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Diving Into the World of Sin Stocks: Financial Greed and Moral Decay



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1 Introduction

In recent years, the financial industry has experienced a growing emphasis on sustainability and responsible investing. Institutional investors increasingly integrate ethical and environmental considerations into their investment frameworks, leading to the exclusion of companies engaged in controversial industries such as alcohol, cannabis, tobacco, gambling, and weapons (Lohia, 2025). These firms, commonly referred to as sin stocks, have increasingly been viewed as undesirable from a moral and social perspective. Yet empirical studies suggest that such firms often deliver higher returns relative to the broader market (Lohia, 2025).

This tension between moral integrity and financial performance is particularly relevant to Norway's Government Pension Fund Global (GPFG), the largest sovereign wealth fund in the world. Managed by Norges Bank Investment Management (NBIM), the fund follows a strict ethical exclusion policy that reflects Norway's commitment to sustainable and responsible capital management. Acting on recommendations from the recently suspended *Council on Ethics*, NBIM excludes companies whose products or conduct are deemed incompatible with the fund's guidelines. These exclusions largely cover the same categories of controversial industries described above and include conduct-based criteria targeting severe human rights violations, environmental destruction, and corruption (NBIM, n.d.). These exclusions raise the question of whether refraining from such investments affects the fund's long-term financial performance.

Against this backdrop, the purpose of this paper is to evaluate whether an investment strategy centered on sin stocks would outperform the broader market and to assess the potential opportunity cost incurred by the GPFG due to its ethical exclusion policy. More precisely, the research seeks to answer the following question:

> *"To what extent do NBIM's ethical exclusions generate systematic differences in long-term returns and risk exposure, and do these exclusions produce short-term valuation effects?"*

To address this question, the paper analyzes the historical performance of selected sin stocks that have been excluded from the GPFG on ethical grounds and compares their returns to the performance of the GPFG and global market benchmarks. The analysis focuses on whether the fund's ethical screening has resulted in measurable forgone returns. Using standard measures of risk-adjusted performance, including the Sharpe ratio and Jensen's alpha, the study suggests a trade-off between ethical responsibility and financial efficiency.

2 Theoretical and Empirical Framework

This section outlines the theoretical concepts and key empirical findings on ESG investing, behavioral biases, and the sin premium that form the basis for our analysis.

2.1 ESG Investing and Exclusionary Policies

Environmental, Social, and Governance (ESG) investing has grown from a niche practice into a recognized framework for integrating ethical and sustainability considerations into financial decision-making. A common approach within this framework is exclusionary screening, where investors avoid firms involved in activities considered harmful or controversial. According to a UNCTAD (2023) study examining the sustainability practices of the world's 100 largest public pension funds and sovereign wealth funds, exclusion-based or negative screening is widely used among these institutions. Nearly two-thirds of the funds covered in the report apply some form of exclusion criteria. The study also highlights substantial variation in how extensively individual funds integrate ESG considerations, indicating that the depth and strictness of exclusion policies differ markedly across institutions. The GPFG is one of the most prominent examples of an institution applying exclusionary principles.

While exclusionary policies serve important moral and political objectives, they raise questions about their financial consequences. By narrowing the investable universe, exclusionary strategies may reduce diversification and potential exposure to high-performing industries. Studies such as Heinkel, Kraus, and Zechner (2001) and Renneboog, Ter Horst, and Zhang (2008) argue that these restrictions can lead to *underinvestment* in excluded firms, lowering their prices and increasing expected returns for remaining investors. Consequently, the act of ethical exclusion may indirectly create a "price discount" on controversial assets, an effect that disciplined, non-restricted investors can exploit through excess returns.

2.2 Behavioral Finance

Traditional finance assumes that investors are rational and that markets price assets efficiently based on available information (Fama, 1970). Behavioral finance, as outlined by Barberis and Thaler (2003), challenges this view by emphasizing that investor sentiment, social norms, and psychological biases often influence financial decisions and asset prices. In the context of sin

stocks, these biases play a vital role in explaining the persistence of the so-called "sin premium."

Moral and emotional aversion is a key driver of underpricing in controversial industries. Investors guided by social values may avoid allocating capital to firms perceived as unethical, even when such firms offer superior risk-adjusted returns. This aversion can lead to systematic mispricing, as the demand for "virtuous" assets inflates their prices, while "sinful" assets remain undervalued. Empirical evidence by Hong and Kacperczyk (2009) supports this behavioral explanation: Sin stocks tend to have lower institutional ownership and less analyst coverage, leading to persistent undervaluation.

From a behavioral perspective, the underperformance of ESG-constrained portfolios is a consequence of *preference-driven utility*. Investors may willingly accept lower financial returns in exchange for the psychological satisfaction of holding ethically acceptable assets, a phenomenon often referred to as the *non-pecuniary utility* of moral investing. Conversely, investors willing to tolerate reputational or moral risk can benefit from the undervaluation of controversial stocks.

In this sense, the performance differential between sin stocks and socially responsible portfolios may not solely reflect differences in risk but also differences in investor psychology and collective market sentiment. As ethical preferences have become more widespread, the aggregate demand for "clean" assets has increased, potentially magnifying the relative undervaluation of "dirty" ones.

2.3 Ethical Investing and the "Sin Premium"

The term *sin premium* refers to the excess return earned by sin stocks relative to the market, which is often attributed to the moral constraints faced by large institutional investors. Hong and Kacperczyk (2009) found that firms operating in industries such as tobacco, alcohol, and gambling systematically outperform comparable non-sin firms, even after adjusting for traditional risk factors. Subsequent studies, such as Blitz and Fabozzi (2017), confirmed that this premium persists across regions and asset classes, suggesting that social norms create enduring mispricing rather than temporary anomalies.

Several mechanisms could explain this premium. First, limited institutional ownership leads to lower liquidity and higher cost of capital, both of which increase expected returns. Second,

restricted analyst coverage and negative public perception may cause these firms to be under-researched and underpriced. Third, sin industries often possess stable cash flows, high entry barriers, and inelastic demand, which enhance profitability and resilience during market downturns.

This dynamic has direct implications for exclusionary investors such as the GPFG. By avoiding sin stocks, the fund potentially forgoes exposure to sectors with favorable risk-return characteristics. The resulting opportunity cost, which is what this paper seeks to quantify, represents the trade-off between ethical integrity and financial performance. Understanding whether this cost is economically significant is crucial for evaluating the broader effectiveness of responsible investment strategies.

3 Methodology

The methodological framework of this study is designed to assess whether the GPFG has forgone financial returns as a result of excluding companies involved in controversial business activities. The analysis brings together the construction of the sin stock portfolio, the selection of benchmarks, the transformation of raw quantitative financial data, and the application of empirical models that measure both absolute and risk-adjusted performance**.** In line with the purpose of the study, the methodological approach is descriptive rather than causal. The analysis seeks to document realized performance differences rather than identify structural or causal mechanisms. This chapter sets out the data sources, sample construction, and analytical techniques used to answer the research question.

3.1 Data and Sample Construction

The empirical analysis is based on monthly returns from 153 firms excluded from the GPFG on ethical grounds. These firms were identified using NBIM's official exclusion list, which specifies companies removed from the investment universe due to breaches of the fund's ethical guidelines. Figure 3.1 summarizes the distribution of firms across the main exclusion categories. It is important to clarify that the portfolio examined in this study is not constructed according to traditional academic definitions of sin stocks. Instead, it reflects the exact set of companies excluded by NBIM, irrespective of whether their activities fall within the classical

sin categories. As a result, the portfolio includes firms excluded for both product-based reasons and conduct-based violations, such as severe environmental damage, corruption, or human rights abuses. This broader construction is necessary because the purpose of the study is to assess whether NBIM has forgone returns by excluding these companies, rather than to evaluate sin stocks in the conventional literature.

