NOTTINGHAM TRENT UNIVERSITY

DISCUSSION PAPERS IN ECONOMICS

No. 2020/3 ISSN 1478-9396

PENSION FUNDS AND SOCIALLY-RESPONSIBLE INVESTMENT IN CORPORATE DEBT SECURITIES: AN EMPIRICAL INVESTIGATION

MICHAEL MCCANN

MAY 2020

DISCUSSION PAPERS IN ECONOMICS

At Nottingham Business School, our Working Papers Series in Economics include a wide variety of approaches reflecting our research interests and academic expertise.

This paper is part of the new series, ***Discussion Papers in Economics***.

Earlier papers can be found at:
https://www.ntu.ac.uk/research/research-at-ntu/academic-schools/research-at-nottingham-business-school/nbs-working-papers

Please contact the Editor for enquiries concerning any of our Discussion Papers:

King Yoong Lim
Division of Economics
Nottingham Trent University
50 Shakespeare Street
Nottingham NG1 4FQ
UNITED KINGDOM

Email: king.lim@ntu.ac.uk
Tel: + 44 (0)115 848 6071

Pension Funds and Socially-Responsible Investment in Corporate Debt Securities: An Empirical Investigation

Dr Michael McCann*

Nottingham Trent University

Email: michael.mccann@ntu.ac.uk

*corresponding author

Abstract

This paper examines the extent of socially-responsible investment conducted by pension funds in corporate debt securities. Behavioural theories of the firms suggest a link between corporate social responsibility and business risk, particularly over the longer-term. Therefore, institutions such as pension funds with a longer-term investment horizon should be more likely to engage in socially-responsible investment compared to investment funds with a short-term horizon. Using data on the holdings by pension funds and investment funds of debt securities issued by North American and European companies, we investigate whether there are any differences in the treatment of corporate social performance by these different institutional groups in their holdings of corporate debt securities. Our results show no significant difference in the corporate social performance of the borrowers whose securities both pension funds and investment funds hold. In addition, our findings indicate that both investment groups reflect broader environmental, social and governance factors in their debt market investments with corporate social performance having a significant impact on credit spreads for securities. However, pension funds place greater weight on social and environmental factors compared to investment funds when pricing debt securities. Our analysis demonstrates that financial flows in debt markets are influenced by social and environmental factors and that pension funds are a key conduit. Consequently, capital allocation decisions by pension funds could play an important role in changing corporate behaviour to achieve more sustainable outcomes.

Keywords: Pension Funds; Responsible Investment; Capital Markets; Corporate Social Responsibility

1. Introduction

Investors can have an important influence on the decisions taken by firms. With increasing awareness of the wider social and environmental costs and benefits associated with the activities of firms, there has been a growth in interest around socially responsible investment (SRI). While conventional investment focuses solely on financial risk and return, SRI adopts a broader perspective involving a variety of objectives relating to environmental and social issues in investment allocation decisions (Eurosif, 2010). The anticipated outcome of SRI is routing capital to firms performing well in relation to these issues, termed corporate social performance (CSP), while denying capital to those with poor CSP. Consequently, investment flows should produce a more efficient allocation of resources in relation to not just economic, but broader social and environmental considerations (Sparkes and Cowton, 2004).

The scale of SRI has grown significantly in the last decade. Eurosif (2010) and the US Social Investment Forum (2010) reported total investments with an explicit social or environmental profile of over $3 trillion in the US and €5 trillion in Europe. By 2016, reports suggest the amount was over $8 trillion in the US and €22 trillion in Europe (Eurosif, 2017; US Social Investment Forum, 2017). However, the scale of investment classified as SRI is still small compared to the total amount of funds invested in Europe and the USA (Busch et al., 2016). If a substantial difference is to be made to CSP, then environmental, social and governance factors, known collectively as ESG, must be adopted by the mainstream investment community, particularly among the financial institutions which manage most of the funds.

Research has drawn attention to the different incentives for financial institutions to engage in SRI (Cox et al., 2004). One group of investing institutions advocated as vehicles for advancing SRI through their investment patterns are pension funds (Sandberg, 2013). Pension funds are institutions established as public or private entities with the aim of providing income for participants in retirement. To do so, the contributions made by participants (and their employers) are invested in a range of real and financial assets,

including debt and equity securities (OECD, 2016). Given the increased scale of pensions across developed market economies, pension funds have become large investors in many developed countries, with the assets of private funds representing on average 50% and public funds on average 11.1%, of GDP in OECD countries in 2016 (OECD, 2018). As a result, the way that pension funds allocate their funds can have a significant impact on financial markets and the behaviour of firms. This is relevant for influencing behaviour towards improving CSP.

Different investment horizons as well as developments in legal and institutional frameworks may produce differences in the way that institutional investors view CSP. Corporate sustainability is likely to influence firm performance more over a longer period of time (Porter and Kramer, 2006). Therefore, financial institutions with longer-term investment horizons, such as pension funds, should be more likely to recognise ESG factors in investment decisions compared to institutions with a shorter investment horizon (investment funds, e.g. hedge funds). Further, across multiple jurisdictions, regulators have required pension funds to incorporate ESG factors in investment analysis (Sandberg, 2013).

Our work complements the limited research analysing the extent to which mainstream institutional investors practice SRI by considering CSP in security selection decisions. Drawing on the efficient market hypothesis (Malkiel & Fama, 1970), both Coffey and Fryxell (1991) as well as Graves and Waddock (1994) found that the presence of institutional investors in a firm's equity ownership had a positive impact on CSP. Johnson and Greening (1999) place their analysis within agency theory (Jensen and Meckling, 1976) and found that pension fund investment had a positive impact on two aspects of corporate sustainability (people dimension and product quality dimension). Work using UK data found that the greater the share ownership of institutional investors with a long-term investment horizon, the better the performance of investee companies across a range of ESG variables (Cox et al., 2004; Cox et al., 2008). In contrast, Dam and Scholtens (2012) analysing a broader European sample report that the equity holdings of institutional investors were not

significantly correlated with CSP. More recently, Kaspereit, and Lopatta, (2016) report a positive association between corporate sustainability and equity values for a sample of large European companies. To our knowledge, no work have analysed the differing attitudes to corporate social performance of institutional investors evident in their investment decisions in corporate debt securities. This paper addresses this gap in the literature.

The analysis of debt markets is relevant for several reasons. Regulation and a better balance of risk and return relating to their long-term investment horizon has led pension funds to re-orientate their portfolios towards fixed income debt securities (OECD, 2017). Furthermore, the potential impact of resource allocation decisions in these markets on the CSP of firms is likely to be more significant than equity ownership. There are several explanations for this. Firstly, the balance sheet values of debt for firms are higher compared to equity capitalisations quoted on financial markets (Rodriguez-Palenzuela, D. et al., 2013). Secondly, according to the pecking order hypothesis, firms avoid using equity as an external source of ongoing financing to avoid market monitoring (Myers, 1984). Therefore, external debt financing is a more common source of continuing finance for companies. Thirdly, private companies finance activities using debt securities so the potential disciplining impact of the credit markets touches far more companies than the equity market. Finally, private investors are not direct participants in credit markets whereas institutional investors such as banks, investment funds, insurance companies and pension funds are. This is important since, private investors are more likely to invest using less and lower quality information compared to institutional investors (Locke and Mann, 2005). They struggle to incorporate complex ESG data and their participation in equity investment creates greater dispersion in ownership, reducing the disciplinary impact of equity ownership on management (Oikonomou et al., 2014). In contrast, their absence from credit markets means that institutional investors like pension funds are more significant in credit markets because of the size and concentration of their holding (Scholtens, 2006). If a firm does not behave in a sustainable manner, then it risks exposure to market discipline when existing loans or debt instruments mature. To ensure credit lines, the company will need to meet the requirements

of potential creditors like pension funds. Therefore, if pension funds reflect CSP in their investment decisions, their influence should generate greater pressure on borrowers and improve corporate social performance.

