EVALUATING THE PERFORMANCE OF ACTIVE MANAGEMENT IN NORWAY'S SOVEREIGN WEALTH FUND (GPFG)

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DECEMBER 1ST, 2025

We have received helpful comments from the Ministry of Finance (MoF) and Norges Bank Investment Management (NBIM). The views expressed in this report are solely those of the authors.

Executive summary

This report concludes that Norges Bank's active management of the Fund has created substantial value for the Norwegian people. Since 1998, active decisions have contributed about 611 billion NOK before costs, and 402 billion NOK after costs. This corresponds to average annual active returns of 0.27% before costs, and 0.19% after costs. In the most recent four year period, active management has continued to add value, with mean annual gross and net active returns of 0.24% and 0.20%. These results reflect very low management costs of about 0.04% per year.

The Fund has taken only moderate active risk, well within the limit that has been set. A key measure, the information ratio, shows how much excess return is earned per unit of risk taken, and has been solid. In the last four years, the Fund's tracking error, that is, how much its returns can differ from the benchmark index, has been about 0.47%. The information ratios have been 0.51 before costs and 0.41 after costs. This indicates a disciplined and effective use of the room for active management.

Viewed over the full 27 year period, the track record is robust. The Fund has had negative active returns in only seven years, which means that roughly three out of four years have been positive. The strongest contributions come from equity and fixed-income strategies, where active management has been diversified and has worked over time.

Within active strategies, two areas stand out as clear successes for the Fund. The market exposure strategy, which includes positioning around market events, and securities lending, generates small percentage gains that translate into large kroner amounts due to the size of the Fund and is well suited to a large long-term investor. The security selection strategy, where internal and external managers pick individual securities based on research, has also created significant value. External managers, in particular, have produced strong results even after accounting for higher fees. These strategies are closely related to the Fund's ownership activities.

The main challenges lie in two areas. First, top-down allocation decisions, such as maintaining a lower share of equities, have reduced returns and are difficult to justify given the Fund's structural advantages as a long-term investor. Second, the real estate portfolio has underperformed relative to both its funding benchmark and the broader property market. The evaluation indicates that the current funding model may encourage a short-term

perspective. Finally, the report underlines that active management should be judged over long periods, with a focus on continuous improvements.

Contents

1 Introduction

The Norwegian Government Pension Fund Global (the Fund) is a large sovereign wealth fund owned by the Norwegian people. The Fund operates under a mandate set by the Norwegian Parliament, and acts on behalf of the population. Parliament, through the Ministry of Finance (MoF), has concluded that a certain degree of *active management* can improve the Fund's risk–return trade-off. A thorough evaluation can inform the public debate by clarifying the rationale for active management, and by assessing whether these objectives are being achieved in an effective manner.

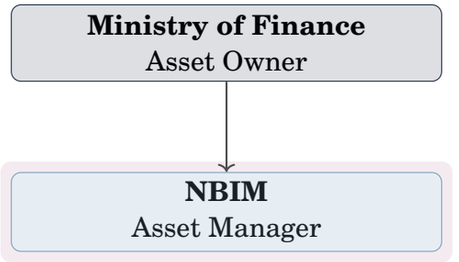
The search for additional returns through active management entails higher costs. There are many theoretical and empirical reasons why average active managers underperform after costs. Such activities should therefore only be undertaken when the Fund is firmly convinced that its *comparative advantages* provide a basis for delivering positive value added within the limits set by the mandate. All active decisions should be grounded in the objective of securing the highest possible return with acceptable risk.

The governance structure is based on the Norwegian people, as the principal and ultimate asset owner, delegating the management of the Fund to Norges Bank Investment Management (NBIM), which acts as their agent. Norway has employed NBIM as its asset manager for almost 30 years and has paid substantial management costs over this period (see Figure C.1).

Active management refers to deviations from the benchmark specified by the MoF in the management mandate (Ministry of Finance, 2023). The owners' tolerance for deviations, that is active risk, is expressed through an ex-ante tracking-error limit of 1.25%. Rather than defining a target for active management, the mandate defines an upper limit for its scale.

Figure 1 illustrates the overall asset-management framework. We focus on how NBIM has exercised the discretion allowed for active management. We examine whether the service provided through active management has been profitable and whether it should be continued in its current form.

