World Journal of Social Sciences
Vol. 6. No. 2. July 2016 Special Issue. Pp. 29 – 38

Share Price Volatility: The Case of Pharmaceutical and Chemical Companies

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The study explores share price volatility as an indicator of economic stability in a developing country setting. This study examines the share price volatility of eight selected pharmaceutical and chemical companies listed on the Chittagong Stock Exchange (CSE). The study period was from 2006 to 2013. Data was compiled from a mix of primary and secondary sources. A combination of statistical techniques including Regression Analysis is used to explore the relationship between the selected variables. Average Share Price is the dependent variable, while Dividend Yield, Earnings Per Share, Price Earnings Ratio and Returns On Equity are the independent variables. The results demonstrate that share price volatility is significantly influenced by the Price Earnings Ratio along with Earnings Per Share.

1. Introduction

A robust capital market is an important component of modern economies. Development of the financial markets is important for the economy (Claessens et al, 2012). Global financial markets are becoming more accessible to small investors (Lusardi and Mitchell, 2014) and individuals are increasingly participating in financial markets (Van Rooij et al, 2011). The capital market in Bangladesh displays a similar trend with more people showing keen interest in the workings of the financial sector. Park and Mercado (2014) express concerns about the adverse impacts of financial globalization. Their view is echoed by Boubakri et al (2016) when they caution that the rapid financial integration of emerging economies increases their exposure to financial crises.

Asset prices vary in an efficient capital market when investors change their expectations (Sadka, 2007). An asset is fragile when it is exposed to a non-fundamental risk (Greenwood and Thesmar, 2011). A positive volatility-return relation is stronger for those firms more likely have real options (Grullon et al, 2012). Forecasting volatility is a significant challenge but is also a basic instrument for risk management (Corradi et al, 2013). Movements in stock prices can be due to a variety of factors from expected cash flows to discount rates (Chen et al, 2013). Important determinants of stock returns are common in the major world equity markets (Haugen and Baker, 1996).

The article explores share price volatility as a market indicator of economic stability in a developing country setting. The findings of the paper are different from other studies because

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it concentrates on Chittagong, whereas previous studies in the context of Bangladesh have mostly focused on the capital markets of Dhaka. The paper also differs from other studies since it concentrates on a developing country setting, and uses a smaller sample size relative to other studies due to market size and the availability of data for existing companies. The focus on Chittagong enhances the coverage within developing country settings.

The primary objective of this article is to measure the stock price volatility of the selected pharmaceutical and chemicals companies listed on the Chittagong Stock Exchange. The research question for the study is as follows: What are the determinants of stock price volatility of selected companies listed on the Chittagong Stock Exchange?

The specific objectives of the article are specified as follows:

- To determine the reasons of the stock price volatility.
- To conduct a statistical analysis of the factors which affect the stock price volatility.

Section 1 of the paper is the introductory section. Section 2 discusses the literature review conducted for the study. Section 3 highlights the methodology and the statistical models applied for the analysis. Section 4 discussed the findings of the paper, while Section 5 is the concluding section which also highlights the limitations of the paper.

2. Literature Review

The research question stated in the previous section highlights the focus of the paper on the capital market of Chittagong. Studies have been undertaken on the capital markets of Bangladesh, however mostly they have tended to focus on the markets of the capital of the nation. A review of the published literature has demonstrated that whether a paper focuses on the capital markets of the developed or developing nations, the emphasis has been on the markets located in the main hub of finance, rather than the markets which may exist in other urban centres. The paper attempts to address this gap in the context of the capital market of a developing nation. On the basis of this research gap, the hypothesis for the paper can be stated as follows: Do market factors impact stock price volatility of selected listed companies on the Chittagong Stock Exchange?

Glassman and Hassett (1999) explore the reasons why stock prices kept keep increasing when the market was thought to be fully valued or on the verge of a crash. The findings of their study suggest that stocks are riskier than bonds and as a result generate more returns. Shiller (2000) claims that there was a bubble in the U.S. market due to psychological factors leading to a heightened state of speculative favor. Poterba and Summers (1988) conduct an extensive study using various frequencies of data from the New York Stock Exchange (NYSE) and 17 other equity markets. Their study consistently shows that returns are positively correlated over longer periods. In addition, Poterba and Summers (1988) find that a reverting component of stock prices could explain a large portion of variations in stock returns. In an examination of European stock markets, Frugier (2016) demonstrated that the patterns in returns behaved as if investors' selected stocks according to volatility. The dynamics of diverse beliefs are important factors which impact the volatility of asset markets (Kurz et al, 2005).

