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Is the environmental, social and corporate governance score the missing factor in the Fama-French five-factor model?

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Background: Companies are increasingly encouraged to focus on the creation of sustainable value. Financial research institutions evaluate companies' performance based on pre-established indicators relating to environmental, social and governance (ESG). These scores are intended to inform decisions by equity investors, among others. However, traditional asset pricing models do not include ESG scores.

Aim: The purpose of this research is to discover whether the inclusion of ESG scores in the Fama-French five-factor model (FF5F) will improve the model's predicting power.

Setting: Financial research institutions aim to improve the information environment in the South African capital markets. Johannesburg Stock Exchange (JSE)-listed firms are also required to produce integrated reports, emphasising responsible investment.

Method: For the largest 40 JSE-listed companies, data over the 5-year period from 2015 to 2019 were employed to compare the predicting power of the FF5F model before and after the inclusion of ESG scores.

Results: The results showed that the predictive power of the FF5F model is only marginally improved when the ESG scores are incorporated.

Conclusion: These findings indicate that equity returns are not significantly influenced by ESG scores. This research provides the basis for further endeavours on the share-price implications of ESG performance.

Contribution: This research contributes to the growing strand of literature on responsible investment and the creation of sustainable value. The research also offers a theoretical contribution by connecting literature on asset pricing with work on sustainability.

Keywords: ESG; ESG performance scores; sustainability; Fama-French; JSE; asset pricing; ESG performance.

Introduction

On September 2015, the United Nations (UN) launched the UN Sustainability Development Goals (SDGs). For the world to meet the SDGs and related sustainability agenda by 2030, participation and commitment is needed from all spheres (United Nations 2015). There have also been attempts by the investment community to build a more sustainable future. As a result, there is greater pressure from stakeholders and society at large for business entities to focus equally on the social and environmental concerns that affect their business – a concept commonly referred to as 'the triple bottom line', as coined by Elkington (1997).

There has also been a growing need for a universal, uniform set of standards for measurement and reporting on environmental, social and governance (ESG) performance – just as for financial performance (Harvard Business Review 2022). Fortunately, in recent years, regulators have also intensified their responses to these global cries. For example, the European Union released its Sustainable Finance Action Plan, which came into effect over the course of 2021. This major piece of regulation is aimed at promoting sustainable investment by clarifying the revised and increased roles and duties asset managers and investors now have in relation to the sustainability agenda.

Asset pricing theory can be used in the positive and in the normative context. When observing the pricing of assets in the market, a position could be taken to try to understand the actual pricing behaviour of the assets and conclusions be formed around why the pricing of assets behaves in the

way that it does, and should the observation not agree with a developed asset pricing model, a stance could be taken that the model needs improvement. This is an example of the positive use of asset pricing models and how they are typically applied in academic spaces. Alternatively, a stance could be taken that the market is incorrect and therefore 'mis-pricing' the asset. This could present trading opportunities for investors (Cochrane 2009). Thus, asset pricing models, although theoretically founded, could be useful tools for shrewd investors.

However, although international and South African studies generally accepted the Fama and French (2015) five-factor model as an improvement to both the original capital asset pricing model (CAPM) and the Fama and French (1992) three-factor model (Charteris, Rwishema & Chidede 2018; Cox & Britten 2019; Fama & French 2016), it still failed to fully explain the expected returns as observed on international markets and the Johannesburg Stock Exchange (JSE) (Alrabadi & Alrabadi 2018; Chiah, Zhong & Li 2016).

Therefore, given the failure of the Fama–French five-factor model (FF5F) to *fully* explain stock performance, there may be scope to improve this model by incorporating an additional risk factor (Chiah et al. 2016). Motivated by the increasing importance of, and focus on, ESG by investors and academics at large, this research proposes that this additional factor may be an ESG factor, measured by ESG performance scores. This research provides initial empirical evidence of whether the inclusion of ESG scores in the FF5F improves the model's predicting power of expected returns.

