The association between board characteristics and the risk-adjusted return of South African companies

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Abstract:

Purpose: Regulatory documents and literature recommend individuals with various characteristics to be included on a board, which should improve the efficiency of the board and promote company performance. Stakeholders have different expectations from a company, for which literature holds the board accountable. Shareholders, for example, want superior returns, while government requires the implementation of transformation initiatives, especially in South Africa. It will therefore be valuable to several interested parties to know which board characteristics are likely to promote their objectives.

Design/methodology/approach: Binary logistic regression is used to analyse the relationship between various board characteristics and the risk-adjusted performance of a company. The dataset comprised 170 companies, from the 13 largest sectors/subsectors of the Johannesburg Stock Exchange for the period 2009 to 2015.

Findings: Percentage female (negative), chief executive officer (CEO) remuneration (negative), chairman remuneration (positive) and non-executive director (NED) remuneration (positive) and the payment gap (positive) showed statistically significant relationships with the odds that a company is categorised as a top performer based on its risk-adjusted return.

Practical implications: The findings inform various parties whether the benefits ascribed to the various board characteristics, by literature and regulations, are actually obtained.

Originality/value: The study moved away from the practice of looking for linearity in corporate relationships and expanded the list of board characteristics reviewed. It used a risk-adjusted performance measure, introduced innovative diversity measures, and focussed on South Africa.

Keywords:

Risk-adjusted return, Sharpe ratio, diversity, market-based, binary logistic regression.

1. INTRODUCTION

"Where there is no counsel, the people fall; But in the multitude of counsellors there is safety." (Proverbs 11:14$_{KJV}$). Solomon may well have had a board of directors in mind when he wrote this proverb, as one of the board's main purposes is to provide counsel to a company. Regulatory documents such as King IV and literature on corporate governance recommend various characteristics to be included on a board of directors, to achieve appropriate levels of diversity, independence, knowledge and experience. This is promoted to improve the functioning of the board and consequently improve company performance (Arzubiaga, Kotlar, De Massis, Maseda and Iturralde, 2018; Ferreira, 2010; IoDSA, 2016; Mans-Kemp, Viviers and Collins, 2018b). However, even though numerous studies consider the relationship between some board composition elements and the performance of companies, literature has failed so far to provide conclusive evidence as to which board characteristics actually benefit the performance of a company, especially in a South African context (Abdo and Fisher, 2007; Hillman and Dalziel, 2003; Mans-Kemp, Erasmus and Viviers, 2017; Nyirenda, 2010; Rashid, De Zoysa, Lodh and Rudkin, 2010; Yusoff and Alhaji, 2012).

This lack of evidence is caused by a number of factors. Firstly, many of the relationships have not been tested, and the few that have been tested produced contradicting results. Secondly, most studies focussed on developed countries, the findings of which are not necessarily valid in the South African emerging economy environment (Rashid, *et al*, 2010). Thirdly, studies, specifically South African studies, in this field typically tested for

linear relationships between corporate governance measures, including some board characteristics and a company's performance (Kirsten and Du Toit, 2018; Morris, 2018; Muchemwa, Padia and Callaghan, 2016; Ntim, 2015; Pandian, Thomas, Furrer and Bogner, 2006; Scholtz and Kieviet, 2018a; Scholtz and Kieviet, 2018b). However, social scientists are progressively questioning the expectation of linear relationships when it comes to corporate (social science) relationships (Basimov, 2019; Canarella and Nourayi, 2008; Lee, 2019; Paniagua, Rivelles and Sapena, 2018; Rasoava, 2019). Fourthly, most studies ignore the risk attached to the performance of the company (Mans-Kemp, *et al*, 2017).

Consequently, binary logistic regression is used to determine the relationship between each of the characteristics and the odds of a company being classified as a top performing company based on the risk-adjusted return of companies in South Africa, as an emerging economy. Logistic regression is a *generalized linear model* (GLM). GLMs are, despite their name, not generally considered linear models. They have a linear component, but the model itself is nonlinear due to the nonlinearity introduced by the link function (Azen and Walker, 2011; Kannu, 2017). The risk-adjusted return is measured by the Sharpe ratio, which includes the level of performance and the risk attached to the performance. The study also uses multiple linear regression and correlation analysis to test the criticism against looking for linear relationships.

The findings will identify development areas that should be dealt with to more efficiently meet government's development goals, enable policy-makers and regulators to determine whether their regulations achieve the desired results and provide shareholders with insights into the characteristics they may wish to include in their boards. Furthermore, nomination committees will be empowered to expand their searches for suitable candidates to a more diverse pool of contenders and directors will be guided on which characteristics to develop as part of their succession plans. The unique contributions of the study include the departure from looking for linear relationships, the use of risk-adjusted returns, the expansion of the list of bard characteristics tested and the introduction of novel approaches to assessing diversity for a number of variables.

