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Hello Travis,

Please find our research regarding ESG investing attached.

Thank you,
Best regards.

Felix Bertram

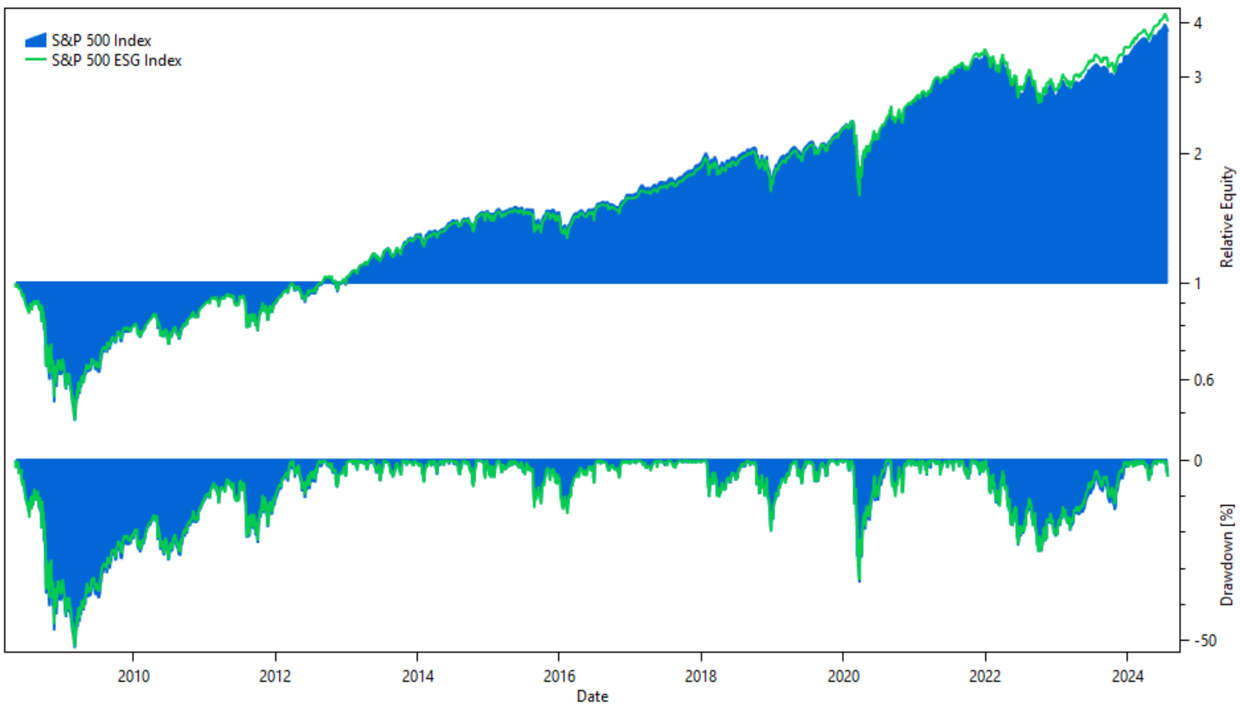
Introduction

Many investors seek to invest in more sustainable ways, with special focus on environmental, social, and governance factors. It should be possible to gain financial returns, while positively contributing to society and the planet.

