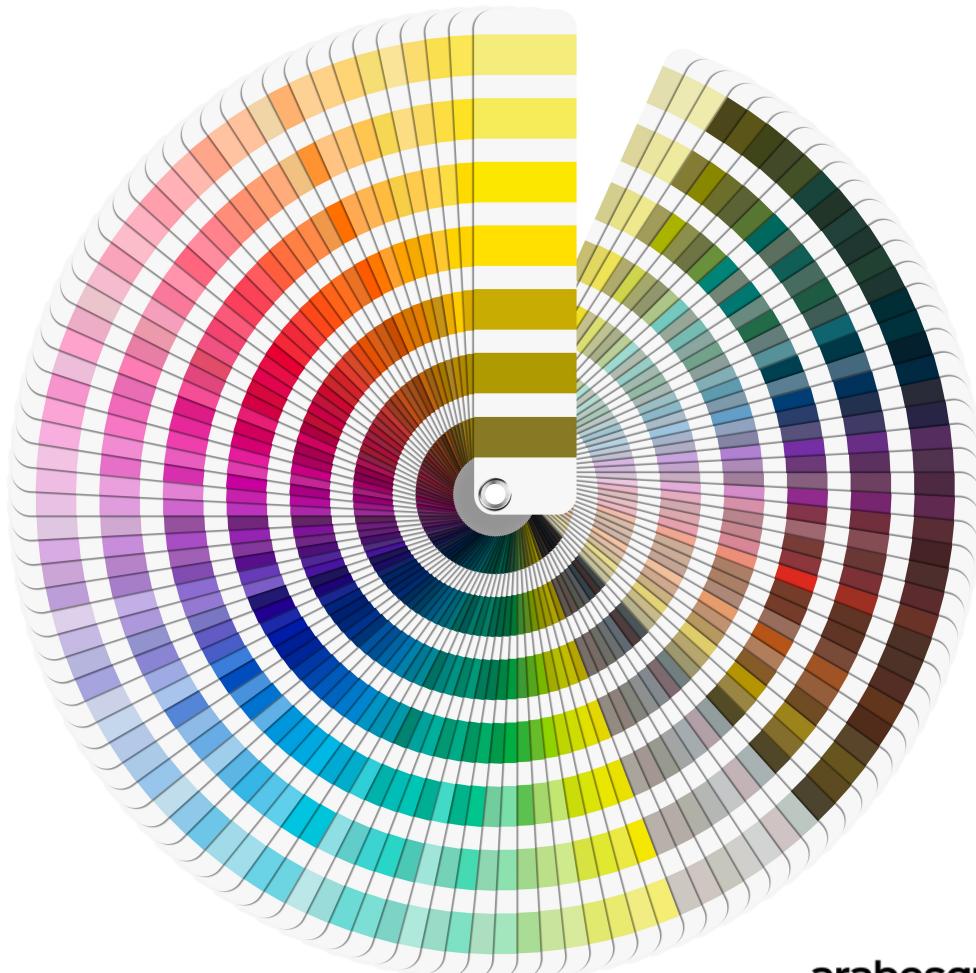


Screened Investing: A Practitioner's Perspective

Practical Applications of the S-Ray®
Preferences Filter

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Introduction

The very first implementations of sustainable investing focused on divesting from “vice” stocks – those firms that were participating in activities considered to be detrimental to the world. Many new techniques have since been developed (thematic investing, best-in-class, etc.), but screening remains one of the most popular implementations, representing over \$26 trillion in assets as of 2018¹.

The S-Ray Preferences Filter allows for substantial customization of the screening process, both in what activities are screened out and at what level the activity becomes a concern. By adjusting these parameters based on their individual utility functions or strategy's objective function, investors can create portfolios that align with both their values and financial goals. We demonstrate that through carefully designed screening investors can achieve their ethical objectives with minimum effect on the risk and return profiles of their portfolios.

“S-Ray’s Preferences Filter allows granular analysis by incorporating revenues derived from each business activity as well as an involvement flag.”