2. LITERATURE AND HYPOTHESES

Literature and regulations recommend several board characteristics that are anticipated to have some form of association with a company's performance. Due to the lack of available empirical evidence it would be ill-advised to eliminate any of these characteristics from the initial regression model. Consequently, the following research hypothesis is posed:

H_{R1}: There is a relationship in the expected direction between each of the board characteristics and the odds of companies being classified as top performers, based on their risk-adjusted return.

To test the research hypothesis statistical hypotheses were formulated for each characteristic based on the literature reviewed.

2.1. Board characteristics

Literature and King IV propagate that, to meet its responsibilities, the board of directors needs to contain an adequate mix of skill, experience, background, gender and race (IoDSA, 2016; Loop, Keller and DeNicola, 2015; Mans-Kemp and Viviers, 2015). Literature on links between corporate governance and company performance is increasing, but with vastly diverse findings. Literature and regulations recommend a number of board characteristics that may impact on the effectiveness of the board.

Board size
Two schools of thought exist. The first prefers larger boards as they feel that, in line with resource dependency theory, such boards have better access to the diverse range of skills required to fulfil its functions (Coles, Naveen and Naveen, 2008; Muchemwa, 2014; Scholtz and Kieviet, 2018a; Scholtz and Kieviet, 2018b). The second prefers smaller boards, which they believe to be more cohesive, easier coordinated, quicker to make decisions and leave less room for individuals to shirk their responsibilities (Bermig and

Frick, 2010; Chen and Cheng, 2018; Kyereboah-Coleman and Biekpe, 2006; Mangena and Chamisa, 2008). Lipton and Lorsch (1992) believe that a board of directors needs to act timeously and efficiently to prevent minor challenges from turning into significant problems. In addition, takeover predators often focus their attention on reducing the board's size in an effort to turn a company around (Yermack, 1996). Based on this, the following hypothesis is set:

H_{S1}: There is a negative relationship between board size and the odds of a company being ranked as a top performing company.

Director independence

Even though some concerns have been raised around the ability of non-executive directors (NED) and independent directors to fulfil their tasks, such as not having enough time or information (Dah, Jizi and Sbeity, 2018; Weir and Laing, 2001), literature and regulations, such as King IV agree that the board should be composed of a majority of NEDs of which the majority, in turn, must be independent (Fahlenbrach, Low and Stulz, 2017; IoDSA, 2016). The view is that, as per agency theory, these directors will be more inclined to look after shareholder interests, better able to set company strategy and direction and better monitors of management, which should bode well for the financial performance (Dah, *et al*, 2018; Kyereboah-Coleman, 2007; Ogbechie, 2012; Sanda, Garba and Mikailu, 2008). However, as Bhagat and Black (2002) advise, the aim should not be total independence, but rather substantial independence. As a result, the following statistical hypotheses are formed:

H_{S2}: There is a positive relationship between the percentage NEDs and the odds of a company being ranked as a top performing company.
H_{S3}: There is a positive relationship between the percentage independent directors and the odds of a company being ranked as a top performing company.

Ethnic diversity

Ethnic diversity refers to the inclusion of individuals as defined as black persons in the South African Broad-Based Black Economic Empowerment Amendment Act (46 of 2013). Literature propagates that ethnic diversity, according to resource dependency theory, provides the company with access to a wider range of views, ideas and experiences, which should lead to better decision making. It also aids the company's attempt to achieve better representation of the community it operates in, as addressed by legitimacy theory (Harjoto, Laksmana and Lee, 2015; Nyirenda, 2010; Trautman, 2012). However, research also found that ethnic diversity could lead to higher levels of conflict and the forming of factions, which may jeopardise the cohesion of the board and impede on swift and effective decision-making (Adams, De Haan, Terjesen and Van Ees, 2015). Therefore, even though the ethnic diversity of a board is expected to benefit a company's interaction with its environment and the image of the company, it is expected that slower decision making and difficulty in agreeing on strategy will negatively influence a company's financial performance. Therefore, the following statistical hypothesis is formulated:

H_{S4}: There is a relationship between ethnic diversity and the odds of a company being ranked as a top performing company.

Gender diversity

The advantage of gender diversity lies in the different strengths and foci of males and females (Nielsen and Huse, 2010), therefore implying that a single-gender board would only excel at certain tasks. Eagly, Johannesen-Schmidt and Van Engen (2003) and Viviers, Mans-Kemp and Fawcett (2017) have found female directors to be less hierarchical, more cooperative and collaborative and more focussed on promoting the self-worth of others, whereas male directors tend to be more ambitious, aggressive, daring, competitive and autocratic. Dickason and Swanepoel (2018) add that females have been found to be more risk averse than their male counterparts.

