Global mineral companies size and corporate governance

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Abstract

This paper analyses the relationship between the *size* of Global minerals companies and corporate governance. This is achieved by augmenting and comparing the corporate governance ratings of minerals companies in South Africa to that of the minerals companies world wide. The results show a statistically significant autonomous corporate governance as well as a statistically significant difference in corporate governance of the sampled companies' measures of transparency, comprising required disclosure and additional disclosure, based on size. The results, however, show no statistically significant difference in corporate governance between minerals companies in south Africa compared to the minerals companies in other parts of the world as well as no statistically significant difference in corporate governance of the companies measures of market value, market performance and financial performance. The paper, nevertheless, recommends a continued encouragement of good corporate governance to all companies, including those in the minerals industry, given the adverse consequences of the recent corporate scandals.

JEL Classification: C13, D22, G30, L70
Keywords: Global minerals companies, Corporate governance, Companies size

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Introduction

Global presence of companies has occasioned interest in the convergence of national corporate governance systems. Companies of different sizes worldwide adopt unique corporate governance models based on geographical location despite the generally universal business objectives, according to Chen (2023) and Byrne (2024). As it will be discussed, according to the Organisation Economic Cooperation and Development (OECD) (2015), different corporate governance models have, thus, been developed in different parts of the world. These models differ in their objectives, ownership structures and mechanisms, as contends Ross (2024). According to McKinsey & Company (2009) and McKinsey & Company (2020) surveys, business executives and professionals generally agree that Environmental, Social, and Governance, or ESG, programs improve companies performance and create short and long term shareholder value. However, Wernicke (2018) and Wright (2020) argue that the size of companies can impact corporate governance where small companies tend to have less resources to support governance structures and reporting.

Corporate governance, generally described as a system of rules, practices and processes by which companies are directed and controlled, has long been viewed as a defining characteristic of resilience, profitability and long term success of companies. Corporate scandals, which can occur based on evidence of unethical behaviour, negligence or interference by third parties, have adversely impacted many companies, according to Conmy (2022). Inadequate governance frameworks are associated with financial loss, legal penalties and reputational damage in addition to unchecked power imbalances and even corporate scandals, which erode stakeholder trust and can have severe financial consequences, as contends Byrne (2024). Companies of all sizes, from all geographical locations, including government regulators, are increasingly recognising the importance of incorporating corporate governance in business strategic decision making, either through voluntary initiatives or legislation. Different corporate governance models can be found around the world, including the Anglo-Saxon model, the Continental model and the Japanese model, according to the Organisation Economic Cooperation and Development (OECD) (2015). South

Africa pursues distinctive corporate governance practices in the form of the Institute of Directors South Africa (IODSA) (2016) King IV report, which is anchored on the Companies Act, the Financial Markets Act (FMA) as well as the Johannesburg Stock Exchange (JSE) (2024) memorandum of incorporation.

The agency theory of corporate governance is the framework that hypothesises the relationship between the *size* of minerals companies and corporate governance. Significant contributions to the agency problem include Coase (1937), Jensen and Meckling (1976), Fama (1980), Fama and Jensen (1983b), Fama and Jensen (1983a) and Jensen (1986). According to Solomon (2020), the agency theory outlines the relationship between agents and principals. The potential for conflicts of interests exists that is a consequence of the non alignment of preferences between shareholders and upper management, also known as the principal-agent problems, and between majority and minority shareholders, also known as the principal–principal problems. An alternative to the agency theory is the stakeholder theory, discussed in Phillips (2003). Glassman (2005), Ungureanu (2012), Chen (2023), survey the corporate governance models, while Morck (2005) and Naciri (2008) provide the theoretical perspective on corporate governance models. Despite the growing interest in sustainable corporate practices, such as, corporate governance and companies specific characteristics, there is neither a consensus on the nature of the relationship between these two phenomena nor how such a relationship manifests across the institutional contexts.

