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"The Impact of Liquidity on ESG and SRI Performance: Empirical Evidence from European Equities"

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1. Abstract

This study examines the impact of market liquidity on the financial performance of sustainable investments, focusing on the European equity market from 2014 to 2024. Using metrics such as bid-ask spreads and trading volumes alongside macroeconomic factors, the analysis reveals that higher sustainability scores are associated with improved liquidity but lower risk-adjusted returns, suggesting a trade-off due to the illiquidity premium. Findings challenge assumptions of superior sustainable performance and emphasize context-dependent resilience during crises. These results inform investors and policymakers of the critical role of liquidity in sustainable finance.

Keywords: European Equities, Sustainability, ESG, SRI, Liquidity, Factor Analysis, Performance

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3. Introduction

The growing prominence of sustainable finance—exemplified by the increasing integration of environmental, social, and governance (ESG) criteria and socially responsible investing (SRI) principles—has sparked ongoing debate about its effect on financial performance. While some studies suggest that sustainability-oriented approaches may yield long-term risk-adjusted benefits (Friede, Busch, and Bassen 2015), others find mixed or negative outcomes (Trinks and Scholtens 2017). Although various factors influencing these results have been examined, one critical dimension remains less explored: market liquidity.

Liquidity is widely recognized as fundamental to market efficiency and transaction cost reduction. Yet, whether liquidity-related advantages apply uniformly to ESG and SRI portfolios, which often adhere to stricter selection criteria and regulatory expectations, remains unclear. The lack of comprehensive insight is especially significant in the European equity market context, where shifting disclosure regulations and changing investor preferences transform capital allocation dynamics.

This study addresses this issue by investigating the impact of liquidity on the financial performance of ESG and SRI investments in the European equity market over a ten-year period (2014-2024). It employs key liquidity measures—such as bid-ask spreads and trading volumes—alongside macroeconomic indicators, to assess whether liquidity alters the relationship between sustainability scores and investment outcomes.

By contributing empirical evidence on the interplay between sustainability ratings and liquidity conditions, this study advances theoretical discussions within sustainable finance. Practically, it informs investors, regulators, and corporate managers about the conditions under which sustainable strategies may achieve favorable, stable returns. The subsequent chapters present the literature review, methodological framework, empirical findings, and insights derived from this comprehensive analysis.

4. Literature Review

4.1 Sustainable Investing Methodologies and Market Development

SRI serves as a framework that integrates non-financial factors into investment decision-making, reflecting sustainable and ethical considerations in the investment process (Staub-Bisang 2012). Historically, SRI practices are rooted in religious considerations, with early examples such as the Quakers (18th century) who abstained from investing in weapons and slavery (Hill 2020, 14) and transformed into further exclusions of non-ethical sectors such as tobacco or gambling (Hill 2020, 16). Given examples characterize the SRI practice of excluding specific investment options—called negative screening—to adjust the investment universe with non-financial considerations. SRI criteria can be used for any investment style (Berry and Junkus 2013). Thus, it is applicable to the European equity market concerned in this paper.

ESG investing builds upon a different idea, assuming that including ESG risks leads to a better understanding and anticipation of risks and regulation (Friede, Busch, and Bassen 2015). Compared to normal financial analysis, ESG incorporates three non-financial risk pillars (E), (S), (G) to create an additional financial return and to promote sustainable, positive changes in society (van Duuren, Plantinga, and Scholtens 2016). In practice, the three pillars host a variety of factors, colluding into an ESG rating (Gerard 2019). With ranking equities across given factors, ESG is considered a positive screening method, as it does not broadly exclude sectors (as in negative screening) but selects equities (Trinks and Scholtens 2017). While traditionally following different approaches, ESG and SRI cannot be categorized as solely positive or negative screening nor mutually exclusive, as both strategies are often integrated in practice to construct a portfolio (van Duuren, Plantinga, and Scholtens 2016).

Although ethical considerations in investing have historical roots, sustainable investing gained significant traction only in the early 2000s (Dunfee 2003; Krosinsky and Purdom 2016),

fueled by demographic shifts. According to Gomes et al. (2023), Generation Z is driving sustainability, demanding deeper integration of sustainable factors, with older generations also showing increased interest (Howarth and Norgaard 1992).

This surge in popularity materializes through initiatives like the UN Principles for Responsible Investment (UNPRI), a set of voluntary investment principles encouraging responsible investment practices, now overseeing over $120 trillion in assets (PRI 2021). Moreover, regulators introduced measures like the EU's Sustainable Finance Disclosure Regulation (SFDR) to mandate transparency in sustainable investments and the Corporate Sustainability Reporting Directive (CSRD) to standardize corporate sustainability disclosures (European Commission 2020; Busch 2023). However, ESG rating inconsistencies persist (Berg, Koelbel, and Rigobon 2019; Chatterji et al. 2016). To date, initiatives by the ISSB and ISO (Freshfields Bruckhaus Deringer 2023; ISO 2022) aim to standardize sustainability reporting, potentially improving comparability and investment performance (Nofsinger, Sulaeman, and Varma 2019), hence highlighting the topic's relevance.

4.2 Financial Returns of Sustainable Investments

The impact of integrating sustainable factors in the investment decision process on investment returns remains a focus of academic discussions, with numerous studies backtesting returns and examining risk characteristics (Friede, Busch, and Bassen 2015). To date, research findings on the performance of sustainable investment frameworks remain mixed, with evidence of both over- and underperformance depending on market conditions and the chosen timeframes (Friede, Busch, and Bassen 2015; Muñoz, Vargas, and Marco 2014).

Analyzing negative screening, reasons for outperformance can be enhanced risk characteristics due to the exclusion of controversial sectors (Kiymaz 2019) or below-market cost of equity (Akala, Neuhaus, and Leary-Govender 2022). On the other hand, underperformance can result from a limited investment universe (Trinks and Scholtens 2017;

Chatzitheodorou et al. 2019), potentially excluding potent investment options and/or leading to limited diversification (Auer 2016).

The factors on performance for positive screening overlap in part, with overperformance being promoted by long-term incentive alignment (Ameer and Othman 2012; Clark, Feiner, and Viehs 2015), as discussed by the stakeholder theory (Harrison and Wicks 2013). Yet, underperformance can be the result of mispriced assets causing diminished alphas due to preferred investor selection, the risk of greenwashing, or deviating sector allocations (Gavrilakis and Floros 2024; Pástor, Stambaugh, and Taylor 2021).

In addition to generalized answers to performance characteristics of sustainable investments, Ibikunle and Steffen (2017) discovered changing return patterns under varying circumstances. Their study found sustainable funds underperforming historically, but progressively overperforming in recent years. Furthermore, studies show no statistically significant alpha under normal market conditions for either investment type, but overperformance for green funds in times of crisis (Lins, Servaes, and Tamayo 2017) and under positive ESG shocks (Pástor, Stambaugh, and Taylor 2021), in particular for green US asset managers and limited excess returns for green EU asset managers (Muñoz, Vargas, and Marco 2014). Deviating performance in times of crisis can partially be attributed to changing investor behavior and diminished performance expectations for sustainable investments from investors (Riedl and Smeets 2017; Bollen 2007).