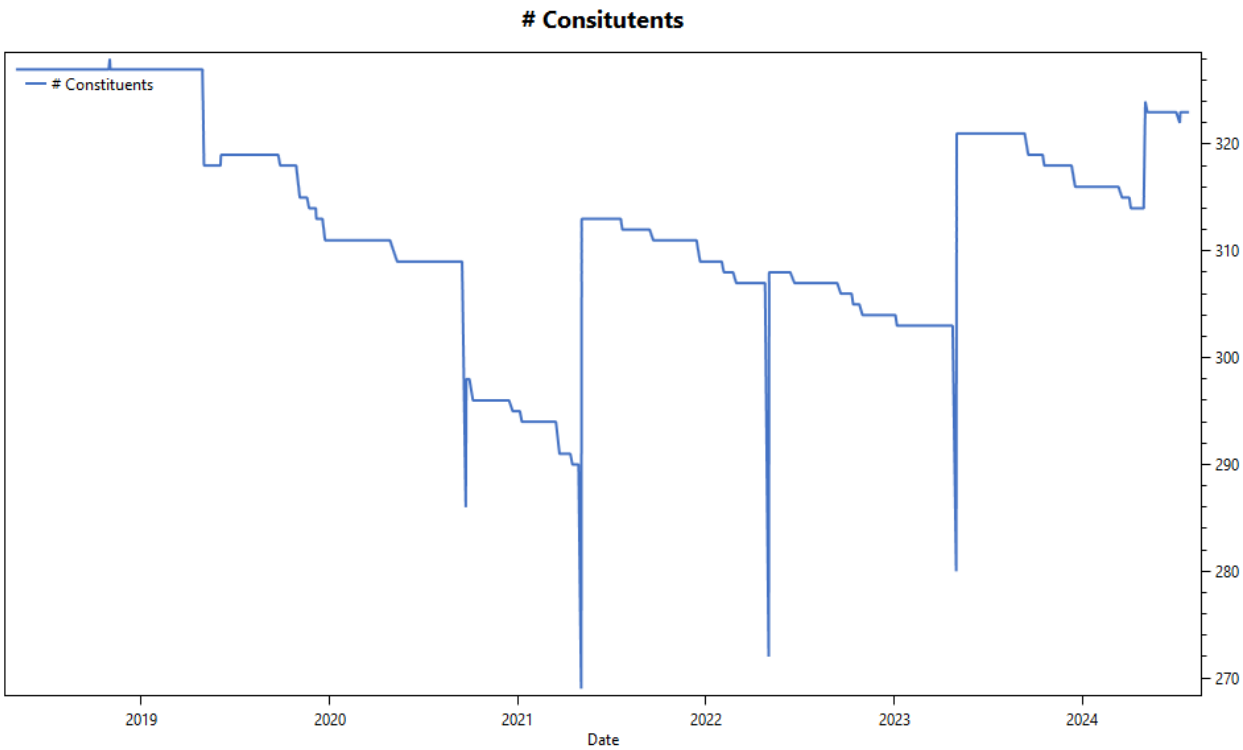
Standard & Poor's has recognized this trend, and introduced the S&P 500 ESG Index. The index is a broad-based, cap-weighted index, designed to measure the performance of securities meeting sustainability criteria, while maintaining similar overall industry group weights as the S&P 500.

For a sustainable stock-investing strategy, we are planning to retrofit TuringTrader's Stocks on the Loose, a variant of Clenow's Stocks on the Move, to use constituents from the ESG index.

S&P 500 ESG Index



The index is available since May 2008. The chart above shows how the S&P 500 ESG Index performs virtually indistinguishable from the S&P 500 since then.



Obviously, the index will have less than 500 constituents, given that some companies from the S&P 500 are removed for not meeting the required sustainability criteria. Nonetheless, the chart shows that the index has around 300 constituents, with a rising tendency in the past years. Unfortunately, we do not have access to the constituents before May 2018.

This period is rather short to demonstrate the viability of a strategy. Consequently, we need to substitute the ESG-aware universe with a non-ESG universe in the years prior to 2018.

Furthermore, we have concerns that companies at the bottom of the ESG index might not have sufficient liquidity, to allow tactical management on timeframes of a few weeks to a few months. Our research shows that companies at the bottom of the S&P have a trading volume of less than $15M per day.

S&P 100 ESG Universe

Consequently, we'd like to keep a universe similar to the S&P 100 used by Stocks on the Loose – only created from sustainable businesses. That way, we should be able to reach daily trading volumes around $200M. Unfortunately, such a universe is not readily available to us. Consequently, we need to perform some research on how to best accomplish this.

As the main concern about stocks toward the bottom of the S&P 500 is liquidity, it seems very natural to use average daily trading volumes as a ranking criterion. Here is the code we are using:

```
var rawConstituents = SimDate >= DateTime.Parse("2018-05-01T16:00-05:00")
    ? base.Universe("$SPESG") // S&P 500 ESG Current & Past
    : base.Universe("$SPX");  // S&P 500 Current & Past

var topConstituents = rawConstituents
    .OrderByDescending(nick =>
    {
        var tradingVol = Asset(nick).TypicalPrice().Mul(Asset(nick).Volume);
        var period = 252;
        return tradingVol.SMA(period)[0] - 0.5 * tradingVol.StandardDeviation(period)[0];
    })
    .Take(100)
    .ToHashSet();

return topConstituents;
```

This code orders stocks by a slightly pessimistic 1-year estimate of average daily liquidity. Then, the code takes the top-100 ranking stocks.