This paper analyses the relationship between the *size* of Global minerals companies and corporate governance. This is achieved by comparing the corporate governance ratings of minerals companies in South Africa to that of the minerals companies world wide. A sample of companies in the minerals sector is, thus, augmented with a sample of companies in the other sectors of the economy. The relationship between corporate governance of these companies is then analysed against a set of attributes that comprise the sampled companies' geographical location, market value, market performance, financial performance and transparency using Analysis of Variance (ANOVA). A stylised fact, based on existing literature, that includes Bruno and Claessens (2010), Chan et al. (2014), Ioannou and Serafeim (2017), Johnson et al. (2019), Adel et al. (2019) and Herbert and Agwor (2021), is the existence of no discernible relationship between corporate governance and companies' specific attributes. Corporate environments and structures can vary in substantive ways, even when business objectives are generally universal, hence the literature cannot provide a generally applicable corporate governance model, according to Wernicke (2018).

The paper is organised as follows. The next section outlines the methodology and presents the data, then is the discussion of the empirical results. Last is the conclusion with recommendations.

Methodology and data

ANOVA (Analysis of Variance) is used to study the relationship between the attributes of minerals companies and corporate governance. ANOVA (Analysis of Variance) is the econometric methodology that analyses the relationship between a continuous dependent variable and one or more categorical independent variables while adjusting for the effects of one or more covariates. ANOVA (Analysis of Variance) assesses the impact of one or more independent categorical, also called binary, discrete or dummy, variables on a single, continuous dependent variable. ANOVA (Analysis of Variance) is thus a reduced form version of ANCOVA (Analysis of Covariance), which introduces covariates to adjust the model. Analysis of Covariance (ANCOVA) can be considered as a combination of ANOVA (Analysis of Variance) and regression analysis, given that it facilitates testing the difference in mean of a variable while controlling for the effects of the other variables. A detailed discussion on Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA) regression models can be found in Gujarati and Porter (2009).

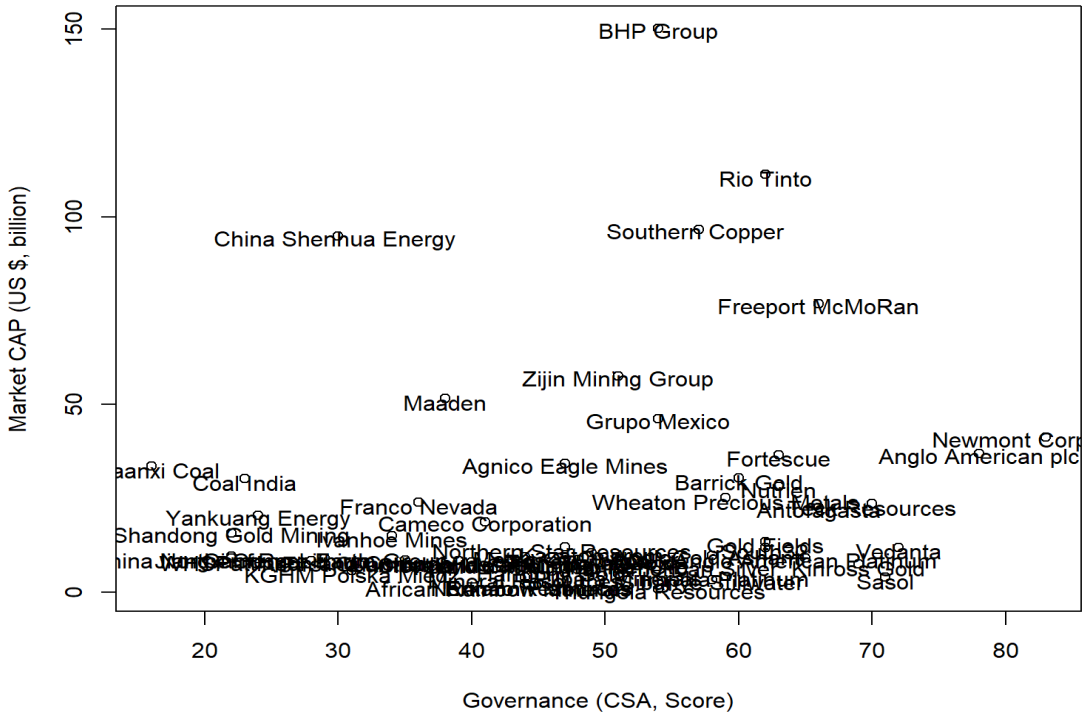
The following generalised Analysis of Covariance (ANCOVA) model is specified

