



The Impact of Green Diamond Reward Rating on Liquidity Risk of ESG Exchange Traded Funds (ETFs)

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Abstract. It is a puzzle that whether environment, social, and governance (ESG) exchange-traded fund (ETF) is a better choice for investors than buying conventional ETFs and whether ESG ETFs with higher green diamond reward ratings could have lower liquidity risk, especially during the recession. By regression analysis and fixed effect analysis, this study focuses on 83 ESG ETFs compared with 83 matched conventional ETFs and 10 anti-ESG ETFs. It collects ESG ETFs liquidity data from the WRDS database and ESG ETF lists from the Bloomberg terminal between 2016Q1 and 2022Q8. As robustness checks, the result holds for the fixed-effect model, additional measure, and two-stage least square regression. We find that there is a negative relationship between ESG ETFs' green diamond reward rating and liquidity risk. We also find that ESG ETFs have less liquidity risk compared to conventional ETFs, especially during the financial crisis. The findings of this study provide insightful guidance for investors in making an investment decision and support the hypothesis that ESG fund management could add value.

Keywords: ESG exchanged traded funds · liquidity risk · green diamond reward rating · risk management

JEL Classification: G23 · G14 · G12

1 Introduction

Sustainable signals individual investor white paper final¹ demonstrated that at least 80% of U.S. individual investors showed great interest in sustainable investing, and even half participated in more than one sustainable investing activity. To comply with the trend, as one of the most popular investment products which could take a low-cost and convenient way to an investment portfolio, exchanged traded funds (ETF) is committed to integrating ESG into exchange-traded funds. However, with the global spread of COVID-19

¹ Morgan Stanley, sustainable signals: Individual investor interest driven by impact, conviction and choice, available at https://www.morganstanley.com/pub/content/dam/msdotcom/infographics/sustainable-investing/Sustainable_Signals_Individual_Investor_White_Paper_Final.pdf.

and the outbreak of the Russia-Ukraine war, many countries are suffering the pressure of economic downturn and suddenly the skyrocketing rate of inflation², which significantly affect the interest rate and stock price and liquidity. Therefore, studying whether sustainable development could have a positive role in liquidity after 2016 appears to be particularly important.

The remainder of the paper proceeds as follows. Section 2 reviews related literature and develops hypotheses. Section 3 describes the data and methodology. Section 4 presents empirical results. Section 5 concludes.

2 Literature Review and Hypotheses Development

2.1 The Determinants of ETF Liquidity

Previous concentration mainly disclosed some factors that influenced the liquidity, such as inception and providers. Some researchers agree that bond-based ETFs usually have higher liquidity (Agrawal & Clark, 2009) [1], which means funds type could affect liquidity. Additionally, Hedge & McDermott (2004)[7] expose that ETF inceptions could influence the liquidity of their underlying stocks, which reveals that Diamond's ETF saw a dramatic upward trend in the underlying stocks.

2.2 ESG Rating

An important criterion in judging a fund's ESG content is its ESG rating. Wu & Gao (2022) [12] also report that ESG disclosure could enhance stock liquidity and reduce information asymmetry. Therefore, it seems that ESG has positive impact on the fund performance. However, there are some conflicting ideas. Dolvin et al. (2019) [6] employ Morningstar sustainability scores and find similar performance (measured by alphas) for funds with higher and lower sustainability scores. Bauer et al. (2006) [3] investigate the ethical funds in Australia and find the financial performance of SRI funds is no different from those of conventional funds.

2.3 ESG Rating and Liquidity

We argue that ESG's effect on liquidity increase may occur in multiple aspects. First, the most frequently mentioned in the literature that ESG is capable of influencing stock liquidity. For example, Luo (2022) [8] uses the results that ESG premium could change the problematic situation of low-liquidity securities to demonstrate that ESG is associated with stock liquidity and has a positive impact. Caglio et al. (2020) [5] integrated reporting readability, an innovative form of corporate disclosure related to ESG information could link to higher market valuation and higher stock liquidity and tone bias. Analogically, we propose the first hypothesis.

Hypothesis 1: ESG ETFs with high Green Reward Rating could have lower liquidity risk. Liquidity risk of ESG ETF is lower than that of conventional ETF.