Campbell and Mínguez-Vera (2008) and Gordini and Rancati (2017) found that gender diversity has a positive impact on company value, specifically a balance between male

and female directors, rather than only the mere presence of women. Viviers*, et al* (2017) and Gordini and Rancati (2017) also state that the presence of women on a board only serve to enhance performance when they bring additional perspectives to the board, while it has a negative effect if the appointments are merely out of regulatory obligation or tokenism. Therefore, based on the benefits in terms of different strengths and focus brought by gender diversity and the more risk averse nature of females, which should improve the risk management ability of a company, the following statistical hypothesis is formulated:

H_{s5}: There is a positive relationship between the percentage females and the odds of a company being ranked as a top performing company.

Nationality

Foreign directors are said to provide a company with access to foreign debt and equity markets, thereby contributing to increasing the liquidity of the shares, which should make them more attractive to a wider range of investors. This may improve the value of the company to shareholders (Doidge, Karolyi and Stulz, 2004). In addition, foreign directors may limit 'group think', the development of factions and provide a competitive advantage due to different experiences (Harjoto, Laksmana and Yang, 2018; Lipton and Lorsch, 1992). Therefore:

H_{s6}: There is a negative relationship between the percentage South African nationals and the odds of a company being ranked as a top performing company.

Payment gap & Chief Executive Officer (CEO) remuneration

Despite not being specific board characteristics *per se*, literature highlights two related and highly contentious issues, namely the payment gap and CEO remuneration levels. These global issues are especially pertinent to South African companies.

Literature questions whether CEO remuneration levels are based on merit and the effectiveness of excessive levels of remuneration as an incentive to align the interest of

top management with that of shareholders, as promoted by agency theory. Literature has found that increased reward does not motivate increased performance (Bhagat and Black, 1999; Chamorro-Premuzic, 2013; Deysel and Kruger, 2015; Ferreira, 2010). Therefore:

H_{S7}: There is a negative relationship between the relative CEO remuneration movement and the odds of a company being ranked as a top performing company.

The payment gap, being the ratio between the remuneration of the CEO and the average remuneration of other employees, is described as one of the main causes of inequality in South Africa (Pontusson, Rueda and Way, 2002). King IV states that executive management's remuneration should not be excessive compared to that of other employees. Literature explains that the payment gap may have no impact on performance as employees either do not know the magnitude of the payment gap or do not have the ability or motivation to react to the knowledge (Faleye, Reis and Venkateswaran, 2013). However, it may have a negative impact due to a feeling of exploitation, which leads to reduced enthusiasm among employees (behavioural theory (Gao, 2019)) or it may have a positive impact as a big payment gap could motivate employees to work harder for promotion in terms of tournament theory (Chen, Ma and Bu, 2014; Faleye, *et al*, 2013; Gao, 2019). Due to a lack of direction from literature as to which is the most likely scenario a non-directional statistical hypothesis is proposed:

H_{S8}: There is a relationship between the payment gap and the odds of a company being ranked as a top performing company.

Non-executive director remuneration
The demands on and risks to NEDs are increasing (Seegers, Hopkins, Crous, Fourie and Nel, 2015). To ensure that the right calibre of people is attracted and retained, consideration of NEDs' remuneration is necessary (Bar-Hava, Huang, Segal and Segal, 2018; Fahlenbrach, *et al*, 2017). As is the case for executive directors, this is one of the main mechanisms to motivate NEDs to deliver peak performance. It is further reasonable

to expect that technical skills, market contacts and experience to provide guidance on and input into complex functions within the company, come at a premium (Bugeja, Fohn and Matolcsy, 2016). Therefore, the following statistical hypotheses are formulated:

H_{S9}: There is a positive relationship between the chairman's remuneration as a percentage of the CEO's guaranteed remuneration and the odds of a company being ranked as a top performing company.

H_{S10}: There is a positive relationship between the average other NED remuneration as a percentage of the CEO's guaranteed remuneration and the odds of a company being ranked as a top performing company.

Age

On the one hand, literature indicates that younger board members bring new ideas and perspectives and are more adaptable to change, especially in terms of technology, which should benefit financial performance (Lipton and Lorsch, 1992; Shaw, 2011). On the other hand, literature found older board members to be more conservative and more careful to take risks in their business decisions, which may dampen a company's ability to anticipate change and adapt to it (Dickason and Swanepoel, 2018; Shaw, 2011). It can therefore be expected that an older board's conservatism may reflect in lower financial performance while a mix of ages on a board should benefit the company with the best of both worlds. Therefore:

H_{S11}: There is a negative relationship between the average age of the board and the odds of a company being ranked as a top performing company.

H_{S12}: There is a positive relationship between the age diversity of the board and the odds of a company being ranked as a top performing company.