$$Y_i = \alpha + \beta_{Xi} \sum_{j=1}^{n} X_{ij} + \beta_{Di} \sum_{j=1}^{n} D_{ij} + \epsilon_i \tag{1}$$

where Y_i is a vector of observations of a continuous dependent variable, $\sum_{j=1}^{n} X_{ij}$ is a matrix of independent continuous variables and $\sum_{j=1}^{n} D_{ij}$ is a matrix of independent categorical variables. α is the intercept term, β_{Xi} and β_{Di} are the regression coefficients associated with independent continuous and categorical variables, respectively. The subscript i are vectors that describe the observations of dependent and independent variables, model coefficients and the error term, while j are matrices of independent continuous and categorical variables. ϵ_i is the Independent and Identically Distributed (IID), or White noise, error term. The Analysis of Covariance (ANCOVA) model, thus, expresses the dependent, or response, variable as a function of continuous and categorical independent, or explanatory, variables.

The dependent continuous variable Y_i, denoted Governance, measures corporate governance of the sampled companies. The independent continuous variables $\sum_{i=1}^{n} X_{ij}$ are the sampled companies' measures of market value, market performance, financial performance and transparency. Market value measure , denoted Market CAP, is market capitalisation of the sampled companies. Market performance measure, denoted Shares TTM, is the share price of the sampled companies trailing 12 months (TTM), or over a period of one year. Financial performance measures, denoted ROE and ROA, are return on equity and return on assets of the sampled companies, respectively. Transparency measures, denoted Disclosure REQ and Disclosure ADD, are required disclosure and additional disclosure rates, respectively. The categorical variables $\sum_{j=1}^{n} D_{ij}$, also known as discrete or dummy variables, are the sampled companies' measure the geographical location. Geographical location measure, denoted Country DM, distinguishes between the minerals companies in South Africa and the minerals companies worldwide.

The data on the measures of corporate governance and transparency was sourced from Standards & Poors Global's Corporate Sustainability Assessment (CSA) database. The data on the measures of companies economic activity, market value, market performance and financial performance was sourced from Yahoo Finance's Financial Data & Stock Exchanges Performance Dashboard. The data was accessed during the month of April, 2024. The selected variables on the companies attributes are depicted in Figure 1. All the 42 sampled companies are listed on the stock, or securities, exchanges. 16 of the sampled companies operate in South Africa, while 26 of the sampled companies are in other parts of the world., Most of the South African companies are also a part of the Johannesburg Securities Exchange (JSE) top 40 capitalisation weighted index. The minimum condition for the inclusion of companies in the sample was that they have a comprehensive Corporate Social Assessment (CSA) information and detailed financial information on Standards & Poors Global's Corporate Sustainability Assessment (CSA) database as well as on Yahoo Finance's Financial Data & Stock Exchanges Performance Dashboard.



Notes: Data is sourced from Standards & Poors Global and Yahoo Finance. Governance (CSA, Score) is corporate governance Corporate Sustainability Assessment (CSA) Scores of the sampled companies. Market CAP (US $, billion) is the sampled companies market capitalisation in billion U.S. dollars.