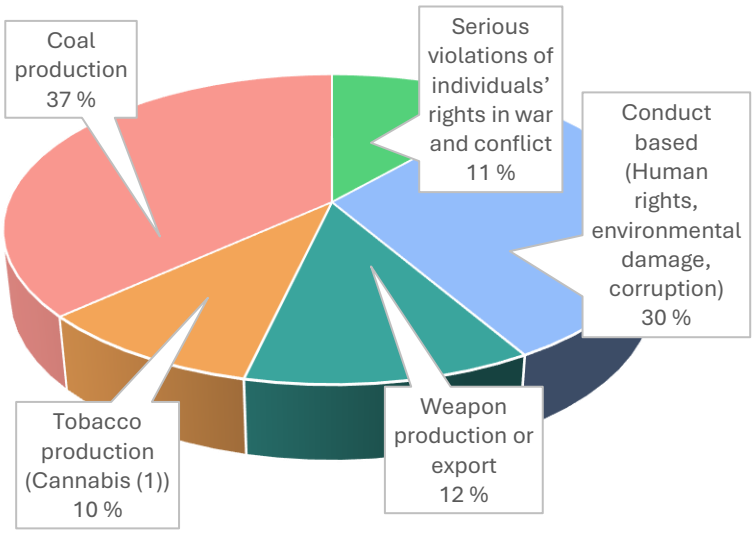


Figure 3.1: Distribution of exclusion categories (153 companies in the sin stock portfolio)

Historical price data for all identified firms were obtained from the RStudio package *Tidyquant* with the function: tq_get("ticker," from = date, to = date) which downloads daily historic data from Yahoo Finance. Unlike downloading data in excel, tq_get() returns adjusted price series (including dividends and stock splits) and provides data for stocks listed on a broad range of international exchanges. Several excluded firms lacked sufficiently long or reliable return histories, often due to delisting, illiquidity, or regional exchange constraints, and were therefore removed to ensure consistency in the time series. While this screening procedure improves internal validity by ensuring a consistent sample, it may introduce a minor selection bias because firms with incomplete or more volatile trading histories are disproportionately removed. The empirical results should therefore be interpreted with the understanding that the portfolio reflects the best-documented segment of NBIM's exclusion universe.

Returns for the sin stock portfolio are measured in the local currencies of the underlying securities, while GPFG equity returns are reported in Norwegian kroner. Percentage returns are compared directly across currencies without converting the series to a common currency or applying hedging adjustments. This approach allows for an examination of relative return

dynamics but implies that part of the observed performance differences may reflect currency fluctuations rather than pure equity effects.

Dividend-adjusted returns were used to measure total returns and prevent underestimating the performance of high-dividend stocks. The sample period extends from January 2004 to December 2024, providing a sufficiently long horizon to analyze cyclical behavior, major global crises, and long-run performance patterns. The starting point in 2004 is motivated by the introduction of NBIM's formal exclusion mechanism, which makes it the earliest period for which the exclusion policy can be meaningfully evaluated. The long sample period also increases statistical reliability by including several market cycles, though it remains subject to the usual limitations of observational financial data.

3.2 Benchmark Selection

The performance of the sin stock portfolio is assessed relative to two benchmarks. The first benchmark is the GPFG's equity portfolio, which represents the actual performance achieved by the fund. These returns are obtained from NBIM's annual reports and reflect the global equity holdings. Restricting the comparison to the fund's equity component ensures consistency with the sin stock portfolio, which is also composed exclusively of equities. To avoid confusion, we distinguish between NBIM and the GPFG. In figures and tables, labels using "NBIM" refer specifically to the GPFG equity portfolio. The second benchmark is the MSCI World Index (net total return), a widely used measure of developed-market equity performance. Because MSCI World includes many firms excluded by NBIM, it provides an appropriate frame of reference for assessing how excluded industries perform relative to global market conditions. It is important to acknowledge that both benchmarks differ in currency composition, geographic exposure, and investment constraints. These differences are mitigated through percentage-based comparisons but cannot be eliminated entirely.

3.3 Portfolio Construction and Return Computation

The sin stock portfolio is first constructed as an equally weighted portfolio (EW). This methodology ensures that each firm contributes proportionally to monthly portfolio returns regardless of market cap. Monthly returns are computed as the simple average of all available firm-level returns in each month. Missing observations are excluded to prevent distortions

arising from incomplete time series. In addition to the equally weighted specification, we also constructed a market-cap-weighted portfolio (MCW), where each firm's weight is determined by its annual market cap and held constant throughout the calendar year. This allows us to evaluate whether portfolio performance is sensitive to firm size and to compare results across weighting methods. The relative performance of sin stocks is assessed using excess returns calculated as the difference between the sin-stock return and each benchmark return:

$$\boldsymbol{ER_t = R_t^{\text{sin}} - R_t^{\text{benchmark}}}$$

For long-horizon comparisons, cumulative return indices are constructed by rebasing all series to 100 at the start of the sample. In addition, a rolling 36-month correlation between sin-stock returns and MSCI World returns is computed to evaluate whether excluded sectors provide any diversification or hedging benefit relative to global equity markets.

3.4 Risk-Adjusted Performance Evaluation

In evaluating whether sin stocks outperform the benchmark portfolios, it is essential to account for differences in risk exposure. Simple return comparisons can be misleading, as sin stocks may carry unique risk factors related to regulatory uncertainty, litigation, or reputational concerns. To obtain a fair comparison, risk-adjusted performance measures are employed.

Risk-adjusted performance is evaluated using the Sharpe ratio, the Treynor ratio and Jensen's alpha. For the sin stock portfolio, the GPFG equity portfolio and the benchmark indices, we first compute monthly excess returns as portfolio returns minus the three-month U.S. Treasury bill rate. Based on these excess-return series, we calculate the inputs required for each measure (mean excess return, standard deviation, and market beta). The exact formulas are reported in Appendix.

Jensen's alpha is obtained from a time-series CAPM regression of monthly excess returns on the excess return of the MSCI World index, estimated by OLS in RStudio. The intercept from this regression is interpreted as abnormal performance after controlling for systematic market exposure, while the slope coefficient provides the portfolio's beta, which is also used in the Treynor ratio. The regression results for both the GPFG equity portfolio, and the sin stock portfolio are reported in Figure 4.8.

3.5 Crisis Performance Analysis

To assess the behavior of sin stocks during periods of heightened financial stress, the study conducts event-based analyses surrounding the 2008 global financial crisis and the 2020 COVID-19 market crash. These crises provide natural stress tests for understanding whether sin-related industries behave cyclically or countercyclically and whether their performance characteristics differ under extreme market conditions. Abnormal returns are calculated as the deviation between realized and expected returns, and average abnormal returns (AAR) and cumulative average abnormal returns (CAAR) are computed across firms within an event window centered on each crisis. This approach captures both the immediate market reaction and the subsequent recovery trajectory, providing insight into the resilience or vulnerability of sin-related industries under extreme market conditions. As with all event studies, results reflect correlations rather than causal effects.

3.6 Post-Divestment Valuation and Arbitrage Testing

To examine whether NBIM's exclusions news may contribute to short-term valuation effects, the event study collects and compares price-to-earnings (P/E) ratios for a subset of excluded firms around the divestment event. Four observation dates are used to capture developments in valuation before and after exclusion: 13 March 2016, 13 April 2016 (the month of exclusion), 14 May 2016, and 14 October 2016. These dates allow the construction of a short event window designed to capture both immediate and lagged valuation adjustments.

P/E ratios are calculated from EPS data from *Investing.com* and stock price history from *Tidyquant* in RStudio. For each observation date, cross-sectional averages are computed alongside firm-level trajectories. The resulting dataset forms the basis for an event-style analysis of whether valuations change systematically following NBIM's divestment announcement. The procedure does not assume that any specific form of adjustment will occur, rather it provides a consistent methodological framework for assessing whether an announcement of exclusion is associated with measurable changes in valuation multiples**.** Because no market-adjusted or industry-adjusted control group is employed, the analysis identifies patterns rather than structural effects, and its conclusions should be interpreted as suggestive rather than definitive.

