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Merger Arbitrage and ESG Impact Investing

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Merger Arbitrage and ESG Impact Investing

Executive Summary

A merger arbitrage portfolio can be structured to encourage large increases in ESG characteristics that are associated with particular mergers. Such a portfolio can generate attractive returns from investing in mergers that increase ESG scores by 50 percent, or more, over the life of the merger.

Compared to a naive implementation of merger arbitrage, a sophisticated implementation is associated with noticeably larger ESG improvements. The difference in average ESG improvements is nearly 20 percentage points. Moreover, the sophisticated merger arbitrage strategy also generates higher returns than the naive implementation.

These large improvements in ESG scores should make such a merger arbitrage strategy appealing to investors who seek to have positive ESG impact in addition to earning attractive, diversifying investment returns.

The large and quick ESG improvements of a sophisticated merger arbitrage strategy contrast sharply with the uncertain, small, and slow benefits of investing in firms that already have attractive ESG scores. It remains unclear whether these more common ESG investment strategies will generate attractive investment returns or improve ESG scores in the future. In long-term equilibrium, if investors value higher ESG scores they should be willing to accept lower returns. For merger arbitrage, however, we find no evidence that larger expected ESG improvements are associated with lower returns.

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1 Introduction

Corporate mergers represent exceptional transformations for the participating firms. We show that one transformation is a large increase in the environmental, social, and governance (ESG) scores of the target firms. This represents an opportunity for merger investors to encourage large, quick increases in ESG scores.

We show that a portfolio of merger deals has experienced a 57% increase in ESG scores, on average. We are not aware of other investment strategies with similar demonstrated ESG impacts. We also show that a sophisticated merger arbitrage strategy can generate even higher ESG improvements of 63%. The ESG improvements associated with this sophisticated strategy are materially larger than the 46% ESG gains from a simpler merger arbitrage strategy that weights mergers according to deal size.

We first outline systematic merger arbitrage strategies and the main aspects of ESG investing. The core of the paper then documents the ESG impacts of merger arbitrage. We briefly discuss some regulatory implications before concluding.

2 Merger Arbitrage

Merger arbitrage, also known as risk arbitrage, focuses on purchasing the publicly traded shares of merger target companies, generally at a discount relative to the consideration offered by the acquirer. If the merger completes, the trade earns the spread between the value of the offer and the purchase price of the shares. For offers involving acquirer shares, sophisticated merger arbitrage trades generally short the acquirer shares offered for each target share. In the event the merger completes, this eliminates uncertainty about future acquirer share prices.

The principal risk of such trades stems from uncertainty about whether the merger will complete at the currently offered terms, terminate, or receive a higher offer. Historically, about 90% of mergers complete successfully. About 75% complete under the original terms and about 15% complete with improved offers. Only about 10% of mergers terminate. Most mergers complete or terminate in less than 6 months.

For our empirical analysis of merger arbitrage, we use the results of simulated merger arbitrage strategies that invest in nearly all liquid announced mergers in North America and Europe. The mergers have to be $500 million or larger. The offers may involve cash or stock in any combination. The simulated strategies hedge out the acquirer stock risk by shorting an appropriate number of acquirer shares for each target share. We investigate

two systematic strategies: A "sophisticated" merger arbitrage strategy and a "naive" merger arbitrage strategy. The sophisticated strategy weights deals according to statistically sophisticated predictions about deal returns and deal risks. The predictions apply machine-learning methods to observable deal characteristics. The naive strategy weights deals in proportion to their size.

3 ESG Investing

Investors are increasingly interested in the environmental, social, and governance (ESG) consequences of their investments. The mainstream approach to this is to compare the ESG scores of a portfolio to the ESG scores of a benchmark portfolio. An alternative approach explicitly targets improvements in the ESG scores of the portfolio companies.

3.1 ESG Scores

Recently, public companies have begun to report a range of ESG information. One example of environmental information now reported by many firms is carbon emissions. For firms that don't yet report such facts, third-party data vendors like Refinitiv, MSCI, or CDP provide estimates. Third-party data firms also rate companies on a variety of ESG criteria not reported by any firm. Berg, Kölbel, Pavlova, and Rigobon (2021) point out that the ESG scores from different data vendors can vary materially.

Standards for aggregating this information from the firm level to the portfolio level are also still evolving.[1] But using a reasonable weighted average across portfolio positions yields a portfolio-level ESG score.