Figure 1: Plots of selected variables

Corporate governance is the sampled companies Corporate Sustainability Assessment (CSA) Scores encompassing Business ethics, board diversity and shareholder engagement, risk management as well as sustainable finance and reporting etc. Geographical location captures the companies location of it's operations and is assigned the value of 1 for companies operating in South Africa and 0 otherwise. Market capitalisation is the share price of companies multiplied by the number of shares outstanding, or market

value of outstanding shares. Share price is the share price of companies trailing 12 months (TTM), or 12 consecutive months of Share price performance. Return on equity is the companies annual return, or net income, divided by the value of total shareholders' equity. Return on assets is the companies profitability, or net income, divided by the total assets. Required disclose is the information that is required to be included in the companies financial statements. Additional disclose is the voluntary information that is neither required nor mandatory, but may be included in financial statements to provide more details.

Minerals companies include those that produce gold, coal, iron ore, platinum group metals, copper, chrome, nickel, aluminium and diamonds etc. Companies that operate worldwide, or in other parts of the world other than South Africa, include those in all continents comprising Asia, Africa, North and South America, Europe and Australia. The independent variable, Country DM, was transformed to a nominal scale, also known as indicator, binary, dichotomous, discrete, categorical or dummy, variable to facilitate the Analysis of Variance (ANCOVA) estimation. Dummy variables usually take a binary value, 0 or 1, to indicate the absence or presence of some categorical effect that may shift the outcome. Country DM, which measures the companies' geographical location, was assigned a value of 1 for companies operating in South Africa, or companies with operations in countries that include South Africa, and 0 otherwise.

The descriptive statistics of the variables are presented in Table 1. The correlation coefficients, which measure the strength and direction of the linear association between two variables, show a weak positive relationship between corporate governance and the companies' measures of geographical location and market value that comprise Country DM and Market CAP, respectively. The results also show a weak negative correlation between corporate governance and the companies' measure of market performance, Shares TTM. The results further show a moderate positive correlation between corporate governance and the companies' measures of financial performance, return on assets and return on equity, denoted ROE and ROA, respectively. The results finally show a strong positive correlation between corporate governance and the companies' transparency measures that comprise Disclosure REQ and Disclosure ADD, respectively. The correlation coefficients of Disclosure REQ and Disclosure ADD are 0.75224 and 0.73979, respectively. This implies a strong positive linear relationship between corporate governance and the companies' measures of transparency, while the opposite is true for the rest of the variables.

	Corr	Max	Min	Mean	Std dev
Governance	1.00000	83.0000	16.0000	48.8246	15.5427
Country DM	0.32644	1.00000	0.00000	0.28070	0.45334
Market CAP	0.14983	1.00000	0.00000	0.31579	0.46896
Shares TTM	-0.15776	1.00000	0.00000	0.40351	0.49496
ROE	0.07199	1.00000	0.00000	0.42105	0.49812
ROA	0.12543	1.00000	0.00000	0.40351	0.49496
Disclosure REQ	0.74439	1.00000	0.00000	0.63158	0.48666
Disclosure ADD	0.63692	1.00000	0.00000	0.52632	0.50375

Notes: Data is sourced from Standards & Poors Global and Yahoo Finance. Corr is the correlation coefficient, or the degree of association between Governance and all the variables. Min and Max are the maximum and minimum values of the variables, respectively. Mean is the average value of the variables and Std dev is the variables standard deviation.

Table 1: Descriptive statistics

The descriptive statistics further show that the dependent variable, Governance, has a mean value of 48.8246, the maximum value of 83.0000 and the minimum value of 16.0000. The Standards & Poors Global's Corporate Sustainability Assessment (CSA) score, or rating, is between 0 and 100 for least performing to high preforming companies, respectively. This means that, on average, the corporate governance rating of minerals companies in South Africa and the minerals companies in other parts of the world, is just about the middle point, or 48.8 percent, of the Corporate Sustainability Assessment (CSA) score. As discussed, the independent variables were transformed from ratio scale to nominal scale. The measures the companies' geographical location, market value, market performance and transparency, denoted Country DM, Market CAP, Shares TTM, ROE, ROA, Disclosure REQ and Disclosure ADD, have a maximum value of 1.00000 and a minimum value of 0.00000 given that they are dummy variables that take a binary value, 0 or 1, to indicate the absence or presence of categorical effect for the minerals companies in South Africa and those that operate worldwide. The mean value of Country DM is 0.28070 with standard deviation of 0.45334, so that just under a third, or 28.1 percent, of the sampled minerals

companies in South Africa, while the rest of the companies that operate in other parts of the world.