² "Consumer prices soared 9.1 percent compared with a year earlier", See U.S. inflation at 9.1%, a record high, PBS NEWS HOUR (July 13, 2022), available at: <https://www.pbs.org/newshour/economy/u-s-inflation-at-9-1-percent-a-record-high#:~:text=Consumer%20prices%20soared%209.1%20percent,percent%20from%20April%20to%20May>.

2.4 COVID-19, Exchange Traded Funds (ETFs) and ESG Rating

The COVID-19 pandemic, a game-changing health crisis, caused a slowdown in economic activities worldwide, which triggered researchers' enthusiasm to explore their impact on ETF. Shum & Kang (2013) [11] point out that during a financial crisis, the liquidity of ETFs will reduce, and underlying premiums and discounts will further distort performance. However, many pieces of research show that if there is ESG involved, the bearish result could be changed or mitigated. For instance, Brodmann et al. (2021) [4] used MSCI KLD 400 index from 1990 until 2019 to examine SRI stock's liquidity, which served as an alternative investment that includes ratings based on the ESG factor. They find the global financial impact on excess returns for SRI and non-SRI stocks, showing SRI stocks performing better during the financial crisis, which means SRI stocks could withstand financial risk better than non-SRI stocks. Analogically, we propose the second hypothesis.

Hypothesis 2: The higher Green Diamond Reward scores have hedging effect on ETF liquidity risk during the COVID-19 pandemic.

3 Data and Methodology

3.1 Data

The data set used in the paper is created by merging two databases: the Warton Research Data Services (WRDS) database and Bloomberg database. The study chooses the last seven years as our sample period, from Japanese 2016 to August 2022. WRDS ETF Global Database provides daily data on liquidity risk in analyzing part (component liquidity scores) and Bid/ask spread (average intra-day bid/ask spread divided by lowest sample intraday ask) in industry part, which could be important factors in calculating liquidity. The database also provides other fund characteristics that I need as control variables. Through Bloomberg, we could find 83 ESG ETFs tickers, which could make it possible that we derive the fund characteristic data about these ESG ETFs through using ETF tickers to merge two databases. The final sample includes 83 funds and 2628 fund-month observations. The sample spans seven years from January 2016 to August 2022.

3.2 Methodology

The literature presents two approaches to estimate liquidity. The first approach uses bid-ask spread data (Su & Tokmakcioglu, 2021) [10], whereas the second is based on Amihud illiquidity measure (Amihud, 2002) [2].

The first strategy is based on the concept that narrower spreads signify greater liquidity, whereas wider bid-ask spreads usually occur in less liquid stocks. The term *bid* refers to the highest price a buyer is willing to pay to buy a specified number of shares of a stock at any given time, while *ask* refers to the lowest price at which a seller will sell the stock.

Based on ST and WRDS data provider, I demonstrate the formula about bid-ask spreads.

$$Spread = \frac{1}{T} \sum_{t=1}^Q \frac{AP_A - AP_B}{LP_B} * (T_{t+1} - T_t) \quad (1)$$

where T is the total time with an available spread measured in seconds, Q is the number of updates in the average bid and ask order, AP_A is average bid price intraday, AP_B is the average ask price, LP_B is the lowest ask price intraday. T_t is $t - th$ spread.

To gauge the effect of Green Diamond reward score on liquidity risk of ESG ETF, we run the following multivariate regression model after controlling for factors that are likely to affect liquidity.

$$Illiquid_{i,t} = \beta_0 + \beta_1 GreenD_{i,t} + \beta_2 RDR_{i,t} + \beta_3 VLS_{i,t} + \beta_4 FEE_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 STR_{i,t} + \beta_7 DVS_{i,t} + \beta_8 STM_{i,t} + \beta_9 ISSUE_{i,t} + \beta_{10} SCT_{i,t} + \beta_{11} CGL_{i,t} + \beta_{12} CLQ_{i,t} \quad (2)$$

where, for ticker i and year t , *Illiquid* is a measure of bid ask spread according to the Eq. (1), *GreenD* represent the Green Diamond Reward Rating, which could measure the degree of ESG content. Following prior studies and database, we include the following set of control variables that influence Liquidity risk.