Some investors pursue an objective to hold portfolios with ESG scores that are better than comparable scores for a benchmark portfolio. For example, an investor may aim to hold a portfolio with lower carbon intensity than the market portfolio. Such investors direct their capital to firms with better ESG scores and away from firms with worse ESG scores. Avramov, Cheng, Lioui, and Tarelli (2021) and Pedersen, Fitzgibbons, and Pomorski (2021) describe portfolio construction methods that simultaneously pursue ESG objectives and investment return objectives.

Unfortunately, it is unclear whether such allocations provide firms with incentives to improve their ESG practices or improve investment returns.

Pastor, Stambaugh, and Taylor (2021) and Berk and van Binsbergen (2021) argue that a large shift in investments towards ESG-friendly firms

[1]Standards for carbon reporting may be the most advanced. For example, TCFD (2021) is a prominent standards proposal.

eventually results in a higher cost of capital for the remaining firms, thereby providing financial incentives for ESG improvements. However, Berk and van Binsbergen (2021) argue that the current level of ESG investment is (still) too small to produce meaningful financial incentives. The empirical analysis by Heath, Macciocchi, Michaeli, and Ringgenberg (2022) finds no impact of ESG investing on corporate behavior.

The evidence on the investment performance of ESG-tilted portfolios is also mixed. Partly this may be due to the relatively short sample periods induced by the short history of ESG scores. Friede, Busch, and Bassen (2015) find that investment returns for ESG stocks have been above average. In contrast, Hong and Kacperczyk (2009) and Bolton and Kacperczyk (2021) find that investment returns for ESG stocks have been below average. However, both positive and negative results in this area tend to be statistically insignificant.

The theoretical equilibrium framework of Pastor, Stambaugh, and Taylor (2021) potentially can explain these conflicting or weak findings. Pastor, Stambaugh, and Taylor (2021) derive a model in which investors are willing to accept lower average returns for firms with better ESG scores. Such a tradeoff seems inevitable for investors who have portfolio objectives in addition to investment returns. Even though firms and portfolios with higher ESG scores should earn lower long-term average returns, they may temporarily outperform when investor preferences for ESG firms increase.

An interesting aspect of such an equilibrium framework is that investors with ESG preferences shift capital away from firms with poor ESG scores. This lowers the share prices of these firms and creates more attractive future returns for investors who pay less attention to ESG criteria. The result is that these investors increase their holdings of firms with poor ESG scores. This substitution reduces and possibly eliminates the effects of "divesting" from firms with poor ESG scores.

These theoretical and statistical challenges in detecting effects of ESG investing on corporate behavior and portfolio returns raise questions about the efficacy of investment strategies that overweight firms or portfolios with attractive ESG scores.

3.2 ESG Impact

One way of overcoming the challenges associated with portfolios focused on current ESG scores is to consider investment strategies that deliver a positive short-term impact on ESG scores.

An investment strategy that pursues positive ESG impact should be interested in measuring ESG scores before the strategy enters positions and

after the strategy exits positions. If ESG scores improve over the investment period, it seems fair to say that the strategy is associated with a positive ESG impact.

4 ESG Impact of Merger Arbitrage

Using a simulated, systematic implementation of merger arbitrage, we now show that such a portfolio is associated with large improvements in the ESG scores of the merger target firms.

4.1 ESG Data

In this study, we use ESG data from Refinitiv. The ESG data includes values self-reported by the firms and Refinitiv estimates for some firms that did not report. Even with those estimates, however, we do not have full historical ESG data for the mergers in our database. We have information about the characteristics of roughly 4,000 mergers in North America and Europe, including the United Kingdom. The mergers were announced between 2003 and 2022. While we have essentially complete information about merger outcomes and returns, for example, the availability of ESG data materially increases over time. We have relatively little ESG information for the earlier years of our merger sample.

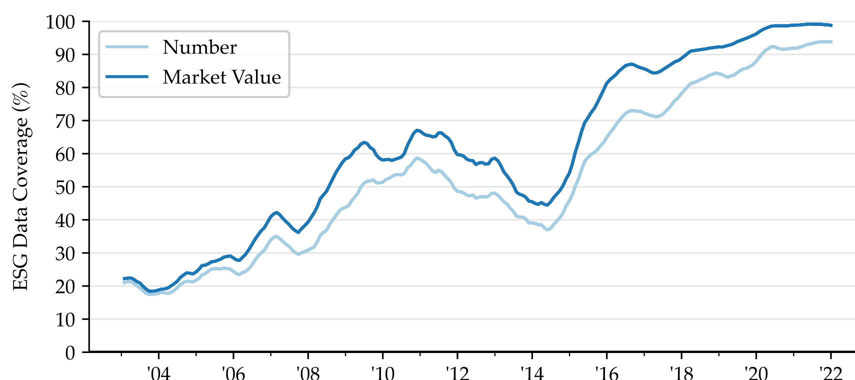
The top-level ESG scores from Refinitiv are aggregated scores of underlying constituent scores. The top-level scores are calibrated so they range from 0 (worst) to 1 (best). On this scale, an increase in a firm's ESG score represents an improvement.

