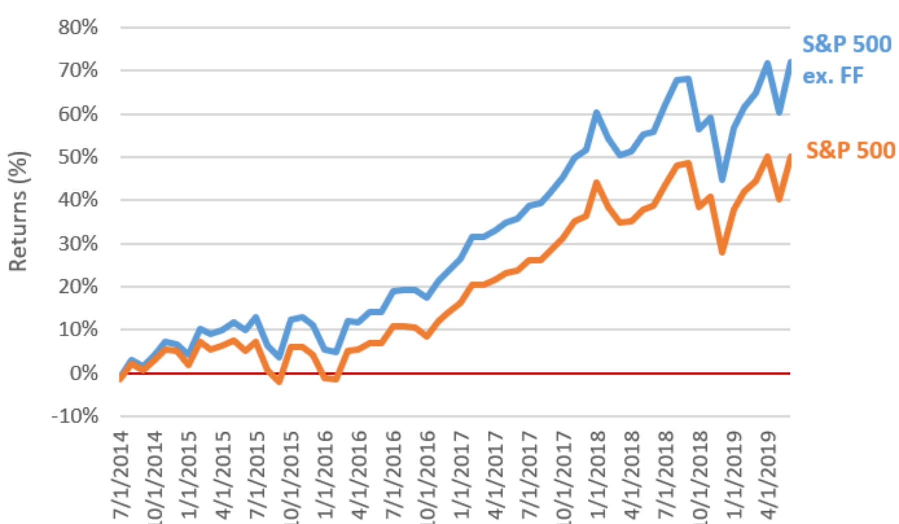
Measuring the Financial Returns of Divestment:
A Case Study of the Somerville Retirement System (Executive Summary)

By: Jamie Hall (MassDivest)
November 7, 2019

In June 2017, the Somerville Retirement Board ("SRB") voted to divest $9.5 million of its assets from a fossil fuel-inclusive portfolio and reinvest them in a fossil free index fund. In July 2017, the Public Employee Retirement Administration Commission of Massachusetts intervened in Somerville's divestment decision. To determine the impact of this intervention, MassDivest analyzed the difference in the financial returns of the S&P 500 and a portfolio representing the S&P 500 excluding Fossil Fuel stocks ("S&P 500 ex. FF"), starting from the date when the City of Somerville reinvested in fossil fuel stocks to the date the analysis was conducted (June 2019).

MassDivest found that Somerville's divested portfolio would have achieved a return of 24.1 percent between July 2017 and June 2019. In comparison, the S&P 500 produced a return of 19.1 percent. Therefore, Somerville's ex-fossil fuels fund would have achieved 5.0 percent higher returns than the S&P 500. For robustness, MassDivest also analyzed the portfolios' returns over a longer investment window of five years. The S&P 500 ex. FF would have achieved a return of 72.2 percent between June 2014 and June 2019, while the S&P 500 achieved a return of 50.1 percent over the same period. This means that the divested portfolio would have achieved a return of 22.1 percent greater than the S&P 500 portfolio (Figure 1). Furthermore, MassDivest ran statistical tests to assess the robustness of the difference in returns and found that the differences between both the average monthly and rolling twelve-month returns of the divested portfolio and the S&P 500 portfolio were statistically significant.

Figure 1. Comparison of S&P 500 and S&P 500 ex. FF Returns (%)



Measuring the Financial Returns of Divestment:
A Case Study of the Somerville Retirement System

By: Jamie Hall (MassDivest)
November 7, 2019

Background

In June 2017, the Somerville Retirement Board ("SRB") voted to divest $9.5 million of its assets from a fossil fuel-inclusive portfolio and reinvest them in a fossil free index fund. However, in July 2017, the Public Employee Retirement Administration Commission of Massachusetts ("PERAC") intervened in Somerville's divestment decision. PERAC advised Somerville that divestment from the fossil fuel industry was a violation of Somerville's fiduciary duty. Thus, the SRB was required to reinvest its previously divested funds into a fossil fuel-inclusive portfolio. As of 2019, the SRB is still unable to unilaterally divest from the fossil fuel industry.

