ESG, Liquidity, and Stock Returns*

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Abstract

We examine the effect of environment, social, and governance (*ESG*) score on stock returns in the United Kingdom (UK). Consistent with Hong and Kacperczyk (2009), Bolton and Kacperczyk (2021), and Pedersen et al. (2021), firms with lower *ESG* earn higher returns than those with higher *ESG*. The environment and social premiums are more pronounced than the *ESG* premium. To understand the premium, we show that the *ESG* premium is significant for low liquidity securities but not for high liquidity securities, which suggests that *ESG* is likely associated with stock liquidity.

JEL classification: G12; G14; G30

Keywords: ESG; Stock Returns; Liquidity

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1 Introduction

Environment, social, and governance (*ESG*) investment plays an increasingly key role in the world economy. For example, the total assets managed by mutual funds specializing in sustainable investing doubled from 2019 to 2020.[1] At the United Kingdom (UK) policy level, *ESG* is emphasized in the Companies Act 2006 (Strategic Report and Directors' Report) Regulations 2013.[2] Further, the UK government plans to ban the sales of new gas boilers by 2025 and new petrol and diesel cars by 2030.[3] The European Union (EU) is also setting up an innovative growth strategy known as the European Green Deal.[4] While the performance of *ESG* investment is ambiguous,[5]we investigate the effect of *ESG* on stock returns in the UK and provide a novel liquidity explanation.[6]

Examining UK stocks from 2003 to 2020, we find that firms in the low *ESG* quintile outperform that of the high *ESG* quintile by 0.513% ($t = 1.83$) per month for value-weighted returns. The *ESG* premium remains largely significant after adjusting for the Fama–French (1993) three-factor model (FF3FM), momentum-extended FF3FM (Carhart, 1997), betting against beta-

[1]See https://www.ft.com/content/74888921-368d-42e1-91cd-c3c8ce64a05e

[2]See https://www.legislation.gov.uk/ukdsi/2013/9780111540169/contents

[3]See https://www.bbc.co.uk/news/science-environment-57149059 and https://www.gov.uk/government/news/government-takes-historic-step-towards-net-zero-with-end-of-sale-of-new-petrol-and-diesel-cars-by-2030

[4]See https://ec.europa.eu/info/strategy/priorities-2019-2024/european-green-deal

[5]For anecdotal evidence, see https://www.ft.com/content/be140b1b-2249-4dd9-859c-3f8f12ce6036. Humphrey et al. (2012) and Albuquerque et al. (2020) find an insignificant relation between UK firms' performance and *ESG*. Lins et al. (2017) and Albuquerque et al. (2020) show that firms with high *ESG* outperformed firms with low *ESG* during the 2008-2009 financial crisis and the COVID-19 crisis, respectively. Pastor and Vorsatz (2020) find that funds with high ratings of sustainability have higher returns than funds with low ratings of sustainability during the COVID-19 crisis. Statman and Glushkov (2009), Edmans (2011), Nagy et al. (2016), and In et al. (2019) find that *ESG* investment helps to boost investment returns. On the other hand, Hong and Kacperczyk (2009), Bolton and Kacperczyk (2021), Pedersen et al. (2021) show that low *ESG* stocks earn higher expected returns, compared to high *ESG* stocks.

[6]While we conduct our main tests using UK firms, we show the relation between *ESG* and STOXX 600 stock returns in the appendices.

extended FF3FM (Frazzini and Pedersen, 2014), and quality-minus-junk-extended FF3FM (Asness et al., 2019). For instance, under the momentum-extended FF3FM, the return differences (alphas) between the low- and high-*ESG* portfolios are 0.561% ($t = 1.92$) per month for value-weighted returns.

Next, we examine the relation between each of the three pillars of *ESG*, namely environment (*Env*), social (*Soc*), and governance (*Gov*), and stock returns. Firms in the low *Env* and *Soc* quintile significantly outperform those of the high *ESG* and *Soc* quintile by 0.645% ($t = 2.44$) and 0.817% ($t = 3.31$) per month for value-weighted returns, respectively. The *ESG* and *Soc* premium is unexplained by the risk factor models.

Further, we unpack *Env* into resource use and emissions; *Soc* into workforce, human rights, community, and product responsibility; and *Gov* into management, shareholders, and corporate social responsibility (CSR) strategy. We find that resource use, emissions, workforce, human rights, and CSR strategy are significantly related to returns.

The seminal work of Merton (1987) extended by recent studies (Heinkel et al., 2001; Luo and Balvers, 2017; Zerbib 2020; Pedersen et al., 2021) can help understand the *ESG* premium. These studies show that *ESG*-sensitive investors are reluctant to hold stocks of low *ESG* firms. Thus, such stocks can be "neglected" and yield higher expected returns than high *ESG* stocks. Further, investors may have a particular appetite for *ESG*-oriented stocks; they can also perceive assets as goods beyond merely their value and returns (Fama and French, 2007). Following these leads, we further examine whether liquidity helps explain the *ESG* premium due to the greater demands of high *ESG* stocks.

Indeed, *ESG*, *Env*, *Soc*, and *Gov* scores decrease steadily from liquid stocks to illiquid stocks (Figure 1). This indicates that high liquidity stocks have higher *ESG*, *Env*, *Soc*, and *Gov* scores than low liquidity stocks. Moreover, we study the performance of *ESG* portfolios across low and high liquidity stocks. We find that the *ESG* premium is only significant for low liquidity stocks but becomes insignificant for high liquidity stocks.

[Figure 1 about here]

The economic intuition of the role of liquidity in the *ESG* premium is as follows. High *ESG* firms are more sustainable, have more transparency, and have better quality, so they attract more investors, compared to low *ESG* firms.[7] During the economic uncertainty and liquidity shortage, high-*ESG* firms comfort investors from unfavorable economic shocks. Investors receive lower returns from stocks of high-*ESG* firms due to their high liquidity.

Our work contributes to the literature in several ways. First, we show the *ESG* premium of UK and EU stocks and thus extend prior studies on U.S. stocks (Hong and Kacperczyk, 2009; Edmans, 2011; Nagy et al., 2016; Pedersen et al., 2021).[8] Second, we provide novel evidence of the role of liquidity in *ESG* and thus extend the importance of liquidity in assessing firms' health including distress/credit (Liu, 2006; Das and Hanouna, 2009), leverage (Fang et al., 2009), and information quality (Ng, 2011) and therein contribute to prior studies on the importance of

[7]Friede et al. (2015), Drempetic et al. (2019), and Clementino and Perkins (2021) examine the link between ESG scores and sustainability. Feng et al. (2018) find that ESG ratings are associated with seasoned equity offerings (SEOs) mispricing since more ethical firms are more transparent. Baker et al. (2021) show that the relation between ESG ratings and initial public offerings (IPOs) is related to transparency. Lee (2017) finds that sustainability is positively associated with the accuracy of management earnings forecasts, which helps to alleviate earnings manipulation. Rezaee and Tuo (2019) show that sustainability is positively related to innate earnings quality.

[8]Gillan et al. (2021) provide a detailed review on the *ESG* and firm characteristics relation. While Hong and Kacperczyk (2009) also examine the relation between sin stocks and returns in the EU, we mainly focus on UK stocks and extend their work by using different *ESG* scores.

liquidity in asset pricing.[9] Third, while prior studies show that *ESG* is related to the market value of firms in Europe and the UK (Humphrey et al., 2012; Qiu 2016 et al; Li et al., 2018; Haque and Ntim, 2020), we investigate the role of *ESG* in UK stock returns.

Our work has useful implications for investors and managers. Institutional investors have been accelerating exposure to *ESG* stocks. We show that investors can achieve high liquidity when holding high *ESG* stocks. This can be helpful during market turmoil accompanied by "fight-to-liquidity" (Acharya and Pedersen, 2005) and "fight-to-quality" (Sadka, 2011; Nagel, 2012). Our results also have the potential to be used in corporate financial decisions. We show that firms with high *ESG* are more liquid and associated with lower expected returns than firms with low *ESG*. This implies that the former can have lower costs of capital, which is important for firms' financing decisions.

The remainder of the paper proceeds as follows. Section 2 develops the hypotheses of the association between *ESG* and stock returns and of the role of liquidity in that relation. Section 3 describes the data and sample. Section 4 presents the empirical results. Section 5 concludes the paper.

2 Hypothesis Development

2.1 The relation between *ESG* and stock returns

The seminal work of Merton (1987) helps in understand the relation between *ESG* and stock returns. Under his framework, certain securities may be unknown to investors due to incomplete information which gives rise to shadow costs. Thus, the expected returns of stocks which are

[9]For US evidence, see Brennan et al. (1998), Amihud (2002), Pastor and Stambaugh (2003), Acharya and Pedersen (2005), Liu (2006), Sadka (2006), and Amihud and Noh (2020). For international evidence, see Bekaert et al. (2007), Lee (2011), and Chaieb et al. (2018)

less familiar to investors are higher than those which are more familiar to investors. Similarly, investors are more willing to hold firms with high rather than low *ESG* scores. For example, institutional investors can have mandates to do so (Chava, 2014) and are determined to incorporate *ESG* into their investment strategies (Chen et al., 2020). Individual investors, in particular younger generations, are reluctant to invest in firms that pollute the environment or are antagonistic with communities and employees (Chen et al., 2020); investment returns are not the single factor in investors' portfolio decisions (Fama and French, 2007; Pedersen et al., 2021). Thus, low *ESG* stocks are likely to be "neglected stocks" while high *ESG* stocks are in higher demand (Chen et al., 2020). Recent studies such as Pedersen et al. (2021) extend Merton's (1987) work by incorporating *ESG* into investors' mean-variance portfolio decisions. Following these leads, we conjecture that low *ESG* stocks earn higher expected returns than high *ESG* stocks.