Tenure

Reguera-Alvarado and Bravo (2017) propagate that longer tenures provide directors with industry experience and a deeper knowledge of the intricacies of a company's business. However, Dou, Sahgal and Zhang (2015) report that lengthy tenures are seen to make

independent directors ineffective in their role as monitors and in setting company strategy and are also said to reduce the indepence of directors. In contrast 'new' directors brings new energy, views and ideas . In addition changes to the board may be seen as a company's effort to adapt to change, which could be positively viewed by the market and therefore benefit the company's image and value. Moreover, King IV recommends a limitation on the length of tenure and a staggered rotation of the board. It therefore stands to reason that a mix of tenures on a board should be to the benefit of a company. Thus:

H_{S13}: There is a positive relationship between the diversity of tenure of the board and the odds of a company being ranked as a top performing company.

Background

Literature proclaim that functional differences of directors are caused by education and professional experience, which forms their attitudes, knowledge, perspectives and thinking (Bantel and Jackson, 1989; Kimberly and Evanisko, 1981). Diversity of backgrounds in terms of fields of study and fields of professional experience is said to benefit a company through more innovation, better problem solving and wider experience (Bantel and Jackson, 1989; Wiersema and Bantel, 1992). Diversity of experience and knowledge is recommended by regulatory documents such as King IV (IoDSA, 2016; Mans-Kemp*, et al*, 2018b). Hence,

H_{S14}: There is a positive relationship between academic diversity (per field) and the odds of a company being ranked as a top performing company.
H_{S15}: There is a positive relationship between the diversity of professional experience of the board and the odds of a company being ranked as a top performing company.

Education

Greater diversity of levels of education should provide different perspectives (Wiersema and Bantel, 1992), as well as the benefits of higher and lower levels of education, for example the problem-solving ability of higher educated people (Dollinger, 1984; Erhardt, Werbel and Shrader, 2003; Kimberly and Evanisko, 1981) and the lower levels of

conservatism of people with a lower propensity to study (De Paola and Gioia, 2012). However, higher levels of diversity could cause conflict, which may lead to assuming more conservative positions and not being able to make quick decisions to seize lucrative opportunities (Pitcher and Smith, 2001). Hence:

H_{S16}: There is a negative relationship between academic diversity (per qualification type) and the odds of a company being ranked as a top performing company.

In addition, higher levels of education should lead to innovation, better solving of problems and a greater ability to differentiate and thereby focussing on matters of importance. Also, the fact that higher levels of education is often associated with greater risk aversion would benefit the risk management processes of a company. This should benefit a company's risk-adjusted financial performance. Therefore:

H_{S17}: There is a positive relationship between the relative education level of the board and the odds of a company being ranked as a top performing company.

Board experience

Literature promotes experience as a director, especially on several boards as a key attribute for a director. This possibly gives them experience with issues faced by their current company for the first time and it would also lead to an extensive network and broader market knowledge (Gray and Nowland, 2013; Kroll, Walters and Wright, 2008). However, literature warns that too many board seats can prevent directors from dedicating adequate time and attention to the proper execution of their duties, but this is mainly an issue when a board is dominated by such directors (Mans-Kemp, Erasmus and Viviers, 2016b; Mans-Kemp, *et al*, 2018b; Shaw, 2011). Thus:

H_{S18}: There is a positive relationship between the average board experience of the board and the odds of a company being ranked as a top performing company.

H_{S19}: There is a positive relationship between the diversity of board experience of the board and the odds of a company being ranked as a top performing company.

2.2.   Corporate performance measure

To determine the impact of the board characteristics, suitable company performance measures are required. Performance should be considered from two angles, namely the level of performance and the variability or riskiness of performance (Jemison, 1987). Previous research mostly considers two types of corporate performance measures, namely accounting-based and market-based measures (Mans-Kemp, *et al*, 2017; Mans-Kemp and Viviers, 2015; Pandian, *et al*, 2006). Accounting-based measures, such as Return on Equity (ROE), are used due to its simplicity and the information being subject to the company's internal controls (Verbeeten and Boons, 2009). However, many scholars and practitioners criticise its usefulness due to managerial and accounting distortions in the figures, its backward looking nature, and because it is internally focussed (Chenhall and Langfield-Smith, 2007; Verbeeten and Boons, 2009). Researchers promote market-based performance measures to overcome these shortcomings (Mans-Kemp and Viviers, 2015). The main advantages of market-based measures are that it is real-time in an efficient, well regulated market and it accounts for risk-adjusted views of future opportunities (Bayrakdaroglu, Ersoy and Citak, 2012; Narayan and Smyth, 2004).

The risk attached to company performance is largely ignored by studies in this area (Mans-Kemp, *et al*, 2017). Hendricks, Patel and Zeckhauser (1993) postulate that returns alone has some predictive ability, however, only in the short term. Elton, Gruber and Blake (1996) support this finding and add that risk-adjusted returns proved to be predictive in both the short- and longer term. Investment strategy theory suggests that investors want to be sure that they are adequately compensated for the risk they are taking on their investments (Elton, *et al*, 1996; Sharpe, 1994).

