

The Relationship Between Corporate Social Responsibility Scores, Earnings Per Share, and Stock Price Volatility in the Pharmaceutical Industry

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Abstract. This empirical study examines the relationship between pharmaceutical stock price volatility, Corporate Social Responsibility (CSR) scores, and Earnings Per Share (EPS) using data from forty publicly traded companies in the US and Europe from 2015 to 2024. A quantitative approach is used to explore the relationship. This study examines how CSR and profitability affect stock market activity using multiple regression analysis. Firm-level variables including market capitalisation, R&D spending, and board makeup are also considered. Since CSR scores and stock price volatility are slightly inversely related, organisations with high CSR scores can have reduced risk profiles. Even if the correlation is not statistically significant, EPS are positively correlated with volatility, suggesting that stock performance stability cannot be reached exclusively by profitability. Volatility, R&D spending, and board size were negatively correlated. These interactions were especially important in innovation and governance systems. Multicollinearity between variables like total assets and tradable share fractions necessitates better models for future research. The results support the hypothesis that pharmaceutical companies' CSR activities decrease financial risk less than previously thought.

Keywords: Corporate Social Responsibility, EPS, Stock Price Volatility, Pharmaceutical Industry.

1. Introduction

In the complex and scrutinised pharmaceutical sector, ethical commitments and financial performance are closely related. As stakeholder demands rise, corporate social responsibility (CSR) has become a strategic tool for transparency, risk management, and investor trust. Businesses and investors still use earnings per share (EPS) as a performance metric.

CSR has become a strategic need in environmentally and socially scrutinised industries, affecting financial performance and commercial value. Academics disagree on whether CSR increases economic value, despite the view that it improves governance and reputation. Yang and Yulianto found that CSR, particularly for social and environmental performance, lowers equity costs in environmentally sensitive economic sectors [1]. However, this gain is less important for chemical firms than pharmaceutical companies. Ji and Liu found that CSR boosts firm reputation and

performance. Reputation mediates pharmaceutical business interactions [2]. However, corporate social responsibility can work differently in different markets. Marc et al. found that Indonesian pharmaceutical firms' firm values are unaffected by CSR and Price Earnings Ratio, which suggests that corporate social responsibility's financial benefits depend on the circumstances [3]. In contrast, Chowdhury and Nehal show that Bangladesh's banking sector's CSR expenditures positively correlate with financial measures including ROA, ROE, and EPS [4]. This supports the premise that CSR can be strategic in certain industries. Shehu and Friday show that adding CSR elements like employee benefits and philanthropy increases the value of Nigerian pharmaceutical companies [5]. The complicated and context-dependent relationship between CSR and financial success is shown by setting-specific research.

CSR is related to stock prices and market dynamics during economic uncertainty or reputational risk. Tamtomo and Setiawan examine how CSR affects stock volatility in industries with economic policy uncertainty [6]. Their main focus is how profitability and leverage ratios affect intermediary actions. Given the association between corporate social responsibility and uncertainty, socially responsible enterprises, especially those in unstable contexts, can incur heightened volatility. Kumar et al. note that CSR stabilises stock markets and investor sentiment, so pharmaceutical companies that lowered their prices during the COVID-19 pandemic sustained positive investor sentiment, especially during public crises [7]. Ouyang et al. illuminated a reactive, reputational side of CSR that affects investor perception, and show how product-harm circumstances encourage corporations to upgrade their CSR initiatives to regain moral legitimacy [8]. Chouaibi et al. found that CSR measures considerably cut the implicit cost of equity for French ESG enterprises. Long-term investors can see socially responsible firms as less risky, which influences volatility [9]. Khan and Hameed state that dividend distribution and EPS affect pharmaceutical stock volatility, but EPS exhibits a negative link, though this is not statistically significant [10]. Only under certain conditions can CSR affect volatility, according to these studies. Investor activities, crisis management preparedness, and a company's financial plan all affect these variables.