Further potential implications are enhanced firm/stakeholder relations and increased confidence in both performance and liquidity characteristics (Eccles, Ioannou, and Serafeim 2014), indicating potential for a positive impact on financial returns (Amel-Zadeh and Serafeim 2018). However, despite given academic literature, the complex and interdependent nature of financial markets highlights the demand for further research to disentangle the effects of ESG factors and liquidity on investment performance.

4.3 Impact of External Events on Sustainable Investment Performance

Significant external events, such as wars or global pandemics (e.g., COVID-19), have shaped sustainable performance in the European equity market. For instance, the 2016 Brexit referendum created substantial policy uncertainty, undermining investor confidence and destabilizing markets (Davies and Studnicka 2018; Bloom et al. 2019). This heightened uncertainty, reduced investment, and increased market volatility (Gulen and Ion 2016).

The onset of the COVID-19 pandemic in 2020 further disrupted global financial markets, highlighting the resilience of companies with strong corporate social responsibility (CSR) practices during a system crisis, as suggested by Lins, Servaes, and Tamayo (2017) and Albuquerque et al. (2020). High-CSR-rated companies experienced more moderate stock price declines, suggesting protective ESG characteristics amid periods of market turmoil.

In addition to COVID-19, regulatory developments and US elections had a pivotal influence on equity markets. With the Elections setting the stage for the implementation of SFDR in March 2021, aiming to enhance transparency and combat greenwashing (European Commission 2021; Busch, Bauer, and Orlitzky 2016), consequently impacting investor preferences and capital allocation, particularly toward firms with higher ESG ratings (Amel-Zadeh and Serafeim 2018).

Recent academic papers again highlight ESG specific characteristics in light of the Russia-Ukraine war. Deng, Leippold, Wagner, and Wang (2022) found that stocks positioned to benefit from low-carbon opportunities gained in Europe, likely due to expectations of strengthened policies supporting renewable energy in response to Europe's dependency on Russian energy resources, while US stocks experienced opposing effects on valuation.

In sum, external events—whatever the direction and characteristic—can have a significant impact on ESG-specific performance by altering investor behavior, market dynamics, and liquidity conditions within the European equity market.

4.4 Defining Market Liquidity

In the context of financial markets, market liquidity is the ability to buy or sell assets without materially altering their market prices. Narrow bid-ask spreads, large trading volumes, and seamless transactions are all signs of strong liquidity (IMF 2002), allowing for effective market operations, hence drawing in investors (Pástor and Stambaugh 2003). Amihud and Mendelson (1986) assert that liquidity has a direct bearing on the needed rate of return on investment, as wider bid-ask spreads reflect higher transaction costs and less liquidity (Harris 2002), highlighting the significance in the assessment of financial assets (Kyle 1985). In conjunction with that finding, Guo et al. (2017) prove a stock market illiquidity premium, pricing the increased cost and risk.

There are two types of liquidity factors: microeconomic and macroeconomic. Asset-specific attributes including market capitalization, volatility, and trading volume are considered microeconomic factors. For example, Chordia, Roll, and Subrahmanyam (2001) noted that the US equity market displays advantageous trading conditions because of its strong liquidity and narrow bid-ask spreads, allowing investors to trade big quantities with little price volatility. Earlier, Grossman and Miller (1988) tested a similar hypothesis, proving a significant impact on liquidity through frequency of trades and number of market participants. Consistent with prior findings, Pástor and Stambaugh (2003) confirm a positive link between performance and liquidity sensitivity, driven by a systematic liquidity risk premium.

On the other hand, macroeconomic considerations encompass more general economic conditions like inflation, interest rates, and economic growth (explained in 4.5).

To conclude, equity performance is affected by both macro- and micro-factors. Therefore, to maintain ideal liquidity levels and navigate the complexity of market dynamics, investors and policymakers must altercate critically.

4.5 Macro Indicators and External Events Impacting Liquidity

In the context of the European equity market, macroeconomic indicators play a pivotal role in shaping market liquidity and overall financial performance. Due to varying economic policies, regulatory environments, and market structures across European nations, liquidity and equity performance can fluctuate significantly (Chordia, Roll, and Subrahmanyam 2001). For a comprehensive understanding of market dynamics, it is essential to incorporate macroeconomic liquidity metrics alongside microeconomic indicators. This study integrates the following four key macroeconomic indicators (see Appendix 1):

1) Interest Rates significantly influence liquidity by shaping borrowing costs and investment activity. Lower rates—often coupled with quantitative easing—boost liquidity by reducing costs and encouraging trading (Brunnermeier and Pedersen 2009). Higher rates, however, tighten liquidity by raising costs and dampening confidence (Chordia, Roll, and Subrahmanyam 2001). The European Central Bank's (ECB) monetary policy adjusts rates and employs quantitative easing to manage inflation and liquidity (ECB 2024).

2) Inflation notably impacts liquidity. High inflation erodes purchasing power, dampens investor sentiment, and lowers trade volumes, reducing liquidity (Fama and French 1993). Conversely, moderate inflation encourages investment and economic activity, enhancing liquidity. As inflation cannot be directly controlled, it shapes ECB policies aimed at indirectly influencing inflation and stabilizing liquidity.

3) Broad Money Supply (M3) measures the total money circulating in an economy. A decline in M3 signals reduced liquidity, whereas an increase expands capital and stimulates trading activity (Lucas 2000). During recessions, the ECB may implement contractionary measures, while in contrasting scenarios, it may expand M3 to enhance liquidity and drive economic activity.

4) The Inflation Target Rate reflects the optimal inflation level set by the ECB.

Adjustments to this rate signal policy shifts with direct impact on financial markets (ECB 2024).

Significant external events—as defined in 4.3—further exacerbate liquidity risks. These events disrupt supply chains, increase uncertainty, and heighten volatility, causing markets to experience sudden liquidity shocks (Baker et al. 2020). The COVID-19 pandemic, for example, led to unprecedented market turbulence as governments imposed lockdowns, and central banks had to intervene with aggressive stimulus measures to stabilize liquidity (Goodell 2020).

Discussed macroeconomic factors are strongly interdependent, and their interplay during external events or policy shifts often heightens market uncertainty, impacting liquidity (Chordia, Roll, and Subrahmanyam 2001; Gulen and Ion 2016). Pastor and Veronesi (2010) highlight that increased uncertainty drives liquidity fluctuations as market participants become more risk-averse. Disruptive events further influence investor sentiment, confidence, and risk perceptions, prompting changes in trading behavior and liquidity (Fama and French 1993).

In conclusion, the complex interactions among discussed macroeconomic indicators and external events underscore the need for a holistic approach to analyzing liquidity in European equity markets—particularly within sustainable investment frameworks. Recognizing this interdependence enables more accurate anticipation of market volatility, assessment of policy changes, and navigation of global disruptions, ultimately supporting more resilient and sustainable market outcomes.

5. Research Methodology

This section outlines the methodological framework employed to examine the impact of liquidity on the financial performance of sustainable investments within the European equity market. The methodology encompasses data collection, data preparation, and analytical procedures, ensuring a systematic and rigorous investigation.