2.2 The role of liquidity in the relation between *ESG* and stock returns

First, a firm's *ESG* score is likely to be related to its investment opportunities, health conditions, and information asymmetry, which are important sources of stock liquidity (Liu, 2006; Lang et al., 2012; Kerr et al., 2020). For example, Gillan et al. (2010), Gao and Zhang (2015), Ferrell et al. (2017), Liangand Renneboog (2017), Buchanan et al. (2018), and Albuquerqu et al. (2019) examine the relation between *ESG* and Tobin's q. Hong et al. (2012) show the importance of financial constraints in firms' sustainability. Hong and Kacperczyk (2009), Dyck et al. (2019), and Nofsinger et al. (2019) find that institutional investors dislike low environmental and social firms.

Second, the intentions of market makers' liquidity provision during economic downturns can play a role in the *ESG* and liquidity relation. Liquidity provision to high-quality firms can arise from a "flight to quality" phenomenon (Sadka, 2011; Nagel, 2012). Thus, high *ESG* firms can attract more liquidity provision from market makers than low *ESG* firms. Lins et al. (2017) show that high social capital firms have high quality and, during the financial crisis, also raised more debt than those with low social capital. Furthermore, prior studies (Ali et al, 2003; Mashruwala et al, 2006; Li and Zhang, 2010; Li and Luo, 2016) find that the intentions of rational investors to correct the dislocations due to irrational investors can be limited by liquidity. Following these leads, we expect that the effect of *ESG* on stock returns can be related to liquidity. Specifically, we conjecture that the *ESG* premium is more pronounced for less liquid stocks than for more liquid stocks.

3 Data and sample

We obtain data on stock returns, trading volumes, and firms' financial information from Datastream. Our sample consists of equites from FTSE All Share Index in UK. The key variables of our study, the *ESG* combined score and each of the three pillar scores, namely Environment (*Env*), Social (*Soc*), and Governance (*Gov*), are obtained from Thomson Reuters' database available from 2002. *Env* covers resource use, emissions, and innovation. *Soc* covers workforce, human rights, community, and product responsibility. *Gov* covers management, shareholders, and corporate social responsibility (CSR) strategy. Prior studies (e.g., Ferrell et al., 2016; Dyck et al., 2019; Albuquerque et al., 2020) have used Thomson Reuters' Refinitiv ESG scores.[10] We

[10]The number of firms which disclose *ESG* is increasing. Amel-Zadeh and Serafeim (2018) show that while there were fewer than 20 firms which disclosed *ESG* data in the early 1990s, the number which disclose *ESG* in 2016 was approximately 9,000. Further, a larger proportion of European investors than American investors take *ESG* into account in investment decisions. However, firms' potential strategic disclosure can still affect investors' perceptions of *ESG* and stock returns.

obtained asset pricing factors data from the AQR website,[11] which provides UK specific factors data including the monthly excess market returns, size factor, book-to-market factor, momentum factor (Asness et al., 2013), betting-against-beta factor (Frazzini and Pedersen, 2014), quality-minus-junk factor (Asness et al., 2019), and risk-free rate from the AQR website.[12] Our sample period is from July 2003 to December 2020.

Table 1 provides summary statistics for the following variables: *ESG*, *Env*, *Soc*, *Gov*, *MV*, and *B/M*. The average score of *ESG*, *Env*, *Soc*, and *Gov* is 49.79, 45.87, 53.12, and 56.45, respectively. This indicates that the mean of *Env* is lower than that of the combined *ESG*, *Soc*, and *Gov* scores. Further, *ESG*, *Env*, *Soc*, and *Gov* are all positively correlated with *MV*. This suggests that larger firms have higher combined *ESG*, *Env*, *Soc*, and *Gov* scores than smaller firms, consistent with prior studies on UK stocks (Qiu et al., 2016; Haque and Ntim, 2020).

[Table 1 about here]

Table 2 reports the average *ESG* and each of three pillar (Environment, Social, and Governance) scores across the ten industries as defined in Fama and French (1997). We find that the scores vary across different industries. For example, the consumer durables industry has lower scores than others. This may be because it includes cars.

[Table 2 about here]

[11] https://www.aqr.com/Insights/Datasets

[12] Prior studies (e.g., Grobys and Haga, 2016; Alquist et al., 2018; Zaremba and Shemer, 2018; Blitz and Hanauer, 2020; Feng et al., 2020; Horenstein, 2021) have used data from the AQR.

4 Empirical results

4.1 Results on portfolio sorts

Our main methodology is the portfolio analysis following Liu and Strong (2008). We use the value-weighted portfolio returns in our study since although microcap stocks accounting for over half the total number of stocks only represent a fraction of the aggregate market capitalization, portfolio returns can be influenced by microcap stocks (Fama and French, 2008). Hou et al. (2015) find that the value-weighted method assigns modest portfolio weights to microcaps while the equal-weighted method assigns large weights to microcaps. This approach helps to alleviate the influence of microcap stocks (Green et al., 2017; Hou et al., 2020). Moreover, the return premium from microcap stocks can disappear after adjusting transaction costs (Novy-Marx and Velikov, 2016).

We examine portfolio performance by the Fama–French (1993) three-factor model (FF3FM), the Carhart (1997) momentum-extended FF3FM, the Frazzini and Pedersen (2014) betting against beta-extended FF3FM, and the Asness et al. (2019) quality-minus-junk-extended FF3FM. Specifically, we run the following asset pricing models:

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,m} f_{MKT,t} + \beta_{i,s} f_{SMB,t} + \beta_{i,h} f_{HML,t} + \varepsilon_{i,t}, \tag{1}$$

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,m} f_{MKT,t} + \beta_{i,s} f_{SMB,t} + \beta_{i,h} f_{HML,t} + \beta_{i,w} f_{WML,t} + \varepsilon_{i,t}, \tag{2}$$

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,m} f_{MKT,t} + \beta_{i,s} f_{SMB,t} + \beta_{i,h} f_{HML,t} + \beta_{i,b} f_{BAB,t} + \varepsilon_{i,t}, \tag{3}$$

$$R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,m} f_{MKT,t} + \beta_{i,s} f_{SMB,t} + \beta_{i,h} f_{HML,t} + \beta_{i,q} f_{QMJ,t} + \varepsilon_{i,t}, \tag{4}$$

where $R_{i,t}$ denotes portfolio i's return in month t, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting-against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor.

Table 3 reports the value-weighed portfolio results.[13] For excess returns, we find that stocks in the low- and high-*ESG* quintile have an average excess return of 1.479% and 0.966% per month, respectively, yielding a premium of 0.513% ($t = 1.83$) per month. The momentum-extended FF3FM, the betting against beta-extended FF3FM, and the quality-minus-junk-extended FF3FM have difficulties in fully explaining the *ESG* premium. For instance, under the momentum-extended FF3FM, for instance, the *ESG* premium is 0.561% ($t = 1.92$) per month. The *ESG* premium in the UK is consistent with that in the US, in line with findings by Hong and Kacperczyk (2009), Bolton and Kacperczyk (2021), and Pedersen et al. (2021).[14]

[Table 3 about here]

We also use the 2008 financial crisis as an exogenous shock to divide our sample into two sub-periods: one from 2003 to 2008 and the other from 2009 to 2020. In untabulated results, the relation between *ESG* and stock return is mainly significant after the 2008 financial crisis. Further, we conduct the test taking into account the pandemic. In our untabulated results, we find that our results are qualitatively similar when excluding 2020.

[13] Following the Fama and French (1993) convention, we form portfolios at the end of June each year and rebalance them after twelve months. Following Gregory et al. (2013), we also construct portfolios at the beginning of October each year and rebalance them after twelve months. Our results are qualitatively similar using the alternative method.

[14] Dhaliwal et al. (2012) and Krueger et al. (2021) find that firms' *ESG* is related to disclosure. In our untabulated results, we find that the relation between *ESG* and stock returns remains robust after controlling for disclosure.

Figure 2 plots the cumulative returns of *ESG* premium together with market, size, and book-to-market factors. As can be seen, the cumulative returns of *ESG* premium largely outperform the market, size, and book-to-market factors between 2009 and 2013 and during 2020.

[Figure 2 about here]

Further, we examine the portfolio returns of each of the three pillars of *ESG*, namely, environment (*Env*), social (*Soc*), and governance (*Gov*), and stock returns. Table 4 reports the performance of the value-weighted quintile portfolios sorted by *Env*. Excess returns generally decrease from low- to high-*Env* portfolios. The low- and high-*Env* firms earn an average excess return of 1.440% and 0.795% per month, respectively, yielding a significant premium of 0.645% ($t = 2.44$) per month. The *Env* premium is higher than the *ESG* premium. After adjusting for the quality-minus-junk-extended FF3FM, the *Env* premium is still significant at 0.754% ($t = 2.71$) per month. We also decompose the environment score to resource use and emissions.[15] We find that both resource use and emissions scores are significantly related to returns in Appendix Table A.1.

[Table 4 about here]

[Table A.1 about here]

Table 5 continues to present the returns of the value-weighted *Soc* quintile portfolios. Excess returns steadily decrease from low- to high-*Soc* portfolios. The low- and high-*Soc* firms have an average excess return of 1.518% and 0.701% per month, respectively, yielding a significant

[15] We observe a small number of stocks in certain portfolios when we use the innovation component of the environment pillar to form portfolios. Thus, we do not report results based on innovation portfolios.

premium of 0.817% ($t = 3.31$) per month. The *Soc* premium is higher than that of *ESG* and *Soc*. After adjusting for the betting-against-beta-extended FF3FM, the *Soc* premium remains significant at 0.899% ($t = 3.48$) per month. The t-statistics of all *Soc* premiums, are greater than 3, suggested by Harvey et al. (2016) and Hou et al. (2020). We also decompose the social score to workforce, human rights, community, and product responsibility. Appendix Table A.2 reports that the premium of human rights score is highly significant.