Pharmaceutical stock price movements should be analysed using EPS and other financial metrics, especially when paired with corporate responsibility and other performance indicators. Financial performance, as measured by EPS and ROA, boosts stock values, according to Hafidzi and Qomariah [11]. Investors prioritise sustainability and resilience during crises like the COVID-19 pandemic, strengthening this connection. A comparable study by Shabbir et al. revealed no linear relationship between CSR and firm performance, and found that environmental and governance disclosures affected market-based and accounting-based returns, with governance moderating the relationship [12]. Lubis and Purwanto found that pharmaceutical company stock prices are strongly influenced by EPS, even while the price-earnings ratio has a small effect [13]. Ge et al. examine how CSR disclosures reduce budgetary constraints, with a synergy between excellent CSR performance and a strategic report tone makes capital access simpler, stabilising stock behaviour [14]. Lobo and Bhat recommend further research on share price movements in the Indian pharmaceutical business, particularly spanning many economic cycles, based on their extensive literature review [15]. Their findings demonstrate that the industry is vulnerable to EPS and other financial indicators, although there are few studies linking these metrics to long-term stock performance. These studies show that pharmaceutical stock price variations are heavily influenced by profitability per share and other variables.

Additionally, CSR can affect business value, financial performance, and stock price volatility. These consequences vary by sector, investor perspective, and regional market dynamics. Although the direct impact of CSR on stock stability is unknown, it can boost corporate reputation and reduce

financial constraints. Additionally, EPS is a key financial statistic that affects stock prices, notably in the pharmaceutical industry. CSR and EPS synergistically affect stock price volatility, although past research ignores or studies them independently.

Existing studies often treat CSR and EPS in isolation or fail to account for their combined influence on stock price volatility. This creates a research gap in understanding how CSR engagement and profitability jointly shape market risk in pharmaceutical firms. This study fills the vacuum by empirically examining the relationship between CSR scores, EPS, and stock price volatility. This study evaluates a representative sample of forty US and European pharmaceutical companies from 2015 to 2024. This research examines CSR scores, earnings per share, and stock price volatility to assess market risk, and uses major control elements like board size, market capitalisation, and R&D expenditure to examine the relationship between financial and ethical dimensions and their effects on market behaviour and volatility.

2. Methodology

2.1. Variables

This quantitative analysis examines the volatility of pharmaceutical industry EPS, CSR, and stock prices Volatility. This empirical study used secondary data from forty US and European pharmaceutical companies from 2015 to 2024. After controlling crucial firm-level characteristics, a statistical analysis will determine how CSR engagement and profitability affect stock price stability.

Reputable sustainability and finance specialists provided the information. Using MSCI ESG Research's rigorous evaluations of firms' environmental, social, and governance performance, CSR ratings were calculated. The whole financial data, including earnings per share and daily stock prices, was collected from Bloomberg. The firms' ownership structure, market capitalisation, total assets, revenue, board size, Tobin's Q, and R&D spending using Yahoo Finance and their annual reports. All variables are shown in Table 1 below.

Table 1: Variable definitions and measurement

Variable	Abbr	Type	Definition / Description	Measurement / Calculation
Stock Price Volatility	SPV	Dependent Variable	Degree of variation in stock prices over time, indicating market-perceived risk	Annual standard deviation of daily logarithmic returns
CSR Scores	CSR	Independent Variable	Composite score evaluating environmental, social, and governance practices	MSCI ESG Ratings
Earnings Per Share (EPS)	EPS	Independent Variable	Portion of net income allocated to each share of common stock, reflecting profitability	EPS = Net Income / Number of Outstanding Shares
Market Capitalization	MC	Control Variable	Total market value of a company's outstanding shares	Share Price multiplied by Number of Shares Outstanding
R&D Spending	RD	Control Variable	Annual expenditure on research and development	R&D expenditure
Total Assets	TA	Control Variable	Monetary value of everything a company owns	Total Assets
Total Revenue	TR	Control Variable	Total income from sales and other operations	Total Revenue/Sales
Debt-to-Equity Ratio	DE	Control Variable	Indicator of financial leverage	Total Liabilities / Shareholders' Equity
Board Size	BOA RD	Control Variable	Number of directors on a company's board	Count of board members
Tobin's Q	TOBI NQ	Control Variable	Ratio of market value to asset replacement cost	Market Value of Firm / Replacement Cost of Assets
Proportion of Shares Held by Institutional Investors	PI	Control Variable	Extent of ownership by institutional investors	Percentage of total shares held by institutions
Proportion of Shares Held by Tradable Investors	PT	Control Variable	Extent of shares that are publicly tradable	Percentage of total shares held by public or non-restricted investors

2.2. Hypotheses

Prior research highlights that CSR can reduce stock price volatility by enhancing firm reputation and lowering perceived risk [2]. Conversely, EPS has been found to influence stock dynamics, potentially increasing volatility due to investor reactions to profitability signals [10]. However, existing studies rarely examine CSR and EPS together in relation to market risk. Thus, this research makes the following hypotheses.