Past research promotes the Sharpe ratio as the most widely-used risk-adjusted performance measure when assessing investments (Castano and Del Campo, 2018; Hodoshima, 2018). This is a market-based measure of the return provided by an investment, over and above a risk-free return, relative to the risk of the investment as measures by the Standard deviation of the investment returns (Strong, 2009).

3. RESEARCH DESIGN AND METHOD

The data was extracted from company records published on the IRESS database, the annual financial statements and web searches where necessary. The population consisted of the 170 companies listed in the 13 largest sectors or subsectors on the main board of the Johannesburg Stock Exchange, measured by number of companies. Subsectors were selected where large sectors contained a variety of companies subject to significantly different macroeconomic and industry-related factors to ensure that the selected groups were more homogeneous in terms of these factors. The references to sectors therefore include both the sectors and subsectors. The period covered is from 2009 to 2015, resulting in 1 026 company-years being included in the sample. The following selection criteria were used:

- At least one financial year-end falling within the observation period.
- Directors had to be on the board at year-end.

All companies that met these requirements were included in the sample to avoid survivor bias.

To calculate the Sharpe ratio, a risk-free rate is required. According to Burger (2012) and Coggins (2000), the preferred risk-free rate is a government bond in a liquid market. Coggins (2000) recommends a government bond with a long-term maturity, usually around 10 years, as a risk-free rate. In South Africa the R186 government bond best meets these criteria. The Sharpe ratio is found to become misleading when the excess return above the risk-free return is negative. Consequently, Israelsen (2005) suggests that the original formula is modified to address this anomaly. The adjusted Sharpe ratio formula is therefore used:

$$\frac{\mu - R_f}{\sigma^{\left(\frac{ER}{abs(ER)}\right)}}$$

(1)

Where:

μ = Average return of investment

Rf = Risk-free rate

σ = Standard deviation of the investment returns

ER = Excess return (μ - Rf)

Pandian*, et al* (2006) highlight that company performance is influenced by industry factors such as product, competition and access to resources. Lashgari (2004) proposes that a company's performance should be measured relative to the performance of its industry or peer group. Therefore, the Sharpe ratio for each company is first expressed relative to the average Sharpe ratio for the company's sector and this relative performance is used to rank the companies' performance. Industry-adjusted dependent variables to remove industry-related factors when analysing company performance are often used in financial research (Giroud and Mueller, 2011; Johnson, Moorman and Sorescu, 2009).

The dependent variable was then converted into a binary variable, by assigning a top-performing company a one and a bottom-performing company a zero. Piercy, Kaleka and Katsikeas (1998) recommend that the middle group of such a high to low distribution should be eliminated to allow for greater distinction between the top and bottom groups. The risk exists that the observations just above and below the divide may have characteristics that are common to both groupings. Krzywinski and Altman (2014) suggest the use of quartiles to determine the middle range of data. Consequently, a binary variable was created by assigning the top 25% of companies, with a Sharpe ratio above their sector average, a one and the bottom 25% of companies, with a Sharpe ratio below their sector average, a zero.

Table 1 shows how the independent variables were derived for use in the analysis:

Table 1: Independent variables

Symbol	Variable	Calculation
BS	Board size	Number of directors at the financial year end.
PN	% NEDs	Percentage of directors that are classified as NEDs.
PI	% independent NEDs	Percentage of NEDs classified as independent.
ED	Ethnic diversity	Percentage of individuals as defined the Broad-Based Black Economic Empowerment Amendment Act (46 of 2013) on the board.
PF	% Females	Percentage females on the board.
PS	% South Africans	Percentage directors classified as South African citizens.
RC	Relative CEO remuneration movement	Percentage movement in total CEO remuneration from year to year expressed relative to the shareholder return in the same period.
PG	Payment gap	Payment gap is calculated by expressing the CEO's total remuneration as a multiple of the average employee's salary.
CR	Chairman remuneration as percentage of CEO guaranteed remuneration	Chairman's relative remuneration is calculated by expressing it as a percentage of the CEO's guaranteed remuneration.
NR	Average other NED remuneration as percentage of CEO guaranteed remuneration	Average remuneration of the NEDs (excluding the chairman) is expressed as a percentage of the CEO's guaranteed remuneration.
AA	Average age	Average age of the directors for a specific year.
AD	Age diversity	Standard deviation of the ages of directors for a specific financial year. The higher the standard deviation, the higher the diversity of age.
DT	Diversity of tenure	Standard deviation of the tenures of the board members. The higher the standard deviation, the higher the diversity of tenure.
AF	Academic diversity (per field)	Director education is divided into 4 categories, namely financial, legal, technical and social. The Simpson diversity index formula is used to determine the diversity in fields of education.
DP	Diversity of professional experience	Director experience is divided into 7 categories, for example financial, legal and industry related technical. The Simpson diversity index formula is used to determine the diversity in experience.
AT	Academic diversity (qualification type)	Director education is divided into 7 categories, for example bachelor's degree, master's degree and no tertiary education. The Simpson diversity index formula is used to determine the diversity in education.