[Table 5 about here]

[Table A.2 about here]

The returns of the value-weighted quintile *Gov* portfolios are presented in Table 6. The low- and high-*Gov* firms earn an average excess return of 1.117% and 0.811.% per month, respectively. However, the *Gov* premium is insignificant. We also decompose the environment score to management, shareholders, and corporate social responsibility (CSR) strategy. Appendix Table A.3 shows that only the CRS strategy score is significantly related to returns. Overall, we find that *ESG* scores, in particular, *Env* and *Soc*, are strongly associated with stock returns.

[Table 6 about here]

[Table A.3 about here]

We also examine the returns of *ESG* portfolios formed by the STOXX 600 stocks. The STOXX 600 index contains the 600 largest European stocks. Appendix Tables A.4, A.5, A.6, and A.7 report the returns of the value-weighted quintile portfolios sorted by *ESG*, *Env*, *Soc*, and *Gov* of STOXX 600 stocks, respectively. We find that the *ESG*, *Env*, *Soc*, and *Gov* premiums are largely significant.

[Table A.4 about here]

[Table A.5 about here]

[Table A.6 about here]

[Table A.7 about here]

4.2 Liquidity explanations

While the above results show a significant *ESG* premium, we further examine whether liquidity helps understand it. Liu (2006) argues that liquidity stems from investment opportunities, firms' health (deterioration will harm liquidity), and the information environment. Compared to those with lower *ESG*, higher *ESG* firms tend to have better investment opportunities due to the worldwide expansions of *ESG* investment and government incentives; have better health due to the funding available to *ESG* projects and regulatory credits;[16] and have a better information environment due to the disclosure of *ESG* information.

Figure 1 depicts the *ESG* combined score and three pillar scores, namely *Env*, *Soc*, and *Gov*, for the *LM* quintile portfolios. It shows that all scores steadily worsen moving from liquid to illiquid stocks. This suggests that liquidity can be helpful in understanding the *ESG*-return relation.

[Figure 1 about here]

[16]See for example https://www.cnbc.com/2021/05/18/tesla-electric-vehicle-regulatory-credits-explained.html

Deterioration in stocks' liquidity can be due to limited investment opportunities, poor firm health, and increasing information asymmetry (Liu, 2016).[17] We test the association between *ESG* and fundamentals of liquidity using the cross-sectional Fama–MacBeth (1973) regression:

$$ESG_{i,t} = \delta_0 + \delta_1 \times InvestmentOpportunity_{i,t} + \delta_3 \times FirmHealth_{i,t} + \delta_2 \times Information_{i,t} + e_{i,t}, \quad (5)$$

Following Trigeorgis and Lambertides (2014), we use capital investment to proxy for exercising opportunities and use the present value of growth opportunity ($PVGO$) to proxy for yet-unexercised future-oriented opportunities. Specifically, we estimate the $PVGO$, following Trigeorgis and Lambertides (2014), as

$$MV_i = \frac{CF_i}{k_i} + PVGO_i, \quad (6)$$

where $MV_{i,t}$ is the market value of firm i, CF_i is the operating cash flow of firm i, and k_i is the firm's weighted average cost of capital (WACC). We follow Xie (2001) in estimating cash flow from operations as funds from operations minus change in current assets plus change in cash and cash equivalents plus change in current liabilities. The cost of equity is computed based on the

[17] We also examine the sustainability, transparency, and quality of the quintile *ESG* portfolios. We proxy for sustainability using the sustainability compensation incentives obtained from Thomson Reuters' Refinitiv. Following Morck et al. (2000) and Durnev et al. (2009), we estimate transparency by using the stock price asynchronicity from the rolling regression of each five-year period for each stock $R_{i,t} - R_{f,t} = \alpha_i + \beta_{i,ind} f_{INDMKT,t} + \beta_{i,m} f_{MKT,t} + \varepsilon_{i,t}$, where $R_{i,t}$ is the month-t return of portfolio i, $R_{f,t}$ is the risk-free rate for month t, $f_{INDMKT,t}$ is the month-t value of the two-digit SIC industry value-weighted return, $f_{MKT,t}$ is the month-t value of the market factor. Transparency is defined as $ln(\frac{1-R_i^2}{R_i^2})$, where R_i^2 is the R-square from the regression. Following Ng (2011), we use earnings precision (EP) to proxy for information quality. EP is calculated as the standard deviation of earnings before extraordinary items scaled by total assets over the five years. In our untabulated results, we find that high *ESG* firms tend to be more sustainable and transparent, and have better quality.

market model and the cost of debt is four units below the cost of equity, following Trigeorgis and Lambertides (2014).

To proxy for *FirmHealth*, we follow Whited and Wu (2006) use the financial constraints index (*WWindex*). We proxy for $Information_{i,t}$ using a dummy variable equal to one if a firm is included in the Financial Times Stock Exchange (FTSE 100) index and zero otherwise. Hegde and McDermott (2003) and Chen et al. (2004) show that the Standard and Poors (S&P) 500 index helps attract institutional investors and reduce information asymmetry.

Firms which have more investment opportunities tend to invest to improve environmental, social, and governance issues. Indeed, Gillan et al. (2010), Gao and Zhang (2015), Ferrell et al. (2017), Liangand Renneboog (2017), and Albuquerque et al. (2019) all demonstrate that investment opportunities are associated with *ESG*. Financially constrained firms are less likely to commit *ESG* investment (Hong and Kacperczyk, 2012). In terms of information and *ESG*, Servaes and Tamayo (2013) and Chen et al. (2020) highlight the importance of firms' information environment in corporate social performance.

In line with the above discussions, Table 7 shows that the *ESG* combined score and *Env*, *Soc*, and *Gov* are positively correlated with the capital investment (*CAPX*) and the present value of growth opportunity (*PVGO*), negatively correlated with financial constraints (*WWindex*), and positively related to the information environment (*FTSE100Dummy*). That is, low-*ESG* firms invest less, are more constrained, and experience more information asymmetry than high-*ESG* firms. Overall, the relation between *ESG* and liquidity fundamentals suggests that liquidity can help to understand the *ESG* premium.

[Table 7 about here]

Prior studies show that transaction costs (one dimension of liquidity) can limit the rational investors' attempts to "undo the dislocations" due to irrational investors.[18] Following Liu (2016), we measure liquidity as the number of zero daily trading volumes adjusted by turnover (LM). We expect that if the ESG and return relation is associated with liquidity, it would be more pronounced for low liquidity stocks (high LM) than for high liquidity stocks (low LM). To test this, we examine the ESG premium across low and high LM groups. Specifically, we classify the sample of UK stocks into three LM-based groups. Then, within each of the three groups, we classify stocks into quintile ESG portfolios.[19]

Table 8 presents the returns of ESG quintile portfolios within the low- and high-LM sub-samples. As can be seen, the ESG premium is only significant for illiquid stocks (high LM). Specifically, for raw returns, the ESG premium is significant at 1.109% in the high-LM sub-sample but insignificant at -0.231% per month in the low-LM sub-sample. The results are consistent after risk adjustment. For example, under the FF3FM, the ESG premium is significant at 1.117% in the high-LM sub-sample but insignificant at -0.159% per month in the low-LM sub-sample.

[Table 8 about here]

Tables 9, 10, and 11 show the returns of Env, Soc, and Gov quintile portfolios across the low- and high-LM groups, respectively. Consistent with Table 8, we reveal that the Env, Soc, and Gov premiums are only significant for illiquid (high LM) stocks but turn insignificant for

[18] Prior studies have highlighted the importance of transaction costs in explaining asset pricing premiums such as the book-to-market premium (Ali et al, 2003), the accrual premium (Mashruwala et al, 2006), the asset growth premium (Li and Zhang, 2010), and the cash holdings premium (Li and Luo, 2016).

[19] We use three groups, in line with prior studies (Li and Zhang, 2010; Lam and Wei, 2011), which also helps to keep a sufficient number of stocks in each group given the double-sorting method. To check the robustness, we also use four groups. Specifically, we classify the UK stocks sample into four liquidity-based groups. Then, within each of the four, we classify stocks into quintile ESG portfolios. Our results are qualitatively similar using four groups for liquidity.

liquid (low LM) stocks. Taken together, Tables 8, 9, 10, and 11 show that liquidity provides a good explanation for the ESG, Env, Soc, and Gov premiums.

[Table A.8 about here]

[Table A.9 about here]

[Table A.10 about here]

[Table A.11 about here]

We also examine the returns of ESG portfolios across different liquidity sub-samples using an alternative liquidity measure. In particular, we use the negative turnover measure (TO) of Datar et al. (1998). Appendix Tables A.8, A.9, A.10, and A.11 report the returns of the value-weighted quintile ESG, Env, Soc, and Gov portfolios across low- and high-TO groups, respectively. We find that the ESG, Env, Soc, and Gov premiums are largely significant for low but not for high liquidity stocks. The results of TO sub-samples are consistent with those of LM sub-samples.

[Table 9 about here]

[Table 10 about here]

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5 Conclusion

ESG investing is a major theme in financial markets. We investigate the ESG portfolio performance of UK securities from 2003 to 2020. The ESG combined score has a significant

effect on stock returns. Lower *ESG* firms earn higher returns than higher *ESG* firms. Further, we unpack *ESG* into environment (*Env*), social (*Soc*), and governance (*Gov*). We demonstrate that the *Env* and *Soc* premiums are stronger than the *ESG* premium. However, the *Gov* premium is insignificant.

Given the increasing fund flows into *ESG* investment, we conjecture that stocks with higher liquidity have higher *ESG* than stocks with low liquidity. Our results are in line with this expectation. Further, the *ESG* premium is only significant for low liquidity stocks but is insignificant for high liquidity stocks, which suggests that the effect of *ESG* on stock returns is associated with liquidity. Results are similar for testing portfolios formed using *Env*, *Soc*, and *Gov*.