5.1 Research Approach

The study employs an empirical, quantitative research design. This approach is suitable

for examining the relationships among financial performance, liquidity, and ESG ratings, allowing for statistical analysis and objective conclusions. The hypothesis is:

- **H1**: Liquidity factors significantly influence the financial performance and volatility of sustainable investments compared to conventional investments in the European equity market.

The study covers a ten-year period from June 2014 to May 2024. This period was selected to capture long-term trends and account for the increased prominence of both ESG and SRI investments in the European equity market.

5.2 Data Collection

To represent the European equity market comprehensively, three ETFs were selected:

1. iShares MSCI Europe ESG Screened UCITS ETF EUR (Acc) - IE00BFNM3D14
2. iShares MSCI Europe SRI UCITS ETF (Acc) - IE00B52VJ196
3. iShares Core MSCI Europe UCITS ETF EUR (Acc) - IE00B4K48X80

These ETFs were chosen due to their extensive market coverage, the ESG and SRI focus, and consistent underlying index (MSCI Europe Index), facilitating comparative analysis. Moreover, the ETFs have sufficient historical data, resulting in an initial pool of 935 equities.

Financial, Economic, and Sustainable data, including monthly closing prices, bid-ask spreads, trading volumes, market capitalization, ESG ratings, and macroeconomic indicators, were sourced from Refinitiv Datastream, a reputable financial database known for its comprehensive coverage and accuracy. Refinitiv's ESG ratings are standardized and based on company-reported data and controversies. Macroeconomic indicators, such as M3 money supply, inflation rates, policy interest rates, and the inflation target rate, were collected from Refinitiv and supplemented with data from the Federal Reserve Economic Data database.

5.3 Data Preparation

The raw dataset underwent rigorous cleaning and preparation to ensure accuracy and

reliability. The first step involved the removal of irrelevant data. Holdings in non-equity instruments such as currencies and financial derivatives were excluded to prevent distortion of performance metrics. The criteria for removal included any asset not classified as equity, resulting in a removal of holdings constituting less than 1% of the total ETF assets.

Handling missing data was a critical aspect of data preparation. Equities with significant missing data were excluded to maintain data integrity, while for equities with minimal missing data, interpolation methods were employed, calculating averages of adjacent data points to estimate missing values (Drettakis 1973).

Duplicate entries were identified and addressed to prevent skewed results. Equities listed multiple times due to dual listings or different share classes were consolidated using their International Securities Identification Numbers (ISINs), ensuring a unique representation.

Currency standardization was necessary because the equities were denominated in various currencies. All financial data was converted to Euro using historical exchange rates provided by Refinitiv, ensuring consistency across the dataset, and facilitating comparisons.

Adjustments for corporate actions were also performed. Prices were adjusted for stock splits, dividends, and other corporate actions to reflect true performance and maintain comparability. This process ensured that the calculated returns accurately represented the investment performance over the period.

Following data cleaning, the final dataset comprised 426 individual equities.

5.3.1 Calculation of Key Financial Metrics

To analyze the relationships between ESG ratings, liquidity, and financial performance, several key financial metrics were calculated.

Monthly returns were determined using the month-on-month percentage change in closing prices. Using the geometric mean of returns, the study accounts for compounding effects throughout the ten-year period (Bicksler, Barnea, and Babad 1973):

$$\text{Geometric Mean}^{1} = \left(\prod_{i=1}^{n} x_i \right)^{\frac{1}{n}} \quad (1)$$

Volatility (σ) was measured as the standard deviation of monthly, providing insights into the risk associated with each equity. Using σ, the Sharpe Ratio was computed to assess risk-adjusted returns, taking the ECB policy rate as the risk-free rate. The Sharpe Ratio is calculated as (Lo 2002):

$$\text{Sharpe Ratio}^{2} = \frac{R_p - R_f}{\sigma_p} \quad (2)$$

5.3.2 Liquidity Measures

Liquidity was evaluated using two key metrics: the bid-ask spread and the market-capitalization-adjusted volume (MCAV). These liquidity measures provided insights into the ease of trading an equity without causing significant price fluctuations.

The bid-ask spread was calculated as the difference between the ask price (AP) and the bid price (BP), expressed as a percentage of the mid-price (MP), which represents the average of the bid and ask prices. This measure reflects the transaction costs associated with trading the equity and is given by (Copeland and Galai 1983):

$$\textit{Bid-Ask Spread (\%)} = \frac{\text{Ask Price} - \text{Bid Price}}{\text{Mid Price}} \times 100 \quad (3)$$

MCAV was determined by dividing the trading volume (TV) with the market capitalization (MC), adjusting for the company's size, and allowing for comparability across equities. It is calculated as (Brown, Crocker, and Foerster 2009):

$$\textit{MCAV (\%)} = \frac{TV}{MC} \times 100 \quad (4)$$

5.3.3 ESG Decile Formation

Equities were sorted into Deciles based on their ESG scores to facilitate comparative analysis. ESG ratings were recalculated annually to capture changes in company performance

[1] where n is the total number of values, x_i represents each data point, and i is the index ranging from 1 to n.

[2] where Rp is the average return of equity, Rf is the risk-free rate, and σ is the standard deviation of returns.

and reflect the dynamic nature of ESG factors. For each year, equities were ranked in ESG Deciles from lowest (1) to highest (10), to allow for a granular analysis of ESG performance.

5.3.4 Control Variables

To enhance the robustness of the analysis, control variables were incorporated. The Fama-French three-factor model (FF3fm) was utilized to adjust returns for market risk, size, and value factors. Data for the factors—market excess return (Mkt-Rf), small minus big (SMB), and high minus low (HML)—were obtained from Kenneth R. French's data library (see Appendix 2). This model is specified as (Fama and French 2004):

$$FF3fm^{3} = R_i - Rf = \alpha_i + \beta_{i1}\,(Rm - Rf) + \beta_{i2}\,SMB + \beta_{i3}\,HML + \epsilon_i \quad (5)$$

Macroeconomic indicators such as inflation rate, interest rate, M3 money supply, and inflation target rate were included to control for broader economic influences on equity performance. These variables help isolate the effect of liquidity on ESG performance by accounting for external economic factors.

Additionally, sector and geographic attributions were analyzed to further dismantle the sustainability-driven aspects of performance.

5.4 Analytical Procedures and Statistical Significance

The study employed a suite of statistical techniques to analyze the data. Descriptive statistics were calculated and plotted to understand their distributions and identify any anomalies and correlations, providing a foundation for more advanced statistical tests.

The Fama-French regression was applied to each ESG Decile to calculate α[4] and assess the significance of liquidity factors. This model adjusts returns for market risk factors,

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[3] Where R_i is the return asset i, Rf is the risk-free rate, Rm is the market return, α_i is the intercept, β_{i1}, β_{i2}, β_{i3} are the factor loadings, and ϵ_i is the error term.

[4] Alpha (α) measures the excess return compared to a pre-selected benchmark with no additional risk.

providing a clearer picture of liquidity's impact.

Statistical tests were conducted to evaluate the hypotheses. A standard significance level of $p < .05$ (p-value) was used to determine the statistical significance of the regression coefficients. Coefficients and p-values from the regression analyses were interpreted to understand the relationships between variables.

