ENVEST INDEX FUND

INVESTMENT THESIS

As the world is evolving, so are investors' expectations regarding the role of corporations towards the well-being of the environment. With growth in Sustainable Investing, there is a greater demand for portfolios to be structured in a way that incorporates social, environmental and governance(ESG) factors. However, some of the factors that the 'S' and 'G' components in ESG constitutes include actual net cash flow per employee, women in management, average age of the board etc. Although the inclusion of these factors is a good metric to measure social and governance policies of the firm, this dilutes the weight of the environment score.

In light of these dynamics, we introduce a novel thematic index, Envest that brings in environmental factors in conjunction with an enhanced value strategy. Majority of the ETFs or fund strategies either integrate ESG or tracks single factors such as low carbon, pollution control, waste management among others. **What makes Envest unique** is that it directs assets exclusively to the environment theme which these indexes lack.

Fund Profile	
Fund Type	Exchange Traded Product
Asset Class	Equity
Market Cap	Broad Market
Geographic focus	United States
Regulatory Structure	Open ended investment company
General Attribute	Environment
Investment Period	10 years
Target Fund Size	USD 1 Billion
Fees	0.40%

Broadly Envest has the following objectives:

1. Achieve optimum reduction in climate exposure from the S&P 500, while maintaining a low tracking error
2. Align investors with their personal beliefs
3. Reduce the long-term risk inherent in a portfolio due to environmental changes

INDEX CONSTRUCTION:

Envest is constructed using top 20 percent large-cap US based companies in S&P 500 using the following five factors:

1. Total ***Greenhouse Gas*** emissions measured in millions of metric tons.
2. Total ***CO2*** Emissions measured in thousands of metric tons, it includes both direct and indirect emissions.
3. ***Total waste*** measured in tons, it depicts the waste that the company discards.
4. Total amount of ***water*** used, measured in thousands of cubic meters; it measures the total supply of water for its operational purpose including process and cleaning water including water retained through recycling.
5. Total ***energy* consumption** measured in Mega Watt hour, it includes energy directly consumed through combustion and through chemical production in known equipment and in a controlled environment respectively.

We standardize each of these five factors with their corresponding market cap, and normalize it to create a z-score. We then create a climate score for each security, using a weighted average of z-scores for all 5 factors.

The portfolio is tilted towards an enhanced value strategy, thus increasing the portfolio value exposure by 20% relative to the S&P 500.

METHODOLOGY:

- Our objective is to maximize the reduction in climate exposure from the S&P 500, while minimizing the forward-looking tracking error.
- This tracking error is estimated using the Exponentially Weighted Moving Average approach, using monthly returns of the previous 3 years.
- The climatic factor exposure reduction forms the focal point to decide the weight allotted to every stock in the portfolio.
- Starting with 2011, we use price returns and emission standards to form an optimal portfolio allocation. These allocation weights are then tested on the next quarter returns and the process continues.
- The index is rebalanced quarterly.
- Following are the constraints used in our optimization model: -
    1. The weights of the assets should not deviate more than 2% from their corresponding weight in the S&P 500 Index
    2. The weights of each sector should not deviate more than 4% (8% in case of Energy) from their corresponding sector weight in the S&P 500 Index
    3. Value score of the portfolio should be at least 20% higher than the value score of the S&P 500
    4. Maximum turnover for every rebalance should be maintained at 40%

    We have used quadratic convex optimization technique to arrive at the allocations.
- Since our portfolio is structured to meet the needs of investors with a long-term horizon, we tilt our portfolio towards an ***enhanced-value factor strategy*** (handpick cheaply available stocks that shows potential to outperform its peers in the long run).

We integrate our value factor by creating a standardized value score starting with Forward price to earnings (P/E), Price to Book value(P/B) and Enterprise value/operating cash flows(EV/CFO).

COST STRUCTURE:

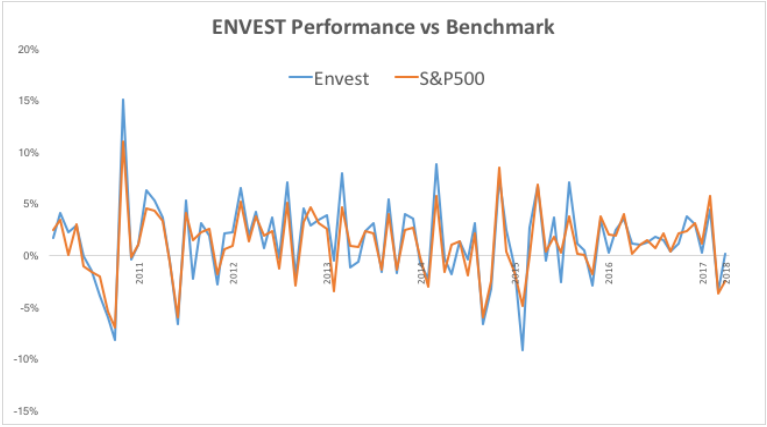
- Outsource real-time data from providers such as Bloomberg, Thomson Reuters, Factset,
- hire 2 research staff to implement portfolio optimization strategies
- hire 2 support staff to solicit emission data from companies by rolling out surveys and questionnaire.
- Approximate annual cost of fund is 2% of the fund size.