We expect our study to be widely applied both in academia and practice. Institutional investors, such as mutual and pension funds, can use our results to help manage their *ESG* funds. Investors who hold firms with high *ESG* scores will have high liquidity, which may be helpful during market downturns associated with "flight-to-liquidity" and "flight-to-quality". Our study also has practical implications for firms' financial decision-making. Firms with high *ESG* have high liquidity and can have lower costs of capital. Corporate managers can use *ESG* as a tool to reduce the costs of raising capital in the capital markets.

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Table 1 Summary statistics

This table presents summary statistics of mean, standard deviation, Q1 (bottom 25%), median, and Q3 (top 25%). *ESG* is the environment, social, and governance combined score. *Env* is the environment pillar score. *Soc* is the social pillar score. *Gov* is the governance pillar score. $MV(\$m)$ is market capitalization in millions of pounds. *B/M* is book-to-market ratio.

	ESG	*Env*	*Soc*	*Gov*	$MV(\$m)$	*B/M*
			Descriptive statistics			
Mean	49.79	45.87	53.12	56.45	6410.07	4.47
Stdev	16.89	25.46	21.18	21.22	14954.45	44.01
Q1	38.37	25.34	36.65	40.47	675.00	1.25
Medium	49.43	44.27	53.47	57.43	1503.58	2.21
Q3	60.61	66.54	69.44	73.36	4653.17	4.10
			Correlation			
Env	0.75	1.00				
Soc	0.79	0.72	1.00			
Gov	0.61	0.37	0.40	1.00		
$MV(\$m)$	0.26	0.44	0.44	0.35	1.00	
B/M	-0.04	-0.05	-0.07	-0.00	-0.06	1.00

Table 2 *ESG*, *Env*, *Soc*, and *Gov* scores across ten Fama and French industries

This table reports the *ESG* score and each of the three pillar: Environment (*Env*), Social (*Soc*), and Governance (*Gov*) score for each of ten industry groups. The testing sample contains UK stocks.

Industries	*ESG*	*Env*	*Soc*	*Gov*
Consumer NonDurables	53.789	56.620	56.573	57.666
Consumer Durables	28.230	20.675	27.375	40.347
Manufacturing	46.894	40.710	48.478	58.777
Oil, Gas, and Coal Extraction and Products	45.677	52.087	57.939	68.383
Business Equipment	39.823	29.854	40.131	45.413
Telephone and Television Transmission	50.240	47.918	60.283	62.709
Wholesale, Retail, and Some Services	44.744	40.349	46.832	51.116
Healthcare, Medical Equipment, and Drugs	54.514	48.940	61.419	64.756
Utilities	54.826	54.175	59.057	62.231
Other	45.757	41.633	48.524	52.344

Table 3
Returns of the *ESG* quintile portfolios

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	*L*ow-*ESG*	*Q*2	*Q*3	*Q*4	*H*igh-*ESG*	*L*−*H*
Ex-Ret (%)	1.479	0.836	0.915	0.651	0.966	0.513
	(3.57)	(2.25)	(2.44)	(1.82)	(3.40)	(1.83)
	FF3FM					
$\alpha_{i,t}$	1.320	0.670	0.754	0.471	0.837	0.482
	(3.51)	(1.99)	(2.20)	(1.42)	(3.18)	(1.78)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.386	0.620	0.835	0.427	0.825	0.561
	(3.15)	(1.59)	(1.85)	(1.07)	(2.42)	(1.92)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.402	0.629	0.847	0.440	0.833	0.569
	(3.54)	(1.67)	(2.04)	(1.22)	(2.62)	(2.00)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.415	0.711	0.840	0.454	0.824	0.591
	(3.20)	(1.76)	(1.75)	(1.14)	(2.28)	(2.06)

Table 4

Returns of the environment pillar quintile portfolios

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	Low-*Env*	*Q*2	*Q*3	*Q*4	High-*Env*	*L*−*H*
Ex-Ret (%)	1.440	1.520	0.943	0.902	0.795	0.645
	(3.74)	(4.49)	(2.35)	(2.88)	(2.53)	(2.44)
	FF3FM					
$\alpha_{i,t}$	1.290	1.393	0.739	0.776	0.645	0.645
	(3.67)	(4.45)	(2.06)	(2.67)	(2.25)	(2.50)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.325	1.377	0.789	0.748	0.599	0.726
	(3.27)	(3.87)	(1.67)	(2.18)	(1.63)	(2.65)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.339	1.389	0.803	0.757	0.608	0.731
	(3.60)	(4.18)	(1.87)	(2.37)	(1.78)	(2.67)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.357	1.355	0.866	0.769	0.602	0.754
	(3.34)	(3.79)	(1.79)	(2.23)	(1.54)	(2.71)

Table 5
Returns of the social pillar quintile portfolios

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	*L*ow-*Soc*	*Q*2	*Q*3	*Q*4	*H*igh-*Soc*	*L*−*H*
Ex-Ret (%)	1.518	1.155	1.049	1.067	0.701	0.817
	(4.00)	(3.12)	(3.24)	(2.93)	(2.27)	(3.31)
	FF3FM					
$\alpha_{i,t}$	1.394	1.011	0.934	0.910	0.542	0.851
	(4.05)	(2.90)	(3.02)	(2.82)	(1.92)	(3.62)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.388	1.033	0.867	0.968	0.494	0.894
	(3.56)	(2.57)	(2.51)	(1.90)	(1.45)	(3.45)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.402	1.045	0.877	0.979	0.504	0.899
	(3.94)	(2.79)	(2.72)	(2.05)	(1.59)	(3.48)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.385	1.071	0.839	1.040	0.498	0.886
	(3.56)	(2.69)	(2.48)	(1.85)	(1.41)	(3.31)

Table 6
Returns of the governance pillar quintile portfolios

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

Panel C: Governance Pillar						
	Low-*Gov*	*Q*2	*Q*3	*Q*4	High-*Gov*	*L*−*H*
Ex-Ret (%)	1.117	0.851	1.128	0.897	0.811	0.307
	(3.03)	(2.63)	(3.01)	(2.56)	(2.60)	(1.29)
	FF3FM					
$\alpha_{i,t}$	0.974	0.740	0.949	0.733	0.667	0.306
	(2.91)	(2.39)	(2.79)	(2.34)	(2.32)	(1.28)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	0.891	0.646	0.942	0.788	0.639	0.252
	(2.19)	(1.73)	(2.38)	(1.79)	(1.83)	(1.03)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	0.901	0.654	0.956	0.799	0.649	0.252
	(2.37)	(1.82)	(2.68)	(1.94)	(2.01)	(1.03)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	0.878	0.681	0.949	0.840	0.622	0.256
	(2.03)	(1.74)	(2.51)	(1.75)	(1.72)	(1.03)

Table 7

Firm *ESG* and the sources of liquidity

This table reports the results of regressing *ESG* combined score (Environment (*Env*) pillar score, Environment (*Env*) pillar score, and Environment (*Env*) pillar score) on investment opportunities, financial health, and information environment. We proxy investment opportunities by investment rate (*CAPX*), which is the ratio of capital expenditure to total asset in Panel A and by present value of growth opportunity (*PVGO*) scaled by market value in Panel B; financial health by Whited-Wu (2006) index (*WWindex*); information environment by a dummy variable which is one if a firm belongs to the FTSE 100 index and zero otherwise. The sample includes UK stocks over 2002 to 2019. Numbers in parentheses are *t*-statistics.

Panel A: *CAPX*				
	c	*CAPX*	*WWindex*	*FTSE100Dummy*
ESG	-0.622	28.656	-60.059	6.046
	(-0.09)	(3.35)	(-6.76)	(4.81)
Env	-49.375	58.151	-118.997	10.267
	(-4.47)	(4.76)	(-7.83)	(6.28)
Soc	-20.311	50.415	-89.373	7.169
	(-2.42)	(5.96)	(-7.79)	(4.92)
Gov	2.452	17.577	-68.864	4.251
	(0.36)	(1.94)	(-7.27)	(2.75)
Panel B: *PVGO*				
	c	*PVGO*	*WWindex*	*FTSE100Dummy*
ESG	-9.221	0.122	-73.255	7.799
	(-1.50)	(2.03)	(-8.42)	(7.89)
Env	-80.312	0.122	-167.886	8.841
	(-7.29)	(3.58)	(-10.39)	(5.22)
Soc	-44.019	0.147	-126.582	6.824
	(-4.69)	(2.00)	(-9.61)	(5.58)
Gov	-7.963	0.068	-86.427	5.573
	(-0.89)	(1.71)	(-6.56)	(3.78)