Figure 1 shows that the data coverage for ESG scores has improved over time. Although our merger data start in 2003, the ESG coverage during the early years is fairly low. In more recent years, we have ESG scores for 90% of mergers, or more.

4.2 Systematic Merger Arbitrage

In order to analyze the ESG impact associated with merger arbitrage, we simulate a systematic merger arbitrage strategy. The strategy buys all announced merger deals over $500 million in the United States, Canada, and Europe between 2003 and 2022. The strategy holds these positions until the mergers complete or terminate. More than 90% of announced mergers complete. On average, deals take about 5 months to complete. The portfolio operates with variable leverage. Leverage is higher when there are more mergers and lower when there are fewer merges. For offers that contain a stock component, the strategy shorts the appropriate number of acquirer shares in order to eliminate uncertainty about future prices of these shares.

Figure 1: ESG Data Coverage over Time



The graph shows the fraction of mergers for which we have ESG scores from Refinitiv. The light blue line shows coverage as a fraction of the number of outstanding mergers. The dark blue line shows coverage as a fraction of outstanding merger values.

Over the full sample period, the coverage averages 55% of the number of mergers and 63% of merger values. As the figure shows, coverage has increased markedly over time.

The merger sample includes the targets and acquirers from 1,991 announced mergers with market values over $500 million between January 2003 and May 2022.
Source: ESG Data received from Refinitiv. Internally prepared by Versor Investments.

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The short exposures rise when there are more stock offers and fall when there are fewer stock offers.

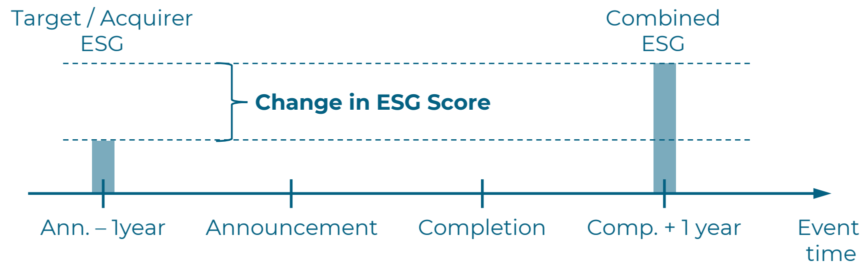
We compare two variations of this strategy. The first is a merger arbitrage strategy that uses sophisticated machine learning methods to make forecasts for different deal outcomes. Based on these forecasts, the strategy overweights attractive deals and underweights less attractive deals. The strategy's primary focus is on attractive portfolio returns but it also considers the ESG characteristics of the positions.[2] The second is a naive merger arbitrage strategy that holds positions that are directly proportional to the size of each merger. The naive strategy makes no forecasts for deal outcomes and pays no explicit attention to the ESG improvements associated with the mergers.

4.3 Measuring ESG Impact

For the deals in these systematic merger arbitrage portfolios, we measure the changes in ESG scores over the period from 1 year prior to each merger's announcement to 1 year following each merger's completion. Figure 2

[2]Versor Investments offers a similar portfolio to clients.

Figure 2: Measuring ESG Changes for Mergers



The figure illustrates the event time line for ESG changes associated with mergers. We measure the changes over an interval that starts one year prior to merger announcement and ends one year after merger completion.

illustrates the timeline for this measurement in event time relative to merger announcements. We measure the changes for merger targets, a matched portfolio of their sector peers, merger acquirers, and a matched portfolio of their sector peers. We focus on successful mergers since they constitute more than 90% of all announced mergers.

Table 1 shows that the merger targets in this investable universe increased their ESG scores by an average of 57%! This increase vastly outstrips the contemporaneous increases for a portfolio of matched sector peers. The ESG scores of the sector peers rose by 10%, on average. The difference between these ESG improvements is highly statistically significant, with a Student *t*-statistic of nearly 19. The ESG scores for the acquirers in these transactions rose by 13%, also more than for their matching sector peers. Once again, we comfortably reject the hypothesis that acquirer and peer ESG scores increase by the same amount, with a Student *t*-statistic of nearly 5.