The purpose of the research is to investigate whether the inclusion of ESG scores will improve the explanatory power of the FF5F in predicting expected returns. Its aim is not to evaluate the significance levels of the relationship of each of the factors in the FF5F in the context of returns on the JSE. Nor does the research seek to empirically test the validity of the five-factor model as a whole in explaining expected returns. Rather, as in Fama and French (2015) and Cox and Britten (2019), it investigates whether the explanatory power of the FF5F model is *improved* by the inclusion of ESG scores.

Theoretical background

The capital asset pricing model

The seminal work by Markowitz (1952) on portfolio selection theory laid the foundations for modern portfolio theory. It provided a framework for the creation of investment portfolios based on mean-variance analysis. The theories are based on the assumptions of rationality and risk preferences of investors. The notion of portfolio return being a function of market and firm-specific risk factors precipitated the creation of various asset pricing models.

The CAPM, as developed by Treynor (1961), Sharpe (1964), Lintner (1965), Mossin (1966) and Black et al., Jensen and Scholes (1972), was the first coherent framework for evaluating the effect of risk factors on the price of assets (Perold 2004). The CAPM modelled the return of an asset as a function of systematic risk and idiosyncratic risk. The former risk is the undiversifiable risk that is faced by all investors resulting from macro-economic and political factors. The latter type of risk, that is, idiosyncratic risk, is born out of firm-specific factors attached to that share.

The CAPM has enjoyed a great deal of popularity, both academically and in practice. It is frequently the only asset pricing model taught in most undergraduate and postgraduate finance classes. In addition to this, it is heavily used by portfolio managers and investors for a host of reasons, including estimating the cost of equity for listed securities, selection of investment projects, evaluating the performance of mutual funds and other portfolios (Fama & French 2004) and for the purposes of performing valuations. Despite the popularity of the CAPM, there is empirical evidence that challenges its ability to fully explain returns (Banz 1981; Bhandari 1988; Fama & French 1992).

One of the most prominent earlier studies to challenge the empirical validity of the CAPM was that of Basu (1977). The objective of the Basu (1977) research was to empirically research whether the investment performance of common stocks was related to their price-to-earnings ratios (hereafter P/E ratios). He found that when the stocks were sorted on P/E ratios, the stocks with higher P/E displayed higher expected future returns than what was predicted by the CAPM.

Banz (1981) also highlighted problems linked with the use of the CAPM. The study showed that the common stock of small firms, on average, outperformed that of larger firms; that is, smaller firms displayed higher average risk-adjusted returns, relative to larger firms – a concept commonly referred to as the 'size effect'. Despite these findings, it was not until Fama and French (1992) that research challenging the role of beta and the CAPM gained traction. They examined the size and book-to-market anomalies that were discovered by prior literature and confirmed the empirical shortcomings of the CAPM. Their study found that the combination of the size and book-to-market equity absorbed the role of market beta in explaining cross-sectional returns.

The Fama–French three-factor model

Having noted the empirical contradictions of the CAPM in explaining expected returns (see Banz 1981; Basu 1977), Fama and French (1992, 1993) extended the CAPM to a three-factor model that captured the value and size premium in addition to the contribution of the excess market return. Size (measured by market capitalisation) and book-to-market equity (the value effect) had been found to capture the cross-section of average returns that were often associated with size, leverage and book-to-market equity in earlier literature. Notably, size and book-to-market ratios proxied underlying asset risks rather than mere anomalies (Fama & French 1992).

The Fama–French five-factor model

The FF5F was developed in Fama and French (2015) with the aim of improving on some of the empirical failings of the

Fama–French three-factor model (FF3F), given that the model was found to not adequately capture cross-section returns. The FF5F is therefore an extension of the FF3F, with Fama and French (2015) adding an investment and profitability factor to the model in an attempt to address the empirical embarrassment of the FF3F. The FF5F is specified as:

$$Rit = i + \beta i\,(Rmt - Rf\,t) + si\,SMBt + hi\,HMLt + ri\,RMWt + ci\,CMAt + \varepsilon it \quad \text{[Eqn 1]}$$

where α, RF, bi(RM – RF), siSMB, hi HMLt and ε are defined as can be seen in the FF3F; r and c represent the loadings on the respective profitability and investment factors, and RMW and CMA represent the respective profitability and investment factors.