5.5 Further Considerations & Conclusion

The study adhered to ethical standards in data usage and reporting, employing publicly available or licensed databases in full compliance with data protection regulations. Methodologies and analytical procedures were well-documented, enabling replication and verification by other researchers. The analysis was conducted impartially, with results transparently reported, regardless of their alignment with the initial hypotheses. This robust methodological framework provides a solid foundation for exploring the impact of liquidity on sustainable investment performance. By employing rigorous data collection, preparation methods, robust statistical techniques, and addressing potential limitations, the study aims to offer valuable contributions to sustainable finance.

6. Findings

This section presents the empirical findings on how liquidity affects the financial performance of sustainable investments in the European equity market. By analyzing returns, volatility, liquidity measures, macroeconomic influences, and external events, the results provide a comprehensive understanding of the complex interplay between liquidity and sustainable investment performance.

6.1 Evaluating the Relationship of Sustainability and Performance

Despite the integration of non-financial frameworks, financial return remains the key indicator for investment success. Equities were sorted into ESG score Deciles, and average annual returns were calculated over the ten-year period (see Figure 1).

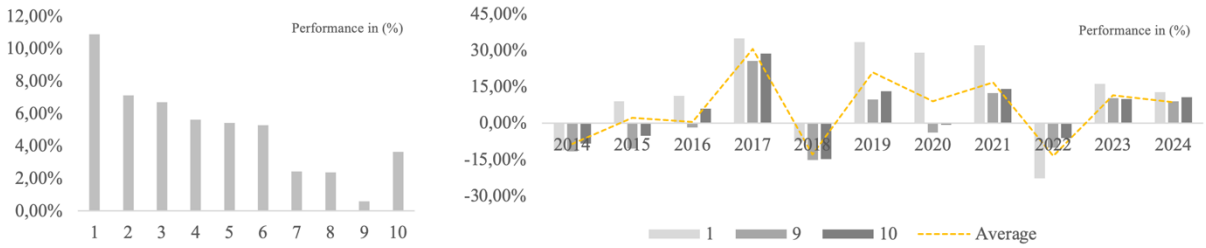

Figure 1: Averaged ESG Decile Returns (2014-2024) (left) and Selected ESG Decile Returns (right)

Examining Figure 1, a negative ESG/Return correlation is revealed across the timeframe, with deviating changes in performance between Deciles. However, Decile 10 outperforms Deciles 7 to 9, representing an inverting slope. The Figure furthermore displays the yearly returns of selected Deciles, suggesting significant influence of the ESG factor on returns. Interestingly, Decile 2 shows a limited correlation to Deciles 9 and 10, indicating potential diversification benefits (for exact ESG Decile return numbers see Appendix 3).

These findings imply that higher ESG ratings do not lead to superior financial returns, challenging existing assumptions in academic literature (e.g., Friede, Busch, and Bassen 2015).

Sector Allocation Delta (Δ)						
Top 10	MSCI Europe	ESG	SRI	ESG Δ	SRI Δ	ESG - SRI Δ
Financials	18,11%	20,68%	18,94%	*2,57%*	*0,83%*	*1,74%*
Industrials	16,56%	16,00%	17,21%	*-0,56%*	*0,66%*	*-1,22%*
Healthcare	15,73%	17,42%	13,66%	*1,69%*	*-2,07%*	*3,76%*
Consumer Discretionary	11,52%	12,17%	16,12%	*0,65%*	*4,60%*	*-3,95%*
Consumer Staples	10,19%	5,81%	6,61%	*-4,38%*	*-3,58%*	*-0,80%*
Information Technology	7,59%	8,69%	9,32%	*1,10%*	*1,73%*	*-0,63%*
Materials	6,11%	5,25%	6,34%	*-0,86%*	*0,23%*	*-1,09%*
Energy	5,60%	4,68%	3,91%	*-0,93%*	*-1,69%*	*0,76%*
Utilities	3,82%	3,99%	1,91%	*0,17%*	*-1,91%*	*2,08%*
Communication Service	3,22%	3,65%	3,66%	*0,43%*	*0,44%*	*-0,01%*

Sector ESG Decile Analysis		
Avg.	Min	Max
4,89	4,59	5,21
5,15	4,86	5,32
5,71	5,16	6,13
5,52	5,31	5,76
6,10	5,92	6,42
4,45	4,24	5,00
6,96	6,71	7,20
6,58	6,23	7,08
5,66	5,09	6,41
5,30	4,79	6,17

Sector Performance Analysis		
Avg.	Min	Max
4,56%	-16,17%	29,41%
9,04%	-15,35%	36,00%
11,21%	-19,88%	35,96%
7,12%	-21,53%	37,35%
3,16%	-9,82%	23,09%
19,05%	-31,23%	54,33%
7,22%	-23,16%	41,46%
5,31%	-24,85%	31,17%
4,17%	-10,14%	23,89%
0,77%	-17,57%	21,54%

Country Allocation Delta (Δ)						
Top 10	MSCI Europe	ESG	SRI	ESG Δ	SRI Δ	ESG/SRI Δ
United Kingdom	21,15%	19,59%	11,86%	*-1,57%*	*-9,30%*	*7,73%*
France	16,57%	17,44%	18,76%	*0,87%*	*2,19%*	*-1,32%*
Switzerland	15,13%	12,84%	19,22%	*-2,29%*	*4,09%*	*-6,38%*
Germany	12,95%	13,52%	8,12%	*0,58%*	*-4,82%*	*5,40%*
Netherlands	9,33%	9,39%	13,11%	*0,06%*	*3,78%*	*-3,72%*
Denmark	5,70%	6,54%	10,81%	*0,84%*	*5,12%*	*-4,27%*
Sweden	4,89%	5,60%	2,16%	*0,71%*	*-2,73%*	*3,44%*
Spain	3,98%	4,36%	2,04%	*0,37%*	*-1,94%*	*2,32%*
Italy	3,68%	4,10%	3,14%	*0,42%*	*-0,55%*	*0,97%*
Finland	1,56%	1,78%	6,29%	*0,22%*	*4,74%*	*-4,52%*

Country ESG Decile Analysis		
Avg.	Min	Max
5,57	5,42	5,78
6,10	5,83	6,25
5,17	4,88	5,48
6,37	5,96	6,82
5,03	4,47	5,82
4,26	4,00	4,53
4,63	4,38	4,85
7,03	6,59	7,41
5,83	5,17	6,32
5,68	5,23	6,08

Country Performance Analysis		
Avg.	Min	Max
3,75%	-11,23%	23,68%
5,50%	-10,14%	34,97%
8,12%	-15,49%	32,64%
6,78%	-18,60%	38,39%
13,40%	-11,27%	55,43%
10,60%	-20,44%	41,79%
9,91%	-23,42%	36,61%
2,92%	-10,10%	30,89%
8,03%	-15,80%	37,86%
4,36%	-12,16%	25,77%

Table 1: Sector and Country Delta Analysis between the MSCI Europe, ESG and SRI (2014-2024)

Table 1 reveals notable shifts in sector and country allocations under ESG and SRI strategies compared to the MSCI Europe, with the sustainable portfolios uniformly increasing their positions in Financials, Consumer Discretionary, and Information Technology while reducing positions in Consumer Staples and Energy. Deviations between ESG and SRI arise in

Healthcare, Materials, and Utilities, revealing Deltas (Δ) between -3.95% and +3.76%.