This white paper analyzes the financial returns of fossil fuel divestment. Specifically, MassDivest considers the financial impact of Somerville's reinvestment into fossil fuel companies as required by PERAC and compares these returns with the returns that Somerville would have achieved had it remained divested.

Methodology

Our analysis consisted of comparing the returns of the S&P 500 index and a portfolio replicating the S&P 500 while excluding fossil fuel companies.

The S&P 500 is an index measuring the performance of the 500 largest companies listed on U.S. stock exchanges, including fossil fuel companies. It is "widely regarded as the best gauge of large-cap U.S. equities."[1] The S&P 500 excluding Fossil Fuels ("S&P 500 ex. FF") is a portfolio developed by RhumbLine Advisers that excludes companies listed on the Carbon Underground 200 ("CU 200"). The CU 200 is a list of the top 100 coal and top 100 oil and gas publicly-traded reserve holders throughout the world, ranked by the possible carbon emissions of their reserves.[2] The S&P 500 ex. FF was used by RhumbLine Advisers when the Somerville Retirement System divested in June 2017.[3]

---

[1] See: https://www.investopedia.com/terms/s/sp500.asp.
[2] See: https://fossilfreefunds.org/carbon-underground-200.
[3] Our analysis included only the companies included in the S&P 500 ex. FF that were listed on stock exchanges throughout the full study periods. If MassDivest included companies that became listed towards the end of the study period, the portfolio value would have been artificially inflated. If MassDivest excluded companies that became delisted towards the end of the study period, the portfolio value would have been artificially deflated. After removing stocks that were not listed throughout the full study periods, the portfolio MassDivest analyzed included a total of 437 stocks.

MassDivest analyzed the difference in the historic financial returns of the S&P 500 and the S&P 500 ex. FF, starting from the date when the City of Somerville reinvested in fossil fuel companies (July 2017) through the date when the analysis was conducted (June 2019). This two-year period represents our primary study period.

The goal of the analysis was to calculate the difference in returns relative to the S&P 500 that would have been achieved had Somerville remained divested from fossil fuel companies. To test whether the difference in returns during our two-year study period was a part of a longer trend, MassDivest includes a secondary, five-year study period from June 2014 through June 2019. In addition to monthly returns, MassDivest analyzed the difference in rolling twelve-month returns to eliminate the influence of cyclicity and to determine if the monthly differences persist for longer periods of time.

While calculating the difference in returns provides useful information on the absolute change in portfolio values through the study periods, MassDivest used statistical analysis to test the hypothesis that the performance of the S&P 500 is consistently different from the performance of the S&P 500 ex. FF. MassDivest used a Difference in Means test called the one-sample t-test. The one-sample t-test is used to test if the average ("mean") of a sample is statistically different from a hypothesized population mean.[4] In our analysis, MassDivest tests whether the samples of monthly and rolling twelve-month differences between the returns of the S&P 500 and the S&P 500 ex. FF are statistically different from zero.

MassDivest used R, a popular statistical analysis software, to pull monthly stock values throughout the study periods. MassDivest also used Microsoft Excel to calculate the portfolio value, compare the returns of the S&P 500 and the S&P 500 ex. FF, and perform the statistical analysis.

Results

First, MassDivest compared the returns of the two portfolios for the two-year study period. MassDivest found that Somerville's divested portfolio would have achieved a return of 24.1 percent between July 2017 and June 2019. This assumes that a fixed quantity of assets was held in the portfolio over the study period. In comparison, the S&P 500 produced a return of 19.1 percent between July 2017 and June 2019. Therefore, Somerville's ex-fossil fuels fund would have achieved a 5.0 percent higher return than the S&P 500.

To assess the statistical significance of these results, MassDivest conducted one-sample t-tests, as described above. The t-tests yielded p-values of < 0.001, well within the traditional level of significance ($p < 0.05$). Based on the results of the t-tests, MassDivest concludes that the monthly and rolling twelve-month differences in returns are statistically significant.