Together, these procedures offer a basis for exploring whether the GPFG's ethical exclusions might be associated with financial costs and potential short-term pricing effects.

4 Analysis and Results

This section presents the empirical findings of the study, including portfolio performance, diversification properties, valuation effects, and risk-adjusted returns.

4.1 Sin Stock Portfolio versus the Market

The analysis begins by examining the time-series behavior of the sin-stock portfolio relative to the MSCI World Index and the GPFG equity portfolio. To provide a fuller picture of performance we consider both the EW portfolio and the MCW portfolio. Monthly returns are computed for both weighting methods, and relative performance is assessed using excess returns.

Figures 4.1 and 4.2 plot the monthly returns for the EW and MCW sin stock portfolios respectively, alongside the MSCI World Index and the GPFG. Both weighting methods exhibit strong co-movement across the entire sample, and both displays pronounced negative shocks during the 2008 financial crisis and the onset of COVID-19. While the EW and MCW portfolios move broadly in line with both MSCI World and the GPFG portfolio, there are notable differences in the magnitude of monthly return swings. In contrast to the expectation that a MCW portfolio should display somewhat dampened volatility due to its larger exposure to more established firms, our results show the opposite during the COVID-19 rebound in 2020. In this period, the MCW portfolio records higher positive monthly spikes than the EW portfolio. This suggests that a few of the largest sin-stock companies experienced particularly strong recoveries, and that their weight in the MCW construction amplified this effect. In other words, concentration effects appear to dominate the usual diversification argument in our data, causing the MCW portfolio to exhibit more pronounced upside movements in specific high-volatility months.

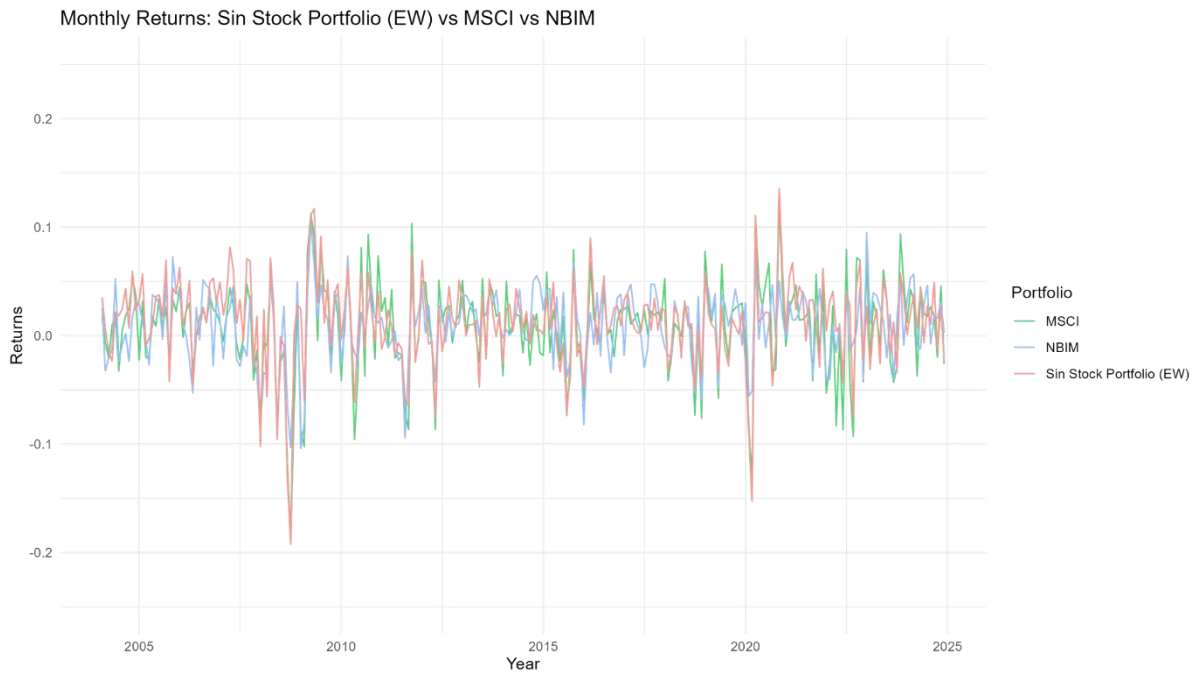


Figure 4.1: Monthly returns: Sin Stock Portfolio vs MSCI World vs NBIM (equally weighted)

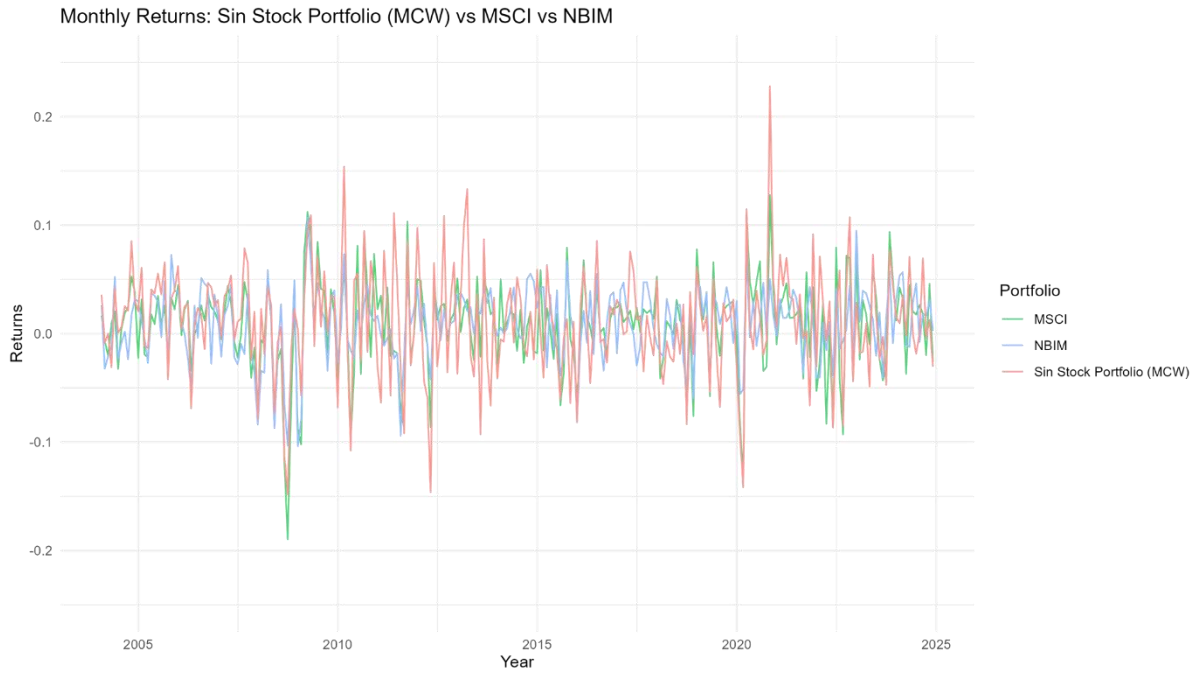


Figure 4.2: Monthly returns: Sin Stock Portfolio vs MSCI World vs NBIM (market-cap-weighted)

These return dynamics translate into substantial differences in long-run cumulative performance. Figure 4.3, which rebases to 100 at the start of the sample, shows that the EW portfolio grows to approximately 1 800 by the end of 2024, while the GPFG reaches around

700 and the MSCI World approximately 500. The corresponding MCW series displays a similar but slightly less pronounced trajectory: the portfolio rises to roughly 1 100 by December 2024, still comfortably outperforming both benchmarks. The implied compound annual growth rate (CAGR) of the EW portfolio is 14.9%, compared to 10.9% for the GPFG equity portfolio and 8.28% for the MSCI World Index. The MCW portfolio delivers a lower, but still clearly elevated, CAGR of 12.8%, indicating a similar underlying sin premium, though moderated by firm-size effects.