Market CAP, which measures market capitalisation of the sampled companies, has a mean of 0.31579, so that about under a quarter, or 31.6 percent, of the sampled companies have above average market capitalisation. Shares TTM, which is the share price growth over a period of one year, has a mean of 0.40351, so that about 40.3 percent of the sampled companies have above average share price growth over a period one year. ROE and ROA, which are return on equity and return on assets, respectively, have a mean of 0.42105 and 0.40351, so that 42.1 percent and 40.4 percent of the sampled companies, respectively, have above average financial performance. Disclosure REQ and Disclosure ADD, which are Corporate Sustainability Assessment (CSA) transparency measures of the sampled companies, have a mean of 0.63158 and 0.52632, so that 63.2 percent and 52.6 percent of the sampled companies, respectively, have above average transparency. As discussed, of the total of 57 sampled minerals companies, 16 companies operate in South Africa, while the rest of the companies operate in the other parts of the world.

Empirical results

The **Analysis of Variance (ANOVA)** model was estimated to capture the relationships between the size of minerals companies and corporate governance, as discussed. The empirical results of the ANOVA (Analysis of Variance) model are presented in Table 2. The dependent variable is corporate governance, while the independent variables are the companies' attributes that include geographical location, market value, market performance, financial performance and transparency. Residual Standard Error (RSE), or the deviation between the regression function and the data set, is 9.694907 on 49 Degrees of Freedom (DF). Coefficient of determination, which measures the predictive ability of the independent variables, shows that Multiple R Squared is 0.6595589,, while the Adjusted R Squared, which accounts for the number of predictors and the sample size, is 0.6109245. This means that 65.9 percent of the variability in corporate governance is explained by the minerals companies' attributes including the companies' geographical location, market value, market performance, financial performance and transparency.

The F statistic is 13.56156 on 7 and 49 Degrees of Freedom (DF) with a p value of 0.00000 hence the null hypothesis of the joint insignificance of the regression coefficients is rejected. The regression coefficients of the independent categorical variables are, thus, jointly statistically significant, or sufficiently explain the variability in the dependent variable, corporate governance. The variables coefficients statistical significance codes, or p values, are Pr(> |t|) <0.01 '***', <0.05 '**', <0.10 '*'. The results show that the intercept term and the independent variables, Disclosure REQ and Disclosure ADD, are statistically significant at 5 percent level of significance, while the rest of the coefficients, including Country DM, are statistical insignificant. The other regression diagnostics for the validity of the regression model's assumptions, show that the Studentised Breusch and Pagan (1979) test statistic is 4.2884639 with 7 Degrees of Freedom (DF) and a p value of 0.7460169. The null hypothesis of homoscedasticity is thus accepted, and as such, the model residuals are equally spread at 5 percent level of significance.