S-Ray Preferences Filter

Almost all the existing research into negative screening uses the companies' sector or industry classifications as the screening parameter. S-Ray's Preferences Filter allows for a much more granular analysis by incorporating revenues derived from each business activity as well as an involvement flag. The revenue breakdown data tracks reported company revenue from financial statements and 10-K reports, while the business involvement data tracks products and services sold by companies as reported on company websites or in company reports and presentations. It is possible for a company to have a recorded involvement in a particular business segment, but no reported revenue, for instance if they do not report segmented revenue, or their revenues from the business activity of interest fall below their designated threshold for reporting separately.

1. UN PRI, 2020

Combined, these features can be used to ensure a bespoke fit in the screening parameters. Take for instance an investor for whom alcohol exposure is a concern. With traditional industry exclusions, the best they will be able to do is exclude alcohol producers (brewers and distillers), alcohol wholesalers, and alcohol-specific retailers (e.g. liquor store chains). There are many obvious potential cases this methodology would miss, such as a food conglomerate that includes a brewery or a general food distributor whose products include alcohol, neither of which would fall in an excluded industry. Adding revenue analysis will account for those two examples but could still miss a restaurant group that does not report alcohol sales separately but cites an agreement with a brewer on its website. In this case, the Preferences Filter business involvement flag would be triggered. Depending on the level of objection to alcohol, the revenue and involvement thresholds can be tweaked to match the investor's preferences.

In addition to our standard filters, S-Ray offers specialty binary screens, including a Controversial Weapons Filter. This expands on the weapons and defense filters by identifying companies that are involved in or invest in the manufacture of landmines, cluster munitions, chemical weapons, biological weapons, or nuclear weapons. For instance, it allows for the exclusion of a semiconductor company that produces guidance chips that have been traced to cluster munitions, which would not show up in other revenue or involvement screens.

"There is much debate as to whether equity divestment can effect change on the offending companies."

Portfolio Implementation

Individual Features

There is much debate as to whether equity divestment can effect change on the offending companies². We will not take a position on that debate here, but rather focus on the case where profiting from the activities of the screened companies is anathema to the underlying investor based on their ethical beliefs. Given this justification for screening, the most likely desired outcome is a portfolio that is as similar as possible on a risk and return basis to its un-screened counterpart. As such, the graphs and data overleaf demonstrate the return, risk, and tracking error effects of each individual filter³ available in the standard Preferences Filter product.

2. Blitz & Swinkels, 2020

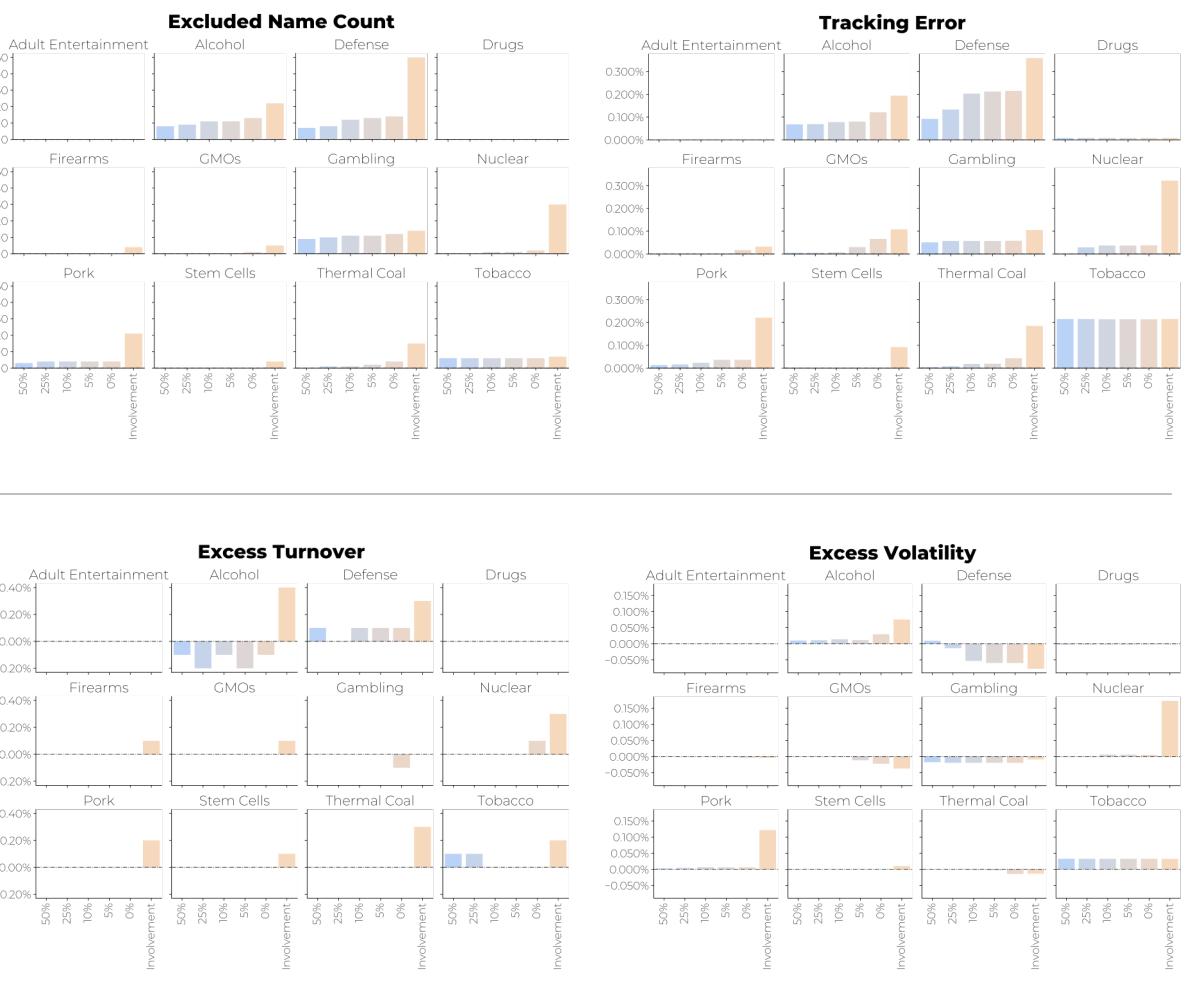
3. See Appendix A for filter definitions