As for country allocation, SRI and ESG allocations deviate more significantly, in specific in the UK (Δ 7.73%), Switzerland (Δ -6.38%), and Germany (Δ 5.40%).

Deviations in both sector and country weights have direct implications on performance, as average performances deviate up to 18.28% respective 10.48%.

The findings underline the complexity of sustainable investments and their impact on allocations, challenging the assumption of consistently superior returns for high ESG ratings.

To account for ESG-unrelated risk factors, Fama-French α returns were calculated, using the FF3fm (see Appendix 2). The statistical significance of the results was determined at a standard p-value threshold of $p = .05$.

Decile	Alpha (α)	p-value > .05	α (p-value)	R-squared
1	-0,13%	no	0,86	51,71%
2	-0,16%	no	0,78	60,44%
3	0,04%	no	0,94	58,40%
4	-0,52%	no	0,43	53,52%
5	-0,88%	no	0,10	62,79%
6	-0,78%	no	0,24	53,92%
7	-0,99%	no	0,16	50,14%
8	-1,16%	no	0,12	55,32%
9	-1,32%	no	0,06	64,01%
10	-1,39%	yes	0,03	66,55%

Table 2: Monthly Fama-French Analysis on ESG Deciles

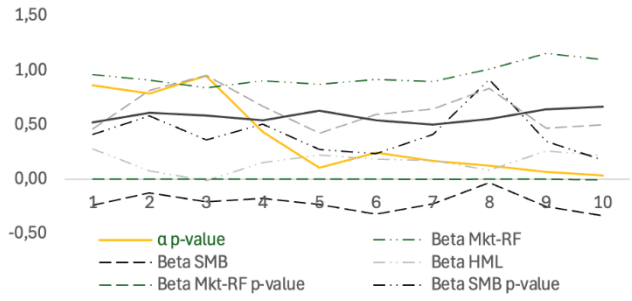

Figure 2: Fama-French individual Factor Analysis and Statistical Significance

As displayed in Table 2, only Decile 10 showed statistical significance with a p-value below .05 and an R^2 of 66.55%. For this Decile, the model reveals a strong negative α, indicating underperformance even after adjusting for market, size, and value factors.

The lack of statistical significance across other Deciles limits further interpretation. However, the significant underperformance in Decile 10 supports the notion that higher ESG ratings may be associated with lower financial returns (see Figure 1), potentially due to enhanced liquidity characteristics (see Figure 4), missing out on the illiquidity market premium, indicating a significant impact of liquidity factors on ESG-specific performance.

6.2 Examining the Correlation of Sustainability with Volatility and Liquidity[5]

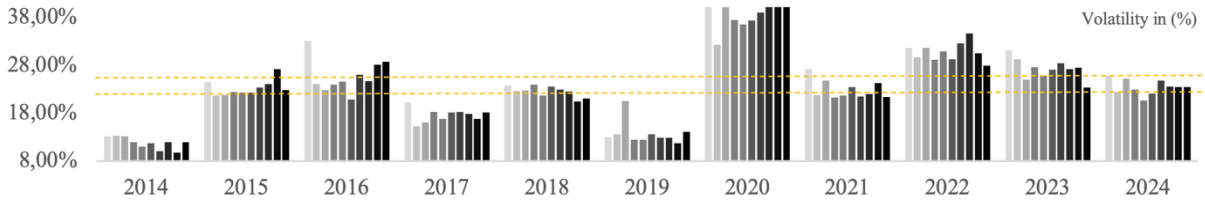

Figure 3: Yearly ESG Decile Volatility (2014 – 2024)

Volatility-Adjusted Return:

	1	2	3	4	5	6	7	8	9	10
Overall Performance:	10,89%	7,14%	6,72%	5,64%	5,43%	5,30%	2,44%	2,36%	0,59%	3,65%
Overall Vola:	25,80%	22,34%	24,28%	22,86%	22,25%	22,68%	23,63%	23,96%	23,79%	23,02%
Risk-free Rate:	0,82%									
Sharpe-Ratio	**0,39**	**0,28**	**0,24**	**0,21**	**0,21**	**0,20**	**0,07**	**0,06**	**-0,01**	**0,12**

Table 3: Risk-Adjusted Returns by ESG Deciles (2014 - 2024)

As financial success is measured as risk-adjusted return (see 5.3.1), volatility was analyzed across ESG Deciles, revealing minimal outliers over the ten-year period. Volatility ranged from approx. 22% to 26% (see Figure 3), with Decile 1 displaying the highest and Decile 2 the lowest volatility. Although no clear pattern or correlation emerged, these observations underscore the variability of ESG Deciles.

Sharpe Ratios, calculated to assess risk-adjusted returns (see Table 3), slightly narrowed performance deviations. However, findings from Section 6.1 remain consistent, showing a continual decline in Sharpe Ratios, except for a trend reversal in Decile 10.

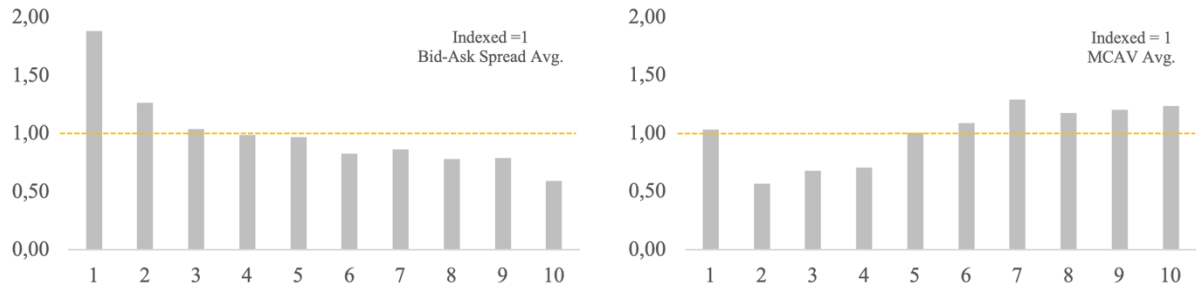

Figure 4: Indexed Bid-Ask Spread Avg. (left) and Indexed MCAV (right) per ESG Decile

As outlined in 5.3.2, this research paper assesses liquidity using the bid-ask spreads and

[5] Bid-Ask spread and volume ESG Deciles are calculated excluding 2024 due to poor data quality from Refinitiv.

MCAV factor. Figure 4 illustrates both, displaying a negative correlation between bid-ask spreads and ESG Deciles. Higher ESG-rated Deciles exhibits lower bid-ask spreads, indicating higher liquidity. This suggests that investments in higher ESG-rated stocks do not face liquidity constraints, as found by Amihud and Mendelson (1986).

While MCAV generally increases towards higher ESG Deciles, the relationship is not consistent. Decile 1 displays higher volume characteristics compared to Deciles 2 to 5, and peak volumes occurrs in Decile 7. This inconsistency indicates that trading volume alone may not fully capture liquidity differences across ESG Deciles.