Goldfeld and Quandt (1965) test statistic is 1.4957445 on 21 and 20 Degrees of Freedom (DF) for the first and second models and a p value of 0.1861617. The null hypothesis of homoscedastic error terms is accepted, and hence, the residuals are equally spread, as with Studentised Breusch and Pagan (1979) test. Variance Inflation Factors (VIFs), available on request, show the minimum VIF of 1.163452, the mean of 2.124530 and the maximum VIF of 3.602687 for the independent variables in the regression model, hence the conclusion is that there is no severe multicollinearity, or correlation between the predictor variables. Shapiro and Wilk (1965) test statistic is 0.978933 with a p value of 0.419491 so that the null hypothesis of the normal distribution of errors is accepted. Ramsey (1969) RESET test statistic is 0.080892 with 2 and 47 Degrees of Freedom (DF) for the restricted and unrestricted model and a p value of 0.922422. The null hypothesis of no model misspecification is accepted, hence, the estimated regression model is correctly specified. Examination of model Residuals versus Fitted plot and Quantile-Quantile (Q-Q) plot, depicted in Figure 2, shows equal error variances, no outliers and the normal distribution of residuals.

As discussed, the independent variables, including the companies' geographical location, were transformed from ratio scale to nominal scale, where a value of 1 was assigned to the observations that are greater than, or fall above, the mean of the respective measures and 0 otherwise. Autonomous corporate governance rating, measured by the intercept term, is 31.5689. This is the corporate governance rating of an average sampled company, holding the independent variables constant. Disclosure REQ coefficient shows that corporate governance rating is higher by 16.5654 points for the sampled companies with required disclosure score greater of equal to 78.24561 compared to those with the lower scores, where 78.24561 is the mean of required disclosure score of the sampled companies. Disclosure ADD coefficient shows that corporate governance rating is higher by 11.0939 points for sampled companies with additional

	Corr	Coeff	Std Error	t value	Pr(> |t|)
Intercept	1.00000	31.5689	2.8289	11.1593	0.00000 ***
Country DM	0.32644	2.94351	3.51609	0.83716	0.40657
Market CAP	0.14983	0.60275	2.97980	0.20228	0.84054
Shares TTM	-0.15776	-1.06271	3.16632	-0.33563	0.73858
ROE	0.07199	-2.53737	4.93664	-0.51399	0.60957
ROA	0.12543	3.55624	4.96477	0.71630	0.47721
Disclosure REQ	0.74439	16.5654	3.66999	4.51375	0.00004 ***
Disclosure ADD	0.63692	11.0939	3.28345	3.37876	0.00144 ***

Significance codes: Pr(> |t|) <0.01 '***', <0.05 '**', <0.10 '*'
Residual standard error: 9.694907 on 49 Degrees of Freedom (DF)
Multiple R Squared: 0.6595589, Adjusted R Squared: 0.6109245
F-statistic: 13.56156 on 7 and 49 DF, p value: $1.352444e^{-9}$

Notes: Data is sourced from Standards & Poors Global and Yahoo Finance. Variables are defined in text. Corr is the correlation coefficient, or the degree of association between Governance and all the variables. Coeff are the regression coefficients. Std Error are the coefficients' standard deviations. t values are individual regression coefficients' t statistics that measure statistical significance. Pr(> |t|) is the p value. R Squared is the coefficient of determination. F statistic is the joint, or overall, regression coefficients' statistical significance.

Table 2: Empirical results

disclosure score greater of equal to 70.40351 compared to those with the lower scores, where 70.40351 is the mean of required disclosure score of the sampled companies. The independent categorical variables that include the companies' geographical location, market value, market performance and financial performance are not statistically significant at 5 percent level of significance hence there is no discernible, or meaningful, relationship between the set of companies' characteristics and corporate governance.

The empirical results have revealed an interesting relationship between corporate governance and the companies' measures of geographical location, market value, market performance and transparency. The results have shown a statistically significant autonomous corporate governance as well as a statistically significant difference in corporate governance of companies with higher, or above average, measures of transparency, comprising required disclosure and additional disclosure, in comparison to the companies with lower, below average, measures of transparency. The results have, however, shown no statistically significant difference in corporate governance of the minerals companies in South Africa compared to the companies in other parts of the world. The results have also shown no statistically significant difference in corporate governance of companies with higher, or above average, market value, market performance and financial performance in comparison to the companies with lower, below average market value, market performance and financial performance. The measures of transparency are thus, statistically, important in describing the differences in corporate governance of South African companies based on their size, while the opposite is true for the rest of the other measures of companies' specific characteristics, such as companies' geographical location, market value, market performance and financial performance.