TARGET INVESTOR POOL:

Pension funds, insurance accounts, sovereign wealth funds, endowment funds, investors with a long-term investment horizon.

FUND PERFORMANCE:

We tested our model against the S&P 500 index, starting 2011 and following are the results as of Q1 2018.



Our analysis depicts that Envest has been able to track the S&P 500 profile very closely, and outperform in periods when Value factor has delivered good results, for a 0.3% average tracking error.

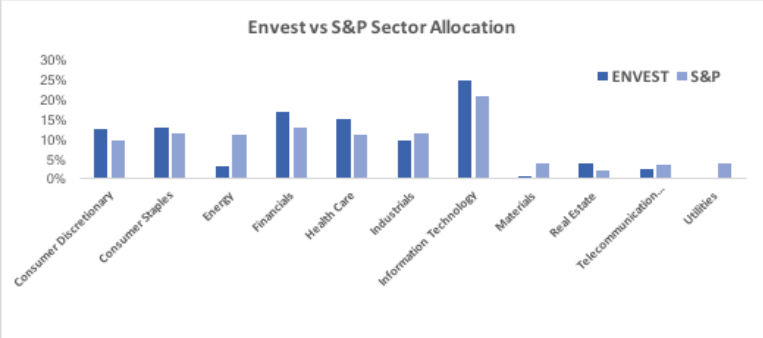
These returns might also be attributed to greater allocation to companies who are showing an increasing concern to climate change risks, and that market has already started pricing their future potential.

Performance indicators	Fund	Benchmark
Correlation	0.96	-
Beta	1.11	-
Tracking Error	0.33%	-
Information Ratio	0.41	-
CAGR	0.78%	0.64%
Skewness	-0.41	-0.49
Kurtosis	4.48	5.27
Number of constituents	96	500
Drawdown Risk-Q1 2018	9.34%	10.16%

INDUSTRY ALLOCATION

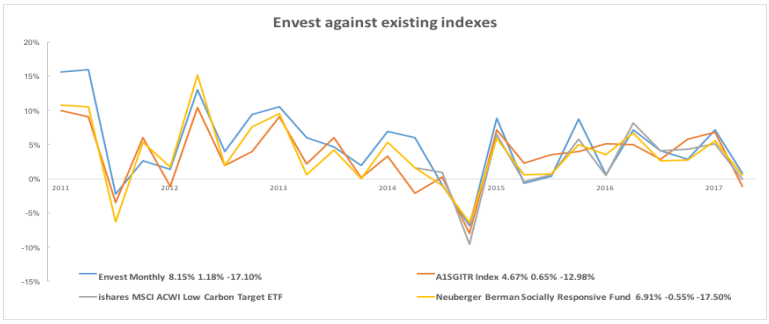
As seen, the exposure to different Industry sectors varies on account of quarterly rebalancing. Following are the sector allocation results as of the latest quarter:

- Consumer Discretionary and Consumer Staples have showed consistently higher allocations
- Materials and Energy sectors have lesser contribution compared to other sectors, because of a low environment and value score.
- There is a steady increase in allocation to Information Technology and Financials, thus signaling their growing concerns to environmental challenges



PERFORMANCE WITH OTHER POPULAR INDEXES:

Following is a comparison of Envest with other popular Sustainability Indexes. These indexes cover either ESG as a whole or track low carbon or single factors like pollution, waste or water among others.



SCALABILITY:

1. Diversify our asset universe to support Fixed Income asset class
2. Span geographical areas beyond United States.
3. Incorporate multifactor strategies and currency hedged indexes in case of cross country allocations.