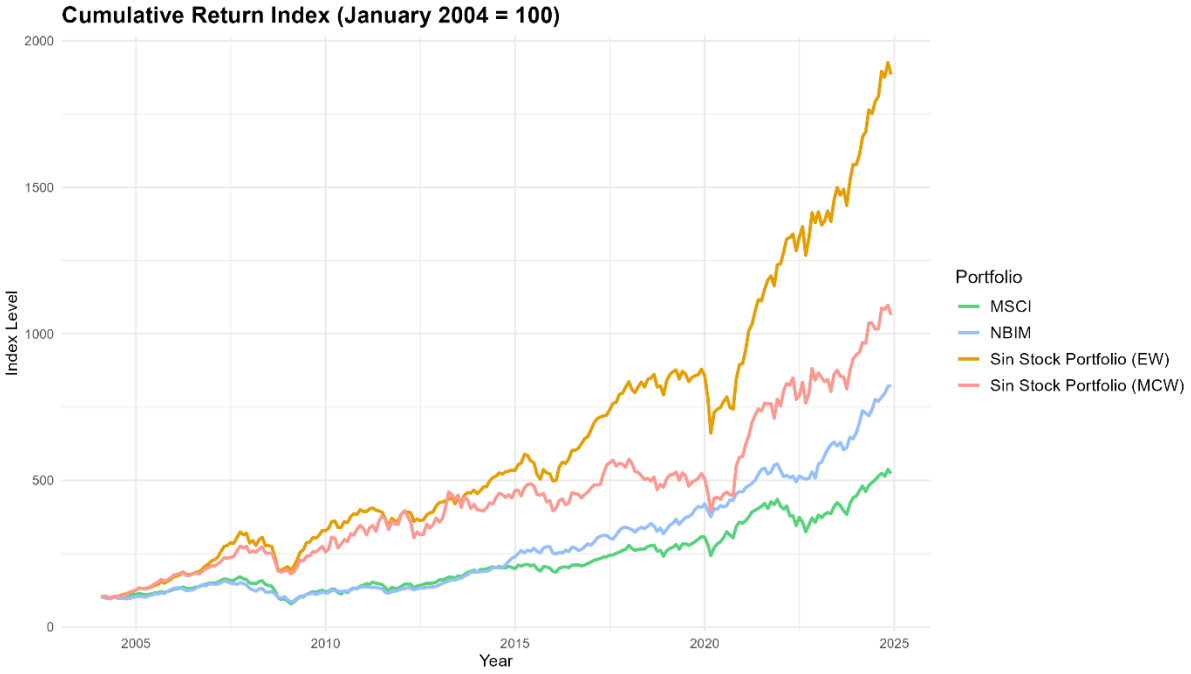


Figure 4.3: Cumulative monthly returns from 2004 – 2025

Risk-adjusted performance supports this interpretation. Annualized volatility of the EW portfolio (14.00%) slightly exceeds that of the MCW variant (15,67%), which is more in line with the GPFG and MSCI World due to the stabilizing influence of large constituents. When evaluated using the Sharpe ratio, both sin-stock portfolios outperform the MSCI World Index, but to differing degrees. The EW portfolio achieves the strongest risk-adjusted performance with a ratio of 0.956, well above the GPFG (0.802) and MSCI World (0.498). The MCW portfolio attains a Sharpe ratio of 0.747. Although this remains substantially higher than the MSCI World, it falls marginally below the GPFG, indicating that the sin premium becomes less pronounced when smaller, more volatile firms receive lower weight.

Crisis-period dynamics further illustrate this behavior. Figures 4.4 and 4.5 aggregate abnormal returns around the Lehman collapse in 2008 and the COVID-19 crash. For the EW portfolio, sin stocks exhibit pronounced negative abnormal returns in the event month, followed by a marked recovery in the subsequent months, which drives cumulative abnormal returns upward. The MCW portfolio displays a similar pattern, although the magnitude of both the event-month decline and the post-event rebound is somewhat more muted.

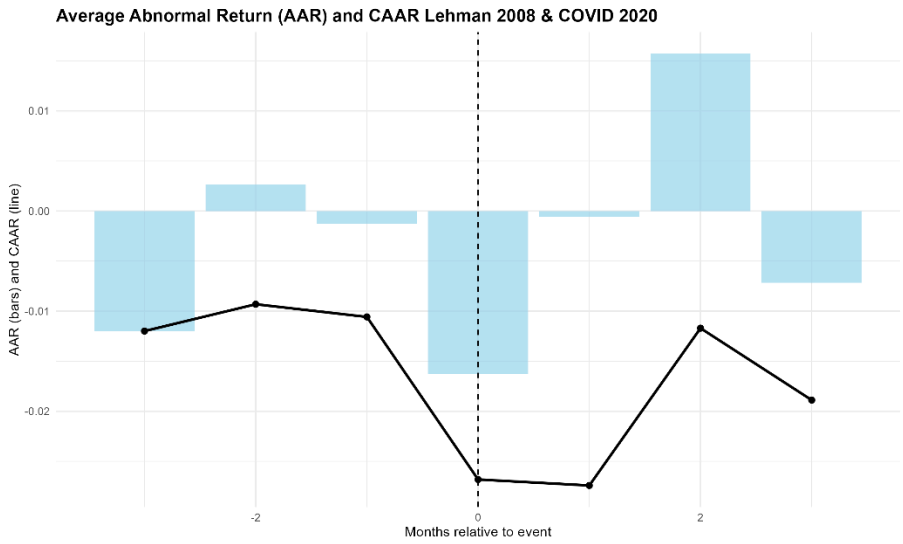


Figure 4.4: Aggregate abnormal returns (equally weighted)

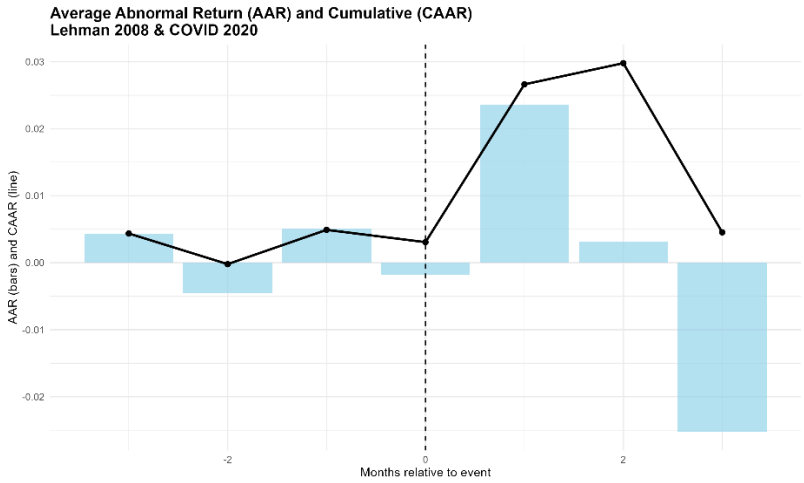


Figure 4.5: Aggregate abnormal returns (market-cap-weighted)

4.2 Potential loss of Hedge Effect

A crucial question is whether the GPFG's exclusions lead to a loss of diversification or hedging opportunities. Figure 4.6 reports the 36-month rolling correlation between the sin stock portfolio and the MSCI World Index for the EW and MCW constructions, respectively. Correlations remain high in both cases, although the MCW portfolio exhibits somewhat more variation over time.

