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Cash dividend payment and EPS Performance Insights: Evidence from Selected Standard and Poor Economic Sectors in Time-Series Approach

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ABSTRACT

Introduction: Earnings per share (EPS) as performance measure and its effect on cash dividend payments has become a topical issue in both developed and developing countries.

Objectives: This study examines how earnings per share (EPS) performance affects cash dividend payments in the Standard and Poor 500 (S&P 500) economic sector.

Methods: Employing a sample of four S&P 500 economic sectors with quarterly time-series data of the US stock market spanning from 2008Q1 to 2023Q3 using a dynamic Autoregressive Distributed Lag (ARDL) bounds testing research design and the Granger Causality test.

Results: The study demonstrated that the S&P 500 economic sectors with higher EPS performance better sustain cash dividend payments, in line with investor awareness theory. The positive EPS growth of the financial (FNCL), industrial (INDL), energy (ENGY), and information technology and communication (INCA) sectors shows a notable commitment to cash dividend payments over short- and long-run periods, consistent with signaling theory. Further, the spectroscopy fit peaks result affirms that financial activities significantly contribute to earnings growth capacity to support shareholders' cash dividend expectations.

Conclusions: This study provides important insights, as it acknowledges that the contribution of EPS by the S&P 500 economic sectors of least return has specific prospects to pay dividends to shareholders.

Keywords: S&P 500, EPS, Dividend, Accounting & Finance, Time series, ARDL

1. INTRODUCTION

Since the turn of the century, a burgeoning body of research has used earnings per share (EPS) information in financial accounts to measure corporate performance in relation to invested capital (De Villiers et al., 2003; Balsam & Lipka, 1998). The importance of EPS in both developing and developed large companies in the capital market is recognized in the literature as an acceptable performance measure (Consler et al., 2011) for dividend payout commitment and their respective growth opportunities (Ali, 2022). Earnings undoubtedly drive the predictive ability of cash dividends in accounting numbers (Thielemann, 2018; Chen & Zhao, 2011; Ball & Brown, 1968) and signal a performance effect (Shehata, 2022). This provides insights into the EPS performance of S&P 500 economic sectors in explaining dividend commitments amidst the inherent risks associated with S&P 500 investments (Black, 1976). Additionally, the S&P 500 reckons EPS as a driver of earnings for the growth trajectory across economic sectors for proactive investment decisions by market participants in anticipation of excess returns from diversified sectors (Gary,

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2017; Butters, 2022; Butter, 2022). It is also worth noting that the S&P 500 catalyzes the overall performance if the US government assesses the financial health of the economy.

It is worth noting that several researchers have inadvertently presented their works related to this topic emphasizing on dividend policy as the unit of interest complementing other performance and corporate governance metrics such as return on equity, return on assets, free cash flow savings, dividend yield/or capacity, corruption, and stock price/repurchase (House & Thornton Jr, 2017; Dong et al., 2021; Ali, 2022; Shehata, 2022; Bossman et al., 2022; Mazur et al., 2023). However, this study largely emphasizes and examines the EPS of the S&P 500 sector as an interest variable in explaining commitment to cash dividend payments. This position was theorized by Jenzen (1986) to heighten earnings quality over mere earnings quantity, as posited in the work of Ball and Brown (1968). Therefore, this study explains that the EPS of the S&P 500 sectors have an aversion to sustaining dividend payments and would pave a resilient pathway for investment growth. Therefore, we posit that EPS capacity, which emanates from the sector's production volume or operational level, may drive a commitment to sustain dividend payments. This is especially true if the economic sectors intermittently reveal the least performers in return and sales, just as influencing the selection of the energy, financial, and industrial sectors (except information technology) in this study.

Furthermore, the low returns and earnings-performing sectors provide support for reduced dividend payments (Das & Dhole, 2024) which catalyze the ground for investors selling their shares. As a result, shareholders may occasionally protest to ascertain why a corporation is unable to pay dividends. For instance, Lehman Brothers experienced poor EPS, but continued to pay dividends, consequently causing cessation to operate (Acharya et al., 2017; Mazur et al., 2023). This suggests that EPS is a significant determinant of cash dividend obligations and illiquidity corrections, stabilizes market sentiment, corrects differences in risk perception, and improves information asymmetry so that all could create pathways for future growth prospects. Altogether, market participants should be abreast with sufficient and appropriate information to feed outside investors and other financial communities; hence, full information disclosure on the EPS of the S&P 500 indices is paramount (May, 1968; Erasmus, 2010). Additionally, credit analysts, financial analysts, and those charged with governance must make many inroads into the S&P 500 EPS analysis of their cash dividend aspirations. This requires increasing demand from market participants and other investors for EPS information to serve the best interests of the financial community (Gharaibeh et al., 2022).

As pointed out in the strand literature, the quality of EPS can contribute to reducing uncertainties associated with market differentials (Bossman et al., 2022) to reduce risk investment choices (Hagendorff & Vallascas, 2011) to benefit from sustained dividend payments. This re-echoes the study objective of exploring the extent to which the EPS of the S&P 500 sector is committed to cash dividend payments. Thus, this study selected the S&P sectors considered to be the least performers in returns and sales. Therefore, the fundamental question is whether prudent management of earnings per share of the S&P 500 sector explains its commitment to cash dividend payments in the long run. Earnings per share can potentially generate greater liquidity in sector-based products, offering reasonable assurance of driving cash dividends for sustainable and responsible consumption initiatives (Chen & Zhao. 2011; Mary et al., 2001). Thus, all things being equal, earnings can enhance responsible consumption to realize Sustainable Development Goals (SDGs) through judicious selection of economic activities. The vibrant S&P 500 sector reflects the ability to economically realize and utilize EPS opportunities to facilitate strategic consumption planning and policies to position their competitive environment in terms of share prices, returns, and market share (Péli, 2023; Saleh, 2023). This circumstantial evidence is predominant in the U.S. S&P 500 sector, which increases market efficiency (S&P Dow Jones, 2019).

In addition, the argument affirmed that the U.S economy has heavily undergone financial regimes, especially after the Enron case and the oversight role of the Sarbanes Oxley Act (Act 2002) in the financial sector. These regulated bodies in the US have focused on financial transparency and accountability reporting in all matters of value creation. Furthermore, the S&P 500 commands 80% of the US market value, signifying its importance in the global stock marketplace (Mohamed, 2024; Tong & Bin, 2011). Evidence shows that the S&P 500 presents financial issues of strategic importance that deal with the composition of equity portfolios of relative primary importance in earnings and returns (Tong & Bin, 2011) accounting numbers. Sector-based products induce active returns, including EPS capacity, to drive dividend payments to attract both financial investors and other major stakeholders in the long run. This study ascertains the extent to which S&P 500 earnings arouse the interest of stakeholders for long-term

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investment in these sectoral indices. This study argues that the S&P 500 sectors (energy, financial, industrial, and information technology) provide evidence of causal effects between their EPS and the extent of cash dividend performance. Although the application of causality effects in economics has been minimal in accounting and finance (Auret & De Villiers, 2000), especially from the S&P 500 perspective, this study provides evidence. Therefore, this study investigates the causal relationships between the selected S&P 500 EPS in economic sectors and cash dividends.