Therefore, our work adds to the growing strand of literature analysing the extent of SRI conducted in corporate debt (credit) markets. Both Menz (2010) and Oikonomou et al. (2014) found a significant relationship between a corporate borrower's overall social performance and their cost of debt. In contrast, Stellner et al., (2015) found no significant relationship at the corporate level but significant differences across countries. Both Ge and Liu (2015) plus Gong and Gong (2018) found that companies with better CSP face lower costs when issuing new debt securities. Other studies report similar findings in relation to governance (Bradley et al., 2007: Zhao, 2017) and environmental factors (Bauer and Hann, 2010; Chava, 2014). However, there has been little analysis of differences in the capital allocation decisions of institutional investors in debt markets in relation to CSP, specifically the differential incentives to conduct SRI in debt markets due to the diverse legal and institutional frameworks in which they operate and their dissimilar investment horizons. We address this gap and contribute to the existing literature by investigating whether CSP is of greater significance to pension funds compared to investment funds.

Finally, SRI is recognised as a multidimensional construct (Girerd-Potin et al., 2014). Despite this, existing studies limit their analysis to either a broad classification (Menz, 2010), or limited range of ESG objectives (cf. Bradley et al., 2007; Chawa, 2011). This study adopts both an aggregated construct of corporate social performance but also separate economic, social and environmental measures. This permits the analysis of the preferences of different institutional investors across these different facets of SRI.

We find that both investment funds with a short-term investment horizon and pension funds with a long-term horizon integrate CSP into their pricing of corporate debt securities. However, while both types of institutions treat governance characteristics in a similar way, pension funds place a greater weight on social and environmental performance compared to

funds expected to have a shorter investment horizon. This adds to existing work by indicating that institutions with a longer investment horizon consider social and environmental factors specifically to be more material in balancing risk and return across debt as well as equity investments. Given the scale and scope of international debt markets, capital allocation decisions by pension funds could play an important role in changing corporate behaviour to achieve more sustainable outcomes.

The paper proceeds as follows. In the next section we discuss the different theoretical arguments surrounding socially responsible investment. Section three present the methods used in our empirical analysis. Subsequently, section four reviews the results of our analysis followed by a discussion of their implications. Section 6 is the conclusion.

2. Theoretical Underpinning to Socially Responsible Investment

While conventional investment concentrates on narrow financial risk and return, socially responsible investment (SRI) represents a broad group of investment objectives across ecological efficiency, corporate governance and good relations with corporate stakeholders (Renneboog et al., 2008). As a result, SRI is a multidimensional concept, with investors using a variety of environmental, social and governance (ESG) criteria, depending on their specific objective, to distinguish the corporate social performance (CSP) of firms (Eurosif, 2010). Legal, institutional and theoretical developments suggest that SRI should be considered beyond specialist funds (Busch et al., 2016). Like Cox et al., (2004), our framework for analysing SRI among mainstream institutional investors is grounded in portfolio theory (Markowitz, 1952). In debt markets, this suggests that investors will balance yield and credit default risk. The trading preferences of institutional investors will be determined by the nature of the products that they sell. A broad distinction can be made between long- and short-term beneficiaries influencing the investment horizon over which

risk and return is considered. In debt markets, this implies that the importance of ESG factors in institutional investment decisions may be expected to depend on the influence of CSP on the credit default risk of corporate borrowers and the time over which that risk is material.

2.1 Corporate Social Responsibility and Risk

The traditional perspective suggests that SRI by institutions will be at odds with their duty towards ultimate beneficiaries. Encouraging firms to consider wider ESG factors in their activities will have a detrimental effect on their financial risk and hence returns to the institutional investors. Two line of arguments are proposed. Firstly, over-investment theory proposes that investors who encourage firms to address environmental and social factors through for example, enhanced health and safety measures or modern environmentally friendly production facilities, will raise their costs resulting in lower profitability and competitiveness (Friedman, 1970). With reference to debt markets specifically, social investments related to fixed costs increase the volatility of earnings and reduces creditworthiness (Frooman et al., 2008; Goss and Roberts, 2011). Secondly, multidimensional targets that encompass not just economic but also social and environmental outcomes may produce inefficient performance contracts with unclear and conflicting incentives for managers (Tirole, 2001). This implies that by encouraging corporate social responsibility through SRI, institutional investors may not only compromise a firm's creditworthiness, but also fail to achieve the desired social and environmental outcomes as well.

An alternative perspective suggests that SRI can benefit investment institutions. In behavioural models of the firm, social and ecological issues may be relevant to corporate policy (Renneboog et al., 2008). One such model - stakeholder theory (Cyert and Marsh, 1963), proposes that better corporate social performance is associated with improved financial performance for several reasons. Sustainable corporations should be more resilient

to changing conditions in the business environment. For example, fairer treatment of employees may improve morale. This should attract better quality employees, who are motivated and remain with a company for longer periods. This is associated with lower credit default risk (Phillips et al., 2007). Moreover, socially responsible enterprises have lower costs due to less production-related environmental damage and possible litigation. This improves reputation and brand value. Furthermore, such companies often maintain good relations with public institutions and other organisations, therefore creating a 'moral capital' with insurance-like effects that has a positive effect on a firm's creditworthiness (Godfrey, 2005). Overall, such firms should have lower business risk and lower credit default risk, particularly over the longer-term, compared to firms who adopt a narrow financial perspective (Hoepner et al., 2016; Porter and Kramer, 2006). Consequently, responsible investors could use environmental, social and governance information to improve the risk-return profile of their portfolios, particularly over longer investment horizons compared to conventional models.

Another perspective suggests that responsible investors may consider social and environmental issues independently of risk mitigation (Sandberg, 2013). This may be determined by the values of their ultimate beneficiaries. So, investment institutions may be attracted to firms that account for broader stakeholders through avoiding the sale of particular products, community engagement, diversity in management and workforce, environmental mitigation and employee empowerment. The Institutions conduct SRI because of the social and environmental considerations themselves, and not because it is in the financial interests of their beneficiaries. As Sandberg (2013) proposes, investors may interact with firms on child labour, not because it improves the return of their ultimate beneficiaries, but because it is morally repugnant and wrong. In this case, social performance will be independent of financial return.

2.2 Preferences of Investment Institutions and Socially-responsible Investment

The theoretical arguments suggest that different types of investment institutions will have different incentives to engage in socially-responsible investment (SRI). Given the nature of the products which they provide, the requirements of many investment funds are for short-term financial performance and liquidity. For example, the immediate redemption rights to owners of unit trusts encourages mutual funds' managers to adopt a short-run investment horizon, holding securities with a high level of liquidity (Johnson and Greening, 1999; Zera and Madura, 2001). This suggests that these types of funds will not consider environmental, social and governance (ESG) factors in their investment decisions since these are unlikely to influence risks associated with the investee firms, and hence, investment returns over that short investment horizon.

In contrast, pension funds, due to the nature of their financial products have long-term liabilities (Davis and Steil, 2001). This means their fiduciary duty is to hold a portfolio of assets which matches this time horizon (Hoepner et al., 2011). Since, according to the financial case, ESG factors are more likely to influence corporate sustainability and hence creditworthiness over a longer period, pension funds should be more likely to engage in SRI compared to investment funds. Indeed, a report commissioned by the United Nations Environments Programme's Finance Initiative (UNEP FI) in 2005, while reaffirming the traditional fiduciary duty of pension funds, argued that integrating ESG factors was obligatory if such concerns had financial implications.

Further, regulatory developments have required pension funds across a variety of jurisdictions to recognise ESG factors in their investment decisions. From 2000, UK-based pension funds were expected to disclose within their 'Statement of Investment Principles',"... the extent (if at all) to which social, environmental or ethical considerations are taken into account in the selection, retention and realisation of investments" (United Kingdom, 1999). Similar guidelines have been issues in France, New Zealand, Norway and Sweden (Scholtens, 2006). Further, many pension funds have signed up to the United Nations Principles of Responsible Investment (PRI). This requires commitment to adhering to the principles; for

example, incorporating ESG issues into investment analysis, and incorporating ESG issues into ownership policies and practices. Following these arguments, we propose to test the following hypothesis:

For debt securities owned by pension funds, environmental, social and governance factors are more likely to be reflected in credit spreads compared to those not owned by pension funds.