Table 8

Returns of the *ESG* quintile portfolios across low- and high-*LM* sub-samples

Liquidity is measured as the number of zero daily trading volumes adjusted by turnover of Liu (2006) (*LM*). We classify the sample of UK stocks into three *LM*-based groups, and then classify stocks in each of the three *LM* groups into value-weighted quintile portfolios based on the *ESG* combined score. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	Low-*ESG*	*Q*2	*Q*3	*Q*4	High-*ESG*	*L*−*H*
			Panel A: The low-*LM* sub-sample			
Ex-Ret (%)	1.296	1.044	1.168	1.300	1.528	-0.231
	(2.55)	(1.90)	(2.22)	(2.79)	(2.75)	(-0.73)
			FF3FM			
$\alpha_{i,t}$	1.085	0.806	0.921	1.097	1.244	-0.159
	(2.38)	(1.71)	(1.93)	(2.51)	(2.65)	(-0.53)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	1.220	1.037	1.129	1.053	1.788	-0.568
	(2.22)	(1.38)	(1.97)	(2.26)	(2.34)	(-1.28)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	1.237	1.054	1.147	1.068	1.805	-0.568
	(2.46)	(1.50)	(2.17)	(2.49)	(2.54)	(-1.28)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	1.270	1.150	1.143	0.999	1.870	-0.600
	(2.26)	(1.39)	(2.03)	(2.19)	(2.23)	(-1.19)
			Panel B: The high-*LM* sub-sample			
Ex-Ret (%)	1.788	1.368	0.986	0.468	0.679	1.109
	(4.90)	(3.19)	(2.31)	(1.31)	(2.37)	(3.16)
			FF3FM			
$\alpha_{i,t}$	1.708	1.180	0.847	0.366	0.591	1.117
	(4.89)	(3.10)	(2.16)	(1.05)	(2.10)	(3.24)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	1.664	1.231	0.690	0.262	0.459	1.206
	(4.65)	(2.65)	(1.74)	(0.67)	(1.44)	(3.16)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	1.675	1.248	0.700	0.271	0.464	1.211
	(4.89)	(2.93)	(1.82)	(0.72)	(1.50)	(3.18)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	1.689	1.240	0.607	0.245	0.435	1.254
	(5.10)	(2.64)	(1.46)	(0.62)	(1.33)	(3.39)

Table 9

Returns of the environment pillar quintile portfolios across low- and high-*LM* sub-samples

Liquidity is measured as the number of zero daily trading volumes adjusted by turnover of Liu (2006) (*LM*). We classify the sample of UK stocks into three *LM*-based groups, and then classify stocks in each of the three *LM* groups into value-weighted quintile portfolios based on the *ESG* combined score. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	Low-*Env*	*Q*2	*Q*3	*Q*4	High-*Env*	*L*−*H*
Panel A: The low-*LM* sub-sample						
Ex-Ret (%)	1.448	1.588	0.599	1.318	1.406	0.042
	(3.06)	(3.54)	(1.25)	(2.93)	(2.51)	(0.11)
	FF3FM					
$\alpha_{i,t}$	1.248	1.443	0.341	1.157	1.142	0.107
	(2.92)	(3.44)	(0.77)	(2.73)	(2.32)	(0.29)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.405	1.510	0.463	1.312	1.354	0.051
	(2.74)	(2.88)	(0.93)	(2.53)	(2.07)	(0.13)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.423	1.523	0.483	1.323	1.370	0.053
	(3.06)	(3.05)	(1.09)	(2.71)	(2.24)	(0.13)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.429	1.518	0.646	1.315	1.258	0.171
	(2.73)	(2.87)	(1.36)	(2.49)	(1.76)	(0.38)
Panel B: The high-*LM* sub-sample						
Ex-Ret (%)	1.531	1.548	1.315	0.815	0.546	0.985
	(4.05)	(4.24)	(3.45)	(1.89)	(1.93)	(3.16)
	FF3FM					
$\alpha_{i,t}$	1.413	1.486	1.211	0.686	0.450	0.963
	(4.02)	(4.24)	(3.34)	(1.66)	(1.65)	(3.21)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.394	1.457	1.271	0.560	0.311	1.082
	(3.43)	(4.04)	(2.96)	(1.29)	(1.00)	(3.27)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.407	1.519	1.283	0.567	0.318	1.089
	(3.70)	(4.46)	(3.20)	(1.32)	(1.07)	(3.34)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.401	1.448	1.293	0.566	0.277	1.124
	(3.33)	(4.49)	(2.88)	(1.27)	(0.86)	(3.33)

Table 10

Returns of the social pillar quintile portfolios across low- and high-*LM* sub-samples

Liquidity is measured as the number of zero daily trading volumes adjusted by turnover of Liu (2006) (*LM*). We classify the sample of UK stocks into three *LM*-based groups, and then classify stocks in each of the three *LM* groups into value-weighted quintile portfolios based on the *ESG* combined score. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	Low-*Soc*	*Q*2	*Q*3	*Q*4	High-*Soc*	*L*−*H*
Panel A: The low-*LM* sub-sample						
Ex-Ret (%)	1.497	1.160	1.072	0.970	1.350	0.146
	(3.26)	(2.70)	(2.44)	(2.13)	(2.43)	(0.39)
	FF3FM					
$\alpha_{i,t}$	1.350	0.994	0.913	0.769	1.048	0.302
	(3.19)	(2.52)	(2.16)	(1.95)	(2.17)	(0.84)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.446	1.120	0.882	0.992	1.270	0.176
	(2.81)	(2.30)	(1.74)	(1.68)	(2.17)	(0.42)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.460	1.134	0.896	1.012	1.286	0.174
	(3.01)	(2.54)	(1.89)	(1.93)	(2.36)	(0.42)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.434	1.212	0.949	1.069	1.208	0.226
	(2.64)	(2.53)	(1.94)	(1.70)	(1.94)	(0.49)
Panel B: The high-*LM* sub-sample						
Ex-Ret (%)	1.809	1.532	1.060	0.694	0.595	1.214
	(4.93)	(3.75)	(2.64)	(1.89)	(2.09)	(3.71)
	FF3FM					
$\alpha_{i,t}$	1.726	1.409	0.939	0.568	0.493	1.233
	(5.02)	(3.64)	(2.43)	(1.60)	(1.78)	(3.90)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.672	1.491	0.727	0.389	0.362	1.310
	(4.49)	(3.71)	(1.88)	(0.99)	(1.15)	(3.81)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.685	1.507	0.735	0.393	0.369	1.316
	(4.80)	(4.03)	(1.93)	(1.02)	(1.22)	(3.84)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.714	1.379	0.627	0.560	0.305	1.410
	(4.78)	(3.85)	(1.56)	(1.41)	(0.94)	(4.16)

Table 11

Returns of the governance pillar quintile portfolios across low- and high-LM sub-samples

Liquidity is measured as the number of zero daily trading volumes adjusted by turnover of Liu (2006) (LM). We classify the sample of UK stocks into three LM-based groups, and then classify stocks in each of the three LM groups into value-weighted quintile portfolios based on the ESG combined score. Ex-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	Low-Gov	$Q2$	$Q3$	$Q4$	High-Gov	$L-H$
Panel A: The low-LM sub-sample						
Ex-Ret (%)	0.897	1.428	1.355	1.142	1.356	-0.459
	(1.89)	(3.09)	(2.94)	(2.15)	(2.45)	(-1.26)
	FF3FM					
$\alpha_{i,t}$	0.727	1.280	1.154	0.946	1.048	-0.321
	(1.64)	(2.78)	(2.80)	(1.99)	(2.21)	(-0.89)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	0.740	1.291	1.293	1.178	1.339	-0.599
	(1.26)	(2.64)	(2.51)	(1.79)	(2.10)	(-1.65)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	0.755	1.305	1.308	1.195	1.355	-0.600
	(1.38)	(2.86)	(2.77)	(1.96)	(2.28)	(-1.66)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	0.860	1.162	1.233	1.139	1.414	-0.554
	(1.44)	(2.58)	(2.20)	(1.60)	(2.11)	(-1.57)
Panel B: The high-LM sub-sample						
Ex-Ret (%)	1.497	1.092	1.383	0.805	0.599	0.898
	(3.13)	(2.50)	(4.00)	(2.44)	(2.05)	(2.02)
	FF3FM					
$\alpha_{i,t}$	1.319	1.023	1.276	0.718	0.494	0.825
	(2.94)	(2.52)	(3.80)	(2.24)	(1.76)	(1.88)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.321	0.976	1.070	0.548	0.335	0.986
	(2.76)	(2.07)	(2.76)	(1.31)	(1.11)	(2.15)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.334	0.991	1.074	0.556	0.343	0.991
	(2.93)	(2.24)	(2.78)	(1.39)	(1.18)	(2.19)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.219	0.911	1.254	0.568	0.276	0.943
	(2.57)	(1.79)	(3.17)	(1.32)	(0.90)	(2.05)