Fama and French (2015) studied companies listed in the New York Stock Exchange (NYSE), National Association of Securities Dealers Automated Quotations (NASDAQ) and American Stock Exchange (AMEX) from July 1963 to December 2013. From testing the FF5F in numerous sorts, they found that the FF5F showed an improvement in explaining expected returns when compared to the FF3F, as it produced lower intercepts. Fama and French (2015), however, found that there was very little difference between their FF5F and a four-factor model that excluded the HML factor. This suggested that the HML factor was superfluous in the dataset, as the HML associated returns were already captured by the other factors. In addition to this, they found that their model mispriced small stocks that had negative exposures to the profitability and investment factors. In response, Fama and French (2016) considered anomalies that were not addressed by the FF3F, such as accruals, net share issues, momentum and volatility. Their results showed that with the exception of accruals and momentum, the list of anomalies left unexplained by the FF3F shrink when the FF5F is used.

In South Africa, Charteris et al. (2018) sought to investigate whether the alternative three-factor model formulated by Chen, Novy-Marx and Zhang (2011) and a FF5F could explain momentum on the JSE. The results of the study indicated that the CAPM, FF3F and the Carhart (1997) four-factor model could not explain the momentum of past returns on the South African market. On the contrary, for the models that included the investment and profitability factors as pricing factors, as in Chen et al. (2011) and the FF5F, Charteris et al. (2018) found that the pricing errors were significantly lower than was observed for the CAPM and the classical FF3F. Profitability was found to be significantly and positively related to returns, with investment displaying a weaker relation to momentum than profitability.

Hypothesis development

It is apparent from the prior literature that the cycle of model development, empirical testing in context and model redevelopment is likely to continue in future asset pricing research endeavours. In developing the study hypothesis, the authors therefore evaluated recent applications of asset pricing models in a South African context.

Empirical testing of asset pricing models on the JSE includes tests of the CAPM (for example, Ward & Muller 2012), the FF3F model (for example, Basiewicz & Auret 2010) and the FF5F model (Cox & Britten 2019). Since Ward and Muller (2012) confirmed the findings of Van Rensburg and Robertson (2003) that returns of JSE-listed shares showed an inverse relationship with beta, subsequent research has found that the addition of factors tended to enhance the accuracy of returns predicted by the models. Notably, Cox and Britten (2019) found that the FF5F, on an overall basis, explained the cross-section of returns on the JSE with greater accuracy than the FF3F.

Yet, despite the FF5F accounting for the highest number of risk factors, recent empirical tests show that the model still has shortcomings in explaining returns of JSE-listed stocks (Mosoeu & Kodongo 2020). The authors therefore use the FF5F as a base model and consider whether the model's predictability will be enhanced through the inclusion of additional factors. The hypothesis is developed from literature that suggests the potential explanatory power of sustainability-related metrics for returns on the JSE.

There is a rapidly growing strand of literature that focuses on the relationship between sustainability and stock returns. Yet the empirical evidence from studies, much like that of asset pricing models, tends to be inconsistent. Griffin and Mahon (1997) suggest that this may be caused by variations in methodology and the choice of measurement approximations. For search endeavours that, like this study, use stock returns as a measure of financial performance, three categories were identified by Wagner, Schaltegger and Wehrmeyer (2001), these being: portfolio studies, event studies and multivariate regression studies.

Maiti (2021) investigated the durability of the ESG factor in a portfolio study. Having formed portfolios based on the individual ESG components' risk factors, Maiti (2021) results found evidence of an ESG risk factor at a significant level of 5%.