3. Empirical Analysis

3.1 Data

Using the Bloomberg Profession Software, we identified data on debt securities of companies incorporated in North America and Western European countries. Consistent with other studies in this area (cf Menz, 2010; Oikonomou et al., 2014) we filtered out securities with special features - call options or convertibility into equity – retaining those with fixed maturity dates so that the determination of yield to maturity is not complicated. Further, we excluded companies in the financial sector due to their different needs for debt securities. The Bloomberg database reported 1485 debt securities that met our criteria were in issuance on 17th July 2018. Bloomberg records the holdings of these securities by type of institutional investor. We focused on direct holdings since these will reveal the intentions of institutions more clearly than investments through intermediaries. In order to discern their investment patterns and the greater likelihood that pension funds will incorporate corporate social performance (CSP) in the way proposed by stakeholder theory, we identified a sample of securities held directly by pension funds and investment funds expected to have a short-term (ST) perspective (hedge funds, private equity, holding funds and venture capitalists). We termed these institutions as investment funds. We did not identify the extent of holdings but assumed that since their holdings are substantial, the preferences of the different institutional types should be reflected in the credit spreads of the securities they own.

On 17th July 2018, both groups invested directly in a large number of marketable debt securities issued by Western European and North American companies. Pension funds held 818 debt securities issued by 220 different companies. Investment funds held 595 debt securities directly, issued by 210 companies. 293 securities were held by both groups. For the regression analysis we identified the distinct securities held by the pension funds and investment funds. After removing several securities due to missing observations, this left a final sample of 807 securities; 521 held by pension funds and 286 held by investment funds.

3.2 Measuring Corporate Social Performance

Previous work has used a variety of ways to measure corporate social performance (CSR) or the more contemporary term, corporate sustainability, since social impact is just one dimension. In our analysis, we adopt the Robeco Sustainable Asset Management Research (SAM) measures of CSP. RobecoSAM conducts a corporate sustainability assessment to rank firms ability to respond to sustainability opportunities and challenges presented by trends such as resource scarcity, climate change and aging populations. It adopts an integrated model which allocates weights in rankings according to the financial materiality of factors. Those with the greatest impact on long-term financial performance have a higher weighting. Those with the lowest impact on long-term financial performance have a lower weighting. The agency distributes questionnaires to companies covering economic, social and environmental dimensions of CSP. Questions are weighted to arrive at a measure for overall performance and individual economic, social and environmental dimensions. Responses are scored between 0 and 100, with a higher figure representing better performance. RobecoSAM use evaluation procedures involving outside interests (universities) to ensure the data is meaningful. In our sample, a number of securities held by pension funds and investment funds did not have a RobecoSAM score. In this analysis, these securities were given scores of zero overall and across the dimensions of CSP. RobecoSAM measures were

used in several studies analysing CSP in debt markets (cf Menz, 2010). Therefore, our results adds to that strand of the literature.

3.3 Measuring Credit Spread

The credit spread of a corporate debt security represents the premium that an investor receives for the additional risk incurred in comparison to the risk-free investment (sovereign debt). The credit spread on a given security is its' yield minus the yield on a sovereign debt instrument that is identical to the corporate bond (in terms of maturity, coupon rate and frequency of payments per year). Hence, differences should reflect several sources of risk including credit default risk, liquidity risk and systematic interest rate risk (Menz, 2010). However, such sovereign securities may not exist or be difficult to discern (Oikonomou et al., 2014). We proxy the risk-free benchmark using sovereign yields of the equivalent maturity estimated from the yield curve. While not exact, it provides a sound approximation of the risk-free return for different maturity periods. In many instances, the borrowing currency and ultimate parent country of risk are the same, but, in many instances, they are not. Firms borrow in a variety of currencies, mostly to take advantage of lower borrowing costs. In such instances, it would be inappropriate to use the sovereign yield of the ultimate country of risk for the firm. The opportunity cost for investors are determined by the borrowing currency, so we use the yield on a sovereign security with the same maturity in the borrowing currency as the risk-free benchmark to determine the credit spread.

3.4 Control Variables

When analysing the econometric relationship between corporate social performance (CSP) and credit spreads, one must be careful to control for other factors which may influence the risks related to a particular security, particularly financial and business risk (McWilliams and Siegel, 2000), but also liquidity risk (Oikonomou et al., 2014) and systematic interest

rate risk (Fama and French, 1993). We use several variables to control for financial and business risks, which should not be covered by sustainability indicators. A company's level of debt, liquidity position and performance can also indicate financial and business risk. Measures of these factors such as debt ratios, interest coverage ratios and return on assets are used in conjunction with judgements of management quality to determine the creditworthiness of firms (Ederington and Yawitz, 1987). While a number of established agencies conduct ordinal ratings (Moody's, Fitch and Standard and Poor), we adopt a 5-year probability measure of default calculated by Bloomberg. This is useful in that it provides a quantitative measure of credit default risk determined by maximum likelihood estimation. Our calculations indicate that this probability measure is strongly correlated with the gearing, liquidity and profitability of borrowers in our sample. Consequently, it provides a parsimonious measure of financial and business risk. Further, including this rating ensures that sustainability indicators ultimately measure more than credit risk in the empirical analysis (Menz, 2010).

Since different industrial sectors have different structural characteristics and cyclical sensitivities, their systematic risks vary and so do their risk premia. This pattern is supported by empirical evidence, even for firms with identical credit ratings (Longstaff and Schwartz, 1995). A consideration of sector effects is important since corporate sustainability research indicates that the social and environmental issues in different industries are of differing relevance (Scholtens, 2008; Steger et al., 2007). We use a series of dummy variables to control for the sectoral effects.

Di Giulio et al., (2007) show that larger firms have more resources to devote to CSP and so tend to score highly in these areas. Since our sample includes private limited companies, a market-based measure is inappropriate. Instead, we use the natural logarithm of total assets as a proxy for firm size (all companies asset values converted into dollars).

The total nominal amount borrowed at issuance indicates the liquidity of a specific security, as opposed to that of a company. The greater the nominal amount issued, the greater the

liquidity. We convert all of the securities nominal amounts into dollars and conduct a logarithmic transformation. Debt securities are also subject to systemic interest rate risk since their prices will vary in relation to movements in market yields. Interest rate risk is greater for bonds with longer maturities (Kao, 2000). In order to reduce the distorting influence of varying maturities on the credit spread we use the modified duration as a control for interest rate risk. Since modified duration is related to maturity, we do not include the latter as a variable in analysis. Table 1 shows the variable definitions and expected signs.

Table 1: Variable Names, Definitions and Expected Signs

Variable Name	**Definition**	**Expected Sign**
SPREAD	Yield on security minus the yield on the borrowing currency sovereign debt security matched by maturity	
SAMSUST SAMECON SAMSOC SAMENV	Specified measures of corporate social performance measured by RobecoSAM SAMSUST – Overall Sustainability Score SAMECON – Economic Dimension Score SAMSOC – Social Dimension Score SAMENV – Environmental Dimension Score	-
B5YPD	Bloomberg's published estimate of the probability of default within five years of date (measure of credit default risk)	+
MDUR	Estimate of modified duration for debt security (estimate of interest risk)	+
LNAO	Natural log of amount issued (all converted to dollars for comparability). A measure of liquidity.	-

LNTA	Natural logarithm of total assets of the company (all converted to dollars for comparability).	-
PFOWN	A dummy variable identifying a security distinctively held by pension funds (given a value of 1: 0 if held by investment funds)	N.A.
PFSAMSUST	Variable measuring interaction between ownership by pension funds and different dimensions of corporate social performance	-
IND	Categorical measure covering eight industrial sectors adapted using the primary 2-digit GICS Code	N.A.