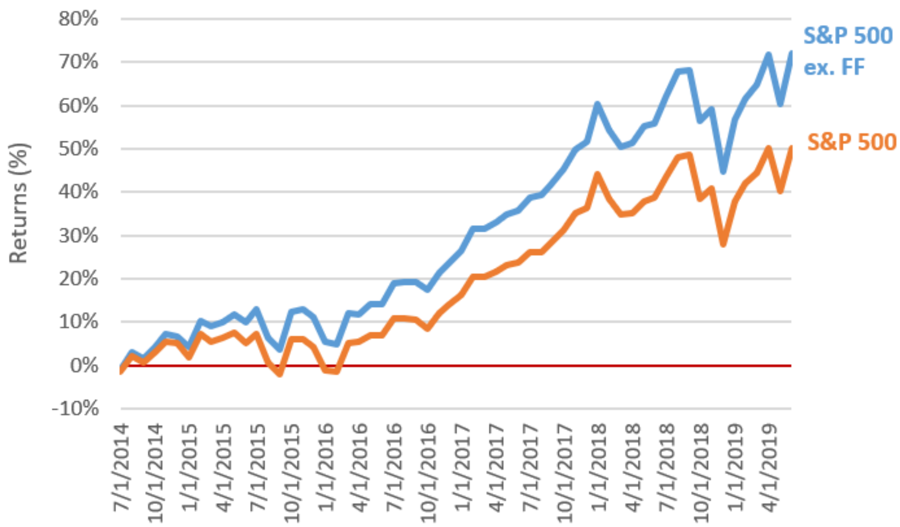
---

[4] For more information on one-sample t-tests, see: https://www.statisticssolutions.com/manova-analysis-one-sample-t-test/.

For robustness, MassDivest also analyzed the two portfolios' respective returns over a longer investment window of five years. Somerville's divested portfolio would have achieved returns of 72.2 percent between June 2014 and June 2019. In contrast, a portfolio emulating the S&P 500 would have achieved a return of 50.1 percent over the same investment horizon. This means that the divested portfolio would have achieved a return of 22.1 percent greater than the S&P 500 portfolio. As with the two-year study period, one-sample t-tests were used to determine statistical significance. Again, MassDivest found that the monthly differences in returns are statistically significant (i.e., $p < 0.001$).

Figure 1 presents a comparison of the compounding five-year returns of the S&P 500 and the S&P 500 ex. FF Returns.

Figure 1. Comparison of S&P 500 and S&P 500 ex. FF Returns (%)



Conclusion

Our analysis finds that the SRB would have achieved a return 5 percent greater had it remained divested from the coal, oil, and gas stocks in the CU 200 between July 2017 and June 2019. While one might argue that our study period represents a uniquely rough period for the performance of fossil fuel stocks relative to the broader economy, MassDivest points to the results of our longer secondary study period: during the five-year period of June 2014 to June 2019, the S&P 500 ex. FF experienced returns that were 22.1 percent greater than those experienced by the S&P 500. Additionally, the results of the rolling twelve-month analysis were statistically significant, indicating that the monthly differences identified in the analysis similarly manifest during longer periods of time.

MassDivest is not the first to identify this trend of divested portfolios outperforming fossil fuel investments.[5] Similar research conducted by Corporate Knights found that the New York State Common Retirement Fund would have achieved an additional $22.2 billion in returns had it divested from fossil fuels during the period from April 2008 to March 2018.[6] Thus, there is a growing body of evidence supporting positive investment returns achieved from divesting from fossil fuels.

[5] See, for example, *The Institute for Energy Economics and Financial Analysis*' May 2019 article titled "Clean investments in U.S. doing far better than fossil fuel stocks since 2017," available at: http://ieefa.org/clean-investments-in-u-s-doing-far-better-than-fossil-fuel-stocks-since-2017/.

[6] "New York State Common Retirement Fund (NYSCRF) Pays $22B for Holding on to Fossil Fuel Stocks: A Corporate Knights Analysis," available at: https://www.corporateknights.com/wp-content/uploads/2018/10/2018-10-02-NYSCRF-CK-Analysis-Presentation.pdf.