In an event study, Capelle-Blancard and Petit (2019) investigated the stock market's reaction to both positive and negative ESG news for 100 firms listed on the Dow Jones. It was found that, on average, firms faced a drop of 0.1% of their market value following negative ESG publicity but gained nothing from positive publicity. Moreover, the authors found that investors have a stronger response to media reports than communication from the companies themselves and even nongovernmental organisation (NGO) disclosures.

Lastly, some studies utilise regression analysis to investigate the link between ESG and financial performance. La Torre et al. (2020) investigated how companies' ESG performance affected their returns. The results from the study indicated that although a correlation exists between the ESG index and most stock returns, this correlation is weak and even absent for some firms. The statistical analyses also highlighted that the stock return effects arising from ESG strategies are limited

and may be concentrated to only some industries, for example, the energy and utilities sector, where operating activities are likely to have a high environmental and social impact.

From an ideological standpoint, it can be argued that the utilisation of firm resources for sustainability objectives decreases shareholder value (Derwall et al. 2005). The reasoning is that the costs involved in such pursuits, such as costs of abiding by additional standards, translate into higher operation and product costs, which erode competitive advantage and subsequently profitability (Walley & Whitehead 1994). There is evidence that indicates that investors may support this view. Halbritter and Dorfleitner (2015) and Naffa and Fain (2022) find no significant relationship between ESG performance and stock returns.

Others believe that the improvement of a firm's sustainability practices could enhance its operational efficiency or create new sales opportunities (Derwall et al. 2005). For example, Porter and Van der Linde (1995) argued that company policies that translate to improved sustainability practices could translate to cost and pricing advantages because of a more parsimonious utilisation of all forms of capital. It follows then that the benefits of sustainability-related practices should outweigh the costs, and firms that embrace this practice would be expected to report higher corporate earnings relative to less socially and environmentally responsible firms.

However, the extent to which ESG practices and policies translate to investment abnormal returns is a function of the ability of market participants to incorporate sustainability into their projections of future returns. From the review of asset pricing literature, it is apparent that market returns are proportionally related to underlying risk factors and that an ideal equity portfolio is one that is well-diversified. Thus, following this reasoning, socially responsible investors should expect to report suboptimal returns, as their portfolios would inherently lack diversity, given that such portfolios are ordinarily grouped based on firm-specific characteristics – for example, ESG scores.

Environmental, social and governance ratings and scores are used in most of the studies empirically testing sustainability performance effects on returns (Alda 2020; Derwall et al. 2005; Eccles, Ioannou & Serafeim 2014; Galema, Plantinga & Scholtens 2008; Kempf & Osthoff 2007; Lee, Faf & Rekker 2013; Statman & Glushkov 2009). The benefit of using ESG scores is that the sustainability effects on shares can be decoupled and the effect of each dimension analysed separately. This may have the added benefit of informing researchers and investors of the most critical elements of sustainability for particular firms – a concept referred to as ESG materiality.

Most of the studies on the United States (US) market find ESG performance to have a positive relationship with returns, with some studies finding that high ESG firms significantly outperform low ESG firms (Derwall et al. 2005; Eccles et al. 2014; Galema et al. 2008; Kempf & Osthoff 2007; Lee et al. 2013; Statman & Glushkov 2009). Other studies find a significant positive relationship between specific elements of ESG and returns: using ESG scores, Mănescu (2011) found that community relations criteria (social) displayed a significant positive influence on returns. Galema et al. (2008) also found that the employee relations indicator (social) had a significant positive relationship with the stocks' returns.

Based on empirical evidence from prior literature, this study hypothesises as follows:

> H1: The inclusion of an ESG scores factor in the Fama–French 5 factor model will improve the model's predictability of returns.
>
> H0: The inclusion of an ESG scores factor in the Fama–French 5 factor model will not improve the model's predictability of returns.