3.5 Methods of Analysis

We use a cross-sectional regression to test our hypothesis that the credit spreads of debt securities held by pension funds are more likely to reflect corporate social performance (CSP) compared to those held by investment funds. Previous studies analysing debt markets adopt a panel approach, incorporating cross-sectional and longitudinal data on daily corporate credit spreads. However, since many of the variables which determine corporate spreads change infrequently (social performance measures, credit default risk, size and liquidity measures), there is little informational gain from that approach regarding the different preferences of institutional investors. A cross-sectional design is valid because it enables the work to capture the different propensities of long-term preferences (pension funds) and short-term preferences (investment funds) to incorporate CSP in their investment decisions through the discrete credit market securities that they directly hold. In the regression modelling we incorporate a dummy variable to signify that a security is held by pension funds (given a value of 1; otherwise 0) and include an interaction term which is the product of the dummy variable and each measure of CSP. This will enable the work to discern differences in the responsiveness of credit spreads to corporate sustainability

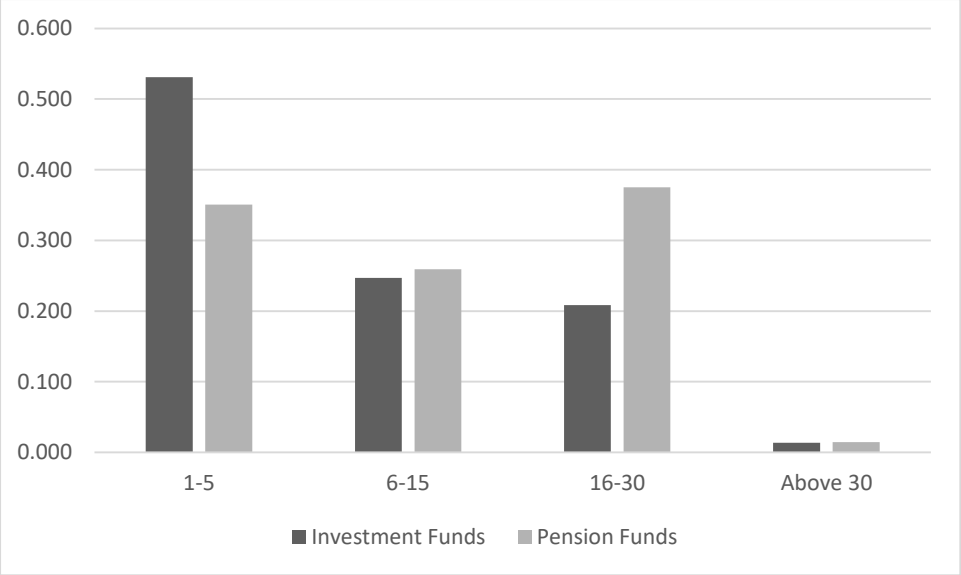
performance between the two sub-samples (pension funds and investment funds). We analyse several models covering overall sustainability and each individual dimension – economic, social and environmental.

4. Results

4.1 Sample Characteristics

The maturity profile of the securities held by the two groups of institutional investors are consistent with expectations about their investment horizons. Figure 1 illustrates the maturity profile of the total number of securities held by the two groups on 17th July 2018. Investment funds held a greater proportion of short-dated securities (1-5 years maturity represent over half of securities held) compared to pension funds (0.35 of total securities held). Conversely, pension funds held a higher proportion of longer-dated securities (nearly double the proportion in securities with maturities greater than 15 years compared to investment funds). Both groups held very few corporate securities with maturities beyond 30 years. The differing profiles are consistent with the perspective that while investment funds are concerned with short-term risk and return, pension funds hold a longer-dated asset profile to match the profile of their long-term pension liabilities. Hence, pension funds should certainly be interested in financial and business risk over the longer time horizon where stakeholder theory suggests that sustainability factors are financially material.

Figure 1: Maturity profile of Debt Securities held by the investment groups



Both groups hold multiple securities issued by the same borrow (for instance, 32 different debt securities issued by Verizon Communications Inc. were held by pension funds). Further, there was a substantial overlap in the companies represented in the holdings of both groups. Additionally, both groups had holdings of a large number of the same debt securities (293). Interestingly, in addition to public companies, there are a number of securities issued by private firms held by both groups. This suggests both sets of investing groups do not have significantly different requirements regarding the companies represented in their holdings of debt securities. In relation to corporate social performance (CSP), a significant proportion of companies across the holdings of both groups do not have a published RobecoSAM performance rating. This is to be expected for private companies whose disclosure requirements are lower (though a number of these had published Robeco SAM ratings). However, a significant minority of the public companies did not have published Robeco SAM ratings either. Table 2 illustrates the characteristics of the issuing companies represented in the sample of securities held by both institutional groups.

Table 2: Characteristics of the sample of firms held by the Institutional Investment groups

	Pension Funds	**Financial Institutions**
Total Number of Securities held directly	818	595
Number of Entities Represented	254	241

Number of Ultimate Companies	220	210
Number of Listed companies	202	192
Number of Private Companies	18	20
Number of Companies held by both Groups	149	149
Number of distinct Companies held by each group	71	61
Number of companies with a RobecoSAM Sustainability Score	174 (79.5%)	164 (77.4%)

Table 3 shows the average RobecoSAM rankings for the companies held. Given the significant overlap in the corporate borrowers represented in the debt securities held by the two institutional groupings, it is little surprise that there is no significant difference in the average RobecoSAM performance scores of the companies held. Even when comparing the average rankings for the distinctive companies held by both types of institutions, while those held by pension funds have higher rankings across all the dimensions of sustainability, analysis of variance show the differences are not significant. If there is a difference in the treatment of CSP, the composition of the sample of securities held by the two groups suggests it is not through a strategy of exclusion. The substantial overlap in securities with investment funds and the inclusion of firms with no SAM ratings suggests that pension funds did not exclude the securities of companies on the basis of poor sustainability measures. It may well be that sustainability preferences are reflected in different rates of return required.

Table 3: Average RobecoSAM rankings for the companies held.

	All Companies held by Pension Funds	**All Companies held by Investment Funds**	**Distinctive companies held by Pension Funds**	**Distinctive companies held by Investment Funds**
RobecoSAM Sustainability Score	47.86	46.42	43.74	37.66
RobecoSAM Economic Score	49.74	47.01	46.63	36.75

RobecoSAM Social Score	46.29	45.32	41.86	37.39
RobecoSAM Environmental Score	48.05	46.72	43.01	37.38

All calculations use a zero score for companies without a RobecoSAM score

4.2 Regression Analysis of Credit Spreads

In order to test whether the different preferences hypothesised are evident in credit spreads we disregard securities held by both institutional groups. The remaining securities 808 securities were split into two sub-samples – 521 discrete debt securities held by pension funds and 286 held by investment funds respectively. Analysing these discrete groups enables the research to assess the extent to which the institutional types differ in their use of corporate sustainability scores to determine credit spreads of securities they hold. Table 4 shows the descriptive statistics for the total sample and both sub-samples. The mean credit spread is higher for the pension fund group, which may be due to the higher mean maturity for that sub-sample, but also, the higher average probability of default. The average scores across all the dimensions of sustainability performance is higher for the pension fund sub-sample which supports the argument that these institutions, with their longer-term horizon are more likely to invest in the securities of corporate borrowers which have better CSP, and hence, lower risk over that period. However, the results need to be treated with caution since the difference is not statistically significant.

Table 4: Descriptive statistics for the total sample and both sub-samples.

	Average for Overall Sample (n=807)	**Average for Distinctive Securities held directly by Pension Funds (n=521)**	**Average for Distinctive Securities held by Financial Institutions (n=286)**
Credit Spread	1.529	1.761	1.106
Maturity (in years)	11.05	13.37	6.828
Modified Duration	7.135	8.243	5.113
Probability of Default	0.029	0.036	0.016

Natural Log of Amount Outstanding	19.744	19.586	20.03
Natural Log of Total Assets	10.99	10.852	11.242
RobecoSAM Sustainability Score	48.13	48.9	46.72
RobecoSAM Economic Score	49.03	50.75	45.91
RobecoSAM Social Score	46.29	46.43	46.01
RobecoSAM Environmental Score	49.29	49.68	48.59

All calculations use a zero score for securities without a RobecoSAM score

Table 5 shows the correlation matrix for the variables to be included in the regression model. There is significant positive correlation between the RobecoSAM scores between all the dimensions. This is consistent with observations that strong performance in one dimension is associated with strong performance in other dimensions (van Durren et al., 2016). Consequently, we analyse these measures in separate regression models. The scores have a strong positive correlation with size suggesting that larger companies are more likely to exhibit better sustainability performance. This is consistent with prior expectations - larger firms are able to devote more resources to broader CSP. The Robeco SAM scores also have a strong negative correlation with a security's 5-year default probability (B5YRD). This is consistent with the argument that better sustainability performance is associated with lower credit default risk. These correlations did not affect the results of the regression so do not require separate models.