H0 (Null Hypothesis for H1): CSR scores and EPS have no relationship with Stock Price Volatility in the pharmaceutical industry.

H1 (Alternative Hypothesis for H1): Higher CSR scores are associated with lower Stock Price Volatility, and higher EPS are associated with higher Stock Price Volatility in the pharmaceutical industry.

2.3. Model formulation

SPSS was used for regression modeling. The model's fitness was evaluated using R-squared and F-statistics. Multicollinearity diagnostics, including the Variance Inflation Factor (VIF) and Condition Index, were conducted to ensure the robustness of the results.

$$\ln(SP_{it}) = a_0 + a_1 \ln(CSR_{it}) + a_2 \ln(EPS_{it}) + a_3 \ln(MC_{it}) + a_4 \ln(RD_{it})$$

$$+a_5\ln(TA_{it}) + a_6\ln(TR_{it}) + a_7\ln(DE_{it}) + a_8BOARD_{it} + a_9TOBINQ_{it} + a_4PI_{it} + a_4PT_{it} + \mu_{it}$$

The model is a log-linear multiple regression that explains the natural logarithm of stock price volatility $\ln(SPV_{it})$ as a function of various financial and structural variables.

$\ln(CSR_{it})$ represents the natural logarithm of Corporate Social Responsibility scores for firm i at time t , capturing the ethical and governance-related practices that may influence market stability.

$\ln(EPS_{it})$ is the natural logarithm of Earnings Per Share, indicating firm profitability and its potential effect on investor behavior and stock volatility.

$\ln(MC_{it})$ and $\ln(RD_{it})$ are the logs of Market Capitalization and R&D Spending, respectively, accounting for firm size and innovation investment as control factors.

$\ln(TA_{it})$ and $\ln(TR_{it})$ refer to the natural logarithms of Total Assets and Total Revenue, controlling for overall operational scale.

$\ln(DE_{it})$ accounts for the firm's financial leverage through the Debt-to-Equity Ratio.

$BOARD_{it}$ reflects Board Size, a governance variable expected to influence decision-making quality and oversight.

$TOBINQ_{it}$ measures firm value relative to asset replacement cost, capturing market valuation efficiency.

PI_{it} and PT_{it} represent the proportions of shares held by institutional and tradable investors, controlling for ownership structure and liquidity effects.

μ_{it} is the error term, accounting for unobserved influences.

2.4. Descriptive statistics

Table 2 shows numerous features and means and standard deviations from 171 pharmaceutical companies. These variables reflect numerous corporate operational and financial measurements. Stock price volatility, has a standard deviation of 1.03607 and a mean of 0.0643, indicating a lot of volatility diversity. EPS averages 4.8464 with a large fluctuation, indicating that company profitability varies greatly. However, CSR Scores average 71.3158 with moderate variation.

Table 2: Summary statistics

	Mean	Std. Deviation	N
SP_Volatility	0.0643	1.03607	171
CSR_Scores	71.3158	18.10573	171
EPS	4.8464	9.24947	171
Market_Capitalization	104218.9573	127782.0072	171
RD_Spending	4528.9954	5092.82575	171
Tot_Asset	53024.9536	57347.44914	171
Tot_Rev	23115.9259	24756.90542	171
DE_Ratio	108.5964	229.07561	171
Board_Size	11.7953	2.58028	171
Tobins_q	3.3838	2.23336	171
Pro_of_ins	74.1049	25.27079	171
Pro_of_tra	89.92	17.2058	171

The analysed companies' diverse market capitalisation and total assets show their major variances. In addition, the Debt-to-Equity Ratio and board size fluctuate greatly. Research & development spending and overall income diverge due to the extent of activities and the substantial investment in innovation.