Table 1 shows results for overall ESG scores. Separately, we have investigated similar changes for the environmental, social, and governance scores and carbon emission intensities. All of these show similarly dramatic improvements.

Although ESG scores overall have drifted up during this period, merger targets and acquirers have strongly outperformed their sector peers. Especially for merger targets, this difference is very large and unlikely to be matched by investment strategies that overweight firms with above-average ESG scores. For such strategies, there simply are not enough corporate events that have a chance to produce large ESG changes. By contrast, a merger is likely one of the largest corporate events in a firm's lifetime. In this sense, merger arbitrage can have an exceptional ESG impact. The data show that merger arbitrage has a large positive ESG impact.

A part of these large improvements in ESG scores stems from the fact that

Table 1: ESG Impact of Mergers

	Targets		Acquirers	
	Change in ESG (%)	*t*-Stat	Change in ESG (%)	*t*-Stat
Merger	56.8	(22.7)	12.9	(20.4)
Sector Benchmark	9.5	(41.0)	9.6	(40.2)
Difference	47.2	(18.8)	3.2	(4.8)

The table compares the changes in average ESG scores for acquirers and targets participating in mergers and matched sector peers from 2 different merger strategies. Changes are expressed in percent. To the right of the estimates, the table shows the associated *t*-statistics in parentheses.

The sample includes 1,991 announced mergers with market values over $500 million between January 2003 and May 2022. There are 685 targets and 1,368 acquirers with available ESG scores.

Source: ESG data received from Refinitiv. Internally prepared by Versor Investments.

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merger targets often start with below-average ESG scores. After completion of the merger, these scores are materially higher. While the associated portfolio holdings start with below-average ESG scores, they result in exceptional ESG improvements. This should be appealing to investors with an interest in making investments with a positive impact.

4.4 Predicting ESG Impact

A sophisticated merger arbitrage portfolio can target mergers with especially large ESG improvements since we can predict these changes.

Table 2 shows results from regressions that predict ESG changes based on various characteristics of the merger. The table shows results for univariate regressions based on selected predictors and for a multivariate regression including several predictors.

The predictors are proprietary and we veil their exact construction. However, table 2 demonstrates that we can forecast the majority of ESG changes associated with mergers.

The R^2 statistics in table 2 show that all of the regressions deliver material predictive power. Several of the models achieve R^2 values of 70%, or more. Predictive models like this can meaningfully separate mergers with large expected ESG improvements from mergers with small expected ESG improvements.[3]

[3] In practice, even more accurate forecasts may be achievable with additional predictors or machine learning methods. Table 2 shows relatively simple linear models for illustration.

Table 2: Predicting ESG Changes for Mergers

	(1)	(2)	(3)	(4)
Predictor 1	0.01			0.01
	(17.18)			(1.82)
Predictor 2		1.05		0.38
		(42.82)		(4.44)
Predictor 3			0.99	0.62
			(45.06)	(7.51)
N	685	685	685	685
R^2 (%)	30.18	73.86	75.83	76.59

The table shows results for regressions that try to predict the ESG changes for merger targets.

In all regressions, the dependent variable is the change in the target ESG score from one year before the merger announcement to one year after the merger completion.

The regression models use one or more explanatory variables. We label the explanatory variables predictor 1, predictor 2, and predictor 3, respectively. The precise nature of these predictors is proprietary.

All regressions include an intercept. The table shows the slope coefficients with their t-statistics in parentheses, the number of included observations, and the R^2 from the regression.

The sample includes announced mergers with market values over $500 million between January 2003 and May 2022 and available ESG scores.

Source: Data received from Refinitiv. Internally prepared by Versor Investments.

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4.5 ESG Changes and Merger Returns

It is natural to ask whether a merger arbitrage portfolio that overweights mergers with large expected ESG improvements realizes higher or lower returns than a portfolio that ignores ESG changes.