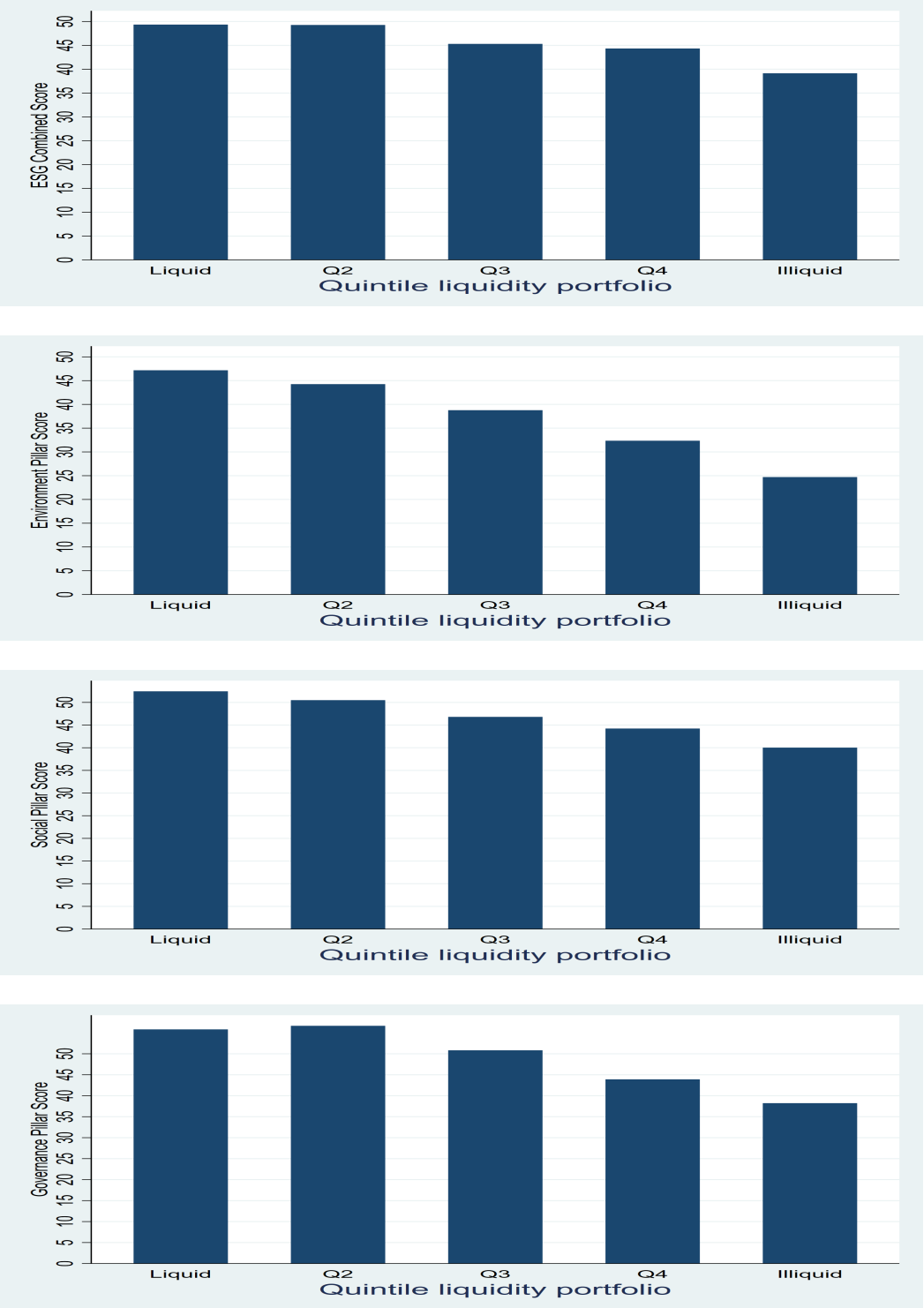

Fig. 1. ESG combined, environment, social, and governance pillar scores of liquidity portfolios
This figure plots the ESG combined, environment, social, and governance pillar scores of the liquidity quintile portfolios.

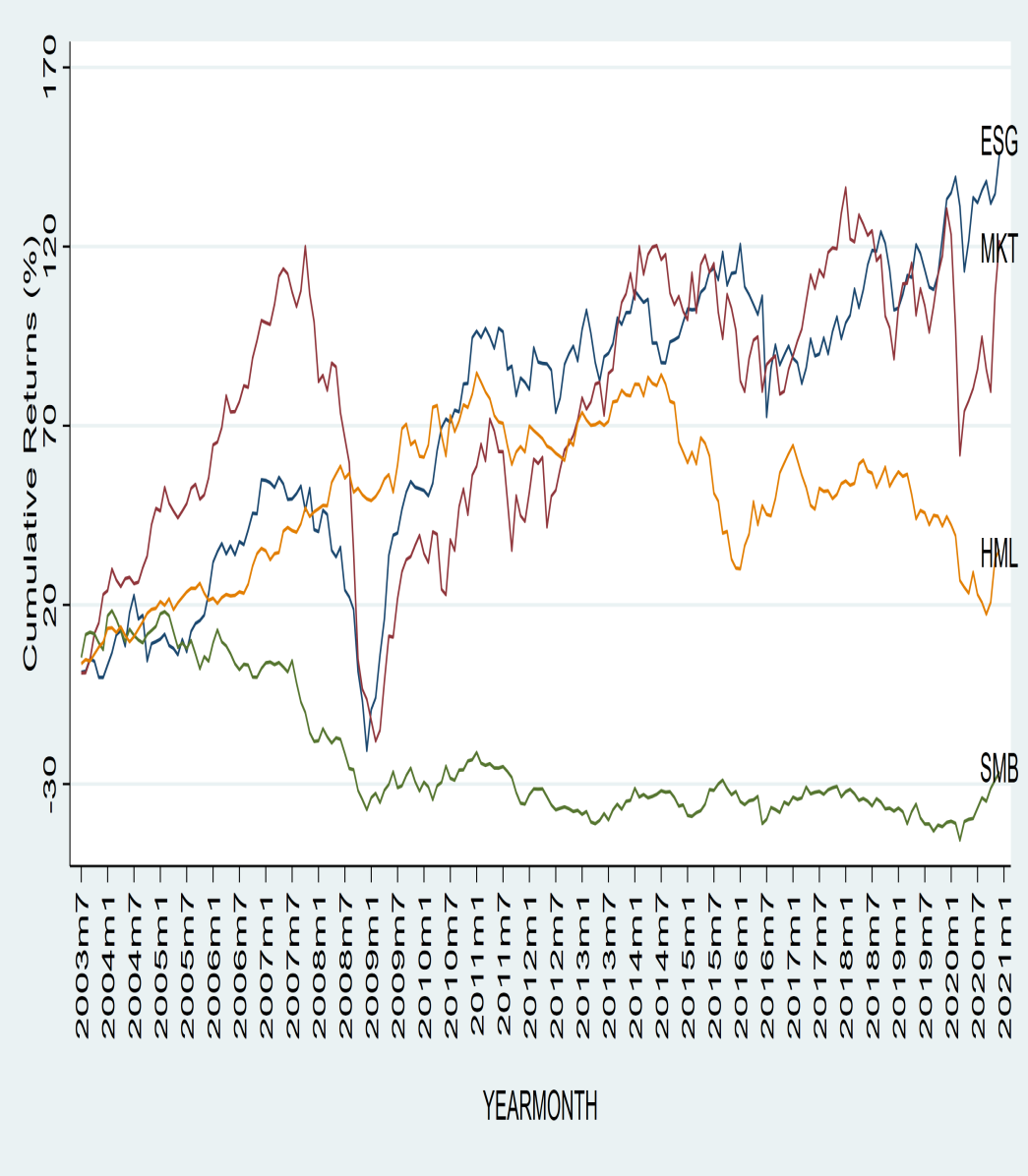

Fig. 2. Cumulative returns

This figure plots the cumulative returns of *ESG* premium, market factor, size factor, and book-to-market factor.

Table A.1
Returns of each of the environment component quintile portfolios

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

Panel A: Resource Use						
	Low-*Ru*	*Q*2	*Q*3	*Q*4	High-*Ru*	*L*−*H*
Ex-Ret (%)	1.444	1.329	1.015	0.912	0.751	0.693
	(3.83)	(3.48)	(2.97)	(2.94)	(2.36)	(2.90)
	FF3FM					
$\alpha_{i,t}$	1.299	1.212	0.881	0.781	0.595	0.704
	(3.78)	(3.35)	(2.80)	(2.69)	(2.07)	(3.02)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.275	1.276	0.927	0.764	0.558	0.716
	(3.29)	(3.16)	(2.29)	(2.04)	(1.54)	(2.92)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.289	1.296	0.939	0.774	0.568	0.721
	(3.60)	(3.44)	(2.54)	(2.23)	(1.67)	(2.92)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.331	1.302	0.921	0.773	0.567	0.763
	(3.52)	(3.17)	(2.15)	(2.00)	(1.48)	(3.15)
Panel B: Emissions						
	Low-*Emi*	*Q*2	*Q*3	*Q*4	High-*Emi*	*L*−*H*
Ex-Ret (%)	1.541	1.137	0.892	0.736	0.757	0.784
	(4.21)	(2.98)	(2.58)	(2.36)	(2.37)	(3.37)
	FF3FM					
$\alpha_{i,t}$	1.401	1.051	0.740	0.574	0.612	0.789
	(4.19)	(2.98)	(2.34)	(2.00)	(2.10)	(3.50)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.374	1.043	0.703	0.514	0.612	0.762
	(3.66)	(2.70)	(1.83)	(1.44)	(1.63)	(3.15)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.388	1.106	0.716	0.522	0.622	0.765
	(4.02)	(3.09)	(2.05)	(1.55)	(1.79)	(3.15)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.348	1.041	0.663	0.607	0.599	0.749
	(3.57)	(2.78)	(1.64)	(1.64)	(1.51)	(3.02)

Table A.2
Returns of each of the social component quintile portfolios

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

			Panel A: Workforce			
	Low-*Wf*	*Q*2	*Q*3	*Q*4	High-*Wf*	*L*−*H*
Ex-Ret (%)	1.171	1.036	1.094	0.947	0.720	0.451
	(3.51)	(3.21)	(2.91)	(2.81)	(2.33)	(2.12)
			FF3FM			
$\alpha_{i,t}$	1.038	0.916	0.918	0.792	0.576	0.462
	(3.40)	(2.94)	(2.75)	(2.64)	(2.01)	(2.19)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	0.870	0.894	1.055	0.749	0.527	0.343
	(2.62)	(2.52)	(2.06)	(1.89)	(1.56)	(1.54)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	0.879	0.907	1.067	0.761	0.535	0.344
	(2.77)	(2.80)	(2.25)	(2.09)	(1.68)	(1.54)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	0.909	0.929	1.120	0.774	0.506	0.403
	(2.71)	(2.69)	(1.99)	(1.85)	(1.46)	(1.72)
			Panel B: Human rights			
	Low-*Hr*	*Q*2	*Q*3	*Q*4	High-*Hr*	*L*−*H*
Ex-Ret (%)	1.217	0.637	1.326	0.916	0.709	0.508
	(3.56)	(1.14)	(3.72)	(2.55)	(2.28)	(2.64)
			FF3FM			
$\alpha_{i,t}$	1.093	0.664	1.226	0.767	0.557	0.536
	(3.41)	(1.27)	(3.59)	(2.37)	(1.96)	(2.79)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	1.089	0.506	1.061	0.798	0.518	0.572
	(2.82)	(0.97)	(2.81)	(1.85)	(1.45)	(2.65)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	1.101	0.641	1.093	0.816	0.527	0.574
	(3.09)	(1.29)	(2.96)	(2.02)	(1.60)	(2.66)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	1.104	0.854	1.075	0.942	0.484	0.620
	(2.78)	(1.60)	(2.94)	(2.12)	(1.30)	(2.74)