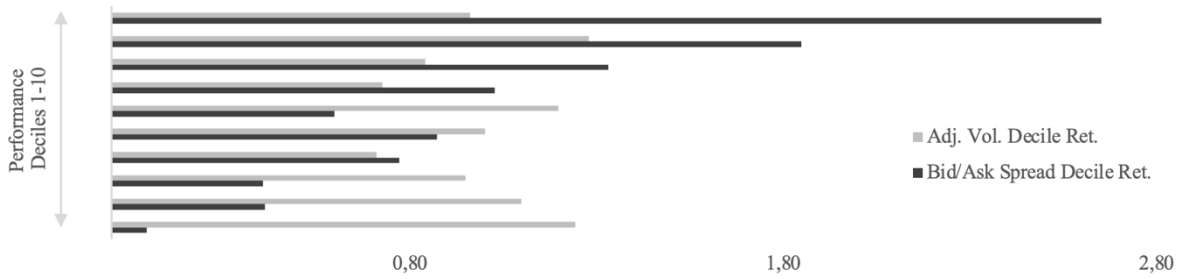

Figure 5: Indexed Performance of Bid-Ask Spread and MCAV Deciles (Deciles represent Performance, not ESG)

As displayed in Figure 5, Decile spreads widen towards increasing performance Deciles, proposing a negative correlation between financial performance and liquidity, while no return pattern can be derived for different MCAV Deciles. Hence, the analysis implies that reduced liquidity, as evidenced by wider bid-ask spreads in lower ESG Deciles (see Figure 4), may contribute to lower returns due to increased transaction costs and reduced ease of trade.

6.3 The Impact of Monetary Policy on Performance per Sustainability Decile

To further analyze the impact of liquidity measures, ESG Decile returns are plotted against macro-factors[6]. Within the process, each macro-factor is split into “up” and “down” categories, depending on the month-on-month change within the factor. Next, the performance

[6] Despite being discussed in 4.5, “Eurozone Inflation Target Rates”, is not analyzed because of the unchanged target rate of 2,00% across the ten-year timeframe.

data is calculated with "+1 month lag", to simulate the real-world circumstances of receiving the data end-of-month.

To interpret Figure 6 accurately, it is important to focus beyond absolute Decile performance, as omitted variables (e.g. varying timeframes, lack of factor isolation) prevent a direct analysis of absolute performance and deviations under increasing/decreasing macroeconomic factors. Instead, meaningful insights arise by comparing factor performances to the general Decile return and analyzing relative changes across Deciles.

	M3	Policy Rate	Policy Target Rate	CPI
UP	102	10	0	55
DOWN	17	109	119	64

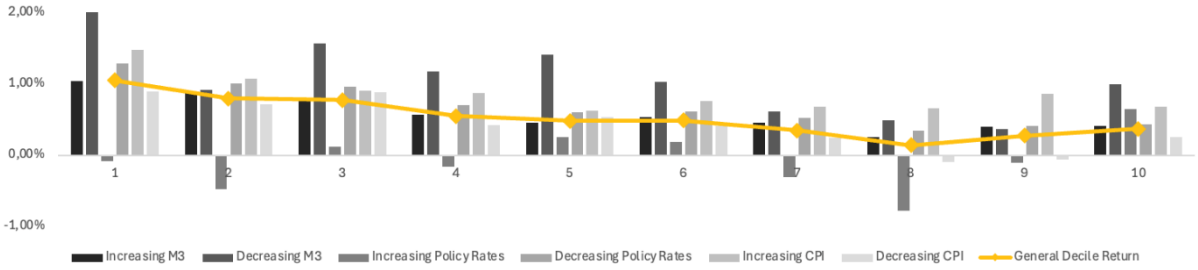

Figure 6: Performance Delta by ESG Decile to Macroeconomic Indicator (M3, Policy Rate, CPI)[7]

Analyzing Figure 6, the macroeconomic influence on ESG performance[8] is visualized. In regard to M3, lower-to-mid ESG Deciles display above average change in performance under decreasing M3 conditions, while returns remain close to average under increasing M3. Analyzing policy rates, an increasing environment displayed significant dispersion from the market average, compared to only slight overperformance in times of decreasing policy rates.

However, between 2014-2024, the market experienced increasing policy rates only in 10/119 cases. As for CPI, an increasing market environment drove returns in particular for the ESG Deciles 8 and 9, but also damped them the most in times of decreasing CPI, while remaining in proximity of general return rates.

[7] See Appendix 4 for an analysis of individual macroeconomic factors per ESG Deciles.

[8] While risk-adjusted ESG Decile returns are calculated in 6.2, Figure 6 is based on non-adjusted performance.

6.4 The Impact of External Events on Performance per Sustainability Decile

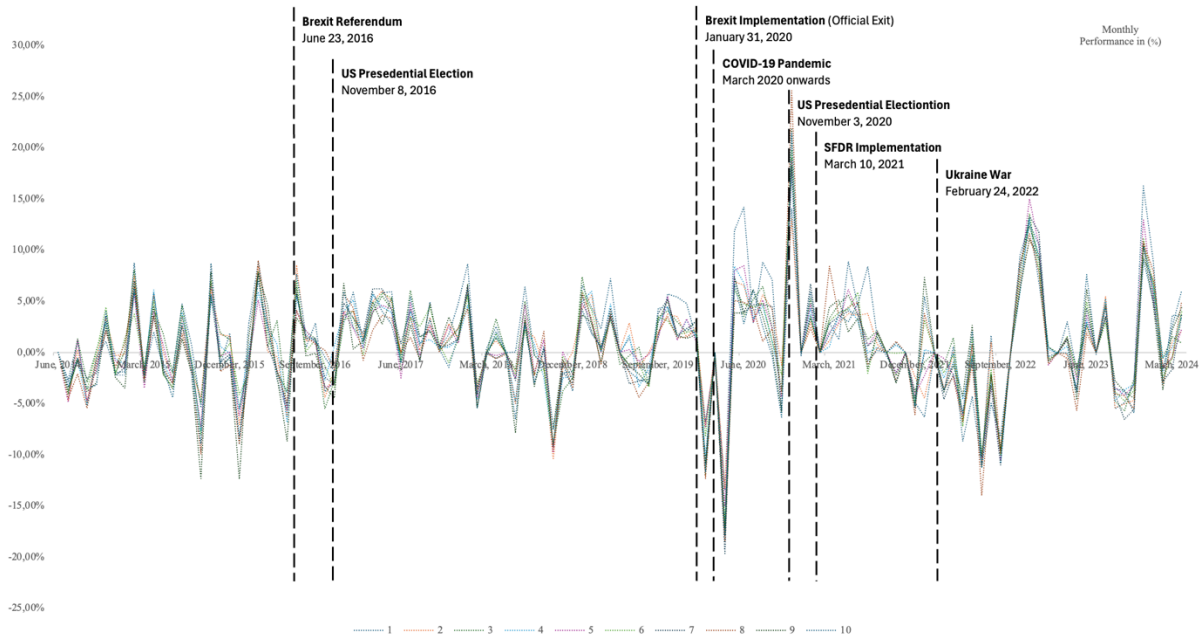

Figure 7: ESG Decile Performance and Macro Events (2014-2024)

As proposed by Chordia, Roll, and Subrahmanyam (2001), Figure 7 reveals immediate impact of external events on stock returns. While general volatility persists throughout the analyzed timeframe, ESG Deciles exhibit deviating returns after significant external events.