We expected this code to have only very little impact on the strategy's performance, but, unfortunately, that is not true. Here is another variant we tried:

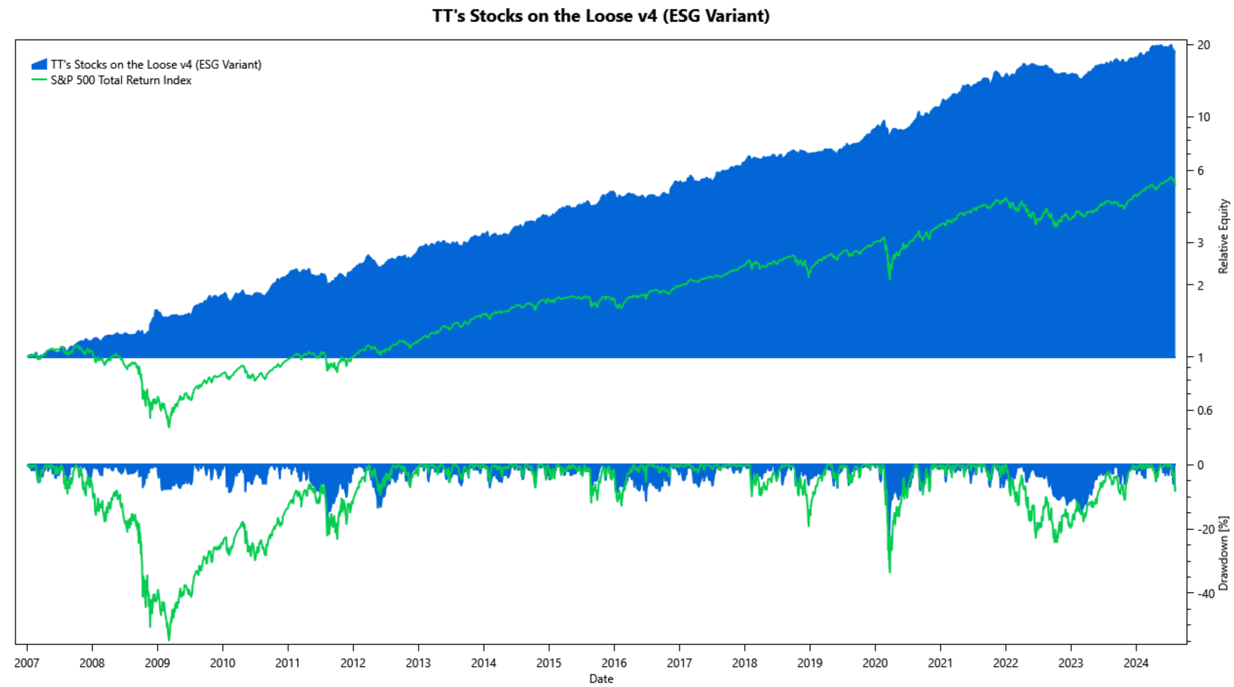
```
var oex = base.Universe("$OEX"); // S&P 100 Current & Past

var topEsg = SimDate >= DateTime.Parse("2018-05-01T16:00-05:00")
    ? base.Universe("$SPESG") // S&P 500 ESG Current & Past
        .Where(nick => oex.Contains(nick))
        .ToHashSet()
    : oex;

return topEsg;
```

This code uses the ESG universe and filters out any stocks that aren't also members of the S&P 100.