This study contributes to the literature by providing empirical evidence that the S&P 500 EPS can influence cash dividend commitment. Specifically, this study documents the impact of the EPS of S&P 500 economic activity on cash dividends by using the listed stock market of the US economy and finds that the granularity of the data and information tends to match the idea of the study. It is acceptable that the granularity of data and information enhances greater computational needs and broader applicability in achieving the research goals.

The contributions of this study are as follows. First, the study proposes an interest variable to be EPS instead of dividend, which has been postulated and applied by several prior strands of work. Unconsciously, quality EPS is anticipated to give rise to sustained cash dividend payments, all things being equal (Auret & De Villiers, 200; Tong & Bin, 2011). Moreover, studies have pointed out that engaging in quality and sustainable EPS paves the way for improvement in cash dividends to arouse the expectations of shareholders and offer protection to analysts. This shift provides evidence in literature.

Second, this study focuses on the advanced economy of the U.S., which leverages granular datasets to strengthen the S&P sectors and improve EPS performance to explain cash dividend commitments. Considering the various forms of earnings restructuring that took place in the U.S. financial sector between 2017 and 2019, this study aims to determine whether earnings quality during such turbulent times influences cash dividend commitments. This study provides crucial evidence from an advanced economic context. For the estimation technique, this study employs Autoregressive Distributed Lag (ARDL), supported by the Granger Causality and impulse response tests, to augment the running of the data to minimize the spurious test results inherent to regression models. This estimation is appropriate for answering research hypotheses regarding current trends.

The results reveal that S&P 500 sectors with enhanced EPS have better quality and sustainable cash dividend payments based on the investor awareness assumption and resource-based theories. Such relationships may vary according to the magnitude of reported earnings of the sector's performance information. The S&P 500 economic sectors of financial, industrial energy, and information technology show positive EPS growth, reassuring a notable improvement in cash dividend payments over short- and long-run periods, which is consistent with resource-based theory.

This paper has the following section organization. Section 2 evaluates the empirical literature review and hypothesis. Section 3 deals with our data source, methodology and model specifications. Analysis and discussion of results are presented in Section 4, and the concluding remark and proposal for plan of action are in Section 5.

2. LITERATURE REVIEW AND HYPOTHESIS TESTING

2.1 Theoretical framework

There has been an ongoing debate regarding the relevance of EPS quality in predicting or determining a corporation's cash dividends (Tong & Bin, 2011). Numerous theories have been used to explain the significance of EPS quality. Theories such as investor awareness assumption and resource-based view theories were used in this study. The investor awareness assumption theory posits that investors are legitimately informed and have accumulated pensive knowledge and information about acceptable business performance measures because firms have many stakeholders with varying interests. This is because of the illiteracy level of many of these investors exists (Lusardi & Mitchell, 2014) and the essential disclosure of information becomes critical. It is obvious that management may focus on products that offer much EPS to attract the implication of dividend payments to shareholders. In line with mandatory information disclosure, those charged with governance tend to scrutinize and prioritize earnings information on a timely basis in economic sectors to facilitate dividend growth to attract investors as part of their investment decisions.

In line with investor awareness theory, Porter's (1986) resource-based view stipulates that the sustainability and achievement of firms' competitive advantage mainly depend on firms' resources and capabilities that are valuable,

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rarely imitable, and could have a strong ability to respond to changing market conditions. By implication, sectors that accrue strategic EPS could leverage them to facilitate dividend payments to sustain competitive advantages over other sectors (Porter, 1985; Penrose, 1959). It should be pointed out that returns or earnings of economic sectors should not be depleted for the sake of dividend payment obligations or should make use of debt to fund dividends when there is a need to choose between internal funds and external debt.

2.2 Empirical consideration

Some authors prior studies have established strand of literature to explore association between financial performance and cash dividend in the areas of finance and accounting (Ahad et al., 2018; Farruk et al., 2017; Hauser & Thorton, 2017). Such studies consistently accept the use of financial performance metrics as the dependent variables, indicating a signal as if that should be the norm. However, most studies outcomes were equivocal, perhaps because of data variations and model misspecification. Specifically, this study examines the extent to which EPS of the S&P 500 sectors contributes to explaining cash dividend payments, as investors tend to signal positively with sectors with more resilient EPS (Tong & Bin, 2011; Auret & De Villiers, 2000). Indeed, there are few studies in this area. For example, the study of Norvaišienė and Stankevičienė (2012) in Lithuania and Vuong, Vu, and Mitra (2017) in UK showed negative earnings indicating that firms spend more than its earnings per share to facilitate debt financing, perhaps leading to increase the volatility of EPS, to thwart the ability of those charge with governance to enhance dividend payments.

Gupta (2015) discovered an affirmative link between capital structure and higher interest coverage, but a positive relationship between profitability and the EPS of Indian enterprises. Should there be an indication of lower service costs, this would have positive consequences for earnings per share. Mand and Singh's (2015) panel data regression study also supported a positive association in EPS and higher interest coverage in capital structure, similar to Saleem and Naseem (2013) and Utami and Hidayah (2017). In contrast, Chen and Chou (2015) also find that EPS has long-term detrimental repercussions on Chinese firms' capital structure in the lower interest ratio coverage, maneuvering effect, and eventually EPS has on the payment of dividends. According to Auret and De Villiers (2000) and Chen and Zhao (2011), there is a correlation between EPS growth and cash dividend payments, which supports the investor awareness theory by indicating that positive EPS connotes higher cash flow coverage ratio leading to motivate reasonable dividend distribution. This tendency reinforces the relevance of the EPS as a predictor of market dynamics and financial stability, which increases investor confidence and may lead to more investments in the future.

Jensen and Meckling (1976) suggest that healthier financial earnings provide better positive synergies for distributing cash dividends to investors to meet their aspirations. This strand is consistent with the resource-based theory narratives that uphold the explanation for cash dividend payment attractiveness. Ultimately, investors' confidence and market momentum are enhanced when EPS is sufficient to make dividend commitments, as opposed to lower EPS. This synergy is marked by investors tending to make social expenditures out of their cash dividends to increase their personal ego and social resources. Consistently, an extensive body of studies pinpoints that corporations that exhibit better earnings also tend to provide larger and commitment to pay dividends (Lintner (1956). Grullon and Michaely (2002) and DeAngelo et al. (2004) indicated that profitable firms generally pay higher dividends, which may positively correlate with future revenue growth in such sectors. An increasing EPS indicates that investors often view stable or growing dividends as signs of financial stability and improved profitability, which can positively influence stock prices in the future. Conversely, if the EPS falls, the company may reduce or skip dividends to preserve cash flows for unavoidable commitments, thus achieving a reasonable assurance of enhancing firm value in the long run. Conversely, declining or stagnant EPS can lead to reduced dividends and investor dissatisfaction, thereby affecting a company's reputation and value in the marketplace.