In 2016, the Brexit referendum and subsequent U.S. election created noticeable volatility spikes, particularly affecting lower Deciles, possibly reflecting market uncertainty surrounding political shifts as discussed in academia (Bloom et al. 2019).

As for 2020, volatility reaches unprecedented levels across Deciles, revealing the broad market reaction to uncertainty and systemic risk. Along with the US elections (in 2020) and the implementation of SFDR, more continuous, external effects are introduced (e.g. the American Rescue Plan Act, COVID-19), resulting in further market fluctuations to which higher ESG Deciles reacted slightly more moderately, suggesting protective characteristics in crisis.

Summarizing findings with the (ongoing) Russia-Ukraine war, low ESG Deciles exhibit the highest drawdowns, solidifying the previously discovered trends and aligning with the discussed academic literature (Lins, Servaes, and Tamayo 2017).

6.5 Real-World Portfolio Allocations for Sustainable Frameworks

With real-world news reporting ESG/SRI outperformance in recent years (J.P. Morgan 2023; Deutsche Bank Research 2018) and advocating for further investments (UBS 2024), the question of reasonability arises considering this thesis results. Hence, to verify results, Decile allocations of both the MSCI Europe ESG and SRI compared to the conventional MSCI Europe are checked.

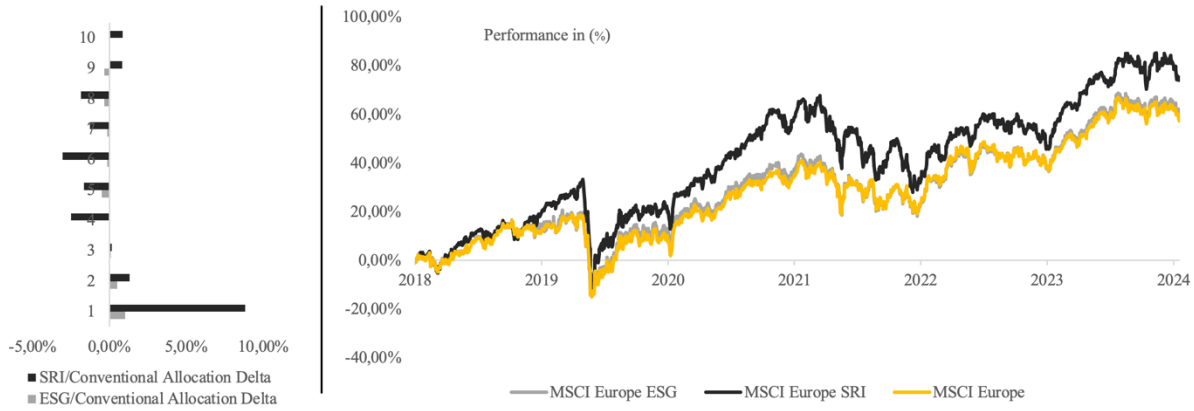

Figure 8: Allocation Delta of Sustainable Allocations in ESG Deciles (2014-2024)

Analyzing Figure 8, the allocation Delta for ESG and SRI funds, relative to the conventional MSCI Europe, reveals a distinct pattern in Decile adjustments. Both ESG and SRI frameworks display reduced allocations in mid-range Deciles (5 to 7), while concentrating significantly higher allocations in the highest Decile (10). Notably, SRI exhibits more pronounced reallocations, indicating stricter exclusionary or inclusionary criteria compared to the broader ESG approach.

This suggests that the real-world performance and resilience of ESG and SRI indices are shaped by selective stock screening, with SRI's stricter reallocation potentially driving its distinctive risk-return profile. Accordingly, these findings align with prior studies, indicating that performance may be largely contingent on the specific ESG criteria and selection methodologies applied within each sustainable investment framework (Friede, Busch, and Bassen 2015).

7. Discussion

7.1 Interpretation of Results

The findings of this study offer a nuanced perspective on the interplay between liquidity, ESG scores, and financial performance in the European equity market. Our initial hypothesis (H1) posited that liquidity factors would significantly influence the financial performance and volatility of sustainable investments compared to conventional investments. The results broadly support H1, although not always in the manner anticipated.

In contrast to some prior literature which suggests that firms with higher ESG scores may outperform or at least maintain competitive returns over the long run (Friede, Busch, and Bassen 2015), our analysis revealed a more complex relationship. While the top ESG Decile (10) does show certain advantages—compared to Deciles 7, 8, and 9—these do not translate into uniform financial outperformance once risk-adjusted factors were considered. Indeed, after employing the FF3fm, Decile 10 displays negative alpha, suggesting that these equities do not deliver excess returns beyond what can be explained by market, size, and value factors. This stands in contrast to commonly held assumptions that sustainable investments inherently produce superior risk-adjusted returns.

An intriguing aspect of the results is the role of liquidity. On one hand, higher ESG ratings correlate with narrower bid-ask spreads, indicating better liquidity conditions and reduced transaction costs. On the other hand, the relationship between higher ESG scores and performance is not uniformly positive. This apparent contradiction resonates with the notion of an illiquidity premium: investors often require extra compensation to hold less liquid assets, resulting in the potential for higher returns from more illiquid equities Guo et al. (2017). Consequently, while top ESG-scoring equities appear more liquid, they also seem to forgo some of the illiquidity premium, possibly contributing to their underperformance relative to expectations.

Macroeconomic factors and external events further complicate the landscape. Significant events—such as Brexit, the COVID-19 pandemic, and the Russia-Ukraine war—impacted market conditions in unpredictable ways. During these periods, higher-ESG portfolios sometimes showed resilience, in line with studies suggesting that companies with robust sustainability profiles may weather crises better (Lins, Servaes, and Tamayo 2017). However, this resilience was not uniform or consistently sufficient to produce long-term outperformance. Instead, it illustrates that ESG's protective quality may be context-dependent, emerging during specific turmoil but not guaranteeing superior performance across all conditions.

7.2 Methodological Considerations

In discussing these findings, it is vital to acknowledge certain methodological limitations. First, the reliance on a single ESG rating provider (Refinitiv) introduces potential bias, as discrepancies in ESG ratings across data providers are well-documented (Berg, Kölbel, and Rigobon 2019). Incorporating multiple ESG rating agencies in future studies could yield more robust, less provider-specific conclusions. Second, the chosen ten-year timeframe—while capturing growth in ESG adoption—may still be too short to observe enduring structural shifts. Long-term patterns may only emerge over multiple decades or through different market cycles, and extending the observation period could reveal more stable relationships.

Geographic specificity also constrains generalizability. The European equity market, influenced by the EU's regulatory environment and investor preferences, may not represent conditions in North American or Asian markets (Muñoz, Vargas, and Marco 2014). Further research in diverse regions, as well as cross-regional comparisons, could clarify whether these findings hold consistently or vary with regulatory and cultural differences. Additionally, this study's reliance on current European ETFs as a stock selection mechanism may introduce a subtle selection bias. As historical ETF compositions evolve, the universe of included equities may shift in ways not fully captured here. Future research might consider using continuously

updated constituent lists or constructing representative stock universes independently of ETFs.