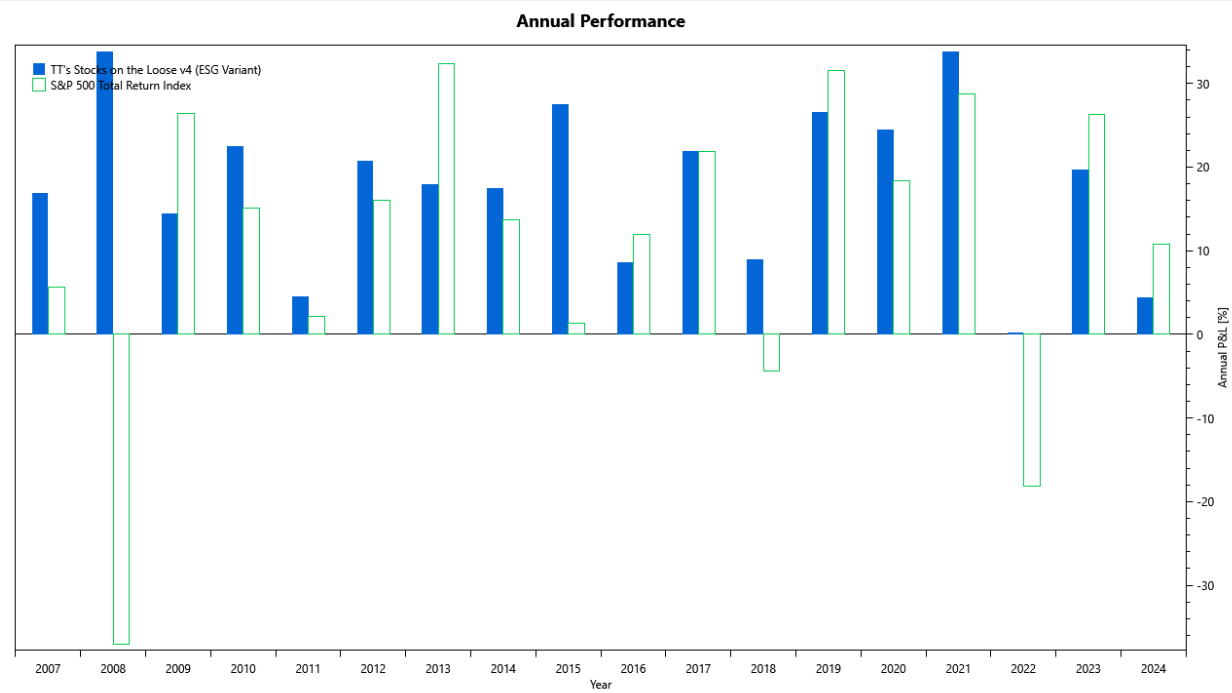
	Advantages	Disadvantages
Code variant #1	• Will always result in a universe of 100 stocks • More flexible to adjust to other universes	• CAGR about 1% lower • More parameters
Code variant #2	• CAGR about 1% higher • Simpler code • No parameters	• Will lead to universe of less than 100 stocks • Very little control over universe

Strategy Backtest

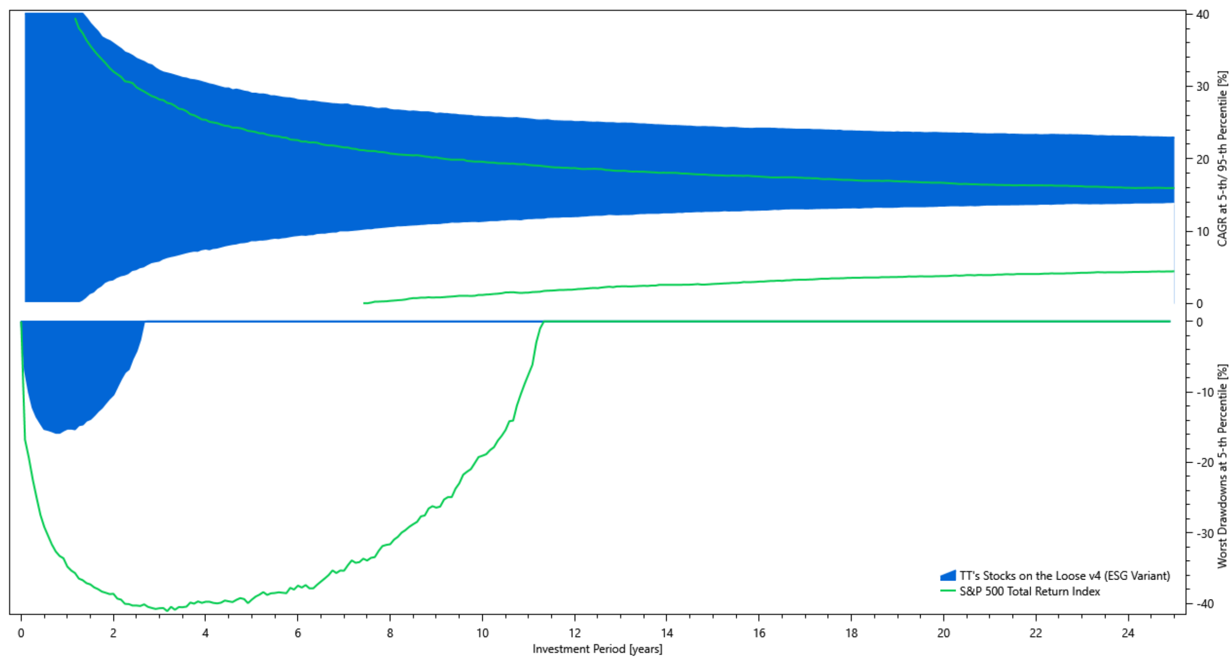
We plugged the newly created S&P 100 ESG universe into the Stocks on the Loose strategy. Here are the results:



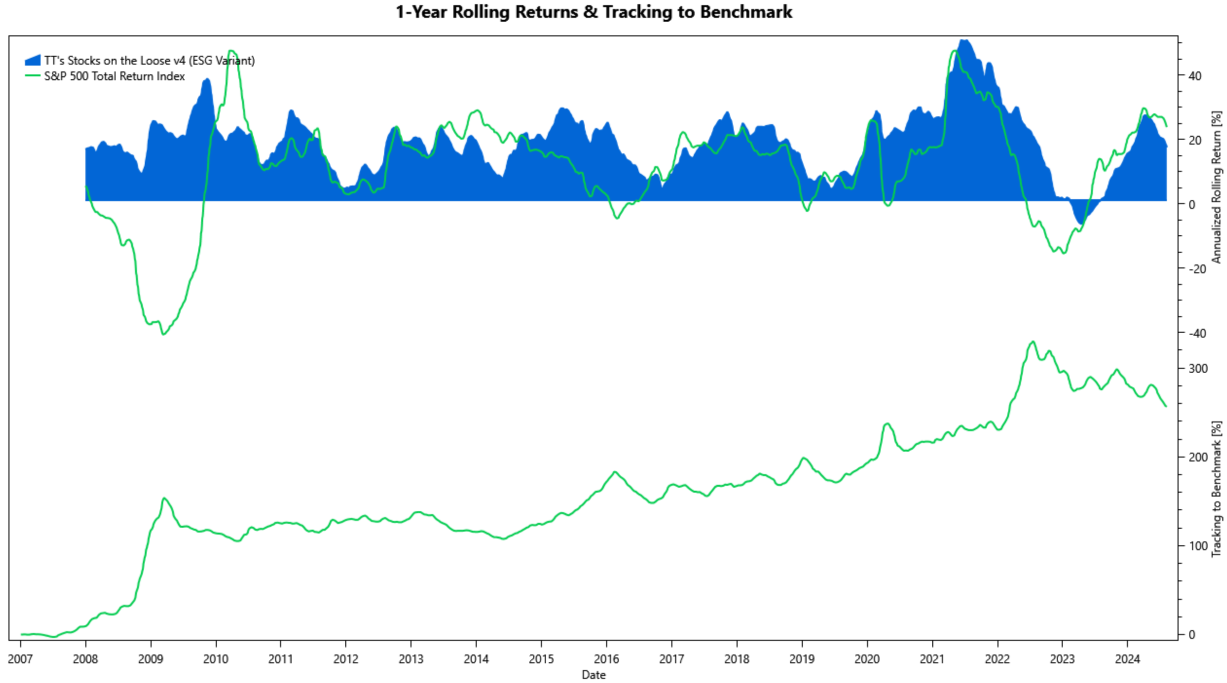
Metric		TT's Stocks on the Loose v4 (ESG Variant)	S&P 500 Total Return Index
Simulation Start	01/03/2007	$1,000.00	$1,000.00
Simulation End	08/06/2024	$18,623.00	$5,237.06
Simulation Period	17.6 years		
Compound Annual Growth Rate		18.09%	9.87%
Stdev of Returns (Monthly, Annualized)		11.80%	15.88%
Maximum Drawdown (Daily)		22.65%	55.25%
Maximum Flat Days		466.00 days	1637.00 days
Sharpe Ratio (Rf=T-Bill, Monthly, Annualizec		1.31	0.53
Beta (To S&P 500, Monthly)		0.37	1.00
Ulcer Index		4.38%	13.57%
Ulcer Performance Index (Martin Ratio)		4.13	0.73