Shaw and Kruglov (2024) revealed that R&D intensity measures innovation, which is considered important in helping explain or improve the financial performance of S&P 500 pharmaceutical companies. Thus, innovation facilitates frontier stock market operations and provides them with earnings assurance to achieve market leadership. Their findings emphasize that financial strength does not always result in linear innovation. It cannot be ruled out that shareholders prime aim to invest in firms with greater liquidity, returns and least risk to encourage and support payment of sustainable dividends.

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It is expected that the larger the sales volume, the higher the EPS value and the more companies are capable of investing in committing to paying dividends (Gai, 2010; Zs et al., 2014). Following this, is it relevant for the S&P 500 sectors with the least performance to pay dividends out of their illiquid earnings? This affirms that the reverse of the puzzle 'effect of dividend policy on firm performance' needs to be studied. During the Covid 19 economic crisis, economic activities were disrupted, resulting in a decline in industry performance indicators such as stock prices and profits in total output due to a sharp decline in consumption (Mazur et al., 2023; Campello et al., 2010). Because EPS capacity is related to an industry's potential sensitivity to paying dividends and ensuring future growth, such a stressful situation affects the effective dividend commitment of some industries. However, other S&P 500 sectors have shown positive cash dividend payments (Litner, 1956). Thus, earnings per share can determine dividend commitment. However, other S&P 500 sectors display affirmative payouts for cash dividends (Litner, 1956). Thus, earnings per share and liquidity can determine corporate dividend commitment.

Investors' awareness of information about sectors that offer much earnings and resource-based theories tend to uphold earnings to support the literature to elucidate the resilience of S&P 500 sector EPS. Therefore, its significance in investigating the effect of EPS of S&P 500 sector on the cash dividend payment serve to fill this study, amidst least-performed sectors make this study appropriate. Based on these theoretical bases, we put forward the central research hypothesis:

H_1: There is no significant relationship between earnings per share and cash dividends in the S&P 500 sector of the US stock market.

In contrast to this study's objective, many prior studies have drawn conclusions regarding the effect of dividends on firms' performance contextually (Ahmad et al., 2018; Farrukh et al., 2017; Hause, 2017; Shah & Mehta, 2016). Research indicates that management's self-interest frequently causes dividend distributions to become insensitive to profitability. For instance, corporations such as Lehman Brothers and Merrill Lynch paid dividends even though they lost money during the financial crisis that lasted from 2007 to 2009. Additionally, during the COVID-19 era, there was an unclear correlation between profits and dividend disbursements, consequently resisting the alteration of dividends (Mazur et al., 2023; Ali, 2022). Using annual reports from four companies (2015-2019), Probadhika and Ratmayake (2022) critically examined the connection between dividend policy ratios and company performance in the US apparel sector. It was concluded that the dividend policy ratio has a signaling role that significantly impacts a company's performance, especially in the manufacturing industry with a changing business environment. The dependent variable was return on equity (RoE), and the independent variables were dividend per share (DPS) and earnings per share (EPS). This result shows a positive relationship between the ROE proportion and firm DPS but reveals an unimportant relationship with EPS (Juhandi et al., 2019; Sukmawardini & Ardiansan, 2018; Lumapow & Tumiwa, 2017). Magnusson and Enebrand (2018) studied how dividends affect business performance and stock prices, using the OLS estimation technique. This study used data from mid- and large-cap companies listed on the Stockholm Stock Exchange (2007-2017). The results show that the stock prices of firms with high dividend yields depend more on financial performance and conclude that business earnings are sufficient to outweigh the rate of inflation.

Similarly, Amidu (2007) examined whether dividend policy affects corporate performance in Ghana using financial statement data from companies listed on the GSE over the past eight years. The results show a positive relationship between return on assets, dividend policy, and sales growth, while larger firms perform worse in terms of ROA. This paper confirmed inverse correlation among these variables ROA, dividend payout ratio, and leverage. This study supports previous empirical findings and highlights the impact of dividend policy on firm performance on the Ghana Stock Exchange (Oppong, 2015). Hence, causality and impulse response estimators were used to achieve the study's objectives. Thus, by employing a dynamic model, this study investigates the extent to which EPS of S&P 500 sectors explain the cash dividend payment amidst the least performer of some S&P sectors of the US stock market. We emphasize the use of a dynamic estimator as employed by Asumadu-Sarkodie and Owusu (2016). Subsequently, the study caters to biases with omitted variables, endogeneity, and heteroscedasticity prevalent with the ARDL bound approach to achieve the study purpose. This study is theoretically positioned to examine this topic in the opposite direction; hence, our research design procedures included the unit root test, causality, impulse-response test, diagnostics, and stability tests to achieve this research objective (Asumadu-Sarkodie & Owusu, 2016). This study adds

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to the body of knowledge by strengthening earlier research on EPS in S&P 500 sectors and advancing the discussion on EPS performance on a worldwide scale. Additionally, this study's policy advice offers detailed insights into the EPS of the S&P 500 on all economic activities.

3. RESEARCH METHODS

3.1 Data

The data used in this study are for both accounting and market types from the S&P 500 website. The study was conducted in a population of 11 economic sectors of the S&P 500, of which four were sampled. This index contributes 80% of the total value in the US stock market and, hence, the selection of this index. The selected sectors are guided by the 2023 S&P 500 breakdown composition of the index by sector return ranking. The least performing sectors were the energy, finance, and industrial sectors, with the exception of information technology. Information technology essentially facilitates the processing of all economic activities and, hence, the reason for its selection. It is essential to note that the least performing sectors contribute inimically to the achievement of competitive advantage, thereby militating the payment of dividends, all things being equal. Additionally, such sectors cannot be earnings-resilient during periods of market stress and uncertainty. In view of this, this study envisages some teething challenges in explaining dividend payments, and hence, the need for this study. This study used a quarterly time-series dataset spanning 2008 to 2023Q3, based on data availability. Five variables are considered in this study (Table 1).

Table 1: Variable definitions and data source(s)

Table 1 below provides details of the variables used in the analysis including the measurement unit of the variable, the company activity as well as the data source(s) of the variables employed.

Variable	Explanation/measurement unit	Company activity	Data source(s)
CDIV	Dividend per share economic sectors substantially pay	Cash dividend per share for each respective quarter in the years	https://www.spglobal.com › additional-material,xls
ENGY	Earnings per share of the S&P 500 energy sector in year t	Firms dealing with in exploration, refining, oil and gas and consumables	https://www.spglobal.com › additional-material,xls
FNCL	Earnings per share of the S&P 500 financial sector in year t	Firms dealing with banking, financial, consumer services, insurance activity	https://www.spglobal.com › additional-material,xls
INCA	Earnings per share of the S&P 500 information technology and communication sector in year t	Software offering, computers, phones, electronics. IT services, hardware distributors, communication logistics	https://www.spglobal.com › additional-material,xls
INDL	Earnings per share of the S&P 500 industrial sector in year t	Aerospace, defense capital equipment, engineering, construction services, industrial conglomerates	https://www.spglobal.com › additional-material,xls

3.2 Model Strategy

We estimated a linear function among the study variables with CDIV as the dependent variable, as expressed in Equation 1.

$$CDIV_t = f(ENGY_{t,}, FNCL_t, INCA_t, INDL_t) \quad \text{(eq1)}$$

Expression of the empirical specification of the model strategy follows as:

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$$CDIV_t = \beta_0 + \beta_1 ENGY_{t,} + \beta_2 FNCL_t + \beta_3 INCA_t + \beta_4 INDL_t + \varepsilon_t \quad \text{(eq2)}$$

ε_t is the error term, and β_0, are the parameters of elasticities to be estimated. This study uses the ARDL estimation technique because it is superior and unbiased compared to other econometric design variables with small sample sizes (Asumadu-Sarkodie & Owusu, 2016). We track the time-series model of ARDL within the cointegration at I (0) or I (1). The ARDL cointegration regression is expressed as follows:

$$\Delta CDIV_t = \alpha_0 + \delta CDIV + \delta_1 ENGY_{t-t,} + \delta_2 FNCL_{-1} + \delta_3 INCA_{t-1} + \delta_4 INDL_{t-1} + \sum_{i=1}^{P} \beta_1 \Delta CDIV_{2T-i}$$
$$+ \sum_{t=0}^{p} \beta_2 \Delta ENGY_{T-1} + \sum_{t=0}^{p} \beta_3 \Delta FNCL_{T-1} + \sum_{t=0}^{p} \beta_4 \Delta INCA_{T-1} + \sum_{t=0}^{p} \beta_5 \Delta INDL_{T-1} + \varepsilon_t \quad \text{(eq3)}$$

Where α = the intercept,

p = lag order,

ε_t = error term, and

Δ =first-difference operator.

We use F-tests to establish the long-run equilibrium relationship, with the null hypothesis of no cointegration between $\Delta CDIV_{2T-i}$, ENGY, FNCL, INCA, and INDL (see Table 1), against the alternative hypothesis of cointegration between the study variables. The incorporation of the ARDL model examines the predictors that can be changed to explain cash dividends paid to selected S&P economic activities as well as to determine the major determinants affecting every predictor (York et al., 2003).

RESULTS AND DISCUSSION

4.1 Descriptive analysis

Table 2 presents the results of a descriptive analysis of the variables used in this study. The skewness results of the FNCL exhibit a long-left tail (negative skewness), but the remaining study variables reveal positive skewness.

Table 2: Descriptive analysis results

	CDIV	ENGY	FNCL	INCA	INDL
Mean	11.02147	7.203810	6.059048	12.21095	6.805238
Median	11.04116	8.420000	5.500000	9.380000	6.520000
Maximum	17.93871	25.73000	16.06000	27.05000	12.98000
Minimum	5.345000	-9.160000	-13.93000	2.730000	2.080000
Std. Dev.	3.833598	7.3725523	4.976596	6.483642	2.349929
Skewness	0.094244	-0.128734	-0.822535	0.660185	0.448068
Kurtosis	1.761911	3.231276	6.067957	2.322992	2.822094
Jarque-Bera	4.117030	0.314418	31.81136	5.779506	2.191111
Prob.	0.127643	0.854525	0.000000	0.055590	0.334354
Correlation					
CDIV	1				
ENGY	-0.027213	1			
FNCL	0.690605	-0.060058	1		

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INCA	0.916841	0.117932	0.777533	1	
INDL	0.720231	0.396773	0.510646	0.662676	1

In addition, ENEGY and FNCL showed leptokurtic distributions, whereas the remaining variables showed platykurtic distributions. The correlation results of multicollinearity between the variables revealed that the strength of the relationship was less than 0.900, except between the CDIV and INCA.

4.2 Unit Root

The unit root test requirement used Phillips Perrons (PP) and Augmented Dickey Fuller (ADF) test statistics, considering the null and stationarity unit roots, respectively. Both the PP and ADF test estimates are applied for unit root tests and stationarity using time-series data to prevent spurious regression bias (long et al., 2012). According to the test results for Level 2 in Table 3, the null hypothesis of stationarity can be rejected at the 5% significance level. However, the null hypothesis of unit root cannot be rejected in the PP test. Similarly, the first difference test result in Table 3 reveals the rejection of the null hypothesis in the PP test; however, given the null hypothesis's stationarity, PP cannot be ruled out at the 5% significance level, indicating that a series is integrated at I (1). Both FNCL and CDIV achieved stationarity at the level and first difference in intercept and intercept and the trend of PP and ADF unit roots; hence, the ARDL model needs to be applied (see Table 3). This implies that the variables I (0) and I (1) are integrated.

Table 3: Test of unit root

Intercept								
	T-stat	**P-val**	**T-stat**	**P-val**	**T-stat**	**P-val**	**T-stat**	**P-val**
Variable	PP Level		PP 1st Diff		ADF Level		ADF 1st Diff	
CDIV	0.9173	0.9952	-8.5651	0.0000	1.0232	0.9964	-8.5672	0.0000
ENGY	-2.5261	0.1143	-7.9363	0.0000	-2.3843	0.1502	-7.9304	0.0000
FNCL	-2.9059	0.0504	-22.9009	0.0000	-3.1690	0.0267	-10.1932	0.0000
INCA	0.2139	0.9714	-15.0152	0.0000	2.3212	0.9999	-5.0229	0.0001
INDL	-1.7749	0.3893	-7.6346	0.0000	-1.6949	0.4288	-7.6300	0.0000
Intercept & Trend								
CDIV	-3.7017	0.0296	-8.8690	0.0000	-4.5609	0.0029	-8.8790	0.0000
ENGY	-2.4503	0.3510	-7.9271	0.0000	-2.3252	0.4143	-7.9257	0.0000
FNCL	-5.3522	0.0002	-26.2235	0.0001	-5.3572	0.0002	-10.1120	0.0000
INCA	-3.6022	0.0377	-27.5824	0.0001	-0.2327	0.9907	-5.7956	0.0001
INDL	-2.9509	0.1544	-7.6263	0.0000	-2.8372	0.1900	-7.6193	0.0000

4.3 Lag order selection criteria

The lag order selection (Table 4) shows the results of the different criteria used to determine the optimal number of lags for a model. Asterisk (*) indicates the optimal shift order based on each criterion. Specifically, the LR, FPE, and AIC values (41.446, 17.900, and 16.731, respectively) were the lowest at lag 5, and SC (18.578) and HQ (17.927) had the lowest values at lag 1. Overall, lag 5 was indicated as the optimal lag according to the LR, FPE, and AIC, whereas lag 1 was favored according to the SC and HQ criteria.

Table 4: Selection criteria: Lag order

Lag	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
0	-714.886	NA	41535.95	24.823	25.001	24.892
1	-477.855	425.022	27.842	17.512	18.578*	17.927*
2	-459.375	29.949	35.550	17.737	19.690	18.498
3	-431.371	40.558	33.698	17.633	20.475	18.740

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4	-392.778	49.236	23.274	17.164	20.894	18.617
5	-355.216	41.446*	17.900*	16.731*	21.349	18.530

*indicate lag order selected by the criterion (log likelihood (LogL), likelihood ratio (LR), final prediction error (FPE), Akaike information (AIC) and corresponding Schwarz criteria (SC). and the Hannan-Quinn (HQ) criteria

To properly apply the ARDL model to establish relationships, it is imperative that the study opts for an optimal model using the Akaike Information Criterion (AIC) with optimal lag 5 (see Table 4). Based on the selected model using the Akaike Information Criterion (AIC), ARDL (2, 1, 1, 1, 2), as depicted in Figure 1.

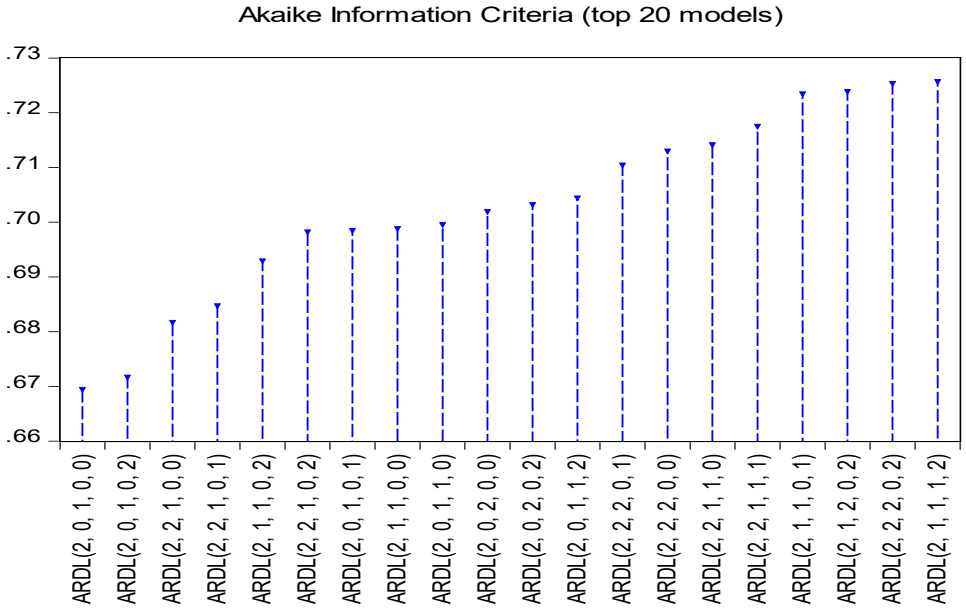

Figure 1: Graph of AIC model selection: ARDL (2,1,1,1,2).

4.4 Diagnostic and Stability Test

There is a need to estimate ARDL model that recognize residuals in the regression analysis to avoid making unbiased statistical inferences. The diagnostic tests of the ARDL regression in Table 5 serve to present and examine the elements of such an unbiased approach. The test result from the Breusch-Godfrey (B-G) serial correlation LM for autocorrelation was not rejected (Prob. 0.1608) at the 5% significance level. The null hypothesis that there are no missing variables in the ARDL regression is not rejected when the powers of the fitted values are applied (see Prob. = 0.0031) at the 5% significance level in the Ramsey RESET test.

Table 5: ARDL Model of Diagnostics

Test statistics	**F-stat. (p-value)**	**Obs *R-squared (p-value chi-sq.)**
B-G serial correlation LM Test	1.899 (.1608)	4.472 (.1068)
Heteroskedasticity: G-P Godfrey	0.529(.8611)	584(.8611)
Heteroskedasticity Test (ARCH)	2.476(0.1208)	2.457 (0.1170)
Ramsey RESET (dif =1,49)	9.710(.0031)	(t-test=3.116(.0031))
Jarque-Bera	(prob=0.554)	(value=1.498)

The Jarque-Bera test for the normal distribution under the null hypothesis cannot be rejected (Prob=0.554) at the 5% significance level, indicating that the residuals are normally distributed to allow for meaningful inferences. The test statistical (JB) value of 1.498 was relatively small, suggesting that the data did not deviate significantly from normality. Evidence serves in the heteroscedasticity test (ARCH) (Prob=0.1208) on assumption that, the higher p-

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value would fail to reject the null (no serial correlation), indicating no significant evidence of heteroscedasticity in the variables.

Additionally, as shown in Figure 2, the cointegration model's constancy is investigated using CUSUM and CUSUM of squares tests. Both test results of CUSUM tended to lie within the 5% significance level, suggesting that the ARDL regression model was stable to avoid statistically unbiased inferences (see Figure 2).

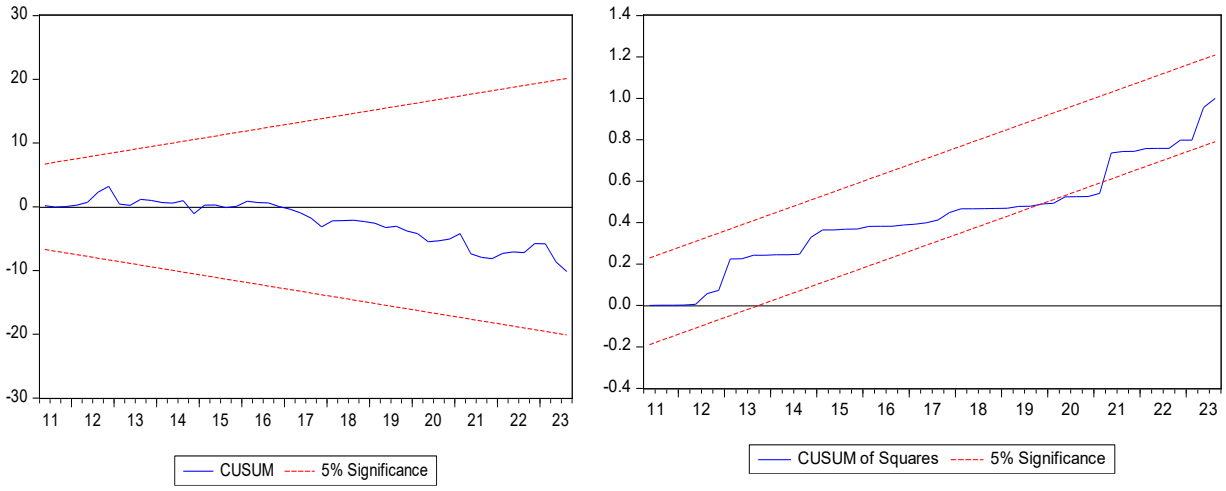

Figure 2: Cusum and Cusum of Squares results

4.5 Cointegration test results

It is necessary to meet the precondition ARDL bounds test to establish and examine cointegration among the series in the long run for the study variables. Based on the optimal Akaike information criterion (2,1,1,1,2) for choosing the optimal model for the bounds estimation, as Table 6 revealed the ARDL bounds test results. The F-statistics of 7.71, is above the upper bound test (3.09, 3.49, and 4.37) at the 10%, 5%, 2.5%, and 1% significance levels, respectively, according to the test results in Table 6. It rejects the null hypothesis that there is no cointegration between $CDIV_{2T-i}$, ENGY, FNCL, INCA, and INDL. This study estimated ARDL to establish cointegration among the variables.

Table 6: ARDL Bounds Test

Test Statistic	**Value**	**K***
F-statistic	7.71	4
Critical Value Bounds		
Significance	I (0)	I (1)
10%	2.2	3.09
5%	2.56	3.49
2.5%	2.88	3.87
1%	3.29	4.37

* Number of nondeterministic regressors in the long-run relationship.

4.6 ARDL Regression results

Table 7 shows evidence of the ARDL outcome of the speed of adjustment (ADJ or ECM) in the $CDIV_{2T-i}$ L1. = -0.12) indicates a long-run equilibrium connection into the research variables FNCL, INCA, INDL, and ENGY and CDIV, with a significant negative result at the 1% significance level. The deviation was corrected by 12% for each period in the equilibrium of significance at the 1% level. By implication, if the dividend payment deviates from its long-run equilibrium value, it takes approximately 12% of the deviation to be corrected for each period with the financial, information and communication, and industrial and energy EPS variables. This result suggests a relatively slow adjustment process based on the equilibrium relationship.

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Table 7: ARDL Regression test results (Dependent variable: CDIV)

D.L $CDIV_{2T-i}$	**Coef.**	**Std. Err.**	**T**	**P > |t|**
ADJ[1] : L1 $CDIV_{2T-i}$	-0.1210	0.0167	-7.2353	0.0000
LR[2]				
LENGY	0.0847	0.0930	0.9105	0.3683
LFNCL	1.3896	0.5622	2.4713	0.0181
LINCA	-0.3335	0.3183	-1.0471	0.0181
LNDL	1.4496	0.33335	4.3460	0.0001
SR[3]				
$CDIV_{2T-i}$				
D1.	-0.4976	0.1054	-4.7215	0.0000
LD.	-0.3693	0.1305	-2.8284	0.0074
L2D.	-0.5156	0.1159	-4.4484	0.0001
ENGY				
D1.	-0.0069	0.0084	-0.8256	0.4141
LD.	-0.0077	0.0083	-0.9275	0.3595
L2D.	0.0183	0.0080	2.2655	0.0293
FNCL				
DI.	-0.0107	0.0111	-0.9624	0.3419
LD.	-0.1151	0.0222	-5.1655	0.0000
L2D.	-0.0700	0.0173	-4.0348	0.0003
L3D.	-0.0581	0.0121	-4.7979	0.0000
INCA				
DI.	0.0045	0.0210	0.2177	0.8288
INDL				
DI.	0.0603	0.0315	1.9090	0.0638
LD.	-0.0980	0.0357	-2.7428	0.0092
L2D.	-0.0260	0.0333	-0.7812	0.4395
L3D.	-0.0742	0.0301	-2.4644	0.0184
_cons (ARDL)	0.0099	0.1316	0.0754	0.9403

ADJ[1] : L1; LR[2] and SR[3] denote the Speed of Adjustment (ECM), Long-run estimates, Short-run estimates respectively.

The short-run equilibrium results of the relationships among the variables are shown in Table 7, using the linear restriction test to reveal the individual outcomes. Table 7 further illustrates the study's findings on the short-term equilibrium link between variables that run from FNCL and INDL to CDIV, and previous years' dividend payments to CDIV. The long-run results show that a 1% increase in FNCL and INDL increases (elastic) CDIV by 1.39% and 1.49%, respectively (Chen & Zhao, 2011) but a 1% increase in INCA decreases (inelastic) CDIV by 0.33% in the long run (Mary et al., 2001). These results reveal that financial and industrial S&P EPS indicate a strong connection in dividend commitment, while information and communication increase uncertainty to reduce dividend distribution.

The short-term test results show that stock market participants believe that the energy and industrial EPS of the S&P 500 revealed thin liquidity to enhance past cash dividend payments and could make future cash dividend payments less likely (Mary et al., 2001). The short-run test result lacks the ability to attract foreign equity investments because investor protection is weak, resulting in high financial risk due to a decline in EPS informativeness. However, the long-run test results show a 5% significance level improvement in cash dividend payments resulting from the positive EPS of the FNCL and INDL economic activities of the S&P 500. INCA has a negative effect on cash dividend payments (Li et al., 2023; Vaidya, 2014), whereas ENGY has a statistically insignificant positive effect on cash dividend

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payments. The affirmative relationship between the variables and CDIV causes higher EPS-related improvements in the value and growth of investors and investment decision processes. The relationship between the EPS of FNCL and INDL results in higher earnings, positively giving reasonable assurance in cash dividend payments and signaling potential concerns for investors about S&P 500 earnings health and future prospects (Vaidya, 2014).

4.7 Granger-causality Test

Granger causation was used to investigate the shifting directions among the study variables, because ARDL regression has limitations in predicting the direction of causality. There is a null hypothesis that the 5% significance level is rejected, suggesting evidence of unidirectional causality, as shown by serial numbers 1, 4, 16, and 18 in Table 8. That is, ENGY was found to cause CDIV, whereas CDIV was found to cause INCA. The analysis of causation further added one-way causality running from the FNCL to INCA and INDL. This may be due to the choice of study variables, their lag operations, and model specifications, which can influence the detection of unidirectional causality.

Subsequently, other results of the analysis revealed a two-way direction between INCA and CDIV (serial 5 and 6), INDL and CDIV (serial and 7 and 8), as well as between INDL and INCA (19 and 20). The results are clear manifestations of the causal nexus that depicts the effect of INCA on INDL and CDIV and that of INDL and CDIV, and vice-versa.

Table 8: Granger-causality

Serial No.	Equation	Does not Granger cause	Chi2	Probability
1	ENGY	CDIV	5.8894	0.0048*
2	CDIV	ENGY	0.1815	0.8345
3	FNCL	CDIV	16.7716	2.E-06
4	CDIV	FNCL	3.1698	0.0496*
5	INCA	CDIV	1.7504	0.0003*
6	CDIV	INCA	3.1698	0.0536*
7	INDL	CDIV	9.2310	0.0003*
8	CDIV	INDL	3.0848	0.0536*
9	FNCL	ENGY	1.3522	0.2670
10	ENGY	FNCL	1.8768	0.1626
11	INCA	ENGY	1.2013	0.3084
12	ENGY	INCA	1.5558	0.2200
13	INDL	ENGY	0.2540	0.7765
14	ENGY	INDL	2.3255	0.1071
15	INCA	FNCL	2.8956	0.0636
16	FNCL	INCA	3.0973	0.0530*
17	INDL	FNCL	0.0629	0.4391
18	FNCL	INDL	4.4590	0.0160*
19	INDL	INCA	3.2395	0.0466*
20	INCA	INDL	6.6363	0.0026*

* Rejection at the 5% significance level.

4.8 Impulse-response Result

The Granger causality test has a limitation in verifying the bearing trend of causality that exists within the series, therefore losing track in examining the extent to which the variables of this study could randomly stimulate innovations within the individual systems. This study presents an impulse response test that curtails the orthogonal problems embedded in out-of-sample Granger causality tests. The test results in Figure 3 reveal a significant gradual increase in the response within the 10-period horizon for LCO to LGDPPC and LIND, ENGY to CDIV and INCA, FNCL to CDIV, INCA to CDIV, INDL to CDIV, INCA, CDIV to FNCL, FNCL to CDIV, LIND to LCO, and LGDPPC.

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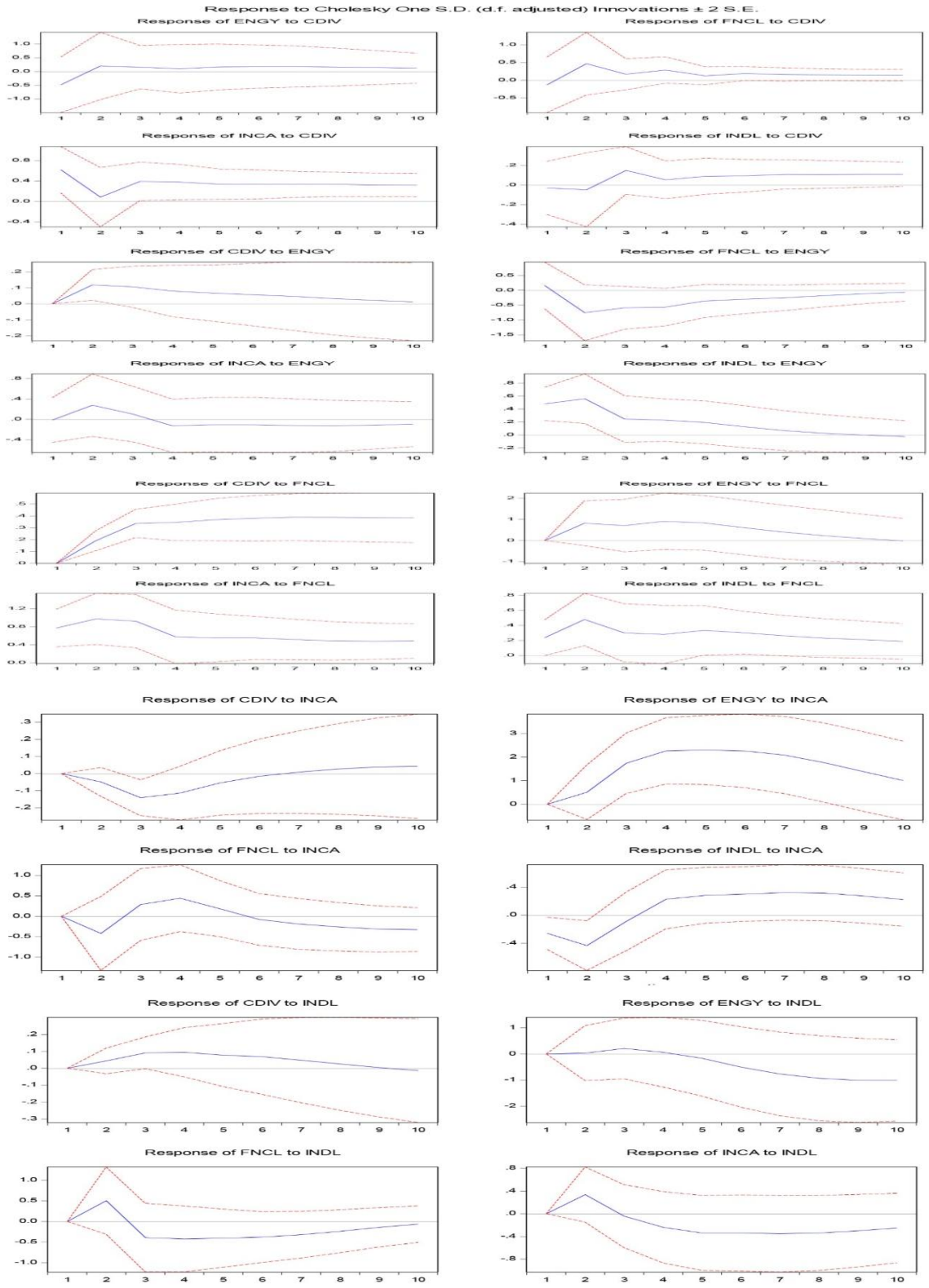

Figure 3: Impulse response results

In contrast, within the same period of 10-period horizon, it was insignificant and achieved a constant trend in relation to LCO to LPOP, LGDPPC, LIND to LPOP, CDIV to ENGY, INCA, INDL, FNCL to ENGY, INDL, INCA to ENGY, FNCL, and INDL. Moreover, the results showed an insignificant response of INDL to ENGY, FNCL, ENGY to FNCL, INCA INDL, INDL to FNCL, CDIV to INCA, INDL, FNCL to INCA, INDL, and ENGY to INDL, in varying periods. It

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is worth noting that FNCL, INDL, and INCA affirmatively affect cash dividend payments in the trend of 10-period horizon in S&P 500 economic activities. These trends in the EPS informativeness of the sectors increase S&P 500 investor protection and reduce financial risk, perhaps in the long term, thereby affecting S&P policy implications.