Table 5: Correlation Matrix for Variables

	MDUR	B5YRD	LNAO	LNTA	SAMSust	SAMEcon	SAMSoc	SAMEnv
SPREAD	0.250**	0.293	-0.201**	-0.208**	-0.289**	-0.255**	-0.28**	-0.311**
MDUR		-0.051	0.025	0.05	0.066	0.084	0.05	0.063
B5YPD			-0.182**	0.03	-0.333**	-0.333**	-0.311**	-0.348**
LNAO				0.044	0.127*	0.121*	0.138*	0.171**
LNTA					0.22**	0.219**	0.214**	0.22**
SAMSust						0.96**	0.977**	0.959**
SAMEcon							0.93**	0.901**
SAMSoc								0.923**

*significant at 0.05 level

**significant at 0.01 level

Table 6: Regression results

	Model 1 Overall Sustainability		Model 2 Economic Dimension		Model 3 Social Dimension		Model 4 Environmental Dimension	
Variable	**Coefficient**	**T-statistic**	**Coefficient**	**T-statistic**	**Coefficient**	**T-statistic**	**Coefficient**	**T-statistic**
INTERCEPT	4.114	7.67***	4.209	7.859***	4.091	7.633***	3.921	7.333***
PFOWN	0.536	2.866***	0.463	2.387**	0.505	2.904***	0.619	3.087***
SAMSUST	-0.004	-3.018***						
SAMECON			-0.005	-2.919***				
SAMSOC					-0.004	-2.504**		
SAMENV							-0.004	-3.287***
PFSAMSUST	-0.005	-2.051**						
PFSAMECON			-0.003	-1.262				
PFSAMSOC					-0.005	-2.148**		
PFSAMENV							-0.007	-2.491**
MDUR	0.073	8.918***	0.072	8.792***	0.073	8.849***	0.073	8.946***
B5YRD	3.053	6.352***	3.253	6.665***	3.216	6.658***	2.947	6.220***
LNAO	-0.08	-3.836***	-0.094	-4.102***	-0.088	-3.748***	-0.080	-3.385***
LNTA	-0.138	-5.161***	-0.14	-5.243***	-0.142	-5.208***	-0.136	-5.172***
CD	0.088	0.701	0.1	0.788	0.093	0.750	0.087	0.704
CS	0.033	0.277	0.052	0.449	0.035	0.299	0.018	0.154
ENERGY	0.0487	0.323	0.053	0.345	0.056	0.372	0.001	0.004
IND	0.153	1.154	0.164	1.236	0.167	1.257	0.141	1.066
IT	0.351	2.738***	0.402	3.165***	0.361	2.809***	0.352	2.751***
MAT	0.322	2.487**	0.298	2.336**	0.325	2.498**	0.313	2.367**
TRANS	-0.485	-2.595***	-0.444	-2.399**	-0.499	-2.657***	-0.486	-2.602***
r2	0.295		0.284		0.292		0.303	
F-stat	23.681***		22.461***		23.301***		24.616***	
Durbin-Watson stat	2.013		2.009		2.001		2.011	

**significance at 0.05 level

***significance at 0.01 level

We include results for overall sustainability (model 1) and individual dimensions of sustainability - model 2 (economic), 3 (social) and 4 (environmental). In all the models, we incorporate interactions between pension fund ownership and sustainability performance measures in order to discern any differential relationship compared to the investments funds' sub-sample. We adjust for heteroscedascity using the standard Huber-White procedure. Table 6 shows the results of the regression analysis.

Model 1 analyses the relationship between credit spread and overall sustainability performance for the sample of securities. The intercept is the credit spread for the sub-sample of securities issued by utility companies held by investment funds. The significant coefficient for PFOWN indicates higher credit spreads for discrete securities from the utility sector held by pension funds, setting everything else equal to zero. The two variables measuring the relationship between overall sustainability performance and credit spreads indicate a significantly negative relationship which is consistent with stakeholder theory – better overall sustainability performance reduces risk, and hence, lowers the required rate of return. Within this, the coefficient for SAMSUST (which indicates the relationship for the sub-sample of securities held by the investment funds) is significant and negative. Tellingly, the coefficient for PFSAMSUST (which indicates the marginal effect of pension fund ownership on the relationship between corporate sustainability performance and credit spreads) is significant and negative. This indicates that the responsiveness of credit spreads to overall sustainability scores is significantly more negative for the pension fund sub-sample. Therefore, corporate sustainability performance has a greater weight in the pricing of those securities.

Results for the models 2, 3 and 4 illustrate where different judgements emerge about the materiality of the dimensions of sustainability. In model 2, we find that economic factors (largely determined by corporate governance quality) had a significant and negative influence on credit spreads. However, while there was no significant difference in their influence on credit spreads in the discrete pension fund sub-sample compared to the

investment fund sub-sample, differences were revealed in both model 3 (social dimension of sustainability) and model 4 (environmental dimension of sustainability). The results indicate that while performance in these aspects of sustainability had significant and negative impacts on credit spreads for the sub-sample of securities held by the investment funds, the negative effect on the credit spreads of the distinct securities held by pension funds was significantly greater. This suggests pension funds place greater weight on these dimensions of sustainability when pricing debt securities compared to investment funds.

Therefore, hypothesis 1 is accepted. Credit spreads of debt securities held by pension funds are more likely to reflect corporate sustainability performance compared to those held by investment funds. This supports the perspective that such factors have greater materiality over the longer-term investment period that pension funds will typically hold securities. The negative relationship between credit spreads and corporate sustainability performance indicates that pension funds are seeking to improve the risk-return profile of their portfolios in a manner consistent with stakeholder theory.

Across all the models, the control variables illustrated consistent signs and levels of significance for their coefficients. Modified duration had the anticipated significantly positive influence on credit spreads, while an increased probability of default also raised the credit spread demanded by investors. Increased liquidity in an issue demonstrated by the amount outstanding had a significantly negative impact on credit spreads. This also held for the size of a company – the relationship indicates larger firms had a lower credit default risk. Our benchmark industrial sector was utilities. Several of the industrial sectors showed no significant difference in their credit spreads compared to this point of reference. Both securities issued by borrowers from the 'IT' and 'Materials' sectors had significantly higher credit spreads while securities issued by borrowers from the 'Transport' sector exhibited significantly lower credit spreads.

5. Discussion

The results provide support the proposition that pension funds are more likely to take corporate social performance (CSP) into account than investment funds with a shorter time horizon. Our analysis has identified the strategies they adopt and the aspects of sustainability where significant differences in treatment exist.

The pension funds do not appear to conduct a strategy of excluding the securities of borrowers with weak CSP. Approximately 20% of underlying borrowers whose securities pension funds held on 17th July 2018 had no RobecoSAM score. This was not very different from the proportion for investment funds' holdings. Further, while the average sustainability performance across all dimensions for the distinctive group of companies and securities held by pension funds was higher, these were not significantly so. This does not suggest that either group of investment groups demand better corporate sustainability performance irrespective of financial return.

Meanwhile, our regression analysis indicates that both pension funds and ST institutional investors adopt strategies of integrating sustainability into investment decisions. Overall, our results show a negative relationship between corporate sustainability performance and the cost of capital charged to borrowers. These are consistent with existing research on credit markets (Chava, 2014; Ge et al., 2015; Menz, 2010). This suggests that environmental, social and governance factors are material in the way indicated by stakeholder theory. We find that pension funds do not price factors reflecting the economic dimension of sustainability differently from investment funds. These results are consistent with studies showing that all mainstream investors consider corporate governance (economic dimension) as an important factor in investment decisions (van Durren et al., 2016). However, our results show that pension funds consider social and environmental factors are more material to the risks they face and hence required return. The credit spreads in the sub-sample of securities held by pension funds were much more responsive to social and environmental scores compared to

those of the sub-sample of securities held by investment funds. Better scores were rewarded with lower credit spreads.

Our findings complement existing studies which show that CSP is important to equity ownership by long-term investors such as pension funds (Cox et al., 2004). We have extended the analysis to pension fund investment in debt securities. Given the importance of debt in financing corporate activities, and the scale of pension funds' investment there, the greater weight they attach to social and environmental factors in the pricing of securities could have a profound influence on the behaviour of potential borrowers. A way to secure a lower cost of borrowing is to improve their corporate social and environmental performance. This should lead to an improved allocation of resources which reflects corporate performance in relation to wider environmental, social and governance factors.