Given the quantity of individual filters available, we will not go into detail on each one, but there are some noteworthy observations. First, it is clear that many of these filters can be implemented with relatively limited effects on the risk and return profile of the portfolio. In many cases, the overall volatility of the portfolio actually declines over the period studied, and when it does increase, it is not by a substantial margin. Additionally, in most cases the excess turnover required to maintain the screened portfolio and the tracking risk assumed by the investor are relatively trivial.

It is also worth noting the filters where the effect comes almost entirely from the involvement flag. The Nuclear, Pork, and Stem Cells exclusions stand out in this regard – where an investor would want to use the involvement flag to ensure they are in fact achieving their stated goals, as a revenue-based screen would have little to no effect on the portfolio.

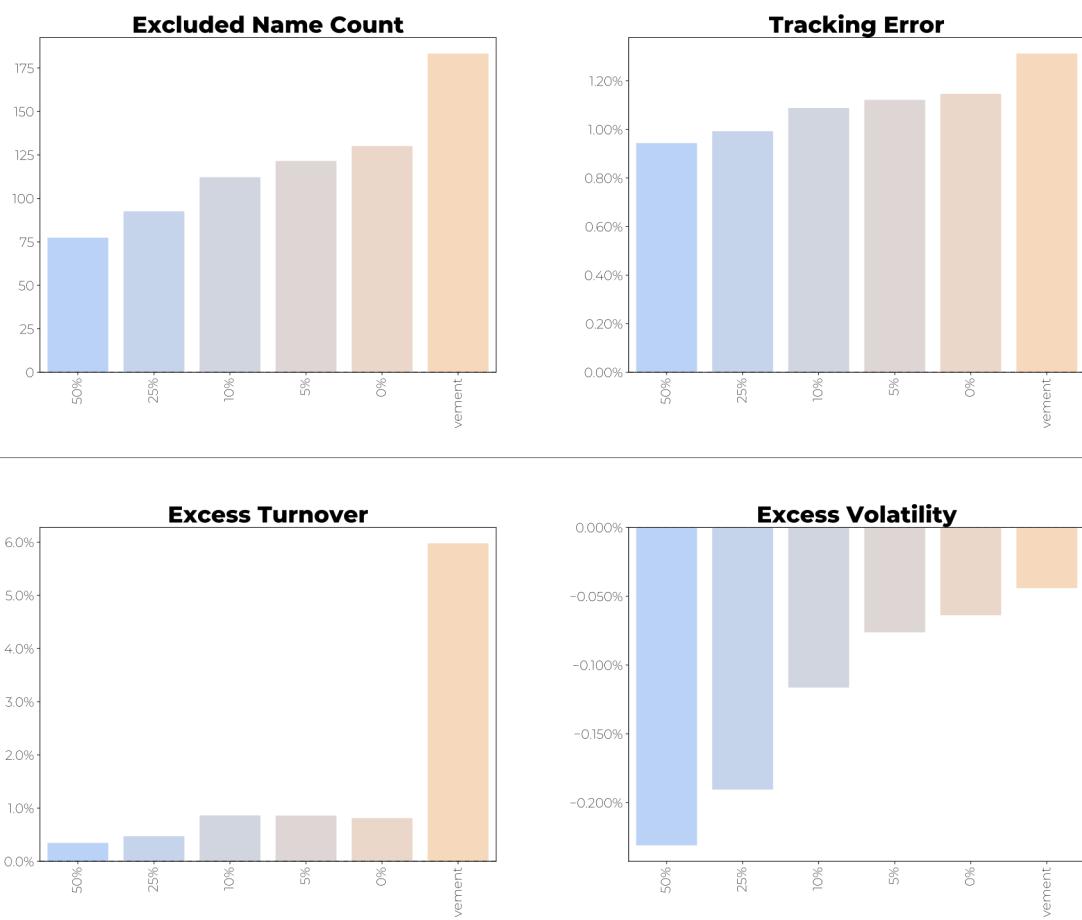
Portfolio Metrics⁴ By Filter and Threshold



