.18	7.88
2.16	6.57	2.78	0.72	1.92	7.70
5.00	0.94	5.58	0.11	3.35	0.28



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<b>Dividend Yield - close Year - 2</b>	<b>Price/Book Value Year - 2</b>	<b>Market Price - year end Year - 3</b>	<b>Price/Earnings Ratio - close Year - 3</b>	<b>Dividend Yield - close Year - 3</b>
0.97	3.17	16.46	39.71	0.57
2.03	2.90	11.38	20.13	2.11
0.62	1.22	3.89	27.31	0.26
1.38	0.72	2.48	12.65	0.76
2.56	0.45	5.05	10.64	0.89
3.70	0.59	3.17	8.98	1.70
3.19	1.19	16.06	12.20	3.00
3.36	0.55	2.11	10.05	4.26
1.75	1.98	12.00	7.34	1.75
2.80	1.02	2.70	12.76	2.59
3.53	0.76	1.31	7.18	4.58
4.17	0.78	2.11	4.38	1.42
0.00	0.14	2.65	15.29	0.00





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<b>Price/ Book Value Ratio Year - 3</b>	<b>Market Price - year end Year -4</b>	<b>Price/Earnings Ratio - close Year - 4</b>	<b>Dividend Yield - close Year - 4</b>	<b>Price/Book Value Ratio Year - 4</b>
3.77	11.25	36.65	0.54	2.78
2.72	9.80	18.60	2.45	2.76
1.45	2.60	22.00	0.00	0.99
1.10	1.48	9.36	1.26	0.77
0.72	2.08	9.07	1.47	0.33
0.71	1.88	6.98	1.76	0.45
1.59	10.50	8.84	2.38	1.13
0.54	1.76	7.16	3.46	0.46
1.95	8.30	7.72	1.57	1.76
1.17	2.50	15.89	2.80	1.16
0.75	1.54	6.14	5.82	0.79
0.89	1.20	4.75	12.50	1.13
0.30	1.90	4.82	0.00	