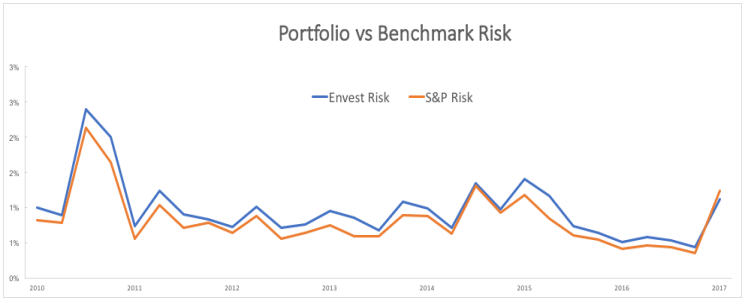
ASSUMPTIONS:

- We optimize the portfolio starting 2011 since emission data was only available from that year onwards on public domain.
- Missing data was estimated using industry average per unit sales in case the emissions were not reported at all. For companies which have data only for the latest periods, we have estimated data points backward by using appropriate growth rates.
- To calculate a standardized z-score for P/B, P/E and EV/CFO, the series is first winsorized, which means the outliers are removed capped to 5th and 95th percentile respectively.
- EV/CFO is considered only for non-financial companies. In case of financial companies, value score is estimated as the weighted average of only Forward P/E and P/B ratios.
- Exponential parameter lambda (half-life) is taken as 0.97 for monthly returns in order to estimate tracking error for the next quarter, using EWMA model.

RISKS:

1. Input data

- The emission standards available for companies on public domain might not be reliable.
- Only few companies in Real Estate and healthcare have reported data related to greenhouse gas emissions.
- Our estimation of total emissions for missing data, based on industry average, scaled with respect to revenue might not be robust.
- Companies have started reporting data as of very recent years (2011). Back-testing of strategies upto 2011 does not give high confidence in results, and might be a part of the same economic cycle.
- Stress-testing of portfolio based on fat-tailed black-swan events give abnormal returns.



2. Implementation in other markets and asset classes

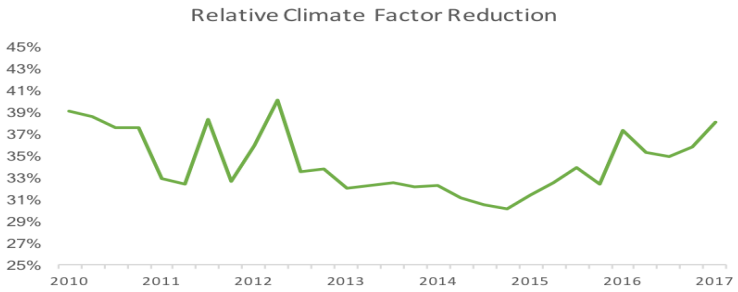
- Emerging markets: This approach is difficult to implement in emerging markets due to a greater scarcity of data and underreporting that would credibly incorporate the environment features.
- Commodities: Production of commodities is often associated with environmental side effects such as mining, pollution etc. making commodities a challenging asset class for Envest.
- As far as alternative investments are concerned, the reduced transparency and reporting needs makes it contrary to the sustainable investing ideology.

FUTURE SCOPE

1. To structure a more robust index fund that can assimilate different drivers of performance by combining factors such as momentum, quality and low volatility.
2. Our present model is excluding companies that have high emissions with respect to the given five factors. These data points are slow moving signals, and there is not enough evidence to justify if a company is moving towards sustainability. Hence, we are penalizing polluters absolutely.
   We plan to allocate more weights towards companies which are making progress towards sustainable environmental practices or reducing pollution.
3. Impact investing: Looking to integrate impact investing so that investors can invest in green financing projects.
4. Negative screening: Performing regular screening to rule out companies that fail to meet certain social, environment or ethical criteria such as tobacco, gambling, weapons, animal testing to name a few.

Achieving the objective of a constrained portfolio in emission standards comes at a premium of an increased risk appetite by 10-15 basis points at present. This is a small premium that investors can pay to account for financial risks in their portfolio in the event of increasing regulation on environment factors, for an equivalent level of return.

The following chart depicts the targeted reduction in the 5 environment factors from the parent universe:



Significant Social and Environmental Impact:

As more asset managers switch to a sustainable investing strategy and overweigh environmentally sound companies in their portfolio, companies and business owners will be compelled to change the business model and incorporate new technologies that will reduce their carbon footprint and improve on their energy efficiency.

CITATIONS:

- **Data Sources: Bloomberg, Thomson Reuters**
- **Index methodology references: S&P and MSCI**
- **Optimization tools: Gurobi**
- **References:**

https://www.msci.com/www/blog-posts/finding-value-understanding/0189058470
http://www.ey.com/Publication/vwLUAssets/EY-climate-change-and-investment/$FILE/EY-climate-change-and-investment.pdf
https://www.blackrock.com/investing/investment-ideas/sustainable-investing