4. See Appendix B for portfolio methodology and metric definitions

The obvious outlier is the Fossil Fuels filter (so much so that it has to be plotted separately⁵), due to the large percentage of the universe excluded. Of particular note is the sharp jump in excess turnover going from a purely revenue-based filter to an involvement filter. Despite excluding only 53 more names⁶ on average, the excess turnover increases dramatically from under 1% to almost 6%. This is a clear example where an investor can benefit from this analysis. If they are undecided on the level at which to set a fossil fuel exclusion, this information can be used to find the equilibrium between the desired outcome and the pursuant portfolio risk.

Fossil Fuel Portfolio Metrics by Threshold



5. Note the substantially larger ranges of the Y axes in the graphs of the Fossil Fuel portfolio metrics.

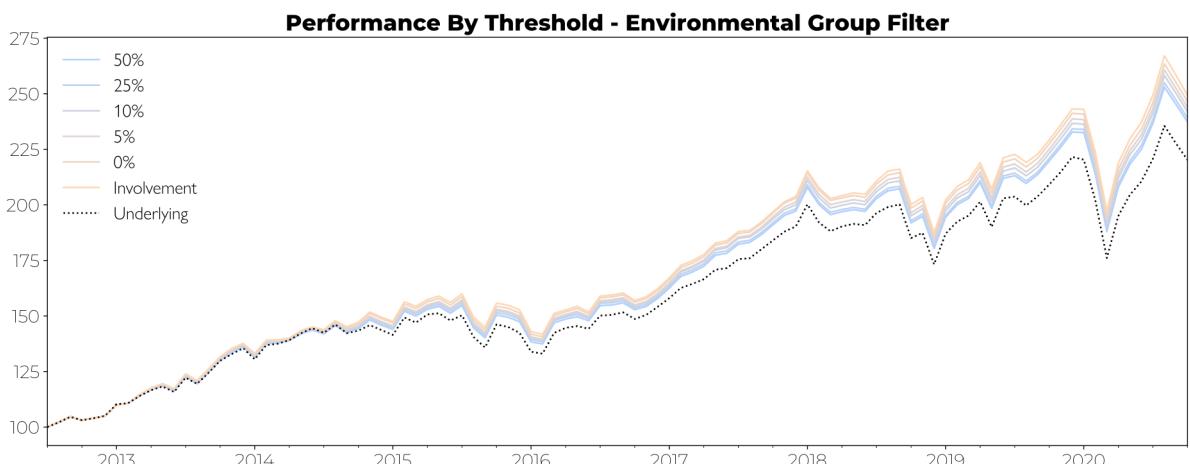
6. As an example of the difference between the direct revenue and involvement filters, these companies include several industrial machinery, engineering & construction, and chemical companies that, while not directly involved in the extraction or distribution of fossil fuels, are major contributors to the process through other avenues.