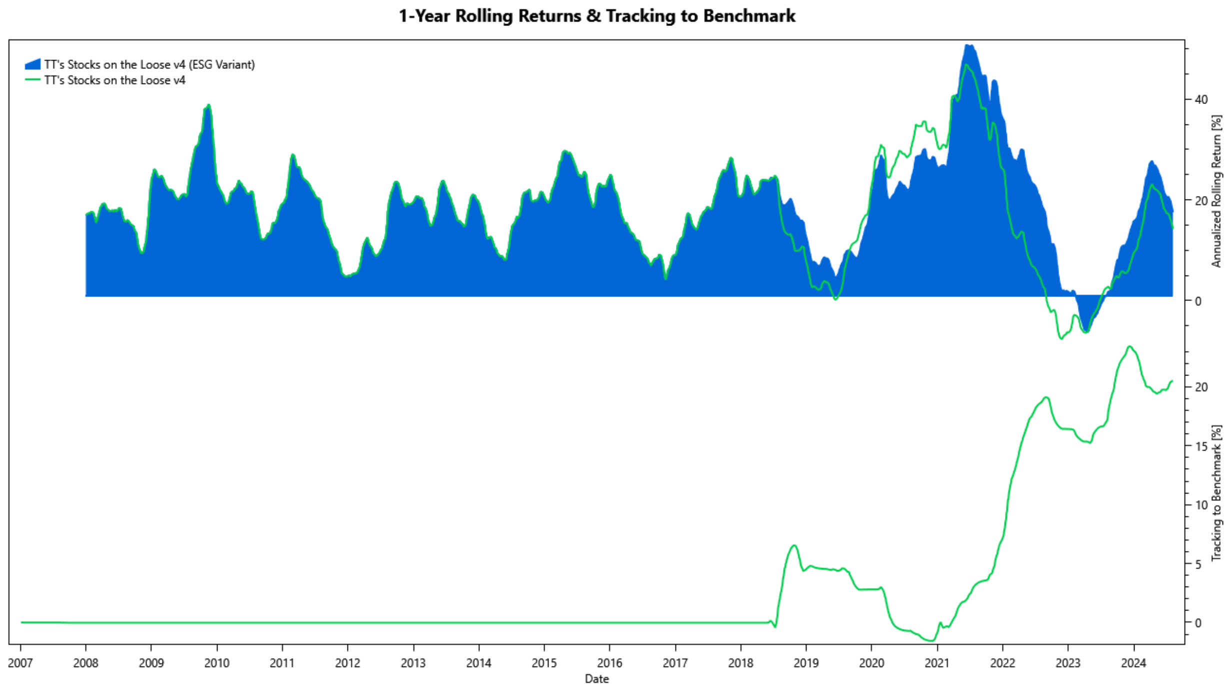
Monte Carlo Analysis of Expected Returns and Drawdowns



1-Year Rolling Returns & Tracking to Benchmark



We notice that the strategy has good performance and docile behavior, much like we've seen with Stocks on the Loose:



Until May 2018, the strategy uses the OEX universe, making it behave exactly like Stocks on the Loose. After that, the ESG-aware strategy performs a bit better. We don't know where this edge comes from, and if it is sustainable moving forward.

Conclusion

ESG on the Loose shows that sustainable investing can be done without sacrificing performance. If at all, the ESG-aware strategy performs slightly better than its cousin trading OEX. Moving forward, we expect more companies to join the ESG bandwagon. As a result, ESG on the Loose will likely converge with Stocks on the Loose in the longer-term future.