Methodology

Data

Given the goal of the study, the data analysis was structured in such a way that if the results of the research found that inclusion of ESG scores improves the predicting power of the FF5F, this would support the researcher's proposal to extend the FF5F into a possible six-factor model that will better predict returns on the JSE. The researcher would achieve this goal by comparing the coefficient of determination (*R*-squared) of the existing five-factor model with the *R*-squared of the proposed six-factor model including ESG scores.

The sample consists of companies included on the JSE Top 40 index during the fiscal year end of 2015 to 2019, representing approximately 80% of the total market capitalisation of all companies listed on the JSE. Given the rampant effects of the coronavirus disease 2019 (COVID-19) pandemic on financial markets, the researcher sought to exclude this period from analysis in the study as this may skew the results of the research.

Both ESG combined score (ESGCS) data and share price data were obtained from the Refinitiv workspace database. One of the advantages of this is that the researcher was able to collect all the data needed for the research from one reputable source, and this adds to the reliability of the data and consistency in methodologies used in the calculation of key ratios. Over the last 16 years, Refinitiv's ESG performance scores have been used widely in academic research (Berg et al. 2021). Furthermore, for the purposes of managing ESG investment risks, major asset managers, such as BlackRock, have chosen Refinitiv as their global ESG data provider. Refinitiv ESG data has been also referenced in ESG research conducted by the World Economic Forum (2020) and in an Organisation for Economic Co-operation and Development (OECD) report (Berg et al. 2021).

In reporting ESG data, Refinitiv makes use of percentile rank scores which range between 0 and 100, allowing empirical

analysis. In addition, the database assigns letter grades (ranging from A+ to D-) to each company based on their performance. The conversion between these two scoring formats is shown in Table 1-A1, found in the Appendix 1.

Although some research relies on ESG disclosure scores in their assessment of ESG performance (Gutsche, Schulz & Gratwohl 2017), this study utilised ESG performance ratings data. Environmental, social and governance disclosure scores are usually based on self-reported company information. On the contrary, ESG performance scores use a variety of sources to evaluate a firm's exposure to ESG risk and how effectively it manages such risk. Therefore, motivated by this, the research avoided the use of ESG disclosure scores in favour of ESG performance data in order to further improve the validity of the research.

Suitable for this objective, the ESG scores provided by the Refinitiv database provide a comprehensive evaluation of a firm's sustainability impact and are prepared using verifiable data sourced from the public domain, such as company and NGO websites, regulatory reports, corporate social responsibility reports and media reports. The ESG data is updated by Refinitiv annually based on the company's fiscal year and aligned with corporate reporting patterns. A combination of human and algorithmic processes is utilised, which includes independent audits, logical error checks and management reviews to ensure that data quality is as high as possible. The scores are based on the data available, account for notable industry performance measures and have minimal company size and transparency biases (Refinitiv 2020).

For the environmental component, issues surrounding the utilisation of resources, carbon emissions and operational innovativeness are considered. The social component considers the employees, human rights and community. The governance component considers factors around management, shareholders and corporate social responsibility strategy. These measures are then translated to a percentile-based score (ranging from 0 to 100) for each of the three pillars. The total ESG score is a weighted sum of the scores for each pillar. The weights vary based on the industry for the environmental and social category, while weights for the environmental pillar vary based on the governance considerations as per the firm's country of origin (Refinitiv 2020).

The environmental pillar score measures a firm's performance in implementing best environmental practices to minimise environmental impact of operations and to take advantage of opportunities to generate environmentally sustainable value for stakeholders (Refinitiv 2020). The social score reflects the impact of management practices on the well-being of its employees, customers and society (Refinitiv 2020). Finally, the governance score is an indication of the firm's implementation of best practice policies that are designed to ensure that those charged with its governance act in the best interests of its long-term stakeholders (Refinitiv 2020). The overall ESG score is obtained by aggregating these pillar scores based on the 10 category weights.

For the purposes of the research, a combined ESG score was selected as a proxy for each respective company's ESG performance. The ESGCS provides a balanced and thorough scoring of a company's ESG performance. The score is reliable as it overlays self-reported information with information on ESG controversies from global media sources (Refinitiv 2020). The primary goal of the score is to discount the ESG performance score based on negative stories in the media, and this is done by incorporating the impact of significant and material ESG controversies in the overall ESGC score (Refinitiv 2020).