Table 3 shows results of regressions

$$r_{i,t+1} - r_{f,t+1} = a + b \; E_t[\Delta s_{i,t+1}] + \epsilon_{i,t+1}, \tag{1}$$

where $r_{i,t+1} - r_{f,t+1}$ is the annualized, hedged return on merger i in excess of the contemporaneous risk-free return, $E_t[\Delta s_{i,t+1}]$ is the predicted change in the ESG score $s_{i,t+1}$ for the target firm in merger i, and $\epsilon_{i,t+1}$ are unexplained residual returns.[4]

The table shows that realized merger arbitrage deal returns do not have a strong association with expected ESG changes. Although deals with larger

[4]Astute readers may be concerned that the estimate of b is likely to be downward biased if we wish to investigate the correlation between merger returns and actual changes in ESG scores. Since the actual changes in ESG scores will not be known until after the merger completes, we cannot use them as investment criteria. As a result, we care about the correlation between merger returns and expected changes in ESG scores. For this purpose, the estimate of b is unbiased.

Table 3: Merger Returns and Expected ESG Changes

	(1)	(2)	(3)	(4)
Predictor 1	−0.08			
	(−0.42)			
Predictor 2		0.19		
		(1.50)		
Predictor 3			0.14	
			(1.17)	
All				0.15
				(1.28)
N	685	685	685	685
R^2 (%)	0.02	0.03	0.02	0.02

The table shows results for regressions that link merger arbitrage returns to expected ESG changes for merger targets,

$$r_{i,t+1} - r_{f,t+1} = a + b\ E_t[\Delta s_{i,t+1}] + \epsilon_{i,t+1}.$$

In all regressions, the dependent variable is the hedged merger return in excess of the contemporaneous risk-free rate. Returns are expressed in annualized percentage points.

The explanatory variables are the predicted changes in target ESG scores using the different prediction models outlined in table 2.

All regressions include an intercept. The table shows the slope coefficients with their t-statistics in parentheses, the number of included observations, and the R^2 from the regression.

The sample includes announced mergers with market values over $500 million between January 2003 and May 2022 and available ESG scores.

Source: Data received from Refinitiv. Internally prepared by Versor Investments.

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expected ESG improvements tend to have higher returns, this association is not statistically significant. While overweighting deals with larger expected ESG improvements may not reliably increase portfolio returns, there is no evidence that doing so reduces portfolio returns. This allows sophisticated portfolio construction for merger arbitrage to take advantage of especially large expected ESG improvements without a reduction in portfolio returns.

As we discussed in section 3, equilibrium analysis suggests that many ESG investment strategies should earn lower long-term investment returns. In table 3, we show that there is no evidence that such a tradeoff is required in merger arbitrage.

4.6 ESG Impact of Different Merger Arbitrage Strategies

We have shown that mergers in general have resulted in improved ESG scores and that we can predict these improvements. We now show that not all merger arbitrage strategies have the same ESG impact. We compare the

ESG effects of two merger arbitrage strategies: the sophisticated merger arbitrage strategy we introduced above, which actively selects deals, and a naive strategy that simply holds deals in proportion to their market capitalization.

As previously described, the sophisticated merger arbitrage strategy systematically invests in announced mergers in North America and Europe, including the United Kingdom. The strategy uses sophisticated machine learning methods to make forecasts for different deal outcomes. Based on these forecasts, the strategy overweights attractive deals and underweights less attractive deals. The strategy's primary focus is on attractive portfolio returns but it also considers the ESG characteristics of the positions.

In contrast, the naive strategy establishes positions that are directly proportional to the size of each merger and pays no attention to the ESG improvements associated with the mergers.

Each of these strategies takes positions in mergers when they are announced. The portfolio weights vary over time, as other mergers complete or come to the market. These fluctuating weights make it cumbersome to form weighted averages across the ultimate ESG outcomes of these mergers. We approximate these strategy weights using a slightly simpler, constant weight for each deal.

We approximate the target weights each strategy assigns to the deals by pooling all deals announced during a 6-month period. We pretend that the portfolio entered into all of these deals at the same time. This allows us to compute fixed target weights for each deal under each strategy. We then measure the weighted average ESG change for the merger targets. Finally, we repeat this process for subsequent 6-month periods. We choose 6 months, because a typical merger lasts about that length of time.

For each merger strategy, this creates a time series of weighted average ESG changes for the merger targets. Since the number of deals with available ESG data materially increases over time, we take a weighted average of these time-series observations. The time-series weights are proportional to the number of deals with available ESG data in each period.[5] Importantly, these time-series weights are the same for both merger arbitrage strategies. Only the cross-sectional portfolio weights differ across the strategies.

Table 4 compares the ESG impact of these two strategies. The table shows that the sophisticated strategy delivers ESG improvements that are nearly 18 percentage points higher, on average. This difference in the

[5]This is a generalized least squares estimate of the average ESG change when the periodic average changes have different variances due to the different numbers of data points in the cross-sections.