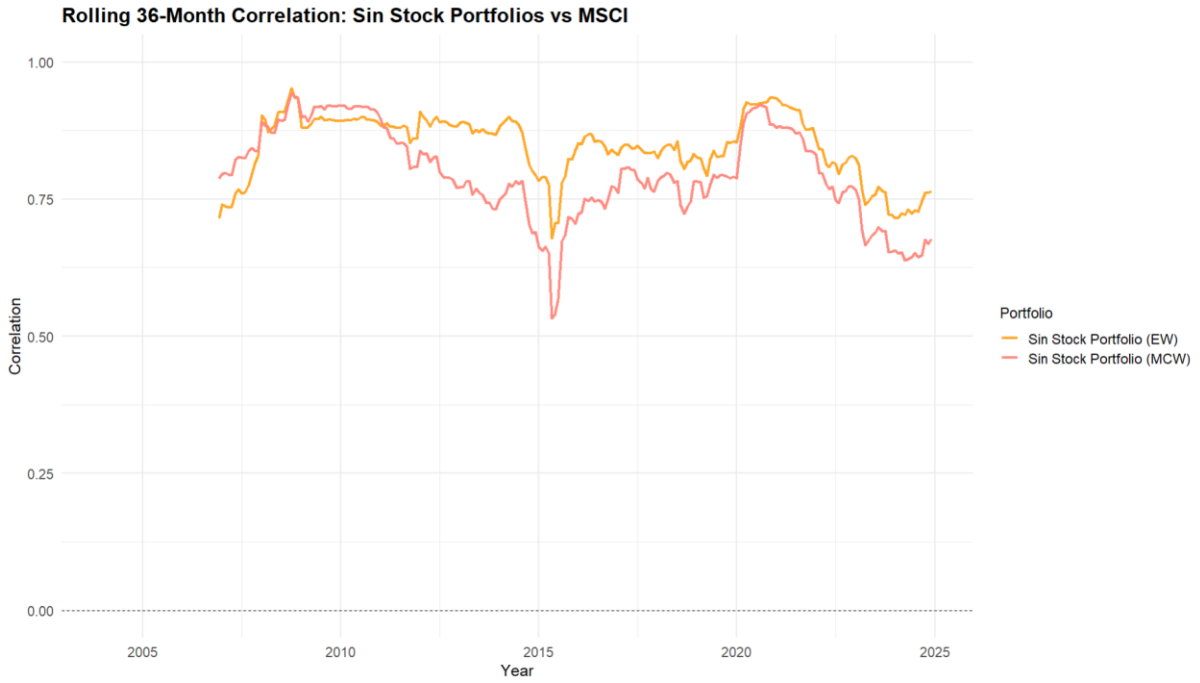


Figure 4.6: Correlation between Sin Stock Portfolio and MSCI World

This indicates that the sin stock portfolio does not provide meaningful diversification benefits relative to global equities. The assets removed through the exclusion policy are not negatively correlated with world markets, rather they represent a higher-beta segment of the same global factor structure. The high correlations align with the CAPM beta estimates reported in Figure 4.8 underline that the primary foregone benefit of exclusion is return-based, not hedge-based.

4.3 Do NBIM Publications Move Valuations

This section examines whether NBIM's public exclusion decisions generate short-term valuation effects in the firms being divested. The analysis focuses on a coordinated exclusion event in April 2016 affecting a group of companies from the sin stock portfolio. The 12 firms included in the study were randomly selected from the broader pool of companies excluded by NBIM on the event date, ensuring an unbiased representation of the exclusion group. For each firm, price-to-earnings (P/E) ratios were collected at four dates surrounding the exclusion: 13 March 2016, 13 April 2016 (the day before NBIM's announcement), 14 May 2016, and 14 October 2016.

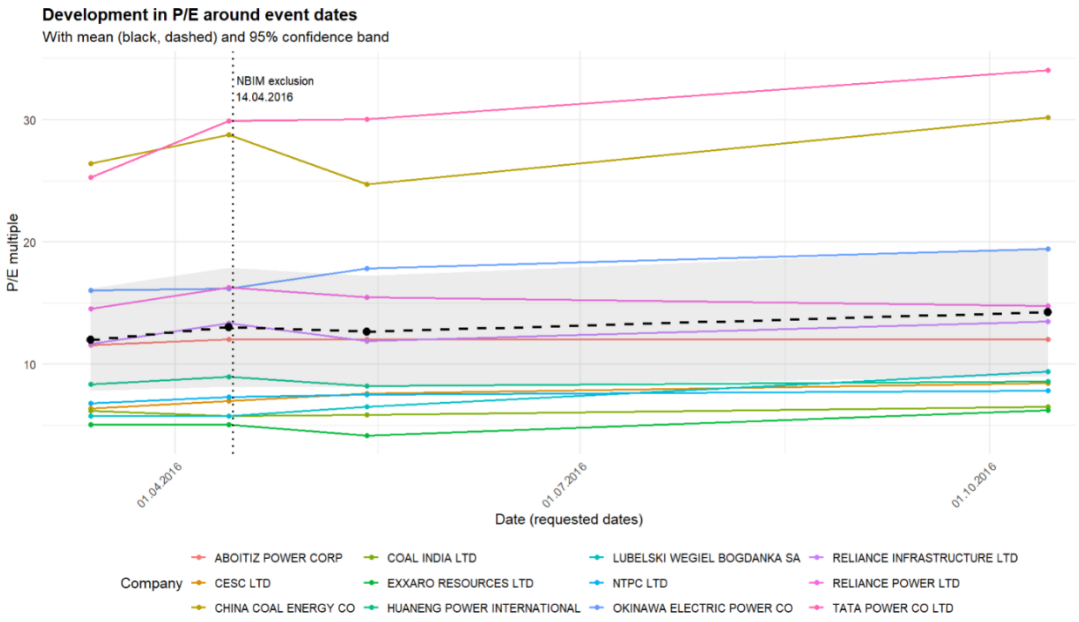


Figure 4.7: P/E development

The cross-sectional mean P/E multiples across these dates were 12.0, 13.0, 12.6, and 14.2, respectively. Figure 4.7 visualizes these developments. Although firm-level valuations vary considerably, the aggregate pattern is consistent: an increase at the time of announcement, a small adjustment in the following month, and a pronounced rise over the subsequent half-year. The dashed black line in Figure 4.7 represents the mean trajectory, with a grey confidence band showing the dispersion across firms.

A repeated-measures ANOVA confirms a significant overall effect of time on P/E ratios ($F \approx 6.9$, $p < 0.001$). Pairwise t-tests provide additional granularity. From March to April, the average P/E multiple increased by 1.02 points ($p \approx 0.028$). Between April and May, P/E decreased by 0.37 points, but this change is not statistically significant ($p \approx 0.384$), and thus we cannot reject the null hypothesis of no difference in P/E over this interval. Over the medium term, from May to October, the mean P/E multiple increased by 1.60 points ($p \approx 0.010$). These values are consistent with the pattern in Figure 4.7, where the medium-term rise dominates the dynamics around the event.

Overall, the results indicate no statistically significant decline in valuation multiples for the affected firms. Instead, P/E ratios displayed a moderate increase around the announcement date and a clear upward adjustment in the six months that followed. Since our event study focuses on the announcement of NBIM's divestment rather than the actual execution of the sales, the observed pattern suggests that any divestment-related selling pressure was either limited or quickly absorbed by other market participants. Moreover, NBIM is likely to have executed the divestments gradually through algorithmic trading strategies aimed at minimizing market impact, reducing the likelihood of observable valuation pressure in the data. Consequently, valuations stabilized and eventually rose above pre-announcement levels.

These findings should be interpreted cautiously. The sample is limited in size, the event window is narrow, and broader market conditions in 2016 are not explicitly controlled for. The results therefore provide indicative rather than definitive evidence regarding the valuation effects of NBIM's exclusions.