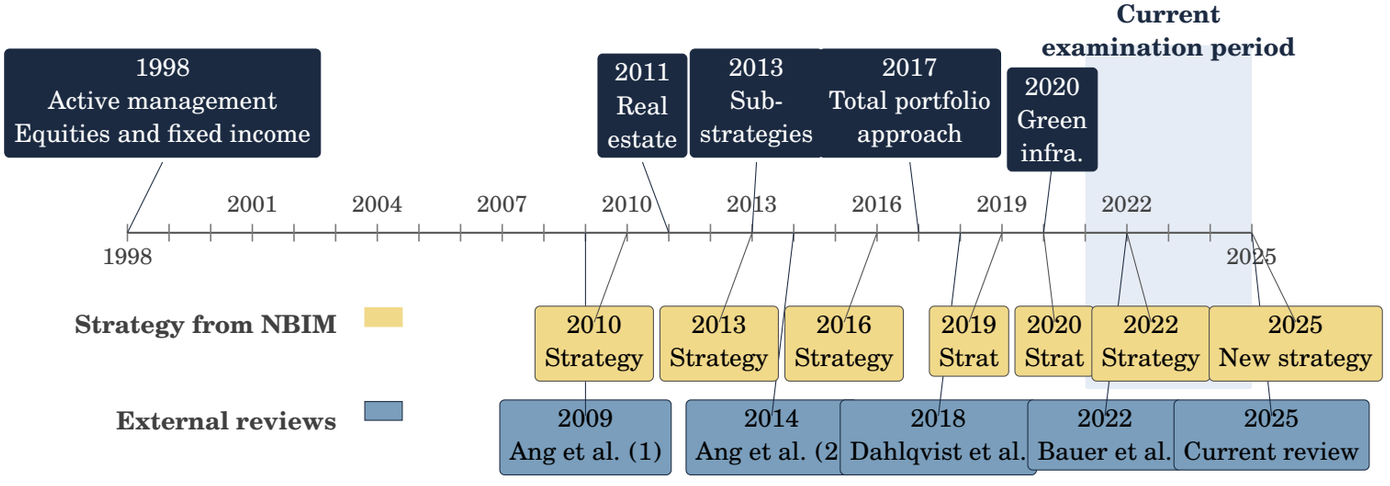
Figure 1. Asset management framework
This figure presents a simplified overview of the asset-management framework. It highlights the two central roles: the Ministry of Finance as the asset owner and Norges Bank Investment Management (NBIM) as the asset manager. The arrow indicates the delegation of investment responsibilities from the owner to the manager.



1.1 The Fund

The Fund was established in 1986 to protect the accumulated surplus of Norway's oil revenues. In Appendix B, we offer a concise overview of the Fund's governance structure. Above the timeline in Figure 2, we illustrate the most important milestones related to the active management of the Fund. In 1998, the Fund began investing in equities, and also engaged in active management for both equities and fixed income. Not much happened over the following decade, but after the Financial Crisis, the tracking-error limit was reduced.

Figure 2. Timeline of main changes and documents
This figure presents a timeline of the Fund's key strategic developments and major external reviews from its inception to 2025. Milestones above the horizontal axis represent important changes to the investment strategy, including the introduction of new asset classes and the adoption of the total-portfolio approach. Items in the two lower lanes summarize NBIM's published strategy documents and independent external reviews, respectively. The shaded area highlights the period covered by the current examination.



In 2011, the Fund started investing in real estate. However, this asset class was included in the strategic asset allocation, and the real estate allocation decision was not considered part of active management. This changed in 2017, when the *total portfolio approach* was introduced. Along the same lines, the Fund began investing in green infrastructure in 2020.

Since 2013, the Fund has provided detailed data not only on active management within the main asset classes, but also on the underlying substrategies.

1.2 Roadmap

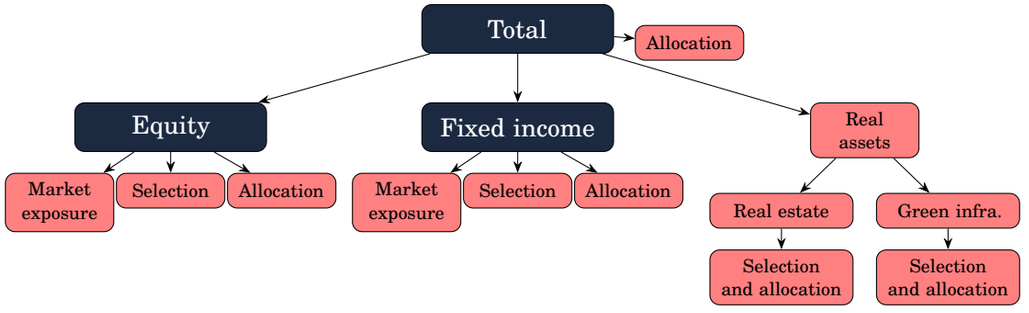
Analogous to NBIM's assessment of its external managers, the principal should conduct an appropriate evaluation of its appointed manager, NBIM. A systematic review of the underlying drivers of the Fund's returns, including the risks and costs incurred to generate them, provides an objective basis for understanding how value has been created, and how investment decisions can be improved. Transparency in this process also enables stakeholders to build trust and legitimacy in the Fund. As shown at the bottom of Figure 2, four comparable expert groups have previously operated under similar mandates (Ang et al., 2009, 2014; Dahlquist & Ødegaard, 2018; Bauer et al., 2022). NBIM likewise carries out its own self-assessments; see NBIM (2017), NBIM (2021), and NBIM (2025) for the three most recent ones.

Asset management involves a continuum of active decisions, and framing investing as purely "passive" or "active" is overly simplistic. In Figure 3, we show the Fund broken down into its asset classes. The red boxes indicate where active management takes place. At the highest level, the Fund portfolio is managed against the benchmark provided by the MoF. