

Eco-investment Expenditures and Financial Performance in Selected Johannesburg Stock Exchange Listed Companies

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Abstract

This study investigates how the socially responsible investments (eco-investments) expenditures (ECI) influence organisations' financial performance, which is a return on assets and equity (ROA & ROE) in selected Johannesburg stock exchange listed organisations. The study used a quantitative research method, using panel data that utilises multiple linear regression analysis to analyse the integrated annual reports of 175 Johannesburg Stock-Exchange (JSE)-listed organisations from 2009 to 2019. The researcher discovered that stakeholders are concerned with the financial performance of their investment choices but also require non-financial performance, which comes from holding portfolios that are consistent with personal and public beliefs. This study adds to the practice of socially responsible investments by encouraging JSE-listed to integrate their ECI policies into their strategic goals. The researcher

recommends that primary qualitative data be used in the yet-to-come studies to measure the influence of ECI on organisations' financial performance.

Keywords: *Sustainability, Performance, Corporate, Responsible, Financial, Governance, Eco-investments*

Introduction

Socially responsible investment is an asset type that recognises organisations by means of extraordinary corporate social responsibility (CSR) outlines (Zhang, 2020). Organisations are evaluated based on eco-friendly, community, and corporate governance (ESG) principles (Valentinov, 2022). According to Valentinov (2022), in the past, organisations have faced increasing pressure not only to perform well financially but also to demonstrate environmental, economic, and social consciousness. Investors and other stakeholders need extra comprehensive reporting on how organisations are honouring their commercial, eco-friendly, social, and governance accountabilities (Richard, 2022). According to Kayikci, Kazancoglu, Gozacan-Chase, and Lafci (2022), environmental interest groups have raised concerns about organisations' inability to deliver adequate evidence on the results of their activities on social, environmental, and economic involvement. As a result, the King Code of Corporate Governance (King IV), Assurance Standards (AA1000AS), and International Standard on Assurance Engagements 3000 (ISAE3000) were introduced as guidelines and standards on sustainability reporting (Kayikci *et al.*, 2022).

Organisations tend to focus more on reporting specific sustainability issues over others. The tendency is for corporate entities to give more attention to some stakeholders at the expense of others. The reporting practice creates an impression of lopsidedness, as the company's directors are required to satisfy the needs of all their stakeholders while ensuring higher returns for their investors. Encouraging these value-creating activities may forge a mutually beneficial response from the stakeholders (Valentinov, 2022; Kayikci *et al.*, 2022). Meske, Bunde, Schneider, and Gersch (2022) indicate that there is a gap in understanding what is required of organisations to split infinite profits for shareholders while ensuring that other stakeholders needs are being taken care of (customer satisfaction—customers are more likely to support companies that are pro-eco-investments). Hence, this study examines how socially responsible investments (eco-investment)

influence organisations' financial performance (return on assets and return on equity).

The return on assets was defined as a measure of how efficiently a company uses the assets it owns to generate profits and return on equity was defined as a gauge of a corporation's profitability and how efficiently it generates those profits (Valentinov, 2022). The researcher chose to use return on assets and return on equity (ROA & ROE) since most literature only focused on return on equity (ROE) alone, and ROA is used as an element of financial performance (other measures of financial performance are NPM, ROI, share price, and market capitalisation) since financial performance gives stakeholders information on whether management is effectively using the available assets in an organisation. Using ROE to test if socially responsible investment expenditures influence organisations' financial performance, Barauskaite and Streimikiene (2021) found that the influence of eco-investment disturbs the shareholders' modification, which affects the performance and production of the whole organisation.

The study's findings will channel the gap in knowledge that exists in contemporary research and help promote further study in this field. Furthermore, the study will lead to greater socially responsible investment awareness by public and private stakeholders and encourage organisations to adopt the practice of socially responsible investments for stakeholders' value creation.

Aim of the study

This study examines how corporate sustainability performance (CSP) influences corporate entities' financial performance, which is measured based on return on assets and return on equity (ROA & ROE).

Research hypothesis

The study will test the following research hypotheses:

H₀: There is no correlation between eco-investment) expenditures (ECI) and corporate entities' financial performance (ROA & ROE) listed on JSE Index.

H_a: There is a significant correlation between ECI and the corporate entities' ROA & ROE

Research objective

To examine the correlation between ECI and corporate entities' ROA & ROE

Literature review

Conceptual considerations

Corporate sustainability activities and King IV Code of Corporate Governance

Socially responsible investing (SRI) is an investment tactic that incorporates environmental, social, and governance aspects (ESG aspects) in the assessment of those investments (Losse & Geissdoerfer, 2021). King IV recognises sustainable development as an inseparable component of value creation in corporate entities. Central to King IV is the need to achieve shifts in corporate behaviour with respect to reporting on investing activities as they pursue capitalism. King IV advocated for the pursuit of financial capitalism that is more inclusive and required corporate behaviour to exhibit a long-term focus (Barauskaite & Streimikiene, 2021).

King IV is effectively a group of intended ethics and important rehearses (Meskeet *al.*, 2022). According to Dietz, Grabs, and Chong (2021), the code distinguishes between ethics and rehearses. Ethics examines the rational justification for our moral judgments; it studies what is morally right or wrong, just, or unjust and rehearses means of practice (a play, piece of music, or other work) for later public performance. According to Dietz *et al.* (2021), ethics are realised by carefully considering and submitting suggested rehearses. Importantly, the King IV amendments now make it compulsory for listed companies to follow references set out in King IV. Failure to meet the terms will call for the organisations to clarify their whys and wherefores (Sounderajah, Ashrafian, Aggarwal, De Fauw, Denniston, Greaves, Karthikesalingam, King, Liu, Markar & McInnes, 2020.).

Audit assurance and consideration of ECI matters

The audit of corporate-reported information (financial and non-financial) has become a mainstream practice done during financial regularity audits in South Africa (Dietz *et al.*, 2021). Stakeholders need to have trust and

confidence in this information through audit assurance (Richard, 2022; Sounderajah *et al.*, 2020). The International Auditing and Assurance Standards Board's International Standard on Assurance Engagements (ISAE) 3000 comprehensively deals with the audit of non-financial information, which includes the outcome of ECI. ISAE3000 is intended to guide the audit profession on the philosophies and techniques for audit assurance of non-financial declaration activities in corporate annual reports. Richard (2022) states that ISAE 3000 brings into line the declaration procedure to the reporting organisation's description of the scope of the information and declaration activities themselves.

The AA1000 Assurance Standard (AA1000AS) is the principal methodology used by sustainability experts to conduct sustainability-related assurance. The methodology helps sustainability experts to assess the nature and extent to which an organisation adheres to the accountability tenets in eco-investment spending. Hidayah and Syahrani (2022) argue that the AA1000AS is a next-generation assurance practice standard: Prioritising user experience regarding ease of use and understandability (Coram, Fu, Garg, Harding, Hay, Khan, MuñozIzquierdo, Prasad, Sultana, & Tong, 2022)

The AA1000AS and ISAE 3000 provide key constructions to understanding the ECI practice. There is currently no regulation required by JSE-listed companies to report ECI matters. It is not required by the KING IV code, and neither is a requirement for this to be audited. JSE-listed companies may voluntarily report on these matters, but it is not a requirement.

Evolution of corporate regulations in South Africa and contribution to ECI practices

The SA corporate law, the Companies Act (Act No. 71 of 2008), applies to organisations seeking to issue shares or other securities listed in a regulated market (JSE). The law has evolved over the years. Among other provisions, the corporate law of SA distinguishes between the executive, non-executive, and independent directors, albeit with a rather confusing description of their duties and tasks. The board of directors' exercises management and control of the company registered under the SA corporate law. The executive members of the Board of Directors (hereafter 'BoD') are deemed to be those shouldering daily governance issues of the corporate entity (Coram *et al.*, 2022).

The provisions of the Companies Act are consistent with King IV. This practice is consistent with what (Dietz *et al.*, 2021) have concluded. Meske *et al.* (2022) contend that the corporate law of any country provides a company act that controls businesses. A company is a business whose main aim or intention is to make a profit through producing goods or providing services to the public. This admittance also shelters guidelines by which organisations and trusts are controlled in South Africa, together with enterprises and sole proprietorships (Clark, Riera & Iborra, 2022). Formerly, during the Industrial Revolution, organisations were a moderately occasional business form. Until 1844, there was no complete legislation governing organisations, so they had to be merged by a detailed Act of Parliament or by permission of a royal charter in Europe (Clark *et al.*, 2022). This was also the case with the British East India organisations in 1600 and the Dutch East India organisations in 1602 (Richard, 2022).

As pointed out earlier, governance considerations are covered in King IV and the Companies Act (Act No. 71 of 2008). Socially responsible investing (SRI) is an ethical investing activity that relates to the environment. Responsible investing implies using clean production technologies and avoiding investment in shares of companies that produce goods or services that attract sin taxes (alcohol, gambling, tobacco, weapons, etc.). The firms are encouraged to favour investments that respect environmental sustainability, labour conditions, and community engagement. ECI spending is a form of investing that aims to generate both social change and financial returns for an investor (Richard, 2022). This is, in part, what King IV calls inclusive financial capitalism. This explains why the researchers have selected financial performance and ECI spending. ECI spending includes companies making a favourable sustainable or social impact, such as solar energy companies, and excludes those making a negative impact. In recent years, Massmart Holdings Limited a wholesale chain in South Africa, has invested in solar panels that supply its stores with solar energy. In comparison, ECI spending permits market players to conduct screening of companies that they believe are engaging in sustainable practices. We theorise that such acts should lead to high ROA (Sisaye, 2021).

Macroeconomic factors affecting the eco-investment

According to Platon, Pavelescu, Antonescu, Constantinescu, Frone, Surugiu, Mazilescu, and Popa (2024), the circular economy (CE) is an

important factor in attaining sustainable development goals (SDG), as several topographies could significantly improve and quicken the circular economy. As a result, artificial intelligence (AI) and eco-investment are two of the most important ones (Platon *et al.*, 2024). Platon *et al.* (2024) assessed the influence of artificial intelligence and eco-investment on the growth of the circular economy in the context of the Sustainable Development Goal (SDG). Platon *et al.* (2024) discovered that AI has a lesser influence than eco-investment on the circular economy; moreover, AI has a substantial impact on the circular economy. Academic studies reveal that socially responsible investments (SRI) have a positive influence on the growing GDP of the country (Lyeonov, Pimonenko, Bilan, Štreimikienė, & Mentel, 2019). Lyeonov *et al.* (2019) investigated the relationship between SRI expenditures and GDP in the region of the Economic Cooperation Organisation (ECO). Through the causality tests, a strong positive connection from SRI to GDP and a slightly less positive connection from GDP to SRI in ECO region were detected (Lyeonov *et al.*, 2019).

The above authors differ on the direction (positive or negative) of the influence of socially responsible investments (eco-investment) on macroeconomic factors (AI & GDP), yet eco-investments influence AI & GDP. Furthermore, the differences in the sample size, statistical tests, and research analysis methods may have led to the differences.

Theoretical review

Stakeholder theory

Stakeholders are recognised as a group of individuals who can have an emotional impact on companies' decisions and performances (Valentinov, 2022). Bouguerra, Hughes, Cakir, and Tatoglu (2023) found a positive correlation between financial performances, how the board of directors as stakeholders conducts their obligations, and how they relate to eco-investments. According to Bouguerra *et al.*, (2023), an organisation cannot maximise value if it overlooks the importance of its stakeholders, counting not only monetary claimants (shareholders) but also consumers, government spokespersons and the public.

Shah and Guild (2022) propose that the stake holder theory supports organisations in apprehending values and offers a way to organise thinking about organisational responsibility. Stakeholders have a claim when they have a lawful or decent right to anticipate an organisation to

fulfil their curiosity. Moreover, investors' involvement is essential in eco-friendly administration, and their recognition and sentiments might guide policy decision-making and usefulness (Stoelhorst & Vishwanathan, 2022).

This study highlights the challenge that organisations tend to focus more on in terms of financial interest issues over others, thereby defeating the postulation of the stakeholder theory. Hence, they give more attention to some stakeholders at the expense of others, thereby creating an impression of lop-sidedness. These groups also have different competencies to affect these organisations differently (Valentinov, 2022). As such, corporate managers should not only contemplate their shareholders' interests, but all stakeholders' interests must also be considered, even when making investment decisions (Shafique & Gabriel, 2022). Hence, the stakeholder theory is more relevant to this study because managers need to balance or match the challenge of meeting shareholders' expectations of higher returns with stakeholders' expectations of improved sustainability performance (Richard, 2022).

The stakeholder theory believes that achieving many organisations is linked to their excellent correlations with their shareholders (Coram *et al.*, 2022). A proper connection between stakeholders would help expand the organisation's performance (Shafique & Gabriel, 2022). Nevertheless, compliance with the guiding principles is necessary for a progressive engagement to avoid disagreements between stakeholders that may lose the organization's status (Meske *et al.*, 2022). The stakeholder theory argues that the presence of independent board members can assist the organisation's sustainability performance because they are more sensitive to other stakeholders' needs by their usefulness in monitoring the social characteristics of the organisation (Kayikci *et al.*, 2020).

Empirical review

Socially responsible investment (Eco-investments) expenditure and financialperformance

As such, Richard (2022) contends that financiers are not merely wrapped up in the financial value of their venture choices but endeavour for non-financial by holding portfolios that are constant with social principles. Besides, organisations need to report on every aspect of their operations because investors are interested in organisations' social, environmental, and corporate governance aspects. Losse and Geissdoerfer (2021) found

that socially responsible investments (SRI) invite many investors' responsiveness. According to Vejzagic and Schmidt (2021), just about 10% of all US investments are rendered from some screening process related to SRI. Therefore, it is likely that if South African organisations are engaged in socially responsible investments, it may improve their financial performance for investors.

Faisal, Ahmad, Riaz, and Rahman (2021) contend that previous studies did not recognise eco-investment as a critical variable in achieving corporate sustainability. This misidentification creates biased estimates of the financial impact of socially responsible investments. Again, Pratama and Wahyuni (2022) maintain that literature often points to a positive connection between socially responsible investment and organisational financial performance. This study will improve the body of existing literature by examining whether socially responsible investments impact the organisation's financial performance using selected mining and manufacturing companies in South Africa. Moreover, socially responsible investments have seen substantial fluctuations in the preceding years (Khalid, Naveed, Nawaz, Sun, Wu, & Ye 2023). It is expedient that organisations must start to implement these socially responsible investment strategies, as Khalid *et al.*, 2023 found that investing in Eco-investments has a constructive influence on the overall organisation's financial performance. The study will help organisations understand how, why, and the benefits of socially responsible investments in an organisation.

Socially responsible investment is gradually dominant in fiscal markets and involves the incorporation of financial and non-financial intentions (Vejzagic & Schmidt, 2021). Additionally, Dietz *et al.* (2021) investigated the effect of riches worries and ethical worries on individual stakeholders' choices to invest sensibly. Dietz *et al.* (2021) conducted an exceptional normal arena research of financiers in a wired financial transactions context in which they framed responsible investment about one or the other riches or morality and studied financiers' subsequent behaviour. They found that rich enclaving is more active than moral enclaving for evidence searches and investment behavior. Carfora, Scandurra, and Thomas's (2021) contribution is dual. First, they provided insight into specific pro-social behavior commercial markets, which is appreciated because of commercial and public importance of those markets (Carfora *et al.*, 2021).

Michalczyk, Klonek, Maszczyk, and Zajac (2020) opine that accountable investment is a monetarily eye-catching investment prospect

in wealth creation. Considering the Michalczyk *et al.* (2020) model, this treatment agrees to influence a stakeholder's insight into remuneration in the rich's component. Accountable investment is a prospect to practice one's investment decisions by partaking in a socially based mindful boldness to investment. According to Richard (2022), this treatment matches up to winning over a stakeholder's insight into the optimistic externality that upturns with developed value and activating pro-social customs.

In a fact-finding manner, Sisaye (2021) examined the impact of some pro-social, economic performance, and socio-demographic variables on SRI behaviour in a directive to clarify why shareholders decide to invest not the same amounts of their investment collection in capital. Sisaye (2021) used ordinal logistic regression analysis on 528 private shareholders. The researchers discovered that two of the three pro-social variables had a constructive influence on how much the consumer values SRI capitals.

Bouguerra *et al.* (2023) reckon that one of the crucial deciding influences in consumer investment choices is the awareness of risk, as the conventional economic theory indicates that risk and return are positively linked. Nevertheless, the literature on risk is split up between the 'objective' academic accepted wisdom of financial risk and the individual belief of risk detained by the specific venture capitalist (Bouguerra *et al.*, 2023). The individual awareness of risk in mutual capital is primarily grounded in boldness and state of mind and has been debated to be influenced by the potential significance of a poor investment choice and great levels of insecurity (Valentinov, 2022). In support, Clark *et al.* (2022) advocate that awareness of risk is expected to be an inspiration for investment choice with respect to SRI, which integrates social accountability into investment. As a result, the essential issue is whether social accountability, overall, reduces or upturns the perceived level of risk paralleled to "regular" mutual capital (Shah and Guild, 2022). Shah and Guild (2022) indicate that SRI stakeholders have many insights concerning risk in SRI. Roughly 20% of SRI stakeholders observed SRI to be not as much and more unsafe than regular mutual capital. Though, the widely held view by stakeholders (60%) is that SRI had comparable risk to regular investments, and that organisations valued high on social performance, as measured by pollution control activities, had lesser total and orderly risk than less socially responsible organisations (Shah & Guild, 2022).

Research Methodology

Research paradigm and design

This study used quantitative research within the explanatory research paradigm since it (the study) described communication between organisations' ROA & ROE and ECI. The explanatory research paradigm is linked with quantitative research and is associated with hypothesis testing to satisfy the research objectives (Valentinov, 2022). The researcher adopted a quantitative research approach to test whether there are correlations between the variables because the data to be analysed is in the form of numbers. Moreover, Zhang (2022) used quantitative research within an explanatory paradigm to investigate the correlation between financial performance and sustainability disclosures between US and European organisations.

Research population and sampling procedure

The study's population included all the listed companies in the Johannesburg Stock Exchange (JSE) Index 2020, from 2009 to 2019. The JSE Index 2020 had 404 listed organisations. JSE index was chosen as a source of data collection because their reports are valid and can be obtained easily through their website, which is available to the public. Purposive sampling was used to choose 175 organisations listed on the JSE index in 2020 because of their reputation regarding their integrated annual reports.

Data collection

This study used secondary data as a collection method in which data was collected before by other researchers or someone else for a purpose other than the current one in the study in question (Richard, 2022). In this study, financial data was acquired from integrated annual reports of 175 JSE Index-listed organisations, which are collected from the websites of organisations and the IRESS database.

The analytical framework

Panel data that utilises multiple linear regression analysis is applied to analyse the data of this study, which was used to define the nature of

correlations between dependent and independent variables. The study has one dependent variable (return on assets and return on equity (ROA & ROE), and one independent variable, Eco-investments expenditures (social activities—charity events, bursaries, and environmental activities—reduction of pollution, waste reduction, energy usage reduction, and carbon emissions). Eco-investments are expenditures with personal values, promote responsible corporate behaviour, and generate competitive financial returns. Benefits include risk mitigation, reputation enhancement, and the potential to drive positive social and environmental outcomes. The panel data analysis was chosen because, in this study, the data structure is quite complicated and is characterised by multiple observations and a period extending up to eleven years.

The control variable includes the leverage ratio, current ratio, total assets turnover, operating profit margin, and price-earnings ratio. The control variables enhance the internal validity of a study by limiting the influence of confounding and other extraneous variables (Meske *et al.*, 2022). This will help the researcher to establish a correlational or causal relationship between the variables of interest and help avoid research bias. The chosen control variables are vital to this study, as they are part of the elements of financial performance since they give other stakeholders information on whether management is effectively using the organisation's assets to generate sales or services to make a profit.

Data management and analysis

Multiple linear regression was used in the study to inspect whether there is a correlation between ROA & ROE and ECI of selected organisations listed on the JSE Index. A series of diagnostic and specification tests were done to select the appropriate regression model. Through content analysis, ECI and Financial Performance (ROA & ROE) data were gathered from annual integrated sustainability and financial reports and were recorded in MS Excel before it was exported into Stata. The gathered financial data was not modified before being recorded in MS Excel, but millions were reduced to thousands before being exported into Stata software.

The study used the following tests to justify the validity of the panel data results in regression analysis tables, scatter plots, heteroskedasticity tests, multicollinearity tests, co-variance, correlation matrix, and fixed and random effects (model fitting).

The study's modelled relationships are presented below:

$$ROA+ROE_{it} = \alpha_{it} + \beta_1 ECOINVEST_{it} + \beta_2 LEVERAGE_{it} + \beta_3 CURRENTRATIO_{it} + \beta_4 TATURNOVER_{it} + \beta_5 OPERATING\pi + \beta_6 PRICEEARNINGS + \beta_7 MARKET + \varepsilon_{it}$$

Where:

ROA_{it} = Return on Assets, ROE_{it} = Return on equity, α = Intercept, β = gradient/slope, $\beta_1 ECOINVEST_{it}$ = socially responsible investments (eco-investment), $\beta_2 LEVERAGE_{it}$ = Leverage ratio, $\beta_3 CURRENTRATIO_{it}$ = current ratio, $\beta_4 TATURNOVER_{it}$ = total assetsturnover, $\beta_5 OPERATING\pi$ = operating profit margin, $\beta_6 PRICEEARNINGS_{it}$ = price-earnings ratio, $\beta_7 MARKET$ = market capitalisation, ε_{it} = error

The modelled relationship provided the analytical framework consisting of the following assumptions:

- Normality and multicollinearity are not violated except for heteroscedasticity, which may be present in the panel data.
- The cross-sectional correlation will not be checked, as it is common in macro data, which spans up to a period of twenty years, and this study spans up to eleven years.
- Despite which modelling fitting model (fixed and random effect regression) is the preferred model, the problem of heteroscedasticity may influence the estimating coefficient.
- For the sake of this study, feasible generalised least square (FGLS) regression may be an appropriate model. There as on is that it addresses heteroscedasticity and cross-sectional dependency.

The above assumptions of the multiple regression model are later tested after generating the modelling fitting results. The assumptions will be tested because the ability of the multiple regression model to account for the assumptions of regression is fundamental in achieving the highest degree of validity of the study results.

Presentation of results

Correlation matrix

The study inspects the correlation between Eco-investment expenditures (ECI) and firm financial performance (FP) variables. There is one independent variable, ECI. The dependent variables are ROA&ROE, which represents FP. The study considered the leverage factor (LR), current ratio (CR), total assets turnover (TAT), operating profit margin (OPM) and price-earnings ratio (PER) as control variables. Spearman rank correlation matrix was performed in Stata software to assess the interrelatedness between the variables. The results are shown in EXHIBIT 1 Below:

EXHIBIT 1. Correlation matrix of the study variables

	ROA	ROE	ECI	MC	LR	CR	TAT	OPM	PER
ROA	1								
ROE		1							
ECI	0,001	0,4893	1						
MC	0,0066	-0,0096	-0,0101	1					
LR	-0,0018	-0,0023	-0,0042	-0,002	1				
CR	0,0003	-0,005	-0,0155	-0,0063	-0,0043	1			
TAT	-0,102	-0,0085	-0,0549	0,0214	-0,0167	-0,0221	1		
OPM	0,068	0,0045	0,0083	0,005	0,0011	-0,0883	0,0171	1	
PER	0,0077	0,0003	-0,0002	0,0092	-0,0004	-0,0018	0,0107	0,0037	1

Source: Researcher's analysis

EXHIBIT 1 above shows that ECI's impact on the selected JSE Index listed organisations' financial performance has a positive return/benefit as the positive correlation between ROA (dependent) and ECI (independent) is 0.001 and ROE (dependent) and ECI (independent) is

0.4893. This further proves that the selected JSE Index-listed organisations' ECI policies are aimed at eradicating the shutting down/sudden unemployment of the selected JSE Index-listed organisations' due to non-profit making.

The multiple regression model results

The results of the multiple linear regression are shown in EXHIBIT 2. There are 9 variables; ROA and ROE are the dependent variables.

EXHIBIT 2. Model fitting results with ROA and ROE as the response variables.

Source	SS	Df	MS
Model	145522.61	9	16169.1789
Residual	5653007.92	1 898	2978.40249
Total	5798530.53	1 907	3040.65576
Number of obs	= 1 925		
F (9, 1898)	= 5.45		
Prob >F	=0.0002		
R-squared	=0.4345		
Adj R-squared	=0.4343		
Root MSE	52.575		

Variables	Coef.	Std. Err.	t	p> [t]	[95% Conf.	Interval]
LogECI	.2052528	.8032832	0.26	0.00735	-1.370158	1.780664
LogMC	2.030554	.3540005	5.74	0.002	1.336283	2.724825
LR	8.53e-06	.0002221	0.04	0.969	-0004271	0004442
CR	.0235559	.0562102	0.42	0.675	-0866843	1337961
TAT	-1.161114	.8206646	-1.41	0.157	-2.770614	4483851
OPM	.000753	.0002394	3.15	0.002	0002835	0012226
PER	.0013586	.0053007	0.26	0.798	-0090372	0117544
_cons	-24.88981	7.76112	-3.21	0.001	-40.11103	-9.668588

Source: Researcher's analysis

The significant level has been set at 95%. The result in EXHIBIT 2 above shows that the regression model is significant as the *p-value* is 0.002, which is lower than the significance level of 5 per cent. The correlation between ROA and ROE (dependent) and ECI (independent) is significant and positive as denoted by the *p-value* of 0.00735. Based on

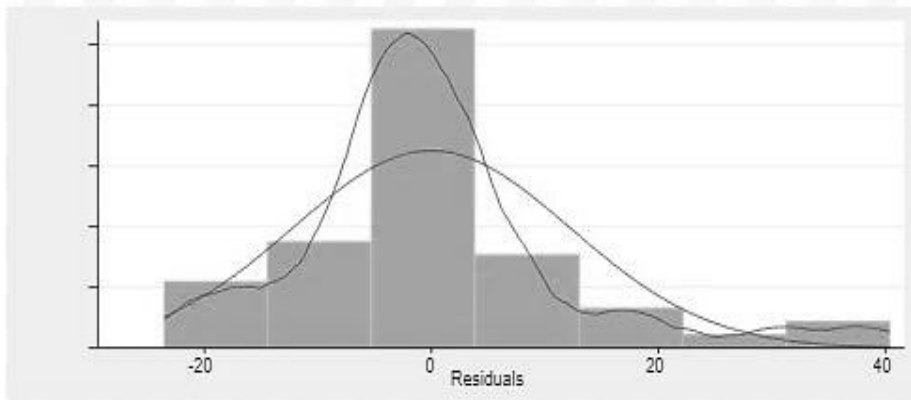
the results above, there is clear evidence proving that the selected JSE Index-listed organisations are embracing ECI policies of distributing wealth in ways that benefit shareholders.

The results confirm that the incorporation of the control variable impacted the correlation between eco-investments (ECI) and selected JSE Index-listed organisations' financial performance (ROA & ROE) as the results of MC and OPM are less than 0.05, which is a significant correlation.

The diagnostic test results

The diagnostic tests were generated to test if the underlying assumptions of the model fitting results hold. Although other assumptions of the regression, which include normality and multicollinearity, are not violated (EXHIBIT 1), heteroscedasticity is present in the panel data. The diagnostic tests helped the researcher to find a suitable model of regression that is valid and plausible. It was important to ensure that the required degree of internal validity was achieved. Pre-tests were done before the panel data analysis. This was done to ensure that the regression assumptions were not violated, which might result in underestimating significance levels. Panel data were subjected to tests to detect the abnormalities that might violate the regression model.

EXHIBIT 3 – The normal distribution curve of variables



Source: Researcher's analysis

Heteroscedasticity.

It is always significant to make sure that the panel data has homoscedasticity. However, if heteroscedasticity is present, it implies that the errors have a variance that is finite but not constant across different levels of the predictors (Zhang, 2022). The null hypothesis assumes that the panel data has homoscedasticity, and alternative hypotheses assume that the panel data have heteroscedasticity. In testing for heteroscedasticity, Alita, Putra, and Darwis (2021) tests were performed for both fixed and random effects models. The results from the Alita *et al.* (2021) tests are shown in EXHIBIT 4 below.

EXHIBIT 4. Heteroscedasticity results.

Alita, Putra, and Darwis/Cook-Weisberg test for heteroskedasticity	
Ho: Constant variance	
Variables: fitted values of ROA and ROE	
chi2(1)	= 2449.73
Prob >chi2 =0.0024	

Source: Researcher’s analysis

As per the outcomes of the Alita *et al.* (2021) tests in EXHIBIT 4, the *p-value* is less than the significance level of 0.05, meaning that the null hypothesis cannot be accepted because the panel data has heteroscedasticity, which is not desirable. This implies that the study results are distorted and cannot be relied on without addressing the problem of heteroscedasticity. The feasible generalised least square will need to be performed to solve the problem of heteroscedasticity.

Multicollinearity

Multicollinearity occurs when there is a close connection between the variables. According to Hunermund and Louw (2020), multicollinearity can be a problem in making inferences and tends to distort the standard error, which might affect the validity of the study results. As shown in EXHIBIT1, the Spearman Rank correlation matrix results show that some of the variables are highly correlated. The variance inflation factor (VIF) tests were done to confirm multicollinearity. The results are shown in EXHIBIT 5 below:

EXHIBIT 5. Variance inflation factor results.

Variable	VIF	1/VIF
ECI	3.89	0.257375
MC	1.03	0.970884
TAT	1.03	0.97497
CR	1.01	0.986292
OPM	1.01	0.986369
PER	1	0.996978
LR	1	0.997648
Mean VIF	9.21	

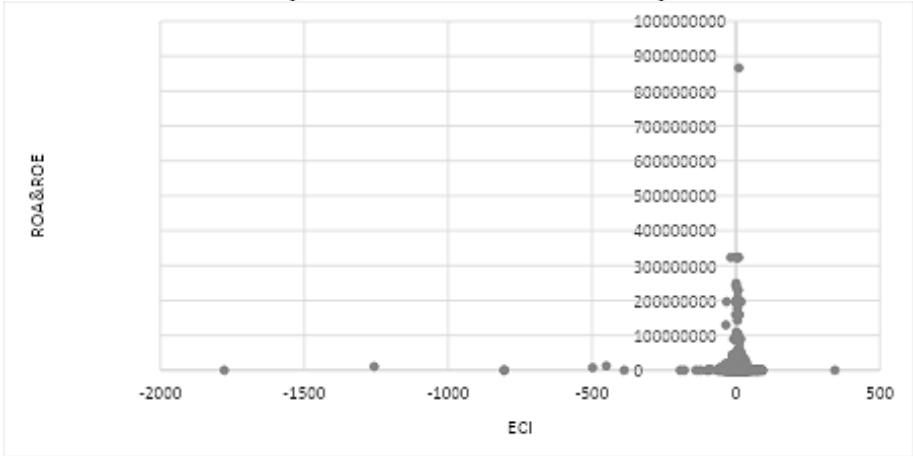
Source: Researcher's analysis

As shown in EXHIBIT 5 above, the mean VIF of 9.21 is less than 10, indicating that multicollinearity is not present in the panel data. This implies that the validity of the study results is not compromised, as the standard error is not affected. The predictor variables are not closely related; therefore, multicollinearity does not pose a major threat to the results. This implies that when the independent and control variables are not closely related, the population coefficient can be precisely estimated, resulting in accurate results that cannot be doubted.

Graphical presentations of the variable performance

The scatter graphs generated in Excel show the degree of correlation between the independent variables (ROA & ROE) and predictor variables. The scatter graphs in EXHIBITS 6 and 7 depict the performance of individual independent variables against the response variable (ROA & ROE).

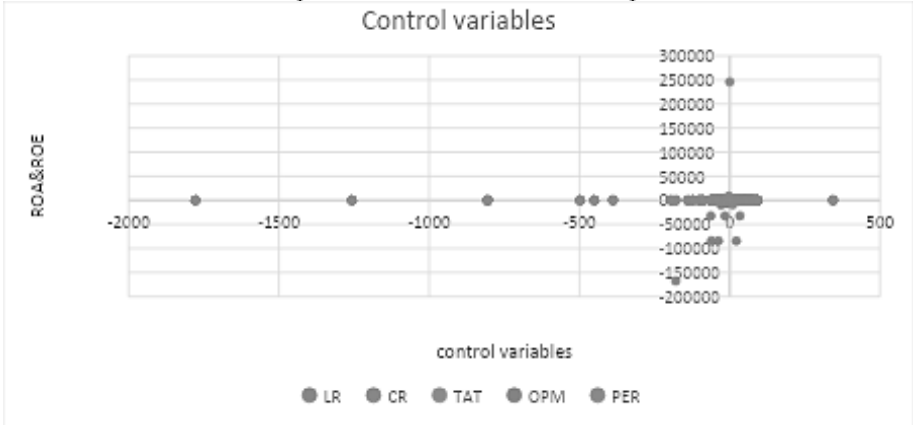
EXHIBIT6: The relationship between econ-investments and the response variable



Source: Researcher’s analysis

The correlation between ECI (independence) and ROA&ROE (dependent) is shown in the graph EXHIBIT 6 above. The three variables have a positive correlation. The ECI impact on selected JSE Index-listed organisations’ financial performance has a positive return/benefit as the positive correlation between ROA and ECI is 0.001 and between ROE and ECI is 0.4893.

EXHIBIT 7. The relationship between control variables and response variables.



Source: Researcher’s analysis

The graph in EXHIBIT 7 shows that the control variables and ROA & ROE are positively correlated, as most of the outliers are below the

margin line. The performance of control variables over an eleven year's period shows that there is a direct connection between the variables.

Summary of significance tests

The study tested significant tests to examine the correlation between ECI and ROA & ROE's impact on corporate entities. The correlation matrix (EXHIBIT 1) showed that ECI has a positive benefit on the ROA & ROE and indicated that some variables are highly correlated. The multiple linear regression (EXHIBIT 2) showed a significant and positive result. The VIF (EXHIBIT5) tests were done to confirm the presence of multicollinearity, which was not present in the panel data, and the graphical presentation of the variance performance (EXHIBITS 3, 6 & 7) indicated that the dependent and independent variables are positively correlated, and the panel data is normally dispersed, and there is no evidence of violating the normality assumptions.

In testing for heteroscedasticity (EXHIBIT 4), specific tests were performed for both fixed and random effects models, and the p-value is less than the significance level of 5%, meaning the panel data have heteroscedasticity which is not desirable. That is the reason why specification tests were done to deal with the heteroscedasticity that is present in the panel data.

Specification tests on fixed and random effects models fitting results

The specification tests were done because the null hypothesis assumes that the panel data has homoscedasticity, and alternative hypotheses assume that the panel data have heteroscedasticity. In testing for heteroscedasticity, Alita *et al.* (2021) tests were performed for both fixed and random effects models. The results from the Alita *et al.* (2021) tests are shown in EXHIBIT4 above.

The specification tests conducted involve performing fixed effects regression (FEM) and GLS random effect model (REM). Furthermore, Hausman tests have been conducted to choose the appropriate model between FEM and REM. The results for the FEM are shown in EXHIBIT 8. EXHIBIT 8 below is grounded on the response variables (ROA & ROE) while the self-governing variables are as follows: Eco-investments expenditures and market capitalisation.

EXHIBIT 8. Model fitting with ROA and ROE as the response variable (1).

Fixed effects (within) regression
Group variable: firm code
R-sq: within = 0.0027
between = 0.0878
overall = 0.0188
corr (u i, Xb) = -0.1005

Number of obs = 1 925
Number of groups = 175
Obs per group min = 6
avq = 10.9
max = 11
F (9.1724) = 0.51
Prob > F = 0.0302

Variables	Coef.	Std. Err.	T	P>t	[95% Conf.	Interval]
LogECI	.1410405	1.287708	0.11	0.0423	-2.384594	2.666676
LogMC	1.183417	.7660045	1.54	0.0122	-3189787	2.685813
LR	-.0001202	.00022	-0.55	0.0585	-0005518	0003113
CR	-.021726	.0628952	-0.25	0.0720	-1450852	1016322
TAT	.2826977	.0002407	.28	0.0777	-2.239185	1.673789
OPM	.0001486	.0052779	0.62	0.0527	-0003236	0006207
PER	.0006265	.0052779	-0.12	0.0904	0097152	0109883
_cons	-6.846151	15.0691	-0.45	0.0650	-36.4018	22.7095
sigma_u	24.650825					
sigma_e	51.415024					
Rho	18690612	(Fraction of variance due to u_i)				

F test that all u_i=0: F (174 1724) = 2.38 Prob > F = 0.030

Source: Researcher’s analysis

As shown in EXHIBIT8, the FEM regression model is significant as demonstrated by a *p-value* of 0.0423. The connection between ROA&ROE and ECI is significant as the p-value (0.030) is smaller than the significant level of 0.05. This indicates that the selected JSE listed organisation’s ECI programmed procurement significantly influences

ROA & ROE. However, these results might not be accurate because the panel data have heteroscedasticity, which is undesirable. The p -value is less than the significance level of 5%, which is clear evidence of the absence of homoscedasticity. The results imply that the panel data analysis results might have overestimated the coefficient, resulting in doubts about the study results. Previous studies employed the same method of ensuring validity (Neri *et al.*,2021).

Random effect model for return of assets

EXHIBIT 9 below is grounded on the response variables (ROA & ROE), while the self-governing variables are as follows: Eco-investments expenditures and market capitalisation.

EXHIBIT9. Model fitting with ROA and ROE as the response variable (2)

Random effects GLS						
Group variable: firmcode						
R-sq: within = 0.0020						
Between = 0.1233						
Overall = 0.0242						
Corr(u_i, x) = 0 (assumed)						
				Number of obs = 1 925		
				Number of groups = 175		
				obs per group:min = 6		
				avq = 10.9		
				max = 11		
				Wald chi ² (10) = 25.35		
				Prob > chi ² = 0.0086		
Variables	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
LogECI	.2793769	.9377403	0.30	0.0766	-1.55856	2.117314
LogMC	1.912518	.444046	4.31	0.000	1.042204	2.782832
LR	-.0000552	.0002159	- 0.26	0.0079	-.0004783	.0003678
CR	.0021267	.0579284	0.04	0.0097	-.1114109	.1156643
TAT	-.8014895	.8760461	- 0.91	0.0360	-2.518508	.9155294
OPM	.0004526	.0002344	1.93	0.044	-6.94e-06	.0009121
PER	.0009788	.0051695	0.19	0.0350	-.0091532	.0111109
_cons	-21.97872	9.590608	- 2.26	0.022	-40.77596	-3.181472
sigma_u	16.788119					
sigma_e	51.415024					
Rho	0963445	(Fraction of variance due to u_i)				

Source: Researcher’s analysis

As shown in EXHIBIT 9 above, the REM regression model is significant, as demonstrated by a *p-value* of 0.0086. The table designates the significant statistics where the regressors and *p-values* are taken note of, and the significant level is set at 95%, with *p-values* greater than 0.05

understood to be insignificant. The inclusion of control variables was conducted, and the tests indicated that the eco-investments (ECI) positively and significantly influence the organisation's financial performance (ROA & ROE).

Hausman tests

The random effects model and fixed effect model. The Hausmann test was applied to ensure that the right model between FEM and REM is selected. The outcomes of the Hausmann test are shown in EXHIBIT 10.

EXHIBIT10. Hausmann test results

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
Response Variable	Fixed	Random	Difference	SE.
LogECI	1.410405	2.793769	-1.383364	0.0018
LogMC	1.183417	1.912518	-0.729101	7.4838

b = consistent under H_0 and H_a ; obtained from xtreg; B = inconsistent under H_a , efficient under H_0 ; obtained from xtreg; Test: H_0 : difference in coefficients not systematic

$$\chi^2(2) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

$$= 174$$

$$\text{Prob}>\chi^2 = 0.0077$$

Source: Researcher's analysis

The results in EXHIBIT10 above show a *p-value* of 0.0077, which is lower than the significant level of 0.05. In this case, alternative hypotheses cannot be rejected (there is a correlation between ECI and selected organisations' ROA & ROE listed on the JSE Index). Hence, the FEM is the preferred model. This implies that the study can further check the validity of the results regarding the assumptions of regression.

Interpretation of model fitting results of feasible generalised least square results

This regression model simultaneously provides results to help address the problems of autocorrelation, heteroscedasticity, and cross-sectional correlation to ensure that the study's results are valid. In this regard, the panel data have heteroscedasticity, and no auto-correlational effects have been detected. The test for cross-sectional dependence was not done

because it is not common in the micro panel with less than twenty years. Kayikci *et al.*, (2021) argue that failure to address cross-sectional dependence in the estimation of the panel model can lead to unfair statistical outcomes. No test was performed to detect cross-sectional dependence in the panel data; hence, the existence of cross-sectional dependence in the panel data could not be ruled out. Therefore, it is, imperative to run FGLS regression to suppress the assumptions of the regression to ensure that the highest degree of validity of the study’s results is achieved. A summary of the results of the FGLS is shown in EXHIBIT 11 below.

EXHIBIT11. Model fitting results with ROA and ROE as the response variable (3)

Cross-sectional time-series FGLS regression	
Coefficients: generalised least squares	
Panel: heteroskedastic	
Correlation: no autocorrelation	
Estimated covariance's	= 175
Estimated autocorrelations	= 0
Estimated coefficients	= 10
Number of obs = 1 925	
Number of groups = 175	
obs per group: min = 6	
avq = 10.90286	
max = 11	
Wald $\chi^2_{(10)} = 49.12$	
Prob > $\chi^2 = 0.0000$	
Log likelihood	= - 10383.5

Variables	Coef.	Std. Err.	Z	P>z	[95% Conf.	Interval]
LogECI	.2052528	.8011754	0.26	0.039	-1.365022	1.775528
LogMC	2.030554	.3530716	5.75	0.000	1.338547	2.722562
LR	8.5306	.0002216	0.04	0.096	-.0004257	.0004428
CR	.0235559	.0560627	0.42	0.067	-.0863249	.1334367
TAT	-1.161114	.8185111	-1.42	0.015	-2.765367	.4431881
OPM	.000753	.0002388	3.15	0.002	.000285	.001221
PER	.0013586	.0052868	0.26	0.079	-.0090033	.0117205
_cons	-24.88981	7.740755	-3.22	0.001	-40.06141	-9.71821

Source: Researcher's analysis

Information in EXHIBIT 11 above shows the FGLS outcomes for the study. The model results are inclusive of the effect of control variables. Given the results in EXHIBIT 11 above, the ROA & ROE has positively influenced by ECI and MC, TAT, and OPM. LR, CR, and PER have negatively influenced the correlation between ECI and ROA & ROE.

Discussion of results

The study's objective was to examine the correlation between ECI expenditure and ROA & ROE of organisations listed on the JSE Index. The study's H_0 : No correlation exists between ECI expenditure and selected organisations' ROA & ROE listed on the JSE Index, and H_a : There is a significant relationship between ROA&ROE and ECI corporate entities. The notion of ECI and ROA & ROE was discussed in a sample of 175 JSE-listed organisations. As shown in EXHIBIT 8, model fitting (1) (FEM) is significant as demonstrated by a *p-value* of 0.0082. The connection between ROA & ROE and ECI is significant as the *p-value* (0.042) is smaller than the significant level of 0.05. However, these results might not be accurate because the panel data have heteroscedasticity, which is undesirable. The *p-value* is less than the significance level of 5%, which is clear evidence of the absence of homoscedasticity. The results imply that the panel data analysis results might have overestimated the coefficient, resulting in doubts about the study results. Similar previous studies employed the same method of ensuring validity (Neri *et al.*, 2021).

As shown in EXHIBIT 9 above, model fitting (2) (REM) is significant as demonstrated by a *p-value* of 0.0086. The table designates the significant statistics where the regressors and *p-values* are taken note

of, and the significant level is set at 95%, with p-values greater than 0.05 understood to be insignificant.

In Hausman tests in EXHIBIT 10 above, the fixed effect model was the preferred model fitting results, but because the panel data have heteroscedasticity, feasible generalised least square model as model fitting results needed to be adopted so that the study can further check the validity of the results about the assumptions of regression.

As shown by EXHIBIT 11, model fitting **(3)** (FGSL) the correlation between ROA&ROE and ECI is significant and positive. Results indicate that the *p-value* is 0.039, which is lower than the significant level of 5%. The outcomes of the FGSL imply that the ECI does influence the return of assets. Therefore, it is important not to accept the hypothesis (H_0 : There is no correlation between ECI and ROA&ROE) and accept the hypothesis (H_a : There is a significant relationship between ECI expenditures and ROA & ROE). There is a business case for sustainability performance (ECI) in South African JSE-listed organisations. The results are consistent with previous research, which found a significant and positive correlation between ECI and ROE (Pratama & Wahyuni2022).

Conclusion

In this paper, a summary of findings is linked to the research objective as follows: the correlation between ECI and organisations' ROA&ROE listed on JSE Index. In addressing the research objective, the study looked at the related literature, which found inconclusive results. For the sake of this study, quantitative technique and the positivist explanatory research design were adopted. Through content analysis, ECI and FP data were gathered from annual integrated reports and were recorded in an MS Excel before it was exported into Stata. A series of diagnostic and specification tests were done to select the appropriate regression model. The diagnostic test outcomes indicated that all the regression assumptions were not violated except for heteroscedasticity. From the specification test done, FEM was preferred even though it had to be abandoned due to the heteroscedasticity challenge in the panel data.

In this study, the FGLS model fitting results were chosen due to their ability to address the three regression assumptions: autocorrelation, cross-sectional correlation, and heteroscedasticity. Hence, the study's findings are grounded on the outcomes of the FGLS model fitting results. Control variables were included for firm size represented by LR,

CR, MC, TAT, OPM, and PER. The researcher achieved the research objective, as there is a positive and significant connection between ECI and selected organisations' ROA & ROE, and the study's hypothesis was rejected (there is no correlation between ROA & ROE and ECI).

Contributions of the study

In the context of South Africa, this study discussed pertinent issues that were inclined to the national agenda of fast-tracking socio-economic transformation progress. This study provides constructive views regarding the ECI/ROA & ROE debate. Firstly, the study enhances the current form of literature on ECI discourse, as the aspects of ECI and ROA & ROE dimensions have not been well thought out in previous literature. This study opened new avenues for examining the impact of ECI on return on assets as a financial measure. The financial performance issue within South African JSE SRI Index-listed organisations is a topical subject that has not been resolved. This study demonstrates to the stakeholders that JSE Index-listed organisations have clear ECI policies that contribute to achieving sustainable business practices.

Recommendations

The study produced positive and significant results, as only 175 JSE-listed organisations have been tested. This implies that further research in this area is needed to ensure appropriate ECI policies that would be beneficial to both shareholders and stakeholders. This study considered aggregating ECI metrics from secondary sources, thus limiting independent views by stakeholders. The researcher recommends that primary qualitative data be used in future studies to measure the influence of ECI on organisations' financial performance.

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