Bekaert and Harvey (1995) find that volatility is difficult to model in emerging markets. They find evidence that the importance of world factors in emerging market volatility may be increasing, and that volatility tends to decrease following market liberalization. Kim and Singal (1993) suggest that there has been no increase in volatility over time, and that volatility has

tended to decrease following market liberalization. Albertazzi and Gambacorta (2009) use five performance indicators (Net Interest Income, Non-Interest Income, Operating Cost, Provisions, Profit before Tax, and Return on Equity) to investigate the influence of stock market volatility on bank performance for a number of industrialized countries (Austria, Belgium, France, Germany, Italy, Netherlands, Spain, United Kingdom and United States) during 1981-2003. They report that Net Interest Income, Non-Interest Income, Provision and Return on Equity are positively related to stock market volatility, while stock market volatility is negatively related to Profit before Tax. In their examination of 589 companies listed on the New York Stock Exchange (NYSE), Narayan et al (2013) find evidence that trading volume and share price volatility have significant impacts on asset price bubbles.

A number of researchers explore the linkage between the dividend policy of corporations and the volatility of their stock prices (Allen and Rachim, 1996; Baskin, 1989). Baskin (1989) examines 2344 U.S common stocks from the period of 1967 to 1986, and finds a significant negative relationship between dividend yield and stock price. Allen and Rachim (1996) report a positive relationship between share price volatility and dividend yield after studying Australian listed stocks, but a negative relationship between share price volatility and dividend payout. Irfan and Nishat (2003) examine 160 companies listed on the Karachi Stock Exchange for the period 1981-2000. Their results show that dividend yield and payout ratio is positively related to share price volatility. Rashid, Rahman and Anisur (2008) explore the relationship between dividend policy and share price volatility and find a positive insignificant relationship between share price volatility and dividend yield for nonfinancial firms listed in the Dhaka Stock exchange during 1999 – 2006.

3. The Methodology and Model

The model investigates the relationship between Dividend Yield, Earning Per Share, Price earnings Ratio, Return on Equity and Mean Share Price within the context of Chittagong Stock Exchange. Dividend Yield, Earnings Per Share, Price Earnings Ratio, and Return on Equity are considered the independent variables, whereas Average Price of Shares is considered the dependent variable. Data is collected from both primary (Stock Exchange, SEC) and secondary sources such as different publications of CSE and Bangladesh Bank. Individual company data is collected from the annual reports of the eight selected pharmaceutical and chemical companies for the years 2006 to 2013. The study applies the Probability Sampling Technique to determine the final selection from the sampling frame.

Earning Per Share, Dividend Yield, Price Earnings Ratio and Return On Equity are measured by summing each year's data from 2006 to 2013 of each company and then average is taken from the annual reports of each of the respective companies. Data is first analysed in a Microsoft Excel spreadsheet. For the current study, a conversion is completed through the Statistical Package for Social Science (SPSS) software Version 17 as it offers greater feasibility in data analysis and visualization. The data is analysed by collecting data of monthly closing market price and then averaging it to obtain yearly average market price of shares.

In the second portion of the statistical analysis, the standard deviation is calculated for each company. In the next step a Correlation Analysis is completed to establish the strength of the relationship between the measured variables as follows:

a) 0.70 and above – Very Strong Relationship
b) 0.50 to 0.69 – Strong Relationship
c) 0.30 to 0.49 – Moderate Relationship
d) 0.10 to 0.29 – Low Relationship

e) 0.01 to 0.09 – Very Low Relationship

Regression Analysis is also undertaken to determine the extent to which the independent variables influence the dependent variable.

The study period from 2006 to 2013 is selected because this is the time period for which a complete set of data is available for the selected companies. The variables have been selected on the basis of the information from previous studies to ensure continuity of the discussion. The variables represent the key market factors which have an impact on stock price volatility as stated in the literature. The paper improves upon previous study models through the incorporation of a larger number of statistical tools to enhance the statistical rigor and reduce the bias of the model.

4. The Findings

Table 1: Stock Price Volatility by Using Percentage Change Compared to Industry Average

YEAR	INDUSTRY MEAN	ACI	% change	AMBEEPHARMA	% change	BXPHARMA	% change	ORION INFU	% change
2006	**478.89**	67.87	-0.86	45.37	-0.91	52.59	-0.89	146.5	-0.69
2007	**625.67**	112.9	-0.82	50.545	-0.92	54.98	-0.91	104.78	-0.83
2008	**909.85**	369.5	-0.59	114.186	-0.87	99.941	-0.89	154.65	-0.83
2009	**642.78**	453.7	-0.29	209.86	-0.67	162.15	-0.75	451.13	-0.30
2010	**1259.2**	431.7	-0.66	343.75	-0.73	157.87	-0.87	748.94	-0.41
2011	**1125.45**	261.2	-0.77	424.84	-0.62	102.36	-0.91	638.16	-0.43
2012	**225.87**	162.6	-0.28	269.36	0.19	66.42	-0.71	44.47	-0.80
2013	**236.13**	150.1	-0.36	238.62	0.01	52.31	-0.78	43.6	-0.82