EL	Relative education level of the board	Each qualification of the directors is rated according to the South African Qualification Authority's NQF (National Qualifications Framework) rating system. The academic qualification level of the board is calculated as the weighted average of the NQF ratings.
BE	Average board experience	Board experience is recorded as a 1 if the director has no other experience, a 2 if his/her experience includes up to two other boards and a 3 if he/she has experience of 3 and more other boards. The average of the categories of all board members is determined. The higher the average the greater the board's experience.
DE	Diversity of board experience	As before the experience is divided into three categories. Diversity is determined by calculating the standard deviation of the experience categories of the board members.

Following the mounting criticism from social scientists against the expectation to find linear relationships when it comes to corporate and business relationships (Basimov, 2019; Canarella and Nourayi, 2008; Lee, 2019; Paniagua, *et al*, 2018; Rasoava, 2019), the study made use of correlation analysis, to determine the correlation strength between the dependent variable and the independent variables, as well as a multiple linear regression, to test the validity of this criticism. The following model was used in the analysis:

Relative Sharpe ratio = α + β_1BS_{it} + β_2PN_{it} + β_3PI_{it} + β_4ED_{it} + β_5PF_{it} + β_6PS_{it} + β_7RC_{it} + β_8PG_{it} + β_9CR_{it} + $\beta_{10}NR_{it}$ + $\beta_{11}AA_{it}$ + $\beta_{12}AD_{it}$ + $\beta_{13}DT_{it}$ + $\beta_{14}AF_{it}$ + $\beta_{15}DP_{it}$ + $\beta_{16}AT_{it}$ + $\beta_{17}EL_{it}$ + $\beta_{18}BE_{it}$ + $\beta_{19}DE_{it}$ (2)

Where:
$_{it}$ = company i at time t, and
variables are named as per the abbreviations presented in Table 1.

The Pearson correlation coefficients showed that weak correlations exist between all the independent variables and the dependent variable. In addition, even though the result of the linear regression indicated that the F-statistic for the regression is significant (the beta coefficient differ significantly from zero ($p < .05$)), the adjusted R^2 was very small. Only 5.3% of the variance in the dependent variable could be explained by the independent variables. The Durbin-Watson statistic was within the acceptable range (1.5 – 2.5), indicating no autocorrelation. This confirmed the merit of using a binary logistic regression approach.

4. RESULTS

The Box-Tidwell transformation test was used to test for nonlinearity between the independent variables and the logit of the dependent variable (linearity of the logit). Two independent variables indicated such a concern, namely *Relative CEO remuneration movement* ($p < .001$) and *Average of other directors' remuneration as a percentage of CEO guaranteed remuneration* ($p = .033$). One of the remedies to address this issue is to convert the variable into a categorical variable to allow further use of the variable (Garson, 2016; Menard, 2010; Wuensch, 2014).

The following model, containing all the characteristics, was used in the initial analysis:

$$\ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta_1 BS_{it} + \beta_2 PN_{it} + \beta_3 PI_{it} + \beta_4 ED_{it} + \beta_5 PF_{it} + \beta_6 PS_{it} + \beta_7 RC_{it} + \beta_8 PG_{it} + \beta_9 CR_{it}$$
$$+ \beta_{10} NR_{it} + \beta_{11} AA_{it} + \beta_{12} AD_{it} + \beta_{13} DT_{it} + \beta_{14} AF_{it} + \beta_{15} DP_{it} + \beta_{16} AT_{it} + \beta_{17} EL_{it} + \beta_{18} BE_{it} +$$
$$\beta_{19} DE_{it} \qquad\qquad\qquad (3)$$

Where:

π = the predicted probability of a company being categorised as a top performer in terms of its relative Sharpe ratio;

$_{it}$ = company i at time t, and

variables are named as per the abbreviations presented in Table 1.