Sectoral dynamics offer another avenue for deeper exploration. ESG's relationship with liquidity and performance may manifest differently in technology, energy, or financial sectors. Disaggregating sector-level effects could shed light on whether certain industries are inherently more prone to either benefit from or be hampered by ESG-driven liquidity conditions.

7.3 Recommendations for Future Research

Despite these limitations, the approach taken here remains robust. The methodology incorporated both micro- and macro-level liquidity indicators and applied rigorous data cleaning, normalization of currencies, and control for corporate actions. By employing the FF3fm, the influence of ESG-related liquidity considerations from broader market risk factors is isolated. This careful empirical approach helps ensure that the observed relationships are not artifacts of data processing.

Looking ahead, the findings open various avenues for future research. Studies that integrate multiple ESG data sources, broaden geographic scope, lengthen time horizons, and examine specific sectoral nuances will contribute to a more comprehensive understanding. In tandem, analyzing the evolving regulatory landscape—especially as initiatives like the EU's CSRD are implemented—will likely clarify ESG's role in shaping market dynamics.

Ultimately, the complex interplay uncovered here encourages a more cautious and context-sensitive stance on the ESG-liquidity-performance nexus. While the hypothesis (H1) about the significance of liquidity factors in explaining ESG-related outcomes is supported, the direction and magnitude of these effects are highly contingent on market conditions, sector composition, and the specific ESG criteria employed. As sustainable finance continues to evolve, investors and policymakers should consider liquidity conditions, rating divergences, and macroeconomic contexts, rather than relying on ESG scores as straightforward predictors of superior financial outcomes.

8. Conclusion

This study provides an in-depth empirical analysis of the relationship between market liquidity, ESG ratings, and financial performance within the European equity market. The results generally support H1, confirming that liquidity factors play a significant, albeit complex, role in shaping sustainable investment outcomes. Contrary to some prevalent expectations, higher ESG ratings do not consistently correlate with superior returns or reduced volatility. Although the highest ESG-rated equities (Decile 10) perform better than mid-level Deciles, their adjusted returns and α are not outperforming low-level Deciles, challenging the assumption that ESG scores inherently drive financial outperformance.

The interplay between liquidity and ESG scoring proves intricate. While increased ESG ratings correlate with narrower bid-ask spreads, signaling improved liquidity conditions, the expected financial advantages do not materialize uniformly. This suggests that better liquidity in high-ESG equities may come at the cost of relinquishing the illiquidity premium, thus dampening long-term returns. Moreover, macroeconomic shifts and external shocks influence sustainable performance unevenly, with crisis periods occasionally highlighting the protective qualities of sustainable investments.

These findings contribute to a more nuanced understanding of sustainable finance. Investors and policymakers should recognize that while ESG considerations can offer certain benefits and crisis resilience, they do not guarantee superior risk-adjusted returns in all contexts. Rather than treating ESG criteria as a one-size-fits-all path to financial success, stakeholders need to consider the role of liquidity, broader market conditions, and regulatory changes. By doing so, they can make more informed decisions, refining their approaches as ESG rating methodologies improve, global markets evolve, and the regulatory environment continues to shape the sustainable investment landscape.

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Appendix

1. Refinitiv IDs and Financial Expressions

M3 = Euro Zone Broad Money* (aEUMM3BA)

Policy/Interest Rate = Euro Zone Policy Rates, Euro short term repo rate, Not SA (aXZPRATE)

Inflation Target = Euro Zone Inflation target rate, Chg Y/Y (aXZPRATE)

Inflation = Euro Zone Consumer Prices, All Items, CP00, Total, Chg Y/Y (aXZCPIALL)

2. Python-Script for Fama-French Factors

```python
import pandas as pd
import statsmodels.api as sm

# Load and prepare the data
decile_returns = pd.read_excel('CleanDecileReturns.xlsx', index_col=0, header=0)
decile_returns.index = pd.to_datetime(decile_returns.index).to_period('M')

fama_french = pd.read_excel('FF_RF.xlsx', index_col=0, header=0)
fama_french.index = pd.to_datetime(fama_french.index).to_period('M')
fama_french = fama_french / 100

merged = decile_returns.merge(fama_french, left_index=True, right_index=True, how='inner')

for col in range(1, 11):
    merged[f'Excess Return {col}'] = merged[col] - merged['RF']

results = []
for col in range(1, 11):
    y = merged[f'Excess Return {col}']
    X = merged[['Mkt-RF', 'SMB', 'HML']]
    X = sm.add_constant(X)
    model = sm.OLS(y, X).fit()
    results.append({
        'Decile': col,
        'Alpha': model.params['const'],
        'Alpha p-value': model.pvalues['const'],
        'Beta Mkt-RF': model.params['Mkt-RF'],
        'Beta SMB': model.params['SMB'],
        'Beta HML': model.params['HML'],
        'Beta Mkt-RF p-value': model.pvalues['Mkt-RF'],
        'Beta SMB p-value': model.pvalues['SMB'],
        'Beta HML p-value': model.pvalues['HML'],
        'R-squared': model.rsquared
    })

results_df = pd.DataFrame(results)
print(results_df)
results_df.to_excel('FF3DecileResults.xlsx')
```

3. ESG Decile Return Numbers

ESG Decile Returns

Date / ESG Deciles	1	2	3	4	5	6	7	8	9	10	Average
2014	-11,19%	-6,37%	-6,64%	-8,76%	-6,94%	-7,75%	-8,28%	-9,98%	-11,68%	-8,30%	-8,59%
2015	9,01%	12,88%	11,14%	0,28%	3,49%	5,78%	-2,08%	-2,82%	-10,48%	-5,10%	2,21%
2016	11,36%	-4,26%	2,80%	-1,27%	-1,08%	-0,52%	-7,37%	2,32%	-1,76%	5,94%	0,62%
2017	35,10%	34,69%	29,28%	32,14%	28,95%	40,02%	27,29%	23,76%	25,73%	28,75%	30,57%
2018	-7,42%	-10,74%	-15,82%	-11,95%	-8,93%	-15,41%	-11,08%	-17,00%	-15,25%	-14,82%	-12,84%
2019	33,55%	28,32%	26,15%	21,39%	24,24%	25,86%	17,47%	10,19%	9,89%	13,24%	21,03%
2020	29,17%	12,47%	15,33%	10,37%	7,75%	9,80%	4,58%	6,34%	-3,78%	-0,68%	9,13%
2021	32,15%	19,63%	22,23%	20,32%	11,02%	10,66%	15,86%	10,55%	12,53%	14,23%	16,92%
2022	-22,78%	-17,11%	-15,36%	-12,88%	-7,69%	-15,75%	-14,88%	-12,96%	-10,00%	-6,19%	-13,56%
2023	16,31%	15,24%	6,98%	13,42%	10,89%	10,18%	8,42%	13,21%	10,30%	9,96%	11,49%
2024	12,93%	6,37%	9,37%	9,19%	5,16%	8,19%	5,44%	10,16%	9,14%	10,76%	8,67%
Overall Performance:	10,89%	7,14%	6,72%	5,64%	5,43%	5,30%	2,44%	2,36%	0,59%	3,65%	
Overall Ranking:	1	2	3	4	5	6	8	9	10	7	

4. Individual Macroeconomic Factors / ESG Deciles