4.9 Fit peaks in time-series analysis

According to the Earnings Insights Report from S&P 500 sectors, the financial economic activities of the Global Industry Classification Standard (GICS) sectors in the U.S. market achieved the third largest market of 13%, which is remarkable sector performance. This revelation affirms that financial activities contribute immensely to earnings growth capacity and tend to provide reasonable assurance of sound and resilient cash flows to support shareholders' cash dividend expectations (Thielemann, 2018). Figure 4 depicts a graphical representation of CDIV as the dependent variable and FNCL as the financial independent variable, using the linear residual method of fit peaks. The graph shows that spectroscopy peaks 4.0 and 7.6 of INDL's EPS realized cash dividend payments of USD 20 and 17. The peak analysis reveals a large number of small EPS of FNCL peaks between 5 and 7.5, and a small EPS between 7.7 and 10 at the smallest cash dividend payment on a more gradual slope, representing the lowest point in the business cycle (Hartzmark & Solomon, 2022).

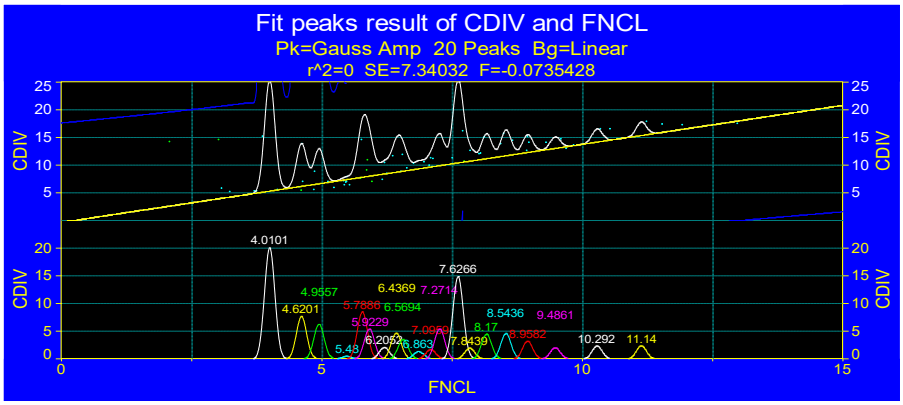

Figure 4: Fit peaks result of CDIV and FNCL

5. CONCLUSION

5.1 Concluding remarks and Policy Recommendation

This study examines the connectional series of EPS and between S&P 500 economic activities: energy, financial, information and communication, industrial, and cash dividends, using the autoregressive distributed lag model on time-series data with a range of observations from 2008Q1 to 20233. The cointegration results reveal evidence of a long-run equilibrium relationship for all study variables. The ARDL results suggest that the strong financial and industrial EPS of S&P may drive dividend growth, while increased uncertainty in the information and communication EPS of the S&P 500 space can lead to reduced dividend payments. This finding implies that investor protection is crucial in terms of confidence in the market, investment vehicles, and growth opportunities.

The study revealed that the S&P 500's financial and industrial EPS have strong returns and earnings, so investors would want to obtain transparency in quality accounting information from accurate and reliable reporting, leading to a growth trajectory pathway that promotes dividend distributions amidst the reduction in information uncertainty. According to the short-run equilibrium relationship results, illiquidity in the EPS of energy and industry is affirmed and attested that cash dividends in the past and future are likely to be affected. This type of economic stress is disinterested in investors. The Granger causality test results demonstrated unidirectional causality (see Table 8) on satisfaction, showing that INDL, FNCL, and ENGY bid a searing in S&P 500 earnings growth and industrial and energy economic activities such as banking, financial services, insurance, and other Global Industry Classification Standards (GICS). The governance of such firms should adopt motivated people-centered pragmatic moves to encourage the impact of patronage on liquidity for earnings growth in sustainable EPS benefits (Sundoro et al., 2023). The FNCL results are consistent with the fitted peaks in the spectra shown in Figure 4.

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The test results from the impulse response of energy, information and communication, and financial and industrial economic activities of the S&P 500 sectors assure EPS to facilitate the cash payment of shareholders' dividends in a 10-period horizon. In addition, the results showed varying periods within the trend of the 10-period horizon to explain and cause responses among the variables (see Figure 2) in the long run. Policy directives should support the micro-financial, energy, and industrial sectors and encourage tax incentives to promote job employment, which may lead to an increase in the volume of production in earnings improvement, to affirmatively cushion cash dividend management as presumed to be shareholders' expectations at low financial risk in the long run. Both short- and long-run elasticities in the VECM-Granger-causality and impulse-response test estimations were estimated. The study utilized the unit root test statistics of Phillip-Peron's and Augmented Dickey-Fuller, the bound test of ARDL regression estimation, to establish long-run periods.

From the policy implications, a 1% increase in FNCL and INDL causes an increase (elastic) in CDIV by 1.39% and 1.49%, respectively. However, a 1% increase in INCA decreases (inelastic) CDIV by 0.33% in the long run. Policymakers should devote more resources to the S&P 500 financial and industrial EPS in the form of capital injections to address future investment growth opportunities and improve earnings, liquidity, and cash flow quality (Sundoro et al., 2023) to improve cash dividend payments. Our findings suggest promoting and prioritizing investor protection and education regarding information awareness and profit competitiveness to achieve market leadership through the economic activities of the S&P 500 EPS to provide new dividend opportunities. For example, we believe that managing S&P 500 indices leverages the benefits of green finance to enable sustainable dividends with attractive tax credits and incentives to promote R&D activities on new products and services to meet customer expectations. This result is consistent with Ng and Zheng (2018). Both financial and industrial EPS of the S&P 500 should be encouraged in an innovative manner to continue driving a sustainable dividend commitment but should turn around the information and communication sector EPS frequently to rejuvenate affirmative dividend payments.

5.2 Limitations and future study directions

Although this study makes marked contributions, the empirical outcomes and results provide tentative reasons for these limitations. S&P 500 indices are known to exhibit an in and out of their index, leading to their effect on share prices. Share price is excluded from the study variables; hence, it poses challenges in generalizing the results to the S&P 500 economic sector. Therefore, future studies should consider the share prices and their changes. In addition, the S&P 500 ignores the use of vital future information in making decisions about their EPS indices, which affects cash dividend payments. We suggest that future prospective information on the S&P 500 be considered in future research on the nexus between cash dividends and S&P 500 EPS. The third limitation is that only S&P 500 indexes are considered for this study, so we recommend that future research consider other non-S&P 500 sectors so that the future findings do not contain spurious results.

CRediT authorship contribution statement

Benjamin Yeboah: Writing – review & editing, Writing – original draft, Methodology, Formal analysis, Conceptualization. **Kingsley Appiah**: Writing review & editing, Validation, Methods & design, formal analysis, & conceptualization. **Halidu Babamu Osman**: Writing – review & editing, supervision, methods & design, conceptualization. **Samuel Osei Owusu Atuahene:** Writing – review & editing, supervision, methods & design, conceptualization.

Declaration of Competing Interest

We have no known conflict of interest to disclose.

Declaration of Originality

We declare that this manuscript is original, has not been previously published, and is not currently being considered for publication elsewhere.

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Data Availability

Data supporting these findings of this study is available on request.

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