The initial model was optimised to establish the optimal model in terms of predicting the dependent variable. This is accomplished by removing the statistically insignificant independent variables to increase the McFadden R^2 ratio and the Likelihood Ratio (LR) statistic, while the Prob(LR statistic) remains statistically significant ($p < .05$). A further aim is to achieve the lowest possible values for the Akaike information criterion, the Schwarz criterion and the Hannan-Quinn criterion. The following independent variables were removed, one at a time (in the order listed), based on the least statistically significance each time to achieve the optimal set of independent variables:

- age diversity (H_{S12} is rejected);
- board size (H_{S1} is rejected);
- relative education level of the board (H_{S17} is rejected);
- academic diversity (per field) (H_{S14} is rejected);
- percentage of NEDs (H_{S2} is rejected);

The following final model was used in the analysis:

$$\ln\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta_1 PI_{it} + \beta_2 ED_{it} + \beta_3 PF_{it} + \beta_4 PS_{it} + \beta_5 RC_{it} + \beta_6 PG_{it} + \beta_7 CR_{it} + \beta_8 NR_{it} + \beta_9 AA_{it}$$
$$+ \beta_{10} DT_{it} + \beta_{11} DP_{it} + \beta_{12} AT_{it} + \beta_{13} BE_{it} + \beta_{14} DE_{it} \qquad (4)$$

The results of the optimal model are reflected in Table 2.

Table 2: Optimal model results

$H_S{}^1$	Variable	Beta coefficient	Standard error	z-statistic	Odds ratio	Hypothesis Outcome	Accept/ Reject
	Constant	5.589	2.993	1.867			
3	% independent NEDs	-.288	.628	-.459	.750	(H) Pos (R) Neg	Reject
4	Ethnic diversity	.537	.733	.732	1.711	(H) ND (R) Pos	Reject
5	% females	-2.414	1.315	-1.836*	.089	(H) Pos (R) Neg*	Reject
6	% South Africans	-.439	.692	-.635	.645	(H) Neg (R) Neg	Reject
7	Relative CEO remuneration movement (categorised)	-.865	.157	-5.514***	.421	(H) Neg (R) Neg***	Accept
8	Payment gap	.016	.004	3.848***	1.016	(H) ND (R) Pos$_\beta$***	Accept
9	Chairman remuneration as percentage of CEO guaranteed remuneration	1.035	.579	1.788*	2.815	(H) Pos (R) Pos*	Accept
10	Average other NED remuneration as percentage of CEO guaranteed remuneration (categorised)	.402	.165	2.431**	1.495	(H) Pos (R) Pos**	Accept
11	Average age	-.049	.032	-1.529	.952	(H) Neg (R) Neg	Reject
13	Diversity of tenure	-.047	.056	-.841	.954	(H) Pos (R) Neg	Reject
15	Diversity of professional experience	-3.567	2.746	-1.299	.028	(H) Pos (R) Neg	Reject

16	Academic diversity (qualification type)	.447	1.859	.240	1.564	(H) Neg (R) Pos	Reject
18	Average board experience	.548	.384	1.426	1.730	(H) Pos (R) Pos	Reject
19	Diversity of board experience	-.647	.822	-.787	.524	(H) Pos (R) Neg	Reject

*** Significant at the 0.01 level, ** Significant at the 0.05 level, * Significant at the 0.10 level

  (H)   Statistical hypothesis
  (R)   Result
  Pos   Independent variable has a positive association with the dependent variable
  Neg   Independent variable has a negative association with the dependent variable
  ND   Independent variable has an association with the dependent variable (No direction predicted)

[1] Statistical Hypothesis

β Low odds ratio indicating a small impact despite statistical significance

The research hypothesis is therefore supported for the following board characteristics:

% females, relative CEO remuneration movement, payment gap, chairman remuneration as a percentage of CEO guaranteed remuneration and average other NED remuneration as a percentage of CEO guaranteed remuneration. For the remaining board characteristics, the research hypothesis is not supported.

The model fit statistics for the optimised model are shown in
Table 3.

Table 3: Model fit statistics

Statistic	Value
Likelihood Ratio	63.3910, p = .0000
Classification hit rate increase: Proportional by chance	32.53%
McFadden R^2	.1342
Hosmer Lemeshow Andrew	8.0851, p = .4252 9.4656, p = .4886
Akaike information criterion Schwartz criterion Hannan-Quinn criterion	1.2877 1.4562 1.3548

Source: EViews output

The Hosmer-Lemeshow and Andrew statistics provide sufficient evidence to accept the model as an adequate fit. Furthermore, the model's success in making correct classifications, compared to what would have been achieved by mere chance, at 32.53%, exceeds the rule of thumb of at least 25% better than chance (Hair, et al., 2010; Reyers, 2013). Based on the fit statistics, the research hypothesis was accepted, since a number of board characteristics have a statistically significant relationship with the company's

risk-adjusted return. The variables with a statistically significant outcome are discussed below.

Relative CEO remuneration movement (p < .01) showed a negative coefficient, which indicates that where the relative CEO remuneration movement moves to a higher category the company is 2.37 times less likely to be classified as a top-performing company. This finding confirms speculation that CEO remuneration is not always based on merit and does not necessarily serve as an efficient incentive to align the objectives of management with those of shareholders and does not necessarily promote improved performance (Chamorro-Premuzic, 2013; Cooper, Gulen and Rau, 2009; Deysel and Kruger, 2015).