The controversy scoring is based on 23 ESG controversy topics, such as anticompetition behaviour, child labour, wage controversies, strikes, taxation fraud reports and others. When the respective company has been involved in any such controversy, the score is calculated as a weighted average of the overall ESG score and the ESGC score per fiscal period, with the recent controversies impacting the score in the latest completed period. In the event that a company is not involved in such controversy, the ESGC score is simply the overall ESG score for that company (Refinitiv 2020). Given that larger firms tend to attract relatively more media attention than smaller firms, severity weights are applied when performing the controversy scoring. For example, a firm with a market capitalisation of less than 2 billion would receive a controversy weighting of a 100%, whereas a firm with a market capitalisation more than or equal to 10 bn would receive a weighting of only 33%. Medium-sized firms, that is, those with a market capitalisation greater than or equal to 2 bn, but less than 10 bn, receive a weighting of 67%.

Analysis

As this study used panel data in the form of annual returns and ESG scores data of the JSE Top 40 companies from 2015 to 2019, a statistical ordinary least squares (OLS) regression model along with the R statistics package (R Foundation for Statistical Computing, Vienna, Austria) was relied upon for the analysis in this study.

The use of statistical regression models has been extensive in seminal studies developing and empirically testing asset pricing models, with almost all of such studies relying on statistical regression models for attempts to determine the strength and character of the relationship between one or more independent variable(s) and expected returns.

For this research, two regression models were used. One was the FF5F as it exists, with factors defined as they were developed by Fama and French (2015). The other was a statistical regression model similar to the first, with the sole difference being the addition of an ESG scores factor. It was specified as:

$$Rit = i + \beta i\,(Rmt - R\,f\,t) + si\,SMBt + hi\,HMLt + ri\,RMWt + ci\,CMAt + liLeMLa + \varepsilon it \quad \text{[Eqn 2]}$$

Where all the factors – save for the proposed ESG factor – are defined and measured as per the FF5F above. The ESG factor (liLeMLa) is defined as the return spread of stocks of ESG leaders minus ESG laggards. Where ESG leaders are those firms with high ESG performance – as measured by ESG performance scores – and ESG laggards are those firms with low ESG performance. The independent and dependent variables remain as per FF5F. The ESG factor (liLeMLa) is an additional independent variable.

In the context of this research, *R*-squared was a statistical measure of the proportion of variation in returns (the dependent variable) that is explained by the five and six factors (the independent variables) of the FF5F and the proposed six-factor model including the ESG factor. Therefore, it follows that should the *R*-squared of the proposed six-factor model have exceed that of the FF5F: the researcher will accept H1. In this instance, the researcher may then be able to conclude that the inclusion of ESG scores in the FF5F would improve the model's predictability of returns and therefore propose that the model be extended into a six- factor model incorporating an ESG scores factor.

Results

This study was designed to investigate whether the inclusion of an ESG scores factor in the FF5F would improve the model's explanatory power of returns for shares on the JSE.

Of the 40 companies that make up the JSE Top 40, the researcher was able to gather ESG data, share price data and financial data for 38 of the JSE Top 40 companies. For Prosus N.V. and Pepkor Holdings Ltd, the researcher was unable to gather ESG scores data because of data paucity for the 2015, 2016, 2017 and 2018 financial years for these two companies. This meant that the researcher could not use these companies in the regression analysis, and thus they have been excluded from further analysis. Factoring in this exclusion, the market capitalisation of the sample captures 82.57% of the JSE main board, which, for the purposes of this research, is sufficiently representative.

Regression results: Fama-French five-factor

Table 1 presents descriptive statistics as well as the regression results for the FF5F model, excluding ESG scores.