Based on the observed data, it is anticipated that higher CSR Scores could be associated with lower Stock Price Volatility, suggesting a potential risk-mitigating effect of CSR activities. Similarly, companies with higher Market Capitalization and R&D Spending can exhibit stronger financial performance, suggesting a robust relationship between company size, innovation investment, and earnings per share.

3. Regression analysis

3.1. Results

Table 3 and 4 from the regression output shows that the model is statistically significant because the F-statistic is 6.159 and the p-value is 0.000. This shows that independent and control factors account for a considerable amount of the variance in the dependent variable, stock price volatility.

Table 3: Model summary

R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					
				R Square Change	F Change	df 1	df2	Sig. F Change	Durbin-Watson
.407 _a	0.165	0.139	0.87833	0.165	6.159	11	342	0	2.481
a Predictors: (Constant), PT, TOBINQ, CSR, PI, DE, EPS, BOARD, MC, TR, RD, TA									
b Dependent Variable: SPV									

The regression's sum of squares is 52.27 (see Table 4), indicating that the model accounts for 316.111 of the variation. The model, with 11 predictors and 342 residual degrees of freedom, is highly explicative. This supports the interpretation of individual coefficients and shows that CSR, EPS, and firm-specific control variables explain pharmaceutical share price volatility.

Table 4: ANOVA results

	Sum of Squares	df	Mean Square	F	Sig.
Regression	52.27	11	4.752	6.159	.000 ^b
Residual	263.842	342	0.771		
Total	316.111	353			
b Predictors: (Constant), PT, TOBINQ, CSR, PI, DE, EPS, BOARD, MC, TR, RD, TA					

According to Table 5, the non-standardized coefficient of corporate social responsibility (CSR) is -0.014 and the standardised beta is -0.032, indicating a strong negative correlation with stock price volatility. Although there is little statistical significance ($p = 0.531$), increasing CSR participation can reduce volatility. This matches theoretical assumptions. The tolerance level is 0.948 and the variance inflation factor (VIF) is 1.055, proving that the CSR is not multicollinear. This suggests that the model's CSR assessment is trustworthy and unaffected by other parameters.

Table 5: Coefficients

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Correlations			Collinearity Statistics	
	B	Std. Error				Zero-order	Partial	Part	Tolerance	VIF
(Constant)	1.066	0.481		2.218	0.027					
CSR	-0.014	0.023	-0.032	-0.627	0.531	0.001	-0.034	-0.031	0.948	1.055
EPS	0.327	0.045	0.449	7.248	0	0.321	0.365	0.358	0.636	1.573
MC	-0.013	0.159	-0.023	-0.08	0.936	-0.01	-0.004	-0.004	0.03	32.787
RD	-0.109	0.098	-0.197	-1.114	0.266	-0.043	-0.06	-0.055	0.078	12.763
TA	0.073	0.165	0.151	0.44	0.66	-0.048	0.024	0.022	0.021	48.005
TR	-0.03	0.068	-0.071	-0.441	0.659	-0.041	-0.024	-0.022	0.094	10.679
DE	-0.03	0.03	-0.06	-1.019	0.309	-0.112	-0.055	-0.05	0.692	1.446
BOARD	-0.019	0.025	-0.054	-0.78	0.436	-0.018	-0.042	-0.039	0.506	1.978
TOBINQ	0.024	0.04	0.066	0.596	0.552	0.037	0.032	0.029	0.199	5.036
PI	-0.193	0.204	-0.05	-0.949	0.343	-0.043	-0.051	-0.047	0.871	1.148
PT	-0.43	0.309	-0.084	-1.392	0.165	-0.052	-0.075	-0.069	0.677	1.477

Dependent Variable: SPV

Unfortunately, earnings per share (EPS) negatively affects stock price volatility statistically. Increasing earnings per share is associated with higher volatility, as shown by a 0.000 p-value and 0.327 unstandardised coefficient. The standardised coefficient ($\beta = 0.449$) indicates a considerable effect size to consider. Better earnings can encourage investors to speculate or generate market changes, which can enhance volatility. Earnings boost performance but can also sway the market. Multicollinearity is not a problem because the VIF and EPS tolerance are acceptable. The VIF was 1.573 and the EPS tolerance was 0.636. According to the model, EPS)is the best predictor of stock performance and performance.