Table 4: ESG Impact of Different Merger Arbitrage Strategies

	Sophisticated		Naive		Difference	
	Change in ESG (%)	t-Stat	Change in ESG (%)	t-Stat	Change in ESG (%)	t-Stat
Merger	63.4	(22.1)	45.7	(19.6)	17.7	(4.8)
Sector	6.9	(21.8)	7.0	(21.0)	-0.1	(-0.2)
Difference	56.5	(19.6)	38.8	(16.5)	17.7	(4.8)

The table compares the weighted average changes in ESG scores for merger targets and sector peers across two different merger arbitrage strategies. Values in parentheses are t-statistics.

The "sophisticated" strategy systematically weights mergers based on a comprehensive set of forecasts for returns and risks, including ESG characteristics. (See text for additional details.) The "naive" strategy systematically weights mergers in proportion to the size of each merger.

To track ESG improvements for these strategies we pool all announced mergers in the investable universe over a six-month period. We then measure the change in the ESG scores for the merger targets from 1 year prior to the merger announcement to 1 year after the deal completion. The portfolio weights differ across the sophisticated and naive strategies.

This creates a time-series of weighted average ESG improvements. We use this time-series to compute the grand mean ESG improvement for each strategy. Since the number of mergers with ESG data increases over time, we weight the time-series observations by the number of available data points in each 6-month period. The time-series weights are the same for both merger strategies.

The sample includes announced mergers with market values over $500 million between January 2003 and May 2022 with available ESG scores. There are 685 merger targets with available ESG data. The portfolios take positions in 519 of these mergers.
Source: Data received from Refinitiv. Internally prepared by Versor Investments.

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average ESG improvements is statistically significant with a Student t-statistic of 4.8. Clearly, not all merger arbitrage strategies produce similar ESG improvements.

Importantly, the sophisticated merger arbitrage strategy also earns more attractive investment returns than the naive implementation. Since our focus here is on the ESG impact of merger arbitrage, however, we do not discuss performance details of these strategies.

5 Regulatory Implications

The regulation of ESG disclosures and ESG-focused investment strategies is evolving rapidly.

Almost all of the regulatory focus has been on the reporting of current ESG characteristics for firms and investment portfolios. Such characteristics are clearly important to many investors and regulation should establish ground rules for transparent and consistent reporting of current ESG char-

acteristics.[6]

As we show above, however, there is an important place for measuring ESG improvements over time. We think that this is a central focus for many investors. However, current ESG scores say essentially nothing about future ESG improvements. As we mentioned previously, merger targets tend to have below-average ESG scores but achieve very large ESG improvements.

While consistent ESG reports permit monitoring of improvements at the firm level, such measurements are more challenging for portfolios. Portfolio holdings are not constant over time. As a result, an improvement in portfolio ESG scores could stem from an improvement at the underlying firms, or simply from a portfolio shift to firms with higher ESG scores. The latter, of course, does not reflect a true economic improvement and is likely to be less important to investors.

We urge investors and regulators to establish additional standards for measuring the ESG impact of investment portfolios. We believe that ESG-focused investors care about the ESG impact of their investments at least as much as they care about the current ESG characteristics of their portfolios. This remains a neglected aspect of ESG reporting and regulation and should be addressed thoughtfully.

6 Summary

We show that a sophisticated merger arbitrage strategy is associated with large increases in ESG scores for the merger targets. On average, the ESG scores for merger targets rise by about 57% from one year before the merger to one year after completion of the merger. The improvements are similar for the overall ESG scores, the environmental scores, the social scores, and the governance scores.

A sophisticated merger arbitrage strategy can further increase these ESG improvements to 63%, on average. A simple merger arbitrage strategy that weights deal by deal size is associated with materially smaller ESG improvements of 46%. Moreover, the sophisticated merger arbitrage strategy also generates higher returns than the naive implementation.

These large and rapid ESG improvements associated with sophisticated merger arbitrage should be appealing to investors who wish to make investments with a positive ESG impact. Such improvements are possible because a merger is a dramatic and unusual event during the life of a firm.

[6]For a discussion of investor-relevant carbon reporting for portfolios, see Gurnani and Hentschel (2022).

We are not aware of other investment strategies that generate similarly large ESG improvements over similarly short time frames. Certainly, the large and rapid increases in ESG scores for merger arbitrage stand in stark contrast to the small, uncertain, and likely slow ESG benefits of investment strategies that overweight firms that already have attractive ESG scores.

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