4.4 Factor Model Results

The factor model estimations provide a more detailed assessment of how the sin stocks perform after controlling for systematic market risk. The regression results in Figure 4.8 show that both weighting methods exhibit higher market sensitivity than the GPFG benchmark. The EW portfolio records a beta of approximately 0.76 under both OLS and CAPM specifications, while the MCW portfolio displays a slightly higher beta of around 0.81. In comparison, the GPFG's beta is roughly 0.55, indicating that the excluded firms covary more strongly with global equity markets.

One possible explanation for the lower beta of the GPFG is that its equity returns are measured in Norwegian kroner. Periods of global market stress are often accompanied by a depreciation of the NOK, which partially offsets declines in international equity prices. As a result, the GPFG tends to fall less than the MSCI World Index during downturns, mechanically reducing its estimated beta.

Despite this higher market exposure, both sin stock portfolios generate positive and statistically significant intercept terms. The EW portfolio records monthly alphas of roughly 0.007 (OLS) and 0.006 (CAPM), while the MCW portfolio attains alphas of approximately 0.005 across both specifications. In contrast, the GPFG benchmark produces lower alphas of 0.005 (OLS) and 0.004 (CAPM). These results suggest that both the EW and MCW portfolios earn returns that exceed what would be expected based solely on their market betas.

The explanatory power of the regressions further supports these patterns. The R^2 values range from 0.69 for the EW portfolio to 0.62 for the MCW portfolio and approximately 0.49 for the GPFG. This indicates that although global equity risk explains much of the variation in returns, a noticeable portion is not captured by the MSCI World factor.

Taken together, the regression estimates show that excluded firms exhibit higher systematic risk than the GPFG but also deliver statistically significant abnormal returns after adjusting for this risk. The results are consistent across weighting methods, although the magnitude of the alpha is somewhat larger under the EW specification.

	NBIM (OLS)	NBIM (CAPM)	Sin EW (OLS)	Sin EW (CAPM)	Sin MCW (OLS)	Sin MCW (CAPM)
(Intercept)	0.005**	0.004**	0.007***	0.006***	0.005**	0.005**
	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
msci_ret	0.550***		0.764***		0.809***	
	(0.035)		(0.032)		(0.040)	
msci_ex		0.550***		0.763***		0.808***
		(0.035)		(0.032)		(0.040)
Num.Obs.	252	252	252	252	252	252
R2	0.494	0.494	0.690	0.690	0.618	0.618
R2 Adj.	0.492	0.492	0.689	0.689	0.617	0.616

Figure 4.8: Regression results

4.5 Impact on GPFG

To evaluate the financial implications of NBIM's exclusion policy more closely, this section compares the annual risk-adjusted performance of the EW and MCW sin-stock portfolios with that of the GPFG and the MSCI World Index. Using a 36-month rolling beta framework, the table in Figure 4.9 reports betas, annual returns, Treynor ratios, and Jensen's alpha for each portfolio across the sample period. This allows for a year-by-year assessment of how the excluded firms perform relative to the fund when controlling for differences in systematic risk.

Risk-adjusted Performance Compared with MSCI World

Sin Stock Portfolios (EW/MCW) and NBIM — 36-month rolling beta

	Beta			Annual Return				Treynor Ratio			Jensen's Alpha		
Year	EW	MCW	NBIM	EW	MCW	NBIM	MSCI	EW	MCW	NBIM	EW	MCW	NBIM
2007	1.088	1.125	0.777	48.91%	35.77%	−1.54%	9.04%	33.74%	24.11%	−7.07%	31.57%	21.80%	−9.17%
2008	1.115	0.918	0.673	−37.46%	−30.32%	−27.84%	−40.71%	−39.26%	−37.87%	−47.45%	11.64%	10.87%	1.52%
2009	0.930	0.791	0.717	64.63%	43.30%	15.31%	29.99%	55.84%	47.49%	22.52%	25.06%	14.70%	−4.58%
2010	0.827	0.753	0.643	21.57%	11.59%	13.21%	11.76%	24.49%	16.32%	19.88%	9.54%	2.53%	4.45%
2011	0.652	0.652	0.592	−9.53%	−16.86%	−7.77%	−5.54%	−14.24%	−27.16%	−12.57%	−6.45%	−14.88%	−4.88%
2012	0.668	0.716	0.432	13.95%	7.50%	11.07%	15.83%	20.65%	11.85%	24.85%	3.45%	−2.60%	4.05%
2013	0.746	0.740	0.503	13.16%	7.94%	36.26%	26.68%	17.10%	11.16%	62.38%	−5.31%	−9.65%	19.19%
2014	0.726	0.862	0.359	14.79%	8.68%	24.61%	4.94%	19.31%	10.22%	62.55%	10.29%	4.39%	20.62%
2015	0.761	0.775	0.431	−2.40%	2.21%	16.77%	−0.87%	−2.19%	3.99%	37.53%	−1.63%	3.13%	16.21%
2016	0.817	0.816	0.588	24.20%	10.52%	3.67%	7.51%	27.10%	12.57%	6.99%	16.01%	4.13%	−0.30%
2017	0.866	0.879	0.669	26.03%	25.92%	19.80%	22.40%	26.00%	25.97%	26.44%	5.64%	5.69%	4.64%
2018	0.745	0.859	0.729	−3.19%	−5.54%	−6.56%	−8.71%	−6.39%	−8.02%	−11.13%	2.80%	1.83%	−0.72%
2019	0.637	0.827	0.655	11.06%	17.01%	28.30%	27.67%	13.90%	17.35%	35.92%	−5.99%	−4.93%	8.26%
2020	0.865	1.078	0.471	1.70%	17.19%	13.31%	15.90%	5.59%	19.56%	27.66%	−10.49%	1.99%	4.68%
2021	0.889	1.106	0.397	38.12%	36.09%	20.51%	21.82%	37.26%	29.15%	47.91%	15.06%	9.78%	10.95%
2022	0.736	0.896	0.378	11.71%	10.61%	−8.75%	−18.14%	13.55%	10.54%	−28.16%	24.42%	27.06%	−3.22%
2023	0.496	0.587	0.411	14.31%	13.50%	26.36%	23.79%	18.09%	14.46%	46.82%	0.28%	−1.81%	12.04%
2024	0.491	0.571	0.432	19.49%	23.16%	28.35%	18.67%	26.95%	29.35%	47.67%	6.99%	9.51%	15.09%
Average	**0.781**	**0.831**	**0.548**	**15.06%**	**12.13%**	**11.39%**	**9.00%**	**15.42%**	**11.73%**	**20.15%**	**7.38%**	**4.64%**	**5.49%**

Figure 4.9: Risk-adjusted performance metrics

The table in Figure 4.9, which summarizes annual return and risk-adjusted metrics, shows that both sin-stock portfolios outperform the GPFG in terms of average annual return. The EW portfolio records an average annual return of 15.06%, followed by 12.13% for the MCW portfolio, compared with 11.39% for the GPFG. A similar pattern appears in Jensen's alpha: the EW portfolio attains an average annual alpha of 7.38%, which exceeds the GPFG's 5.49%, while the MCW portfolio posts a lower average alpha of 4.64%.

However, the GPFG exhibits the highest Treynor ratio. Its average Treynor ratio of 20.15% exceeds that of both sin portfolios, which record 15.42% (EW) and 11.73% (MCW). This indicates that, relative to its level of systematic risk, the GPFG has generated more return per unit of beta. The pattern suggests that although the exclusion policy limits exposure to high-performing industries and results in foregone return opportunities, the GPFG continues to deliver strong risk-adjusted performance when evaluated through a systematic-risk lens.

It should be noted that the average Jensen's alpha values reported in this table differ from the alpha estimates derived from the static regression in Figure 4.8. Specifically, while the MCW portfolio exhibits a significant positive alpha in the full-sample regression, it yields a lower average alpha than the GPFG in this year-by-year analysis. This discrepancy is primarily driven by two methodological distinctions. First, the requirement for a 36-month estimation window necessitates starting the observation period in 2007, effectively truncating the portfolio's inception years (2004–2006). As these initial years were characterized by strong excess returns, their exclusion mechanically lowers the calculated average performance. Second, we employ a rolling metric to capture changes in systematic risk exposure over time, whereas the static regression assumes a constant beta across the entire sample. By dynamically adjusting for fluctuations in market sensitivity, particularly during periods of high volatility, the rolling approach imposes a stricter risk adjustment on the MCW portfolio compared to the unconditional static model.