Finally, the control variables have no statistically significant effect on SWV because their p-values are larger than 0.05. Despite their potential influence on market stability, the coefficients of MC, TA, and TR, financial scale indicators, do not explain volatility in this model. SPV does not correlate with governance criteria like Board Size or Tobin's Q, which are used to analyse market valuation and management structure at the organisational level. The coefficients of ownership structure indicators like PT and PI shareholdings are weak and statistically negligible.This suggests that investor mix does not greatly affect volatility.

Overall, the findings invalidate both H0 and H1.Stock price volatility is weakly negatively correlated with corporate social responsibility (CSR) rankings. CSR activities can minimise volatility since investors consider companies with high CSR rankings as more responsible and reliable. However, earnings per share (EPS) is somewhat positively correlated with stock price volatility, suggesting that higher profitability can increase volatility.

3.2. Recommendations

Pharmaceutical companies should include CSR in their long-term financial plan together with revenue growth. This study found a statistically significant positive association between EPS and stock price volatility. Profit growth can increase market speculation and volatility. However, the modest negative connection between the two variables implies that CSR measures can reduce this effect. Companies with strong profit growth should consider CSR as a stabilising factor that shows a long-term commitment to ethics and increases investment safety. Pharmaceutical businesses can use

CSR programs in their financial decision-making to reduce the hazards of rapid profit growth. These options include equal drug prices, ethical procurement, community health activities, and environmental sustainability. This equilibrium can inspire investor trust, which can help stocks perform better during market upheaval or heightened regulatory oversight.

Pharmaceutical businesses should also emphasise the link between CSR performance and earnings quality in investor communications. Given that CSR had a statistically minimal negative effect on stock price volatility, market players either undervalue or ignore it. Given that EPS affects volatility, short-term prosperity can skew investors' expectations. Companies should link their CSR disclosures to their financial performance to promote transparency. This will show how ethics boosts revenue and efficiency. Investor briefings on how corporate social responsibility efforts boost future profit potential without weakening stability, financial statements on environmental, social, and governance issues, and integrated reporting systems can fall under this category. Pharmaceutical companies can need to restructure investor perceptions to emphasise profitability and accountability to encourage long-term investment and reduce earnings-driven volatility.

4. Conclusion

This study examined the relationship between pharmaceutical stock price volatility, CSR scores, and EPS. This study used 2015–2024 data from 40 publicly traded US and European corporations. Regression study showed a weakly negative relationship between corporate social responsibility and volatility. However, volatility was positively correlated with earnings per share. This suggests that high-earning corporations have more stock price volatility. These findings suggest that CSR can offset profitability's influence on investor behaviour by improving governance and reputational signals, resulting in more consistent market responses. All research show that CSR and EPS are interconnected elements that affect financial risk and investor sentiment.

Despite its discoveries, the study had limitations. The sole basis for corporate social responsibility data was MSCI ESG rankings, a drawback. This shows that the data can not accurately reflect all CSR initiatives or stakeholder opinions of them. Since the sample consisted only of US and European pharmaceutical companies, the findings can not apply to emerging markets or other industries. Revenue and total asset correlation can have affected coefficient estimates. Standard deviation of daily log returns is a reliable volatility measure, although it can not reflect intra-day market dynamics or investor behaviour during extreme volatility.

Future research could address these limitations by employing alternative CSR scoring methodologies, including stakeholder-based surveys or narrative-based ESG disclosures, to assess non-financial corporate performance more holistically. Expanding the geographic scope to include firms in Asia, Africa, or Latin America would offer comparative insights into how CSR and EPS interact in different regulatory and cultural environments. This will be done within various cultural and legal systems. Structural equation modelling and time-series methods can improve analysis of the feedback processes between CSR, profitability, and investor reactions. Since the pharmaceutical industry is ethically and financially complex, it would be interesting to study moderating variables like corporate innovation strategies, crisis response patterns, and investor composition to understand price volatility's complex relationships. definitions and measurement

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