The results are consistent with most of the literature with regard to the relationship between corporate governance and companies' specific characteristics. The empirical results are, however, at odds with the theoretical hypotheses and anecdotal evidence. As discussed, the theoretical hypotheses and prescripts as well as anecdotal evidence have shown that good corporate governance benefits all stakeholders, while bad governance can lead to scandal and insolvency of companies. The recent corporate scandals and the efforts by different institutions, including the Organisation Economic Cooperation and Development (OECD) (2015), Institute of Directors South Africa (IODSA) (2016) as well as the Johannesburg Stock Exchange (JSE) (2024) memorandum of incorporation, are a testimony to the significance of these hypotheses and prescripts in relation to corporate governance that is aimed to avert economic crises and ensure companies' sustainability. Although the empirical results have shown lack of a discernible relationship between corporate governance and the set of selected companies' specific characteristics, saving the transparency measures, the recommendation is continued encouragement and endorsement of good corporate governance to minerals companies in South Africa as well as all the other sectors of the economy.

Conclusion

This paper analysed the relationship between the *size* of Global minerals companies and corporate governance. This was achieved by augmenting and comparing the corporate governance ratings of minerals companies in South Africa to that of the minerals companies world wide. The results have shown a statistically significant autonomous corporate governance as well as statistically significant difference in corporate governance of companies with above average measures of transparency, comprising required disclosure and additional disclosure, based on size. The results have, however, shown no statistically significant difference in corporate governance of companies in the minerals sector compared to the companies in the other sectors of the economy as well as no statistically significant difference in corporate governance of the companies measures of market value, market performance and financial performance. The results are consistent with the stylised evidence of no discernible relationship between corporate governance and the companies' specific performance characteristics. The paper, nevertheless, recommends continued encouragement and endorsement of good corporate governance to all companies, including those in the minerals sector, given the devastating consequences of the recently experienced corporate scandals.

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Appendix

Appendix 1. Description of the variables

The detailed descriptions of the variables are presented in Table 3 below.