6. Conclusion

This paper adds to the literature investigating socially-responsible investment conducted by investment institutions. There is little work analysing the different incentives that institutions have in relation to their fiduciary responsibilities and investment horizons in the context of corporate debt markets. We contribute by testing whether long-term institutional investors (pensions funds) weight sustainability performance in their investment patterns in debt securities more than short-term investment funds. Our hypothesis is based on the stakeholder theory of corporate sustainability. Companies with better corporate social performance (CSP) should have lower business risk and lower credit default risk, particularly over the longer-term, compared to firms who adopt a narrow financial perspective. Institutional investors such as pension funds with a longer-term investment horizon should use environmental, social and governance information to improve the risk-return profile of their portfolios compared to investment institutions expected to have a shorter investment horizon. We analyse distinct samples of securities held directly by pension funds on the one hand and investment funds on the other to assess whether there is any significant treatment

of environmental social and governance factors. We make a novel contribution by distinguishing between dimensions of sustainability – environmental, social and economic – in order to identify where differences exist. These results indicate that both institutional groups considered sustainability important to determining the cost of debt for borrowing companies. Our work extends knowledge in this field by identifying that pension funds give greater weight to social and environmental scores in the pricing of debt securities compared to investment funds.

The results are subject to limitations. As a cross-sectional study of the holdings of debt market securities on one day in July 2018, it does not incorporate how holdings may change over time. Further work could investigate how changes in holdings reflect sustainability; particularly whether the influence of environmental, social and governance factors on credit spreads has increased over time, reflecting the increasing recognition of sustainability in financial markets. Further, studies could analyse how periodic announcements revealing changes in sustainability performance influence the credit spreads of companies' debt securities. We also assume that these institutions, as significant investors in debt securities will have their preferences regarding sustainability reflected in the prices of debt securities they hold. This seems reasonable given the scale of their investments in these markets and the absence of retail investors but could be analysed further by looking at whether the scale of holdings in individual securities is related to CSP in any way.

Given the importance of debt in financing corporate activities, the significance of CSP to both types of institutional investment groups suggests they accept that environmental and social factors are material. This could have a profound influence on the behaviour of corporate borrowers. Specifically, the capital allocation decisions of pension funds could play an important role in changing corporate behaviour to achieve more sustainable outcomes. Corporations will seek to improve their corporate social and environmental performance in order to lower their cost of debt. This should lead to an improved allocation of resources

reflecting corporate performance in relation to broader environmental, social and governance factors and lead to more sustainable business practices over the long-term.

References

Bauer, R. and Hann, D. (2010). Corporate environmental management and credit risk. Working Paper. Available at SSRN: https://ssrn.com/abstract=1660470

Bradley, M., Chen, D., Dallas, G. and Snyderwine, E. (2007). The relation between corporate governance and credit risk, bond yields and firm valuation. Working paper, Duke University, North Carolina.

Busch, T., Bauer, R. and Orlitzky, M. (2016). Sustainable development and financial markets: Old paths and new avenues. Business & Society, *55*(3), 303-329.

Chava, S. (2014). Environmental externalities and cost of capital. Management Science, *60*(9), 2223-2247.

Coffey, B.S. and Fryxell, G.E. (1991). Institutional ownership of stock and dimensions of corporate social performance: An empirical examination. Journal of Business Ethics, *10*(6), 437-444.

Cox, P., Brammer, S. and A. Milligan (2004). An empirical examination of institutional investor preferences for corporate social performance, Journal of Business Ethics, 52: 27-43.

Cox, P., Brammer, S. and A. Milligan (2008). Pension funds and corporate social performance: an empirical analysis, Business & Society, 47 (2), 213-241.

Cyert, R. and March, J. (1963). A behavioural theory of the firm (Prentice Halls, Englewood Cliffs, NJ).

Dam, L. and Scholtens, B. (2012). Does ownership type matter for corporate social responsibility? Corporate Governance: An International Review, *20*(3), 233-252.

Davis, E. P. and Steil, B. (2001). Institutional investments, MIT Press, Cambridge.

Eurosif, European SRI Study, 2010, www.eurosif.org (accessed on 3/6/2018).

Eurosif, European SRI Study, (2017). www.eurosif.org (accessed on 7/6/2018).

Di Giulio, A., Migliavacca, P.O. and Tencati, A. (2007). What relationship between corporate social performance and the cost of capital. In proceedings of the Academy of Management 2007 Annual Meeting, OA (pp. 3-8, Philadelphia, PA).

Ederington, L., Yawitz, J. and Roberts, B. (1987). The informational content of bond ratings. Journal of Financial Research, *10*(3), 211-226.

Fama, E. and French, K. (1993). Common risk factors in the returns on stocks and bonds. Journal of Financial Economics, 33, 3–56.

Friedman, M. (1970). The social responsibility of business is to increase its profits. *The New York Times Magazine*, *13*, 32-33.

Frooman, J., Zietsma, C. and B. McKnight (2008). There is no good reason not to be good. Best Paper Proceedings for the Administrative Science Association of Canada, (paper 29–9), Annual meeting, Halifax, Nova Scotia.

Ge, W and Liu, M. (2015). Corporate social responsibility and the cost of bonds. Journal of Accounting and Public Policy, 34 (6), 597-624.

Girerd-Potin, I., Jimenez-Garcès, S. and P. Louvet, (2014). Which dimensions of social responsibility concern financial investors? Journal of Business Ethics, 121 (4), 559-576.

Godfrey, P.C. (2005). The relationship between corporate philanthropy and shareholder wealth: A risk management perspective. *Academy of Management Review*, *30*(4), 777-798.

Gong, G., Xu, S. and X. Gong (2018). On the value of corporate social responsibility disclosure: an empirical investigation of corporate bond issues in china. Journal of Business Ethics, 150, 227–258.

Goss, A. and Roberts, G. (2011). The impact of corporate social responsibility on the cost of bank loans. Journal of Banking & Finance, *35*(7), 1794-1810.

Graves, S. and Waddock, S. (1994). Institutional owners and corporate social performance. Academy of Management Journal, *37*(4), 1034-1046.

Hoepner, Andreas G. F., Rezec, M. and K. Siegl, Does pension funds' fiduciary duty prohibit the integration of environmental responsibility criteria in investment processes?: a realistic prudent investment test (September 19, 2011). Available at SSRN: https://ssrn.com/abstract=1930189

Hoepner, A., Oikonomou, I., Scholtens, B. and Schröder, M. (2016). The effects of corporate and country sustainability characteristics on the cost of debt: An international investigation. Journal of Business Finance & Accounting, *43*(1-2), 158-190.

Jensen, M. and Meckling, W. (1976). Theory of the firm: managerial behaviour, agency costs and ownership structure. Journal of Financial Economics, 3(4), 305-360.

Johnson, R. and Greening, D. (1999). The effects of corporate governance and institutional ownership types on corporate social performance. Academy of Management Journal, *42*(5), 564-576.

Kao, D. (2000). Estimating and pricing credit risk: An overview. *Financial Analysts Journal*, *56*(4), 50-66.

Kaspereit, T. and Lopatta, K., (2016). The value relevance of SAM's corporate sustainability ranking and GRI sustainability reporting in the European stock markets. Business Ethics: A European review, *25*(1), 1-24.

Locke, P. and Mann, S. (2005). Professional trader discipline and trade disposition. Journal of Financial economics, *76*(2), 401-444.

Longstaff, F. and Schwartz, E. (1995). A simple approach to valuing risky fixed and floating rate debt. The Journal of Finance, *50*(3), 789-819.

Malkiel, B. and Fama, E. (1970). Efficient capital markets: A review of theory and empirical work. The Journal of Finance, *25*(2), 383-417.

Markowitz, H. (1952). The utility of wealth. Journal of Political Economy, *60*(2), 151-158.

McWilliams, A. and Siegel, D. (2000). Corporate social responsibility and financial performance: correlation or misspecification? Strategic Management Journal, *21*(5), 603-609.

Menz, K. (2010). Corporate social responsibility: is it rewarded by the corporate bond market? A critical note. Journal of Business Ethics, *96*(1), 117-134.

Myers S. (1984). Corporate financing and investment decisions when firms have information that investors do not have. Journal of Financial Economics, 13: 487-221.

OECD (2018), Survey of large pension funds and public pension reserve funds 2016 www.oecd.org/finance/survey-large-pension-funds.htm, [accessed on 4/6/2018].