Thematic Features

In practice, it is very rare for an investor to care about excluding only one of these activities from their portfolio. More often, they are grouped together to form thematic filters. We will examine a subset of these groups in more detail:

- **Environmental:** Fossil Fuels, Palm Oil, and Plastic⁷
- **Vices:** Adult Entertainment, Gambling, Alcohol, Tobacco, Recreational Drugs
- **Weapons:** Defence, Firearms, Controversial Weapons⁸

The graphs below show the performance of portfolios formed using various levels of revenue thresholds and the involvement flag⁹. We begin with the Environmental group, as containing the fossil fuels filter it is likely to show the biggest effect, which should make the visualization clearer.



	Annualized Return	Annualized Volatility	Tracking Error	Information Ratio	Name Turnover	Name Count	Name Count %
Original	11.52	13.23	-	-	16.5%	1219	-
50%	12.48	13.00	0.94	1.02	16.9%	1138	93.3%
25%	12.58	13.03	1.00	1.06	17.2%	1114	91.4%
10%	12.75	13.08	1.09	1.12	17.5%	1089	89.3%
5%	12.87	13.12	1.13	1.19	17.5%	1078	88.4%
0%	13.01	13.13	1.18	1.26	17.6%	1067	87.5%
Involvement	13.15	13.13	1.35	1.21	23.2%	985	80.8%

7. Please note that the Palm Oil and Plastic filters are not yet available in our Preferences Filter product and have been used in this analysis for demonstrational purposes.

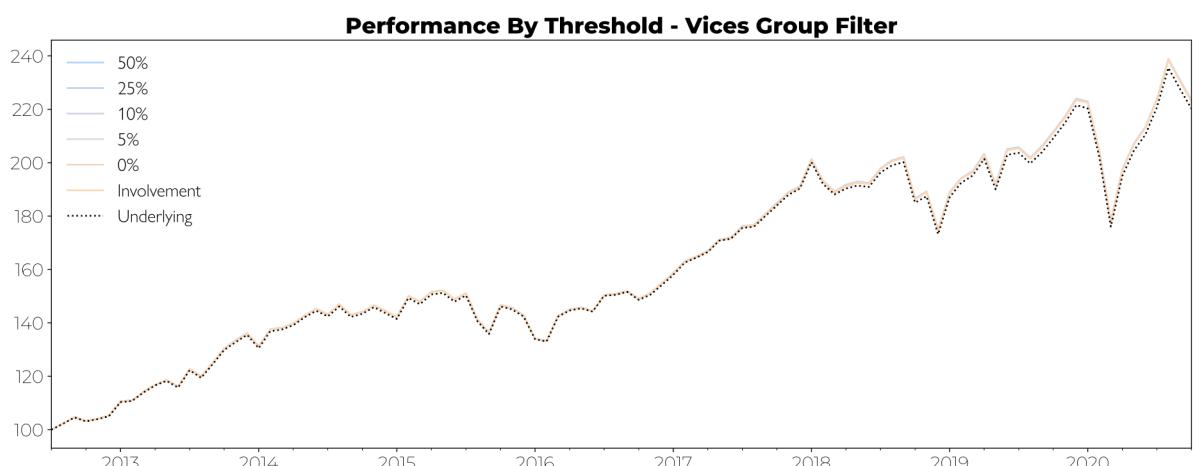
8. As it is a binary screen and likely to be of great concern for any investor wishing to exclude weapons, the Controversial Weapons involvement flag is overlaid on all revenue and involvement threshold portfolios.