Table A.2 (Continued)

Panel C: Community						
	Low-*Com*	*Q*2	*Q*3	*Q*4	High-*Com*	*L*−*H*
Ex-Ret (%)	1.240	0.896	0.975	0.797	0.879	0.361
	(3.67)	(2.33)	(2.79)	(2.22)	(2.86)	(1.48)
	FF3FM					
$\alpha_{i,t}$	1.135	0.720	0.841	0.595	0.747	0.388
	(3.50)	(2.10)	(2.54)	(1.90)	(2.59)	(1.58)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.104	0.796	0.711	0.676	0.671	0.432
	(3.03)	(1.61)	(1.78)	(1.62)	(2.00)	(1.62)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.115	0.807	0.721	0.689	0.681	0.435
	(3.29)	(1.73)	(1.92)	(1.80)	(2.18)	(1.63)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.101	0.915	0.679	0.733	0.628	0.473
	(3.02)	(1.71)	(1.62)	(1.70)	(1.84)	(1.70)
Panel D: Product responsibility						
	Low-*Pr*	*Q*2	*Q*3	*Q*4	High-*Pr*	*L*−*H*
Ex-Ret (%)	1.158	0.944	1.080	0.744	0.740	0.418
	(3.19)	(2.19)	(2.67)	(1.95)	(2.49)	(1.87)
	FF3FM					
$\alpha_{i,t}$	1.047	0.877	1.064	0.616	0.593	0.454
	(3.10)	(2.15)	(2.79)	(1.81)	(2.18)	(2.09)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.044	0.700	1.028	0.608	0.549	0.495
	(2.58)	(1.50)	(2.38)	(1.45)	(1.53)	(2.12)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.057	0.739	1.178	0.656	0.558	0.498
	(2.84)	(1.64)	(2.99)	(1.66)	(1.69)	(2.12)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	0.953	0.817	1.034	0.634	0.594	0.359
	(2.27)	(1.67)	(2.43)	(1.45)	(1.59)	(1.52)

Table A.3
Returns of each of the governance component quintile portfolios

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

			Panel A: Management			
	Low-*Man*	*Q*2	*Q*3	*Q*4	High-*Man*	*L*−*H*
Ex-Ret (%)	0.991	1.003	0.908	0.855	0.846	0.145
	(2.76)	(3.06)	(2.43)	(2.29)	(2.68)	(0.62)
			FF3FM			
$\alpha_{i,t}$	0.849	0.871	0.741	0.663	0.719	0.130
	(2.59)	(2.87)	(2.17)	(2.04)	(2.44)	(0.56)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	0.722	0.862	0.744	0.856	0.629	0.093
	(1.92)	(2.15)	(1.78)	(1.71)	(1.86)	(0.39)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	0.731	0.874	0.754	0.867	0.639	0.092
	(2.05)	(2.40)	(1.93)	(1.85)	(2.03)	(0.39)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	0.719	0.910	0.753	0.936	0.581	0.138
	(1.85)	(2.13)	(1.74)	(1.72)	(1.69)	(0.58)
			Panel B: Shareholders			
	Low-*Shh*	*Q*2	*Q*3	*Q*4	High-*Shh*	*L*−*H*
Ex-Ret (%)	1.013	0.897	1.054	0.721	0.870	0.143
	(2.66)	(2.29)	(3.20)	(2.41)	(2.77)	(0.58)
			FF3FM			
$\alpha_{i,t}$	0.826	0.707	0.941	0.601	0.725	0.101
	(2.39)	(2.07)	(2.99)	(2.11)	(2.48)	(0.40)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	0.832	0.788	0.896	0.536	0.678	0.155
	(1.96)	(1.58)	(2.25)	(1.64)	(1.94)	(0.57)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	0.844	0.798	0.907	0.543	0.688	0.157
	(2.14)	(1.69)	(2.43)	(1.75)	(2.13)	(0.58)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	0.793	0.928	0.883	0.512	0.680	0.113
	(1.78)	(1.72)	(2.13)	(1.53)	(1.90)	(0.39)

Table A.3 (Continued)

			Panel C: CSR strategy			
	*L*ow-*CSR*	*Q*2	*Q*3	*Q*4	*H*igh-*CSR*	*L*−*H*
Ex-Ret (%)	1.269	1.414	1.115	0.862	0.750	0.519
	(3.31)	(3.27)	(3.41)	(2.46)	(2.45)	(2.05)
			FF3FM			
$\alpha_{i,t}$	1.125	1.347	1.000	0.709	0.598	0.526
	(3.17)	(3.35)	(3.26)	(2.26)	(2.16)	(2.13)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	1.147	1.297	0.926	0.744	0.571	0.576
	(2.73)	(3.08)	(2.70)	(1.68)	(1.63)	(2.14)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	1.160	1.421	0.933	0.756	0.580	0.580
	(2.99)	(3.73)	(2.85)	(1.86)	(1.79)	(2.17)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	1.200	1.247	0.968	0.768	0.566	0.634
	(2.78)	(3.11)	(2.89)	(1.60)	(1.54)	(2.23)

Table A.4
Returns of the *ESG* quintile portfolios of STOXX 600 firms

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains the EU stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	*L*ow-*ESG*	*Q*2	*Q*3	*Q*4	*H*igh-*ESG*	*L*−*H*
Ex-Ret (%)	1.225	0.863	0.772	0.789	0.748	0.478
	(3.12)	(2.41)	(2.10)	(2.27)	(2.10)	(3.13)
	FF3FM					
$\alpha_{i,t}$	0.744	0.426	0.324	0.369	0.304	0.441
	(2.39)	(1.42)	(1.06)	(1.29)	(1.06)	(2.93)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	0.712	0.374	0.447	0.327	0.322	0.390
	(2.01)	(1.10)	(1.29)	(1.00)	(0.99)	(2.48)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	0.786	0.443	0.495	0.386	0.399	0.386
	(2.16)	(1.28)	(1.36)	(1.15)	(1.19)	(2.44)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	0.786	0.509	0.612	0.387	0.381	0.405
	(1.97)	(1.30)	(1.59)	(1.07)	(1.03)	(2.49)

Table A.5

Returns of the environment pillar quintile portfolios of STOXX 600 firms

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains the EU stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	Low-*Env*	$Q2$	$Q3$	$Q4$	High-*Env*	$L-H$
Ex-Ret (%)	1.209	0.942	0.925	0.768	0.634	0.575
	(3.09)	(2.64)	(2.59)	(2.22)	(1.75)	(3.31)
	FF3FM					
$\alpha_{i,t}$	0.741	0.523	0.512	0.342	0.168	0.573
	(2.34)	(1.77)	(1.68)	(1.22)	(0.58)	(3.59)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	0.790	0.502	0.429	0.384	0.221	0.569
	(2.13)	(1.50)	(1.25)	(1.22)	(0.66)	(2.78)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	0.870	0.551	0.506	0.436	0.288	0.582
	(2.28)	(1.60)	(1.44)	(1.32)	(0.84)	(2.73)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.005	0.637	0.538	0.378	0.319	0.686
	(2.45)	(1.71)	(1.37)	(1.05)	(0.83)	(3.07)

Table A.6
Returns of the social pillar quintile portfolios of STOXX 600 firms

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains the EU stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	*L*ow-*Soc*	*Q*2	*Q*3	*Q*4	*H*igh-*Soc*	*L*−*H*
Ex-Ret (%)	1.229	0.954	0.767	0.717	0.784	0.446
	(3.18)	(2.53)	(2.06)	(2.00)	(2.32)	(2.74)
	FF3FM					
$\alpha_{i,t}$	0.768	0.492	0.295	0.288	0.370	0.398
	(2.52)	(1.60)	(1.00)	(0.95)	(1.33)	(2.67)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	0.707	0.625	0.303	0.305	0.362	0.345
	(2.04)	(1.79)	(0.90)	(0.89)	(1.16)	(2.17)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	0.756	0.661	0.333	0.366	0.459	0.298
	(2.10)	(1.84)	(0.96)	(1.04)	(1.41)	(1.84)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	0.688	0.800	0.408	0.312	0.498	0.189
	(1.74)	(2.08)	(1.09)	(0.80)	(1.40)	(1.12)

Table A.7
Returns of the governance pillar quintile portfolios of STOXX 600 firms

At the end of June each year, we classify stocks into value-weighted quintile portfolios and rebalance them after 12 months. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains the EU stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

Panel C: Governance Pillar						
	*L*ow-*Gov*	*Q*2	*Q*3	*Q*4	*H*igh-*Gov*	*L*−*H*
Ex-Ret (%)	0.984	0.979	0.927	0.931	0.558	0.426
	(2.56)	(2.73)	(2.63)	(2.70)	(1.54)	(2.77)
	FF3FM					
$\alpha_{i,t}$	0.537	0.552	0.522	0.514	0.079	0.458
	(1.67)	(1.86)	(1.72)	(1.84)	(0.28)	(3.01)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	0.565	0.545	0.496	0.479	0.138	0.428
	(1.53)	(1.65)	(1.44)	(1.53)	(0.43)	(2.47)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	0.637	0.625	0.566	0.556	0.183	0.454
	(1.68)	(1.83)	(1.58)	(1.75)	(0.55)	(2.55)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	0.663	0.576	0.685	0.593	0.181	0.481
	(1.61)	(1.51)	(1.70)	(1.74)	(0.50)	(2.42)