Oikonomou, I., Brooks, C. and S. Pavelin (2014). The effects of corporate social performance on the cost of corporate debt and credit ratings. Financial Review, *49*(1), 49-75.

Phillips, Hager & North (2007). Does socially responsible investing hurt investment returns? Research Paper, Phillips, Hager & North Investment Management Ltd., Vancouver.

Porter, M. and Kramer, M. (2006). The link between competitive advantage and corporate social responsibility. Harvard Business Review, *84*(12), 78-92.

Renneboog, L., Ter Horst, J. and C. Zhang (2008). Socially responsible investments: Institutional aspects, performance, and investor behaviour. Journal of Banking & Finance, *32*(9), 1723-1742.

Rodriguez-Palenzuela, D., Darracq Paries, M., Carboni, G., Ferrando, A., Köhler Ulbrich, P., Zachary, M.D., Geiger, F., Rupprecht, M., Raudsaar, T., McCann, F. and Georgakopoulos, V. (2013). Corporate Finance and Economic Activity in the Euro Area: Structural Issues Report, European Central Bank, Occasional Paper Series, No. 151.

Sandberg, J. (2013). (Re-) interpreting fiduciary duty to justify socially responsible investment for pension funds? Corporate Governance: An International Review, 21(5), 436-446.

Scholtens, B. (2006). Finance as a driver of corporate social responsibility. Journal of Business Ethics, *68*(1), 19-33.

Scholtens, B. (2008). A note on the interaction between corporate social responsibility and financial performance. Ecological economics, *68*(1-2), 46-55.

Sparkes, R. and Cowton, C. (2004). The maturing of socially responsible investment: A review of the developing link with corporate social responsibility. Journal of Business Ethics, *52*(1), 45-57.

Steger, U., Ionescu-Somers, A. and O. Salzmann (2007). The economic foundations of corporate sustainability. Corporate Governance, 7, 162–177.

Stellner, C., Klein, C. and B. Zwergel. (2015) Corporate social responsibility and Eurozone corporate bonds: The moderating role of country sustainability, Journal of Banking and Finance, 59, 538 -549,

Tirole, J. (2001), Corporate governance. Econometrica 69, 1–35.

United Kingdom (1999). The Occupational Pension Schemes (Investment, and Assignment, Forfeiture, Bankruptcy etc.) Amendment Regulations 1999, No. 1849, Regulation 1. Crown Copyright.

US SIF, Report on US sustainable, responsible and impact investing trends 2010, www.ussif.org/trends (accessed 3/6/2018).

US SIF, Report on US sustainable, responsible and impact investing trends 2017, www.ussif.org/trends (accessed 7/6/2018).

Van Durren, E., Plantinga, A. and B. Scholtens (2016). ESG *Integration and the Investment Management Process: Fundamental Investing Reinvented*, Journal of Business Ethics, 138, 525-533.

Zera, S.P. and Madura, J. (2001). The empirical relationship between mutual fund size and operational efficiency. Applied Financial Economics, 11(3), 243-251.

Zhao, K. (2017). A new perspective for solving the credit spread puzzle. International Research Journal of Applied Finance, 8 (3), 163-169.

DISCUSSION PAPERS IN ECONOMICS

2020/3 Michael McCann, *Pension Funds and Socially-Responsible Investment in Corporate Debt Securities: An Empirical Investigation*

2020/2 King Yoong Lim and Shuonan Zhang, *Commodity Shocks and Optimal Fiscal Management of Resource Revenue in an Economy with State-owned Enterprises*

2020/1 King Yoong Lim and Diego Morris, *Learning Before and After the Global Crisis: Firm-level Innovation in Latin America*.

2019/5 Robert Ackrill and Rahmi Cetin, *The Impacts of Patent and R&D Expenditures on the High-Tech Exports of Newly Industrialised Countries: A Panel Cointegration Analysis.*

2019/4 Alan Collins, Jingwen Fan, and Aruneema Mahabir, *Using A LASSO Approach to Analyse the Determinants of Measured and 'Natural' Suicide Rates*.

2019/3 Leighton Vaughan-Williams, Chunping Liu, and Hannah Gerrard, *How Well Do Elo-based Ratings Predict Professional Tennis Matches?*

2019/2 Pengfei Jia and King Yoong Lim, *Police Spending and Economic Stabilization in a Monetary Economy with Crime and Differential Human Capital*.

2019/1 King Yoong Lim and Diego Morris, *Modeling the Drugs and Guns Trade in a Two-Country Model with Endogenous Growth*.

2018/3 Pengfei Jia and King Yoong Lim, *Tax Policy and Toxic Housing Bubbles in China*.

2018/2 Yousef Makhlouf, *Trends in Income Inequality*.

2018/1 Dimitrios Bakas and Athanasios Triantafyllou, *The Impact of Uncertainty Shocks on the Volatility of Commodity Prices*.

2017/9 Eghosa Igudia, Rob Ackrill and Simeon Coleman, *Entrepreneurial Responses to Austerity: The Role of the Informal Sector*.

2017/8 Rahmi Cetin and Robert Ackrill, *Openness and Growth in Challenging Times: Analysing the Trade-Growth Nexus in Slovakia*.

2017/7 Dimitrios Bakas and Yousef Makhlouf, *Can the Insider-Outsider Theory explain Unemployment Hysteresis in the OECD Countries?*

2017/6 Dimitrios Bakas, Georgios Chortareas and Georgios Magkonis, *Volatility and Growth: A not so Straightforward Relationship.*

2017/5 Will Rossiter, *Prospects and Challenges for City Region Devolution in Nottingham and the East Midlands.*

2017/4 Chunping Liu and Zhirong Ou, *What determines China's housing price dynamics? New evidence from a DSGE-VAR.*

2017/3 Morakinyo O. Adetutu and Thomas G. Weyman-Jones, *Fuel subsidies versus market power: is there a countervailing second best welfare optimum?*

2017/2 Robert Mullings, *Do Institutions moderate Globalization's effect on Growth?*

2017/1 Anthony J Glass, Karligash Kenjegalieva, Victor Ajayi, Morakinyou Adetutu, Robin C. Sickles, *Relative Winners and Losers from Efficiency Spillovers in Africa with Policy Implications for Regional Integration*.

2016/4 Sara Ornati, *International Environmental Agreements and Domestic Politics*.

2016/3 Yanhui Zhu, Jingwen Fan and Jon Tucker, *The impact of UK monetary policy on gold price dynamics*.

2016/2 John Ebireri and Alberto Paloni, *Bank Development and a Lower Degree of Sophistication and Diversification of Developing Countries' Exports*.

2016/1 Robert Mullings and Aruneema Mahabir, *Growth by Destination: The Role of Trade in Africa's Recent Growth Episode*.

2015/1 Andrew Atherton, João R. Faria, Dongxu Wu and Zhongmin Wu, *Human Capital, Entrepreneurial Entry and Survival*.

2014/5 Leighton Vaughan Williams, *The US Supreme Court and the 'Affordable Care Act': An Exercise in Closed-Door Forecasting*.

2014/4 Juan Carlos Cuestas and Barry Harrison, *Unemployment Persistence in the EU15*.

2014/3 Francesco Marchionne and Sunny Parekh, *Growth, Debt, and Inequality*.

2014/2 Bo Jiang, Zhongmin Wu, Bruce Philp and Simeon Coleman, *Macro Stress Testing in the Banking System of China*.

2014/1 Eghosa Igudia, Rob Ackrill, Simeon Coleman and Carlyn Dobson, *Austerity Measures or Entrepreneurial Development? The case of the Nigerian Informal Economy*.

2013/5 Barry Harrison and Theodorus Wisnu Widjaja, *Did the Financial Crisis impact on the Capital Structure of Firms?*

2013/4 Geetha Ravishankar and Marie Stack, *The Gravity Model and Trade Efficiency: A Stochastic Frontier Analysis of Potential Trade*.

2013/3 Chunping Liu and Patrick Minford, *How Important is the Credit Channel? An Empirical Study of the US Banking Crisis.*

2013/2 Chunping Liu and Patrick Minford, *Comparing Behavioural and Rational Expectations for the US Post-War Economy.*

2013/1 Dan Wheatley, *Is it good to share? Debating patterns in availability and use of job share*.