9. See Appendix B for methodology

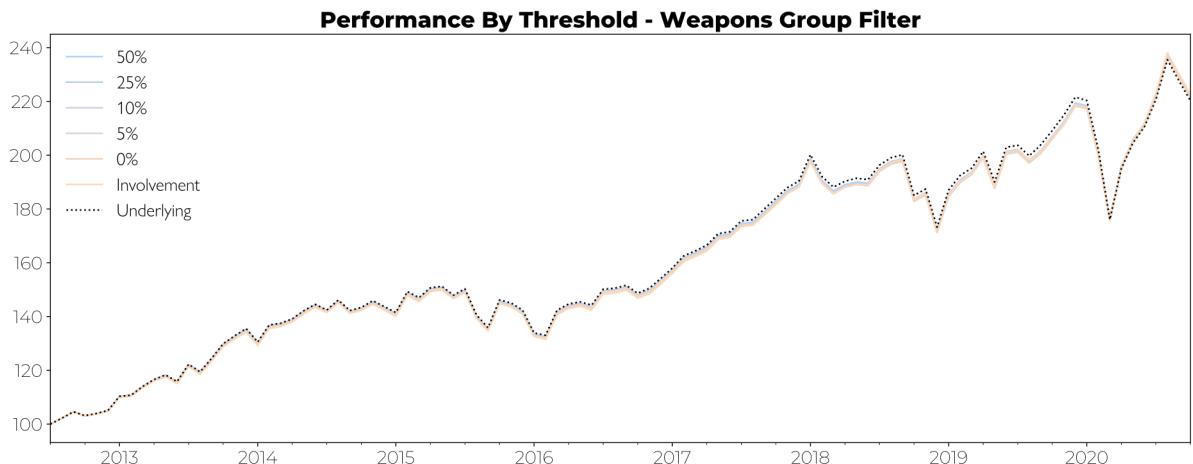


As expected, we see an excellent visual representation of the increasing tracking risk as more names get excluded. As with the individual Fossil Fuels exclusion, there is a large jump in the risk metrics from the revenue-based filter to the involvement. Knowing what we do about the underlying individual filters, it makes sense that Fossil Fuels would dominate the effect. While this large effect allows for an understanding of the underlying dynamics, the size of the risk and return effects are clear outliers among the filters analyzed here. Efficient implementation of low carbon and fossil fuel excluded portfolios is a topic in its own right, and beyond the scope of this analysis.

Therefore, we turn next to the Vices and Weapons groups, which are more representative of the typical risk and return characteristics of grouped filters. In both cases, we see that the risk and return effects from the implementation of these screens are relatively moderate, demonstrated visually by the close tracking of the modified portfolio to the benchmark. As with the Environmental screen (though on a much smaller scale), there is a jump in the risk characteristics moving from a purely revenue-based screen to the involvement flag. Once again, this allows for calibration of one's ethical objections and portfolio requirements.



	Annualized Return	Annualized Volatility	Tracking Error	Information Ratio	Name Turnover	Name Count	Name Count %
Original	11.52	13.23	-	-	16.5%	1219	-
50%	11.71	13.26	0.24	0.79	16.5%	1195	98.1%
25%	11.70	13.26	0.24	0.75	16.4%	1194	98.0%
10%	11.69	13.26	0.24	0.69	16.4%	1190	97.7%
5%	11.68	13.26	0.25	0.66	16.4%	1190	96.6%
0%	11.69	13.26	0.25	0.68	16.4%	1188	97.5%
Involvement	11.67	13.31	0.31	0.49	17.1%	1177	96.6%



	Annualized Return	Annualized Volatility	Tracking Error	Information Ratio	Name Turnover	Name Count	Name Count %
	11.52	13.23	-	-	16.5%	1219	-
50%	11.59	13.08	0.41	0.17	16.6%	1202	98.6%
25%	11.57	13.08	0.42	0.11	16.6%	1201	98.6%
10%	11.53	13.07	0.42	0.01	16.6%	1199	98.4%
5%	11.53	13.07	0.42	0.02	16.6%	1199	98.3%
0%	11.53	13.07	0.42	0.02	16.6%	1197	98.2%
Involvement	11.58	13.05	0.55	0.10	16.9%	1162	95.3%

Conclusion

As we have shown, it is possible in many cases to restrict one's investments in particular business activities while maintaining a relatively limited effect on the risk characteristics of the portfolio. However, to optimize the effectiveness of the screening, it is important to understand the underlying dynamics of each filter. S-Ray's Preferences Filter can be customized to achieve the optimal ethical and financial performance you require. In fact, while we have examined a subset of the currently available Filters, S-Ray can build bespoke tools that include any combination of business activities included here and beyond, as well as provide the requisite analysis to achieve one's goals.