Table 2: Percentage Change for the Last 4 Selected Companies

YEAR	INDUSTRY MEAN	LIBRAINFU	% change	SQURPHARMA	% change	RECKITTBEN	% change	IBNSINA	% change
2006	**478.89**	537.22	0.12	2274.3	3.75	164.19	-0.66	543.01	0.13
2007	**625.67**	584.998	-0.07	3221.4	4.15	263.198	-0.58	612.46	-0.02
2008	**909.85**	1268.86	0.39	3808.4	3.19	422.11	-0.54	1041.1	0.14
2009	**642.78**	1667.75	1.59	294.89	-0.54	639.53	-0.01	1263.3	0.97
2010	**1259.2**	2440.21	0.94	3645.7	1.9	1491.64	0.18	1540.5	0. 22
2011	**1125.45**	3834.7	2.41	3057.4	1.72	1015.35	-0.1	1387.6	0. 23
2012	**225.87**	270.36	0.20	216.14	-0.04	759.64	2.36	93.98	-0.58
2013	**236.13**	288.02	0.22	186.89	-0. 21	749.2	2.17	90.131	-0.62

The tables above demonstrate that LIBRA INFUSION shows a noticeable price increase from the Industry Mean up to 2011. The price drops in 2012 and is in line with the Industry Mean. SQUARE PHARMACEUTICALS shows the highest price fluctuation with the Industry Mean. From 2006 it is well above the Industry Mean but drops sharply below the Mean in 2009. RECKITT BENCKISER exhibited the most stable performance compared to other companies as it experienced a stable outlook in share prices. Interpreting Table 1 along with Table 2, the hypothesis developed in Section 2 is proven, although as the results show, the degree of share price volatility differs among the selected companies.

Table 3: Measurement of Volatility through Standard Deviation

YEAR	ACI	AMBEEPHARMA	BXPHARMA	ORIONINFU	LIBRAINFU	SQURPHARMA	RECKITTBEN	IBNSINA
2006	2.24	3.99	4.56	5.73	41.59	92.81	31.69	54.36
2007	40.56	4.34	6.15	13.23	93.62	822.01	66.1	105.9
2008	147.73	28.63	33.35	42.74	366.24	904.81	53.62	193.3
2009	33.15	36.03	8.32	126.84	242.07	329.52	315.53	190.2
2010	52.24	169.63	16.7	379.43	1062.8	235.86	261.41	120.9
2011	34.32	59.17	16.52	193.04	1137.2	416.26	78	140.4
2012	55.16	40.99	13.69	4.09	34.37	37.32	116.79	21.23
2013	15.91	31.14	6.22	4.04	109.59	16.01	113.39	11.87

Table 3 highlights that that LIBRA and SQUR experience the most fluctuations in the market. Therefore these companies are most sensitive to price volatility. Share prices of the remaining companies show less volatility during the same time period. The table shows that almost all companies experience a stable situation in which the variability of the price is small. As a result, Table 4 also lends support to the hypothesis developed in Section 2.

A Pearson correlation analysis is conducted on all variables to explore the relationship between them. Bivariate Correlation was subject to two tailed tests at significance levels of 0.01% and 0.05% respectively.

Table 4: Correlational Matrix

		EPS	DIV_YIELD	P/E_RATIO	ROE	AVERAGE SHARE PRICE
EPS	**Pearson Correlation**	1	_	_	_	.311
	Sig. (2-tailed)					.0473
	N	8				8
DIV_YIELD	**Pearson Correlation**	_	1	_	_	.686*
	Sig. (2-tailed)					.045
	N		8			8
P/E_RATIO	**Pearson Correlation**	_	_	1	_	.843**
	Sig. (2-tailed)					.009
	N			8		8
ROE	**Pearson Correlation**	_	_	_	1	-.025
	Sig. (2-tailed)					.952
	N				8	8
AVERAGE SHARE PRICE	**Pearson Correlation**	.311	.686*	.843**	-.025	1
	Sig. (2-tailed)	.473	.045	.009	.952	
	N	8	8	8	8	8
**. Correlation is significant at the 0.01 level (2-tailed).						
*. Correlation is significant at the 0.05 level (2-tailed).						