Although the underlying return data extend back to 2004, the analysis employs a 36-month rolling beta to ensure stable risk estimates. As a result, the first year for which beta-adjusted performance can be computed is 2007, which is why the table begins there. This methodological choice also implies that the annual returns shown in Figure 4.9 will differ slightly from the long-horizon CAGR figures reported under chapter 4.1, as the former reflect year-by-year performance conditional on rolling beta estimation rather than compound growth over the full sample.

5 Limitations and Reflection

This section reflects on the main limitations of the empirical analysis and discusses how data constraints, methodological choices, and institutional features of NBIM's exclusion framework may influence the interpretation of the results. The objective is not to undermine the findings, but to clarify their scope and relevance for economic inference.

A central limitation is that the study relies on observational return data, which restricts the ability to draw causal conclusions about the effects of NBIM's exclusion decisions. The performance patterns observed in the sin-stock portfolio may reflect broader market conditions, sectoral exposures, or macroeconomic developments that are not explicitly controlled for in the research design. Although the long sample period improves the robustness of return estimates, it also spans episodes of extraordinary market stress, such as the global financial crisis and the COVID-19 crash, which may influence cumulative performance independently of exclusion policies.

Data availability presents a further challenge. Several excluded firms lacked sufficiently long or reliable price histories and were removed from the sample, potentially introducing selection bias. Firms with incomplete data often operate in less liquid markets or exhibit higher volatility, which may affect measured portfolio performance. As a result, the constructed portfolio represents the best-documented segment of the exclusion universe rather than the full population of excluded firms.

A structural complexity arises from the heterogeneity of NBIM's exclusion list. The portfolio contains firms excluded for both product-based and conduct-based reasons, implying considerable variation in business models, regulatory exposure, and geographic distribution. While this reflects the institutional reality of NBIM's guidelines and aligns with the purpose of the study, such heterogeneity may blur performance differences across exclusion categories.

Another important limitation concerns the comparison with GPFG returns. NBIM's historical return series include periods during which the fund still held positions in firms that were later excluded. Because publicly available data do not allow these contributions to be removed retroactively, the estimated performance gap between the GPFG and the exclusion portfolio may understate the true divergence. Had such adjustments been feasible, the cumulative difference in returns might have been even larger.

Uncertainty also surrounds the precise timing of NBIM's divestments. It is reasonable to assume that exclusion-related sales occur before public announcements, which complicates the interpretation of event-study results. Observed valuation changes around announcement dates may therefore reflect information releases rather than the trading activity itself. Anticipatory trading by market participants could further attenuate measured announcement effects, as sophisticated investors may infer divestment activity from market behavior prior to publication.

A further limitation relates to currency exposure. The sin-stock portfolio is measured in the local currencies of each firm, whereas GPFG returns are reported in NOK and MSCI World returns in USD. Because the analysis compares percentage returns without converting all series to a common currency, part of the long-run performance differences may reflect exchange-rate fluctuations rather than underlying equity behavior.

Finally, the event-study analysis of P/E ratios lacks a matched control group. Without sector-adjusted or market-neutral benchmarks, observed developments in valuation multiples around exclusion dates may partly capture broader market dynamics rather than exclusion-specific effects. The valuation results should therefore be interpreted as indicative patterns rather than causal estimates.

6 Conclusion

This study set out to examine whether NBIM's ethical exclusion policy is associated with measurable financial costs and whether exclusion announcements have short-term valuation effects. By constructing portfolios of firms excluded from the GPFG and benchmarking them against the MSCI World Index and the GPFG's equity portfolio, the analysis identifies a persistent return differential. Both the EW and MCW portfolios generate higher average annual returns and higher long-run growth rates than the benchmarks. Regression results further show that both portfolios earn positive and statistically significant monthly alphas, with the largest effect observed in the EW specification.

These findings lend empirical support to the existence of an "exclusion premium." Consistent with the theoretical framework of Hong and Kacperczyk (2009), excluded firms appear to offer excess returns to compensate investors for the reputational risks and social stigma associated with holding them. The persistence of this premium implies that the ethical constraints faced by large institutional investors like the GPFG create structural return opportunities for unconstrained market participants.

The risk-adjusted results are more nuanced. The EW portfolio achieves a higher Sharpe ratio than the GPFG, whereas the MCW portfolio does not. Moreover, the GPFG records the highest Treynor ratio, indicating stronger performance when evaluated relative to systematic risk. Rolling 36-month correlations suggest limited diversification benefits from holding excluded firms. This implies that the opportunity cost associated with exclusion arises primarily from forgone returns rather than from any reduction in hedging potential.

Regarding market impact, the event-study analysis around the coordinated exclusion in 2016 does not indicate short-run valuation discounts. Instead, P/E ratios tend to increase slightly following exclusion. This counter-intuitive finding suggests that markets are highly efficient in absorbing NBIM's divestments. It indicates that other investors, potentially hedge funds or algorithmic traders who prioritize financial metrics over ESG mandates, quickly step in to provide liquidity. Consequently, while the exclusion policy succeeds in cleansing the GPFG's portfolio, it appears ineffective at financially penalizing the excluded firms through a higher cost of capital.

Taken together, the findings indicate that NBIM's exclusion policy is associated with a meaningful financial opportunity cost, particularly in the EW portfolio. While the GPFG

continues to deliver solid risk-adjusted performance given its massive scale and market exposure, the decision to exclude controversial industries functions effectively as a "tax on morality". A conscious trade-off where financial optimization is sacrificed for ethical integrity.

7 Sources

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8 Appendix

8.1 Sharpe Ratio

The Sharpe Ratio measures a portfolio's risk-adjusted performance by comparing its excess return to the total volatility of those excess returns (Fernando, 2025). It is computed as:

$$\boldsymbol{Sharpe} = \frac{\bar{\boldsymbol{R}}_{\boldsymbol{p}} - \boldsymbol{R}_{\boldsymbol{f}}}{\boldsymbol{\sigma}_{\boldsymbol{p}}}$$

Where: $\bar{\boldsymbol{R}}_{\boldsymbol{p}}$ is the portfolio return, $\boldsymbol{R}_{\boldsymbol{f}}$ is the risk-free rate (proxied by the 3-month U.S. Treasury bill yield), and $\boldsymbol{\sigma}_{\boldsymbol{p}}$ is the standard deviation of the portfolio's excess return. A higher Sharpe indicates more excess return per unit of total risk and is therefore preferred. Common limitations include the assumption of (approximately) normal return distributions and equal penalization of upside and downside volatility (Fernando, 2025).

8.2 Jensen's Alpha

Jensen's Alpha is a risk-adjusted performance measure that captures the abnormal return a portfolio earns beyond what is predicted by the CAPM (Chen, 2025). The calculation proceeds in two steps, first finding the capital asset expected return using CAPM, then the formula for finding Jensen's alpha:

1. Expected return (CAPM):

$$\boldsymbol{E}(\boldsymbol{R}_{\boldsymbol{p}}) \;=\; \boldsymbol{R}_{\boldsymbol{f}} + \boldsymbol{\beta}_{\boldsymbol{p}}(\boldsymbol{E}(\boldsymbol{R}_{\boldsymbol{m}}) - \boldsymbol{R}_{\boldsymbol{f}})$$

2. Jensen's Alpha:

$$\boldsymbol{\alpha}_{\boldsymbol{J}} \;=\; \boldsymbol{R}_{\boldsymbol{p}} - \boldsymbol{E}(\boldsymbol{R}_{\boldsymbol{p}})$$

Where $\boldsymbol{R_p}$ is the expected return of the portfolio, and $\boldsymbol{R_m}$ is the excess return of the MSCI World Index. $\boldsymbol{\beta_p}$ is the beta of the relevant portfolio related to MSCI World Index. A positive $\boldsymbol{\alpha_J}$ indicates the portfolio outperformed its CAPM-implied expectation after accounting for market risk.