A Note on Returns

Many of the filters analyzed here show moderate to substantial outperformance relative to the underlying universe. This does not necessarily align with the academic research on the topic (see, for example Sireklove, 2016; Richey, 2020; Richey, 2016; Yook & Hooke, 2020). This is almost certainly a function of the period of study. Most research uses sector or industry classification to filter and examines a much longer time period (as far back as 1963). While analyzing data over the longest available time horizon is ideal to reduce spurious findings, it can also suffer from a slow reaction to structural change. There is evidence that there has in fact been such a change in the last decade, possibly driven by the increased demand for sustainable investing products (for instance Cornell, 2020 analyzes the underperformance of fossil fuel related companies in the 2010s). However, we would hesitate to suggest that this outperformance should be expected going forward, as the existing academic research shows longer-term evidence and economic theory pointing to either underperformance or performance in line with the benchmark. We therefore focus primarily on the risk characteristics of these portfolios.

Appendix A: Preferences Filter Definitions

Filter	Areas covered
Adult Entertainment	Web sites that generate revenues by providing erotic content. Companies which produce, distribute, and exhibit adult-oriented content, including the production of Adult-oriented content for the cable television, Video/DVD, and internet market Magazines that generally contain explicit sexual content.
Alcohol	Alcoholic beverage manufacturing, including breweries, distilleries, wineries and manufacturers of other alcoholic beverages. Wholesalers of beer, wine and distilled alcoholic beverages. Alcohol-serving bars and pubs.
Defence	Manufacturers of advanced equipment and providers of services targeted at combat, national security, and other defence applications, including defence contractors, advanced weaponry and combat equipment and support systems, autonomous military drone manufacturing, and advanced electronic hardware targeted at military and intelligence applications. Military and defence functions testing equipment. Propulsion launch used in vehicle and missile launch, and computer systems, electrical components, IT solutions and software tailored and designed for the defence industry (note - such technology can also have applications in the aerospace sector).
Firearms	Companies that sell small arms and ammunition, generally comprised of personal, non-military firearms and ammunition.
Fossil Fuels	Companies in the energy industry, encompassing oil and gas exploration and production, pipeline transportation, refineries, and oil and gas equipment and services. Wholesalers which provide electricity generated by hydrocarbon and nuclear technologies. Natural Gas Utilities which offer service to residential and commercial customers. Companies involved in the leasing of coal mines and the mining and processing of coal. Companies producing coke for sale to others are included.
Gambling	Companies in the casino, casino hotel, gaming equipment, and horse racing industries. Software with functionality specific to the casino industry.
GMO	Companies engaged in plant and animal breeding, genetics and genomics, including animal and plant DNA testing services.
Nuclear	Wholesalers which provide electricity generated by nuclear power. Nuclear (radioactive) waste processing, including mixed waste, which is waste that contains both low-level radioactive and hazardous waste. Companies engaged in uranium, radium, and vanadium mining.
Pork	Hog and Pig Farming for food consumption (e.g. bacon, pork, ham). Companies which manufacture beef and pork into meat products or edible casings ready for consumption, or as ingredients for further processing.
Recreational Drugs	Farms which cultivate marijuana, including products for both medical and non-medical use.
Stem Cells	Companies that use adult stem cells obtained from adult human cancellous bone and bone marrow to aid bone regeneration, and autologous stem cells that are harvested from the patient's own body and implant back for repair and healing, including systems used for the collection, cryopreservation, and archive storage of stem cells to be used in stem cell therapy. Companies that offer bioanalytical services that are used to produce identical DNA or RNA molecules (cloning), and bioanalytical services that identify and isolate clones based on DNA fragments.
Thermal Coal	Companies involved in the leasing of coal mines and the mining and processing of thermal (steam) coal.
Tobacco	Leaf Tobacco sold to manufacturers of finished tobacco products. Manufacturers of cigars, cigarettes and other tobacco products, including e-cigarettes, rolling tobacco, and cigarette papers. Wholesalers of tobacco and tobacco products.

The Controversial Weapons Filter

The Controversial Weapons Filter identifies companies with an involvement in controversial weapons, which could be through direct investments or direct involvements. Involvement in controversial weapons is taken to mean involvement in the manufacturing and supply-chain, either through products or services related to any of the following:

- a) Landmines,
- b) Cluster bombs,
- c) Chemical and biological weapons, or
- d) Nuclear weapons; either whole strategic parts or platforms for the use of.