Table A.8

Returns of the *ESG* quintile portfolios across low- and high-*TO* sub-samples

Liquidity is measured as the turnover (*TO*). We classify the sample of UK stocks into three *TO*-based groups, and then classify stocks in each of the three *TO* groups into value-weighted quintile portfolios based on the *ESG* combined score. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	Low-*ESG*	*Q*2	*Q*3	*Q*4	*H*igh-*ESG*	*L*−*H*
			Panel A: The low-*TO* sub-sample			
Ex-Ret (%)	1.254	1.146	0.935	1.335	1.551	-0.297
	(2.46)	(2.07)	(1.79)	(2.73)	(2.74)	(-0.91)
			FF3FM			
$\alpha_{i,t}$	1.047	0.895	0.646	1.161	1.264	-0.217
	(2.28)	(1.89)	(1.39)	(2.45)	(2.66)	(-0.70)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	1.170	1.120	0.877	1.084	1.840	-0.670
	(2.12)	(1.49)	(1.50)	(2.19)	(2.36)	(-1.46)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	1.188	1.139	0.894	1.098	1.858	-0.670
	(2.35)	(1.62)	(1.63)	(2.38)	(2.56)	(-1.46)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	1.230	1.233	1.015	0.975	1.925	-0.695
	(2.18)	(1.48)	(1.75)	(2.09)	(2.24)	(-1.32)
			Panel B: The high-*TO* sub-sample			
Ex-Ret (%)	1.863	1.391	0.929	0.619	0.678	1.185
	(4.99)	(3.25)	(2.21)	(1.79)	(2.39)	(3.32)
			FF3FM			
$\alpha_{i,t}$	1.775	1.204	0.788	0.509	0.595	1.180
	(4.98)	(3.18)	(2.06)	(1.53)	(2.12)	(3.38)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	1.716	1.254	0.651	0.383	0.474	1.242
	(4.73)	(2.69)	(1.70)	(0.99)	(1.49)	(3.22)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	1.727	1.271	0.660	0.393	0.479	1.248
	(4.98)	(2.98)	(1.76)	(1.08)	(1.56)	(3.23)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	1.718	1.272	0.607	0.338	0.448	1.270
	(5.15)	(2.69)	(1.53)	(0.86)	(1.38)	(3.42)

Table A.9

Returns of the environment pillar quintile portfolios across low- and high-*TO* sub-samples

Liquidity is measured as the turnover (*TO*). We classify the sample of UK stocks into three *TO*-based groups, and then classify stocks in each of the three *TO* groups into value-weighted quintile portfolios based on the *ESG* combined score. *Ex*-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	Low-*Env*	*Q*2	*Q*3	*Q*4	High-*Env*	*L*−*H*
Panel A: The low-*TO* sub-sample						
Ex-Ret (%)	1.457	1.427	0.723	1.228	1.370	0.087
	(3.07)	(3.09)	(1.49)	(2.79)	(2.43)	(0.23)
	FF3FM					
$\alpha_{i,t}$	1.255	1.280	0.462	1.075	1.108	0.147
	(2.92)	(2.95)	(1.05)	(2.58)	(2.22)	(0.39)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.420	1.361	0.560	1.184	1.345	0.075
	(2.76)	(2.52)	(1.12)	(2.39)	(2.04)	(0.18)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.439	1.398	0.580	1.195	1.362	0.077
	(3.09)	(2.73)	(1.30)	(2.55)	(2.22)	(0.19)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.443	1.372	0.766	1.186	1.241	0.202
	(2.75)	(2.53)	(1.62)	(2.32)	(1.74)	(0.44)
Panel B: The high-*TO* sub-sample						
Ex-Ret (%)	1.581	1.658	1.251	0.789	0.548	1.034
	(4.17)	(4.52)	(3.35)	(1.80)	(1.95)	(3.28)
	FF3FM					
$\alpha_{i,t}$	1.457	1.590	1.138	0.660	0.450	1.007
	(4.19)	(4.54)	(3.21)	(1.58)	(1.65)	(3.37)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.461	1.570	1.099	0.538	0.305	1.156
	(3.62)	(4.33)	(2.76)	(1.26)	(0.98)	(3.50)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.475	1.633	1.109	0.548	0.311	1.163
	(3.92)	(4.78)	(2.92)	(1.32)	(1.05)	(3.58)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.471	1.545	1.149	0.514	0.264	1.206
	(3.51)	(4.78)	(2.87)	(1.18)	(0.82)	(3.56)

Table A.10

Returns of the social pillar quintile portfolios across low- and high-TO sub-samples

Liquidity is measured as the turnover (TO). We classify the sample of UK stocks into three TO-based groups, and then classify stocks in each of the three TO groups into value-weighted quintile portfolios based on the ESG combined score. Ex-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	Low-Soc	$Q2$	$Q3$	$Q4$	High-Soc	$L-H$
			Panel A: The low-TO sub-sample			
Ex-Ret (%)	1.467	1.197	1.019	1.157	1.232	0.234
	(3.21)	(2.75)	(2.33)	(2.46)	(2.24)	(0.62)
			FF3FM			
$\alpha_{i,t}$	1.324	1.029	0.868	0.945	0.940	0.384
	(3.15)	(2.59)	(2.06)	(2.34)	(1.95)	(1.06)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	1.425	1.149	0.865	1.186	1.185	0.240
	(2.80)	(2.35)	(1.71)	(2.00)	(2.02)	(0.56)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	1.438	1.164	0.879	1.207	1.199	0.239
	(2.99)	(2.58)	(1.85)	(2.30)	(2.18)	(0.56)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	1.417	1.250	0.934	1.238	1.144	0.273
	(2.64)	(2.56)	(1.91)	(1.98)	(1.82)	(0.57)
			Panel B: The high-TO sub-sample			
Ex-Ret (%)	1.871	1.518	1.157	0.834	0.564	1.307
	(5.12)	(3.53)	(2.87)	(2.21)	(1.99)	(4.03)
			FF3FM			
$\alpha_{i,t}$	1.783	1.382	1.030	0.738	0.463	1.320
	(5.21)	(3.45)	(2.68)	(2.03)	(1.69)	(4.21)
			Momentum-extended FF3FM			
$\alpha_{i,t}$	1.718	1.495	0.768	0.610	0.338	1.380
	(4.63)	(3.57)	(2.00)	(1.59)	(1.07)	(4.00)
			Betting against beta-extended FF3FM			
$\alpha_{i,t}$	1.731	1.510	0.775	0.614	0.345	1.385
	(4.95)	(3.85)	(2.04)	(1.63)	(1.15)	(4.02)
			Quality-minus-junk-extended FF3FM			
$\alpha_{i,t}$	1.757	1.369	0.666	0.718	0.281	1.476
	(4.92)	(3.71)	(1.68)	(1.87)	(0.86)	(4.38)

Table A.11

Returns of the governance pillar quintile portfolios across low- and high-TO sub-samples

Liquidity is measured as the turnover (TO). We classify the sample of UK stocks into three LM-based groups, and then classify stocks in each of the three TO groups into value-weighted quintile portfolios based on the ESG combined score. Ex-Ret denotes the monthly returns in excess of the risk-free rate. $R_{i,t}$ denotes portfolio i's monthly returns, $R_{f,t}$ denotes the risk-free rate, $f_{MKT,t}$ denotes the market factor, $f_{SMB,t}$ denotes the Fama–French size factor, $f_{HML,t}$ denotes the book-to-market factor, $f_{WML,t}$ denotes the momentum factor, $f_{BAB,t}$ denotes the betting against beta factor, and $f_{QMJ,t}$ denotes the quality-minus-junk factor. The testing sample contains UK stocks from July 2003 to December 2020 (210 months). t-statistics (in parentheses) are calculated according to the White (1980) heteroskedasticity-consistent standard errors.

	Low-Gov	$Q2$	$Q3$	$Q4$	High-Gov	$L-H$
Panel A: The low-TO sub-sample						
Ex-Ret (%)	0.884	1.511	1.315	1.167	1.304	-0.420
	(1.82)	(3.22)	(2.95)	(2.12)	(2.36)	(-1.13)
	FF3FM					
$\alpha_{i,t}$	0.713	1.359	1.136	0.954	0.994	-0.282
	(1.56)	(2.93)	(2.88)	(1.94)	(2.10)	(-0.77)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	0.715	1.389	1.239	1.212	1.299	-0.584
	(1.21)	(2.82)	(2.47)	(1.83)	(2.04)	(-1.62)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	0.730	1.403	1.253	1.232	1.315	-0.584
	(1.32)	(3.04)	(2.71)	(2.04)	(2.21)	(-1.62)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	0.855	1.273	1.224	1.091	1.393	-0.538
	(1.43)	(2.83)	(2.23)	(1.53)	(2.09)	(-1.51)
Panel B: The high-TO sub-sample						
Ex-Ret (%)	1.547	1.279	1.378	0.701	0.599	0.948
	(3.17)	(2.94)	(3.95)	(2.17)	(2.06)	(2.14)
	FF3FM					
$\alpha_{i,t}$	1.341	1.241	1.283	0.612	0.495	0.846
	(3.02)	(3.04)	(3.82)	(1.94)	(1.76)	(1.99)
	Momentum-extended FF3FM					
$\alpha_{i,t}$	1.378	1.165	1.108	0.433	0.344	1.034
	(2.97)	(2.43)	(2.85)	(1.05)	(1.14)	(2.36)
	Betting against beta-extended FF3FM					
$\alpha_{i,t}$	1.392	1.178	1.111	0.439	0.351	1.041
	(3.20)	(2.60)	(2.87)	(1.10)	(1.21)	(2.41)
	Quality-minus-junk-extended FF3FM					
$\alpha_{i,t}$	1.311	1.082	1.255	0.471	0.273	1.037
	(2.94)	(2.08)	(3.14)	(1.10)	(0.89)	(2.39)