4 Results and Discussions

4.1 Main Result

This study examines the relationship between liquidity risk and green reward diamond ratings of ESG ETFs. Our variable of interest is green diamond reward ratings. It uses bid ask spread as a dependent variable to proxy for the liquidity risk. It adjusts standard errors in all regressions for heteroscedasticity and serial and cross-sectional correlations using two-dimensional clustering at the year and trade-ticker levels (Petersen, 2009) [9]. Table 1 provides the results of the relationship between green diamond reward score and liquidity risk using different estimation methods. Following prior literature, our regressions control for different size, management fee, risk volatility, risk structure, sector, issuing company, and diversification that are deemed to affect the risk of liquidity.

Table 1 presents the results of an ordinary least squares regression of the liquidity risk score against green diamond reward score and other control variables. The standard errors are robust and clustered by ESG ETF and year to control for cross-sectional and time-series dependence. The results show that the Green Diamond Reward Score of ESG ETFs negatively correlates with the liquidity risk, and liquidity risk coefficient is much less than that of conventional ETFs. In other words, the higher Green Reward rating corresponds to the lower liquidity risk and ESG ETFs exhibit a lower liquidity risk than conventional ETFs. It is also consistent with prior literature and the findings of Brodmann et al. (2021) [4]. Turning to the control variables, red diamond reward rating and composite global component show a significant positive association with liquidity risk scores, while volatility risk, deviation risk, sector risk, and diversification are negatively associated

with component liquidity scores. Most coefficients are statistically significant below the 10% level, except structure and issuing firm, which do not seem to affect liquidity risk. This is mainly because we mainly choose ETFs with ESG components, and until now, only most large companies have paid more attention to environmental, government, and social components, so structure risk and issuing firms do not influence liquidity risk.

Table 1. ESG dimension and liquidity risk

<i>Variable</i>	ESG ETF	Conventional ETF
	Bid-ask	Bid-ask
<i>GreenD</i>	-0.0373*** (-0.0267)	0.8970** (0.2829)
<i>RDR</i>	0.1100** (0.0498)	0.2476*** (0.0677)
<i>SEM</i>	-0.1140** (0.0552)	-0.00198*** (0.00490)
<i>SEC</i>	0.00343 (0.00355)	-0.00528*** (0.00432)
<i>DVS</i>	-0.0074*** (0.0028)	0.00177 (0.00176)
<i>ISSUE</i>	0.0026 (0.0038)	0.00161** (0.00267)
<i>SIZE</i>	-0.0001* (0.0000)	0.000155*** (0.2100)
<i>FEE</i>	0.0004** (0.00001)	-0.0749*** (0.0442)
<i>CGL</i>	0.4389*** (0.0797)	0.8182*** (0.1020)
<i>STR</i>	0.0017 (0.0060)	0.0060*** (0.0358)
<i>EFF</i>	0.4789*** (0.7976)	0.8760** (0.2469)
<i>CLQ</i>	-0.4781*** (0.4162)	-0.6723* (0.5216)
Constant	0.7510*** (0.4770)	0.7760*** (40790)
N	2,628	2,291
Number of observations	0.021	0.843
Adjusted R^2	0.011	0.724

Note: this table provides the results of the regressions of green reward diamond rating on liquidity risk. Liquidity risk level and the ESG dimensions. High bid ask spread corresponds to high levels of illiquidity. Appendix A details the lists of ESG ETFs. Robust t – statistics adjusted for clustering by ESG ETFs and year are reported inside the parentheses. *, ** and *** refer to significance at the 10%, 5% and 1% levels, respectively

5 Conclusions

This paper examines whether and how green innovation could affect exchange-traded funds' liquidity. First, we find that environmental innovation significantly decreases the risk of liquidity, as measured by bid ask spread and compared to conventional ETFs. In addition, by splitting our sample before and after covid-19, we show that ETF with ESG component do have mitigating effect on liquidity risk during Covid-19. Fourth, we show that green innovation on liquidity risk loses significance of anti-ESG ETFs.

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