Direct investments can include providing loans to or issuing bonds to companies that fall in the above categories, as reported by both news outlets and non-governmental organizations.

Appendix B: Methodology and Definitions

Methodology

The portfolios are formed as follows: for each month in the range 2012-07-31 – 2020-10-31, we start with the S-Ray® Developed Markets Universe¹⁰ and remove any assets that have no Preferences Filter coverage, to ensure we do not miss any securities that should be excluded or bias the analysis. Next any assets that are flagged by the selected screen are excluded. The remaining assets are proportionately reweighted to return the portfolio to full investment. All transaction costs are assumed to be zero. This is the simplest possible method, intended to show the effects of the filters with as little interference as possible. While there are several other more advanced implementations, these fall outside the scope of this piece, and will be reserved for further research. The screens we examine are 0%, 5%, 10%, 25%, and 50% revenue thresholds, plus the involvement flag. For the revenue thresholds, the percentage indicates the minimum revenue required in the activity to be excluded. For example, in the 50% screen, only companies deriving greater than 50% of their revenue from an activity will be excluded, while the 0% screen will filter companies with any revenue at all.

Metric Definitions

Annualized Return: The geometric average return, expressed in units of return/year. For monthly returns, the formula is $r_{\text{Ann}} = (\prod_{i=1}^n [1 + r_i])^{12/n}$

Annualized Volatility: The standard deviation of returns, expressed in units of return/year. For monthly returns, the formula is $\sigma_{\text{ann}} = \sqrt{\frac{12}{(n-1)} \sum_{i=1}^n (r_i - \bar{r})^2}$

Tracking Error: The standard deviation of active returns, expressed in units of return/year. For

monthly returns, the formula is $TE_{\text{ann}} = \sqrt{\frac{12}{(n-1)} \sum_{i=1}^n ((r_{i,p} - r_{i,b}) - (\bar{r}_{i,p} - \bar{r}_{i,b}))^2}$

Information Ratio: The ratio of active returns to tracking error. The formula is

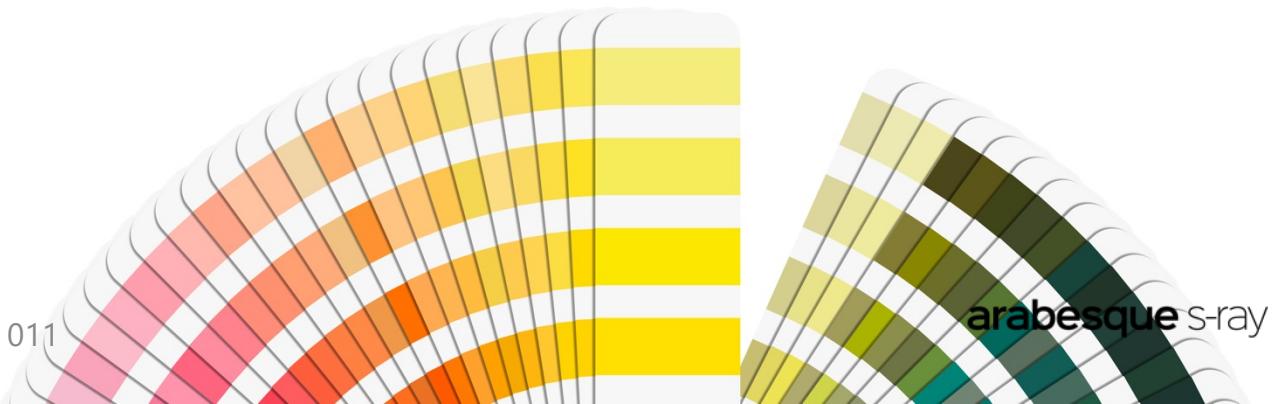
$$IR = \frac{r_{\text{ann, port}} - r_{\text{ann, bmk}}}{TE_{\text{ann, port, bmk}}}$$

Name Turnover: The average number of names newly added or sold completely from the portfolio per year, expressed in units of names/year. For monthly rebalancing, the formula is $TO = \frac{12}{n} \sum_{i=1}^n \frac{\min(nms_{i,liq}, nms_{i,new})}{(nms_{i,tot} + nms_{i+1,tot})/2}$

10. This universe closely resembles the Developed Markets Large/Mid Cap indices of major index providers. The methodology and constituents are available upon request

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