With the exception of profitability factor (RMW) and the investment factor (CMA), all the factors provided results that are significant, at least at a 5% level. It can be inferred that despite there being a premium associated with firms that invest conservatively, the relationship is insignificant. These results are similar to those of Cox and Britten (2019). The market premium factor (Rm-Rf) provided the highest coefficient, with a positive premium of 2.004. Following this was the value factor (HML), which provided a negative premium of -0.936, indicating an inverse relationship between portfolio returns, significant at a 1% level. This is contrary to the finding of Cox and Britten (2019) that high Book-to-Market (B/M) exhibit a greater premium compared to low B/M shares. Both studies, however, show significance at the 1% level, with the HML having the strongest relationship with returns. This suggests the importance of the value factor in the South African market.

TABLE 1: Regression results and descriptive statistics for the Fama and French five-factor model.

Variable	Coefficient	*T*-stat	Mean	Std. deviation
RmRf	2.004	3.572*	0.0375	0.111
SMB	0.448	3.806*	0.284	0.264
HML	-0.936	-4.33**	-0.053	0.2938
RMW	0.292	0.913	0.063	0.192
CMA	0.215	1.193	0.017	0.384
R-squared	0.343632	-	-	-

*Significant at the 5% level, **Significant at the 1% level.

The results of this study provide clear evidence of the size effect, as in Mosoeu and Kodongo (2020), because SMB was significant at the 5% level. However, the positive coefficient is inconsistent with the results of Mosoeu and Kodongo (2020). These differences may be explained by the sample of firms that were analysed in each study. While the present study chose the largest firms on the JSE, the prior study included the entire JSE, including smaller firms. The profitability factor produced a positive coefficient of 0.215. However, this factor was insignificant.

Notably, the *R*-squared for the unadjusted FF5F model was 0.344. This suggests that FF5F and the factors chosen in this study do not sufficiently explain the returns for the majority of shares on the JSE and are consistent with the findings of Mosoeu and Kodongo (2020).

Regression results: Adjusted Fama-French five-factor

Table 2 presents the factor summary statistic results for the six-factor model, including an ESG scores factor. All variables are as defined in the FF5F, with the exception of the ESG scores.

The market premium factor also continues to show a high correlation with expected returns, producing a positive coefficient of 2.802, significant at a 10% level. The profitability factor and the investment factor both displayed positive correlation with expected returns of 0.322 and 0.241, respectively. The authors note that the size and profitability premiums increase in the six-factor model. This is similar to the results of Cox and Britten (2019), as their size and profitability premiums increased as they moved from a three-factor to a five-factor model. As expected, the results are largely consistent with those of the original FF5F model of this study, as shown in Table 1.

Of particular interest is the correlation produced by the ESG scores factor. This factor produced a negative correlation of 0.207. Interestingly, this indicates that a negative relationship

TABLE 2: Regression results for the adjusted Fama and French five-factor model (with environmental, social and governance score).

Variable	Coefficient	*T*-stat
RmRf	2.802	3.324*
SMB	0.665	3.197**
HML	-0.134	-3.48**
RMW	0.322	1.005
CMA	0.241	1.330
ESG score	-0.207	-1.266
R-squared	0.351629	-

ESG, environmental, social and governance.
*Significant at the 10% level, **Significant at the 1% level.

exists between the ESG scores reported by JSE-listed companies and their returns. This result, however, is not significant. The adjusted FF5F produced some correlation with JSE expected returns; however, the direction of this correlation was surprising, as ESG scores were seen to be inversely related to expected returns.

Similarly, employing panel regression on the JSE over the 2012 to 2019 period, Ball (2021) investigated the relationship between ESG and corporate financial performance and during this period also found no statistically significant evidence of a relationship between the two. However, as the main objective of the research performed in this study is the investigation of the model itself, instead of individual factors, more importance will be placed on the model statistics results and the statistical significance thereof.

Notably, the *R*-squared for the FF5F model with ESG scores was 0.352. This indicates that the inclusion of ESG scores does, in fact, improve the predictability of the FF5F asset pricing model (*R*-squared of 0.344), although only marginally.