It is observed that EPS shows a positive correlation coefficient and a moderate correlation with the dependent variable Average Share Price. Dividend Yield is found to have a insignificant impact on Average Share Price. P/E Ratio is strongly positively correlated with Average Share Price. ROE is observed to have negative correlation with Average Share Price. Therefore the hypothesis in Section 2 is supported for EPS and P/E Ratio while it is not supported for Dividend Yield and ROE.

Table 5: Regression Analysis of Average Share Price and Earnings per Share

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
		B	Std. Error	Beta			R Square
1	(Constant)	474.045	401.942		1.179	.283	
	EPS	16.976	21.144	.311	.803	.0473	0.57

a. Dependent Variable: Average Price

Earnings Per Share is found to be related to the Average Share Price of the 8 selected companies since the coefficient of determination is 0.57 which is statistically significant. Hence it is observed from Table 5 that the hypothesis from Section 2 is supported for EPS.

Table 6: Regression Analysis of Average Share Price and Dividend Yield

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
		B	Std. Error	Beta			R Square
	(Constant)	108.710	329.237		.330	.752	
	Dividend Yield	48.900	21.174	.686	2.309	.045	0.471

a. Dependent Variable: Average Price

Dividend Yield is found to be insignificantly related to the Average Share Price of the 8 selected companies since the coefficient of determination is 0.471. Hence it is noted from Table 6 that the hypothesis from Section 2 is not supported for Dividend Yield.

Table 7: Regression Analysis of Average Share Price and Price Earnings Ratio

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
		B	Std. Error	Beta			R Square
1	(Constant)	-245.259	289.721		-.847	.430	
	PE Ratio	29.503	7.672	.843	3.846	.009	0.711

a. Dependent Variable: Average Price

Price Earnings Ratio is found to be strongly related to the Average Share Price of the selected companies since the coefficient of determination is 0.711. Therefore from Table 7 it is noted that the hypothesis from Section 2 is supported for the P/E Ratio.

Table 8: Regression Analysis of Average Share Price and Return on Equity

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	
		B	Std. Error	Beta			R Square
1	(Constant)	749.502	458.792		1.634	.153	
	ROE	-1.443	23.160	-.025	-.062	.952	0.001

a. Dependent Variable: Average Price

Table 8 displays that among the eight selected companies listed on the CSE there is no supported relationship between Return On Equity and Average Share Price, since the coefficient of determination is 0.001. As a result Table 8 does not support the hypothesis stated in Section 2.

Table 9: Multiple Regression Analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
	(Constant)	-359.969	501.769		-.717	.525
	EPS	19.153	24.574	.351	.779	.0493
	Dividend Yield	11.594	32.437	.163	.357	.0445
	PE Ratio	23.690	13.383	.677	1.770	.0175
	ROE	-7.695	28.827	-.136	-.267	.807

a. Dependent Variable: Average Price

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.892[a]	.796	.523	47.509

a. Predictors: (Constant), ROE, PE Ratio, EPS, Dividend Yield

Multiple regression analysis was undertaken to measure the overall influence of the independent variables (Earnings Per Share, Dividend Yield, Price Earnings Ratio and Return on Equity) have on the dependent variable (Average Share Price). The results show that Earnings Per Share, Dividend Yield, and Price Earnings Ratio influence Average Share Price of the selected pharmaceutical and chemical companies by 79.6% (R Square = 0.796) but only one variable i.e. Return On Equity has no influence over Average Share Price.

Table 9 supports the hypothesis for some variables while it does not support the hypothesis for others. The findings of the paper differ from previous studies in that they consider a larger number of independent variables. The independent variables have been explored separately in previous studies. However the authors were unable to locate a paper which examines the

variables together. The grouping of the variables improves the statistical coverage and the validity of the results.

5. Conclusions

The paper finds results which differ from previous studies in the following aspects. Firstly, the paper uses a combination of variables not found in previous studies. Secondly, the paper also applies a mix of statistical tools and techniques not used in previous models. Finally, the paper focuses on a financial market not extensively addressed in the literature. The article advances the knowledge on financial markets in developing nations through the examination of a financial centre which has not received significant coverage. The limitations of the paper include the fact that it considers pharmaceutical and chemical companies, and does not account for companies from other sectors of the economy. Another limitation of the paper is that it does not compare the performance of the selected companies with the market in Dhaka.

The Bangladesh economy is growing and all major economic indicators demonstrate positive trends. The study combines numerous financial indicators to examine share price volatility in selected companies in Chittagong. The study is important since it focuses on the share price performance of companies in Chittagong, whereas previous studies have shown a tendency to focus on the markets of Dhaka. The methodology in the study can be used for any company listed on the stock exchanges of the nation. More rigorous studies can be conducted in the coming years on the share price volatility of companies in the nation. In light of the findings, appropriate policies can be formulated and implemented for sustainable economic growth and stability.

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