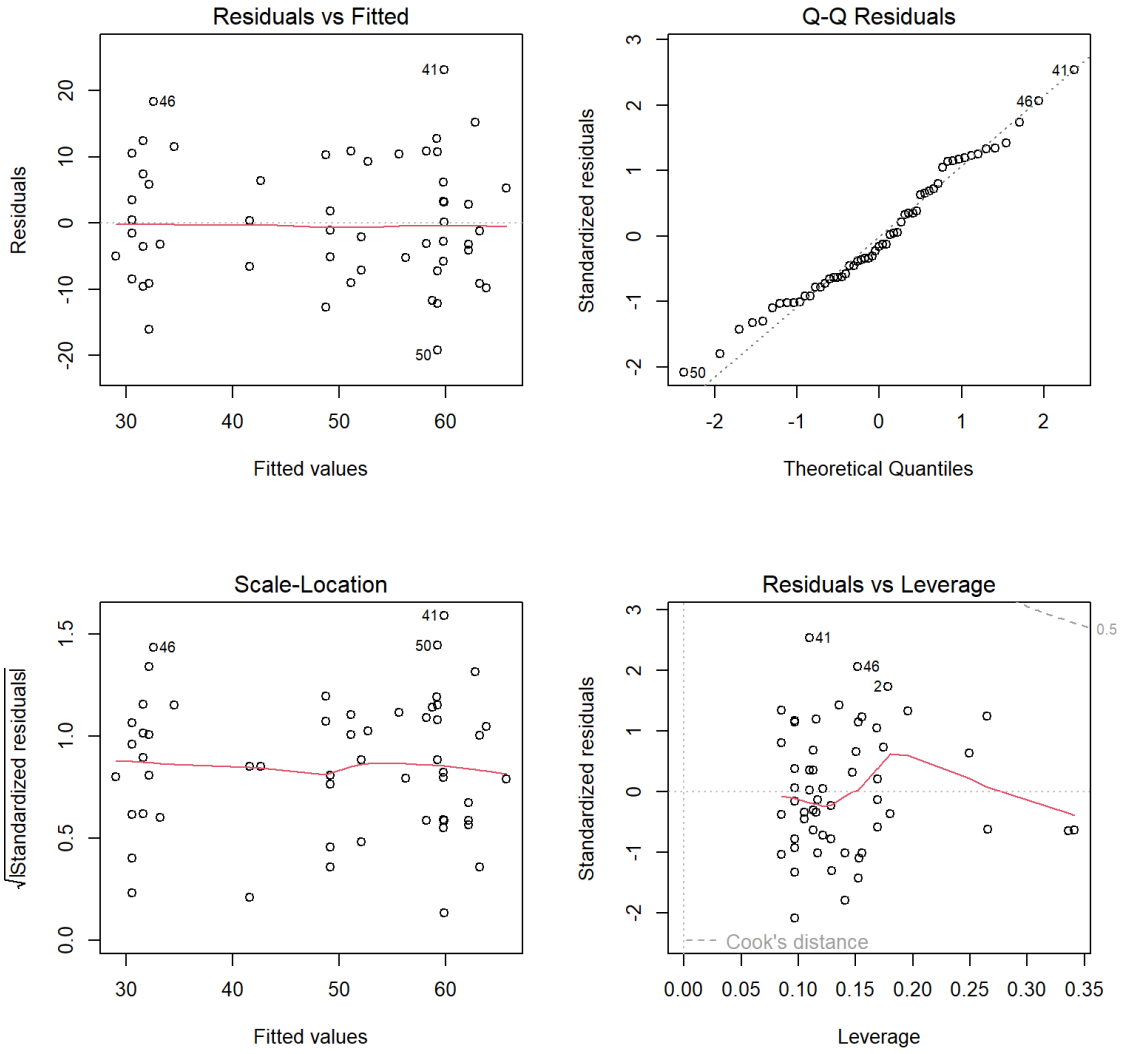
Denotation	Variable	Description
Governance	Corporate Governance	Business ethics, board diversity and shareholder engagement and sustainable finance and reporting etc.
Country DM	Country Dummy	Companies location of operations, assigned a value of 1 for companies operating in South Africa and 0 otherwise
Market CAP	Market Capitalisation	Share price of companies multiplied by the number of shares outstanding, or market value of outstanding shares
Shares TTM	Share price	Share price of companies trailing 12 months (TTM), or 12 consecutive months of Share price performance
ROE	Return on Equity	Companies annual return, or net income, divided by the value of total shareholders' equity
ROA	Return on Assets	Companies profitability, or net income, divided by the total assets
Disclosure REQ	Required Disclose	Information that is required to be included in the companies financial statements
Disclosure ADD	Additional Disclose	Information that is not required, but may be included the companies financial statements to provide more details

Notes: Data is sourced from Standards & Poors Global and Yahoo Finance. Governance is corporate governance, Country DM is a geographical location dummy, Market CAP is market capitalisation, Shares TTM is the share price, ROE is return on equity, ROA is return on assets, Disclosure REQ is required disclose and Disclosure ADD is additional disclose.

Table 3: Description of the variables

Appendix 2. Plots of model diagnostics

Selected model diagnotic statistics are depicted in Figure 2 below and complement model statistics.



Notes: Data is sourced from Standards & Poors Global and Yahoo Finance. Residuals are the difference between the observed values and the estimated values of the estimated Analysis of Covariance (ANCOVA) model. The model diagnostic statistics assist in detection of non-normality, non-linearity, unequal error variances and outliers in the estimated model.

Figure 2: Plots of diagnotic statistics