8.3 Treynor Ratio

The Treynor Ratio evaluates the excess return earned per unit of systematic risk (beta), making it particularly appropriate for well-diversified portfolios in which idiosyncratic risk is negligible (Kenton, 2025). It is defined as:

$$\boldsymbol{T} = \frac{\boldsymbol{R_p - R_f}}{\boldsymbol{\beta_p}}$$

Where $\boldsymbol{\beta_p}$ is the portfolio beta relative to MSCI World index. A higher Treynor indicates better compensation for bearing market risk. Because beta is estimated from historical data, it can vary over time; negative Treynor values (from negative returns or negative beta) are difficult to interpret (Kenton, 2025).

8.4 CAGR

Compound Annual Growth Rate (CAGR) represents the constant annual growth rate that would take an initial value to its ending value over a multi-year horizon, assuming reinvestment (Fernando, 2025):

$$\textbf{CAGR} = \left(\frac{\boldsymbol{V}_{\textbf{end}}}{\boldsymbol{V}_{\textbf{start}}}\right)^{\frac{\boldsymbol{1}}{\boldsymbol{n}}} - \boldsymbol{1}$$

Where**:** $\boldsymbol{V}_{\textbf{start}}$ and $\boldsymbol{V}_{\textbf{end}}$ are the beginning and ending values, and $\boldsymbol{n}$ is the number of years. CAGR smooths period-to-period fluctuations to make multi-year performance comparable, but it masks interim volatility and drawdowns and should be complemented with risk measures (Fernando, 2025).

8.5 Abnormal return

These formulas present the core calculations used in event-study methodology.

Abnormal Returns:

$$\boldsymbol{AR_{i,t} = R_{i,t} - E(R_{i,t})}$$

are defined as the difference between actual and expected returns.

Average Abnormal Returns:

$$\boldsymbol{AAR_t = \frac{1}{N}\sum_{i=1}^{N} AR_{i,t}}$$

are computed as the cross-sectional mean of abnormal returns across all firms.

Cumulative Average Abnormal Returns:

$$\boldsymbol{CAAR_t = \sum_{k=t_0}^{t} AAR_k}$$

are obtained by summing the average abnormal returns over the event window.

8.6 Cumulative Return

The cumulative value development shows how an initial investment evolves over time when returns are reinvested. For each portfolio, the cumulative value at time *t* is given by:

$$\boldsymbol{V_t = V_0 \times \prod_{i=1}^{t}(1 + r_i)}$$

Where,

- V_t = portfolio value at time *t*
- V_0 = initial value (set to 100 for normalization)
- r_i = return in period i

All series are rebased to a common starting point of 100 to allow direct comparison:

$$\boldsymbol{Index_t = 100 \times \frac{V_t}{V_1}}$$

Combining these gives the complete cumulative index formula:

$$\boldsymbol{Index_t = 100 \times \frac{\prod_{i=1}^{t}(1 + r_i)}{\prod_{i=1}^{1}(1 + r_i)}}$$

This provides a time-weighted cumulative return index showing the total growth of each portfolio relative to its starting value.

8.7 Portfolio Weighting

Equally Weighted Portfolio

In this sin stock portfolio, each stock contributed equally to the portfolio's overall return in each period. For the month t, the portfolio was calculated as the average of all available stock returns:

$$\boldsymbol{r_t^{portfolio} = \frac{1}{N_t}\sum_{i=1}^{N_t} r_{i,t}}$$

Where:

- $r_t^{portfolio}$ = portfolio return in month *t*
- $r_{i,t}$ = return of stock *i* in month *t*
- N_t = number of stocks with available data in month *t*

If any stock had missing data for a given month, it was excluded from that month's average to avoid bias. This approach ensures that all active stocks have equal influence of the portfolio's performance over time.

Market-Cap Weighted Portfolio

The market-cap-weighted portfolio was constructed by assigning each stock a weight proportional to its market cap. To ensure consistency and avoid excessive turnover in portfolio composition, annual market cap figures were used to determine the weights. These weights

were updated once per year and applied to all months within that year. For month t, the portfolio return was calculated as the weighted average of individual stock returns:

$$r_t^{portfolio} = \sum_{i=1}^{N_t} w_{i,y}\, r_{i,t}$$

Where:

- $r_t^{portfolio}$= portfolio return in month t
- $r_{i,t}$= return of stock i in month t
- $w_{i,y} = \frac{MC_{i,y}}{\sum_{j=1}^{Ny} MC_{j,y}}$ = weight of stock $i$based on its market cap in year y
- $MC_{i,y}$= market cap n of stock i in year y
- N_y= number of stocks with available annual market cap data in year y

By applying annual market-cap-based weights throughout each year, the methodology reflects each firm's relative economic size while maintaining a stable and transparent weighting approach. Stocks with missing return or market cap information for a particular year were excluded from that year's weighting procedure.

8.8 R-Code

```
> anova_result
$ANOVA
       Effect DFn DFd       SSn        SSd         F            p p<.05        ges
1 (Intercept)   1  11 8073.4566 3004.19310 29.561356 0.0002048186     * 0.72545059
2        Date   3  33   32.0886   51.23587  6.889208 0.0009943232     * 0.01039301

$`Mauchly's Test for Sphericity`
  Effect        W         p p<.05
2   Date 0.485042 0.2201765

$`Sphericity Corrections`
  Effect       GGe       p[GG] p[GG]<.05       HFe       p[HF] p[HF]<.05
2   Date 0.6816456 0.004425475         * 0.8389758 0.002107993         *
```

```
> print(t_test_1_vs_2)

        Paired t-test

data:  pe_2 and pe_1
t = 2.5391, df = 11, p-value = 0.02753
alternative hypothesis: true mean difference is not equal to 0
95 percent confidence interval:
 0.1362907 1.9108616
sample estimates:
mean difference
       1.023576

>
```

```
> print(t_test_2_vs_3)

        Paired t-test

data:  pe_3 and pe_2
t = -0.90681, df = 11, p-value = 0.3839
alternative hypothesis: true mean difference is not equal to 0
95 percent confidence interval:
 -1.2817983  0.5337764
sample estimates:
mean difference
      -0.374011

>
```

```
> print(t_test_3_vs_4)

        Paired t-test

data:  pe_4 and pe_3
t = 3.1009, df = 11, p-value = 0.01009
alternative hypothesis: true mean difference is not equal to 0
95 percent confidence interval:
 0.4632748 2.7294432
sample estimates:
mean difference
       1.596359

>
```

```
> cagr_table
# A tibble: 4 × 4
  Portfolio        n_months years   CAGR
  <chr>               <int> <dbl>  <dbl>
1 MSCI World            252    21 0.0828
2 NBIM Equity           252    21 0.109
3 Sin Stocks (EW)       252    21 0.149
4 Sin Stocks (MCW)      252    21 0.128
>
```

```
> print(sharpe_results)
# A tibble: 4 × 3
  Portfolio        Sharpe_Monthly Sharpe_Annualized
  <chr>                     <dbl>             <dbl>
1 MSCI World                0.144             0.498
2 NBIM Equity               0.231             0.802
3 Sin Stocks (EW)           0.276             0.956
4 Sin Stocks (MCW)          0.216             0.747
```

Annualized Volatility

Standard deviation of monthly returns × √12

Portfolio	Volatility
Sin Stock (MCW)	15.67%
MSCI World	15.23%
Sin Stock (EW)	14.00%
NBIM Equity	11.92%