A key delimitation of this study is that its primary purpose is not to empirically test the validity of the FF5F in explaining returns of JSE-listed companies' shares. Instead, irrespective of the predicting power of the FF5F model as it stands, this study sought to investigate whether there is improvement in that predicting power through the inclusion of ESG scores. Therefore, although the above *R*-squared results from both models suggest that the models do not seem to capture most of the returns on the JSE, the results are acceptable for the purpose of answering the research question and addressing the aim of the study.

The null hypothesis of this study was that the inclusion of an ESG score factor would not improve the predictive power of the FF5F model. Based on the results discussed above, because the *F*- test of overall significance for the adjusted FF5F of 0.000000000176 is below alpha, that is, the significance level of 0.05, the null hypothesis is rejected in favour of the alternative hypothesis. Therefore, inclusion of an ESG scores factor to the FF5F results in a marginal improvement of the model's predictability of expected returns on the JSE.

The results show that the inclusion of ESG scores enhances the explanatory power of the FF5F. However, this was only a slight improvement. As such, it appears that sustainability-related factors do not materially influence investment decisions and that ESG performance is not significantly priced by the market.

Conclusion

This research presents a nexus of key areas of finance research – asset pricing and sustainable value creation. The aim of the research was to discover whether the inclusion of ESG scores in an adjusted FF5F would improve the model's predicting power of expected returns on the JSE.

It was found that although the adjusted FF5F captured more returns than the FF5F, there was only a slight improvement in the predicting power of the model. However, given the fast-growing interest and focus on ESG in the world and the increase in sustainability-related regulation, the researcher suggests that this improvement in predicting power of the model is likely to grow as ESG becomes more integrated in investments by investors. There is scope for further research on the addition of ESG factors in the development of asset pricing models in the future, especially during and after the COVID-19 period, which highlighted the importance of sustainability-related practices.

Furthermore, this research also forms a basis for further endeavours on the trade-off between ESG aspects that is often required in the resource-constrained firm setting. This may be achieved by disaggregating the ESG performance scores and analysing each in the context of firm and share price performance.

Furthermore, as ESG scores tend to be subjective and dependent on the respective databases' ratings approach, using data from other financial research institutions may also provide more insight on the relationship between ESG scores and JSE expected returns. Lastly, the results of this research could be compared to the results of research that has used ESG disclosure in integrated reports as a proxy for ESG performance.

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Competing interests

The authors declare that they have no financial or personal relationship(s) that may have inappropriately influenced them in writing this article.

Authors' contributions

A.S. conceptualised the research topic, supervised the project and reviewed the first draft. L.N. collected the data and wrote the first draft.

Ethical considerations

This research was granted an ethics waiver by the School of Accountancy Ethics Committee and ratified by the University

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Disclaimer

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Appendix starts on the next page →

Appendix 1

TABLE 1-A1: Environmental, social and governance score conversion between percentage and letter grades.

Score range	Grade	Description
0.0 <= score <= 0.083333	D-	'D' score indicates poor relative ESG performance and insufficient degree of transparency in reporting material ESG data publicly.
0.083333 < score <= 0.166666	D	
0.166666 < score <= 0.250000	D+	
0.250000 < score <= 0.333333	C-	'C' score indicates satisfactory relative ESG performance and moderate degree of transparency in reporting material ESG data publicly.
0.333333 < score <= 0.416666	C	
0.416666 < score <= 0.500000	C+	
0.500000 < score <= 0.583333	B-	'B' score indicates good relative ESG performance and above-average degree of transparency in reporting material ESG data publicly.
0.583333 < score <= 0.666666	B	

Source: Refinitiv, A., 2020, *Environmental, social and governance (ESG) scores from Refinitiv*, ESG Scores Methodology, p. 18, viewed 02 November 2022, from https://www.refinitiv.com/en/sustainable-finance/esg-scores.

ESG, environmental, social and governance.