Then follows the *payment gap* (p < .01)*.* The positive relationship indicates that for each multiple increase in payment gap, a company is 1.02 times as likely to be categorised as a top performer in terms of the Sharpe ratio. However, even though the association is statistically significant the odds are just about one time, which indicates negligible odds that the payment gap will contribute to a company being classified as a top performing company based on its Sharpe ratio. This is in line with the views from literature that employees are either not aware of the magnitude of the payment gap or do not have the ability or motivation to do something with the knowledge (Faleye*, et al*, 2013). This may be as a result of fear of being laid-off if they shirk their duties (behavioural theory (Gao, 2019)) or there may not be opportunities to work for promotion (tournament theory – (Chen*, et al*, 2014; Faleye*, et al*, 2013; Gao, 2019)).

Next is *average of other NED remuneration as a percentage of CEO guaranteed remuneration* (p = .015). The positive coefficient indicates that, where the average of other NED remuneration relative to the CEO's guaranteed salary increases from a lower to higher category, the company is 1.50 times as likely to be classified as a top-performing company. This is expected, as it is important for companies to attract the best candidates to their boards and a willingness to pay higher fees should contribute to achieve this (Bar-

Hava*, et al*, 2018). However, care should be taken to ensure that the level of remuneration does not jeopardise the independence of the NEDs.

This is followed by *percentage females* (*p* = .066)*.* The negative coefficient indicates that, if female directors increase by 1%, the company in question is .09 times as likely to be classified as a top-performing company. Even though the less daring and less competitive nature of females (Viviers*, et al*, 2017), combined with their higher aversion to risk (Dickason and Swanepoel, 2018), is expected to lead to lower volatility in performance, it appears to have a disproportionately negative association with the level of a company's performance. This may be exacerbated by the potential conflict that may arise due to the difference between male and female directors (Viviers*, et al*, 2017).

Next is *chairman remuneration as a percentage of CEO guaranteed remuneration* (*p* = .074). The positive relationship indicates that for every 1% that the chairman receives more relative to the CEO's guaranteed remuneration level, the company is 2.82 times as likely to be classified as a top-performer. This is expected, due to the high levels of risk, responsibility and effort required by the position (Seegers*, et al*, 2015). Relatively higher levels of remuneration should stand a company in good stead when looking for appropriate candidates (Bar-Hava*, et al*, 2018).

5. CONCLUSION AND RECOMMENDATION

From the findings it is clear that a number of characteristics have a statistically significant relationship to risk-adjusted performance of a company. A number of conclusions can be drawn from these findings, informing several interested parties. Firstly, companies are empowered to implement reforms imposed by the South African government to redress the injustices of the apartheid era. For example, the results show that ethnic diversity did not have a material relationship to performance. Since the South African government has introduced affirmative action as part of its reforms many companies have been accused of appointments being made out of obligation or tokenism. These findings may indicate that appointments from other ethnic groups are still made as tokenism, depriving the

individuals of making meaningful contributions. However, it may indicate that there is no difference in ability between the various ethnic groups and that appointments can be made from all ethnic groups based on ability and skill. Secondly, policy makers obtain insights as to whether the various regulations achieve the required results. For example, CEO remuneration movement showed a negative relationship to performance warranting stricter implementation of the principle that executive management's remuneration should be fair and reasonable in the context of overall remuneration levels as recommended by King IV.

Thirdly, the results provide investors with insights as to which companies are more likely to meet their risk-adjusted return expectations. Chairman remuneration and other NED remuneration, relative to the CEO's guaranteed salary, showed positive relationships to risk-adjusted return. Investors may consider investing in companies where these board members are properly remunerated.

Fourthly, nomination committees are empowered to widen their search to a more diverse pool of candidates. Equally, the board may look at a wider population of possible contenders when selecting and grooming their successors. On the one hand, average age showed a negative relationship to performance. On the other hand, age diversity, ethnic diversity, academic diversity, professional experience diversity and relative education level did not show statistically significant relationships to performance. This shows that the search for new members could include candidates from all races, different age groups and different fields (such as academics) should there be a shortage of suitable candidates from the traditional sources or if a company identifies a specific reason to include a candidate with a specific attribute, for example a candidate that is more au fait with a new target market for the company, as most of these would not harm company performance.

The study has some limitations, which presents further research opportunities. Only one performance measure is investigated and the study does not purport this measure to be able to fully measure the value creation process of a company. The value creation of a

company is a complex and interrelated concept with many market, political and socio-economic factors having an impact. The study also does not investigate the factors underlying the appointment or not of candidates with specific characteristics. Future studies should explore other performance measures and also delve deeper into the factors underlying the various characteristics to obtain a more complete picture of the relationships. The study should also be expanded to include companies from other sectors.

CONFLICT OF INTEREST STATEMENT

On behalf of all authors, the corresponding author states that there is no conflict of interest.

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