2012/3 Simeon Coleman and Vitor Leone, *Time-Series Characteristics Of UK Commercial Property Returns: Testing For Multiple Changes In Persistence*.

2012/2 Otavio Ribeiro de Medeiros and Vitor Leone, *Multiple Changes in Persistence vs. Explosive Behaviour: The Dotcom Bubble*.

2012/1 Rob Ackrill and Simeon Coleman, *Inflation Dynamics In Central And Eastern European Countries*.

2011/4 Simeon Coleman, *Inflation Dynamics and Poverty Rates: Regional and Sectoral Evidence for Ghana.*

2011/3 Dan Wheatley and Zhongmin Wu, *Work, Inequality, And The Dual Career Household*.

2011/2 Simeon Coleman and Kavita Sirichand, *Fractional Integration and the Volatility Of UK Interest Rates*.

2011/1 Simeon Coleman, *Investigating Business Cycle Synchronization In West Africa*.

2010/11 Marie Stack and Eric Pentecost, *A Gravity Model Approach To Estimating Prospective Trade Gains in The EU Accession And Associated Countries*.

2010/10 Vitor Leone And Bruce Philp, *Surplus-Value And Aggregate Concentration In The UK Economy, 1987-2009*.

2010/9 Robert Ackrill and Adrian Kay, *WTO Regulations and Bioenergy Sustainability Certification – Synergies and Possible Conflicts.*

2010/8 Paul Alagidede, Simeon Coleman and Juan Carlos Cuestas, *Persistence Of Inflationary Shocks: Implications For West African Monetary Union Membership.*

2010/6 Bruce Philp and Dan Wheatley, *The time scarcity and the dual career household: competing perspectives*

2010/5 Juan Carlos Cuestas, Sebastián Freille and Patricio O'Gorman, *The media and public agendas: testing for media effects in Argentina Turing the Kirchner administration*

2010/4 Vitor Leone, *From property companies to real estate investment trusts: the impact of economic and property factors in the UK commercial property returns*

2010/3 Juan Carlos Cuestas and Paulo José Regis, *Purchasing power parity in OECD countries: nonlinear unit root tests revisited*

2010/2 Juan Carlos Cuestas and Bruce Philp, *Exploitation and the class struggle*

2010/1 Barry Harrison and Winston Moore, *Nonlinearities in Stock Returns for Some Recent Entrants to the EU*

2009/7 Joao R. Faria, Le Wang and Zhongmin Wu, *Debts on debts*

2009/6 Juan Carlos Cuestas and Luis A. Gil-Alana, *Unemployment hysteresis, structural changes,non-linearities and fractional integration in Central and Eastern Europe*

2009/5 Juan Carlos Cuestas and Javier Ordóñez, *Unemployment and common smooth transition trends in Central and Eastern European Countries*

2009/4 Stephen Dobson and Carlyn Ramlogan, *Is there a trade-off between income inequality and corruption? Evidence from Latin America*

2009/3 Juan Carlos Cuestas and Luís Alberiko Gil-Alana, *Further evidence on the PPP analysis of the Australian dollar: non-linearities, structural changes and fractional integration*

2009/2 Estefanía Mourelle and Juan Carlos Cuestas, *Inflation persistence and asymmetries: Evidence for African countries*

2009/1 Juan Carlos Cuestas and Barry Harrison, *Further evidence on the real interest rate parity hypothesis in Central and Eastern European Countries: unit roots and nonlinearities*

2008/16 Simeon Coleman, *Inflation persistence in the Franc Zone: evidence from disaggregated prices*

2008/15 Juan Carlos Cuestas and Paulo Regis, *Nonlinearities and the order of integration of order prices*

2008/14 Peter Dawson and Stephen Dobson, *The influence of social pressure and nationality on individual decisions: evidence from the behaviour of referees*

2008/13 Juan Carlos Cuestas and Barry Harrison, *Testing for stationarity of inflation in Central and Eastern European Countries*

2008/12 Juan Carlos Cuestas and Dean Garratt, *Is real GDP per capita a stationary process? Smooth transitions, nonlinear trends and unit root testing*

2008/11 Antonio Rodriguez Andres and Carlyn Ramlogan-Dobson, *Corruption, privatisation and the distribution of income in Latin America*

2008/10 Stephen Dobson and Carlyn Ramlogan, *Is there an openness Kuznets curve? Evidence from Latin America*

2008/9 Stephen Dobson, John Goddard and Frank Stähler, *Effort levels in contests: an empirical application of the Tullock model*

2008/8 Juan Carlos Cuestas and Estefania Mourelle, *Nonlinearities in real exchange rate determination: Do African exchange rates follow a random walk?*

2008/7 Stephen Dobson and John Goddard, *Strategic behaviour and risk taking in football*

2008/6 Joao Ricardo Faria, Juan Carlos Cuestas and Estefania Mourelle, *Entrepreneurship and unemployment: A nonlinear bidirectional causality?*

2008/5 Dan Wheatley, Irene Hardill and Bruce Philp, *"Managing" reductions in working hours: A study of work-time and leisure preferences in the UK industry*

2008/4 Adrian Kay and Robert Ackrill, *Institutional change in the international governance of agriculture: a revised account*

2008/3 Juan Carlos Cuestas and Paulo José Regis, *Testing for PPP in Australia: Evidence from unit root test against nonlinear trend stationarity alternatives*

2008/2 João Ricardo Faria, Juan Carlos Cuestas and Luis Gil-Alana, *Unemployment and entrepreneurship: A Cyclical Relation*

2008/1 Zhongmin Wu, Mark Baimbridge and Yu Zhu, *Multiple Job Holding in the United Kingdom: Evidence from the British Household Panel Survey*

DISCUSSION PAPERS IN POLITICAL ECONOMY

2006/3 Ioana Negru, *On Homogeneity and Pluralism within Economics Schools of Thought*

2006/2 David Harvie and Bruce Philp, *Learning and Assessment in a Reading Group Format or Reading Capital… For Marks*

2006/1 David Harvie, Bruce Philp and Gary Slater, *Regional Well-Being and 'Social Productivity' in Great Britain'*

2004/2 Massimo De Angelis and David Harvie, *Globalisation? No Question: Foreign Direct Investment and Labour Commanded*

2004/1 David Harvie, *Value-Production and Struggle in the Classroom, or, Educators Within, Against and Beyond Capital*

DISCUSSION PAPERS IN APPLIED ECONOMICS AND POLICY

2007/2 Juan Carlos Cuestas, *Purchasing Power Parity in Central and Eastern*

European Countries: An Analysis of Unit Roots and Non-linearities

2007/1 Juan Carlos Cuestas and Javier Ordóñez, *Testing for Price Convergence among Mercosur Countries*

2006/2 Rahmi Cetin and Robert Ackrill, *Foreign Investment and the Export of Foreign and Local Firms: An Analysis of Turkish Manufacturing*

2006/1 Robert Ackrill and Adrian Kay, *The EU Financial Perspective 2007-2013 and the Forces that Shaped the Final Agreement*

2004/5 Michael A. Smith, David Paton and Leighton Vaughan-Williams, *Costs, Biases and Betting markets: New evidence*

2004/4 Chris Forde and Gary Slater, *Agency Working in Britain: Character, Consequences and Regulation*

2004/3 Barry Harrison and David Paton*, Do 'Fat Tails' Matter in GARCH Estimation? Stock market efficiency in Romania and the Czech Republic*

2004/2 Dean Garratt and Rebecca Taylor, *Issue-based Teaching in Economics*

2004/1 Michael McCann, *Motives for Acquisitions in the UK*

2003/6 Chris Forde and Gary Slater, *The Nature and Experience of Agency Working in Britain*

2003/5 Eugen Mihaita, *Generating Hypothetical Rates of Return for the Romanian Fully Funded Pension Funds*

2003/4 Eugen Mihaita, *The Romanian Pension Reform*

2003/3 Joshy Easaw and Dean Garratt, *Impact of the UK General Election on Total Government Expenditure Cycles: Theory and Evidence*

2003/2 Dean Garratt, *Rates of Return to Owner-Occupation in the UK Housing Market*

2003/1 Barry Harrison and David Paton, *The Evolution of Stock Market Efficiency in a Transition Economy: Evidence from Romania.*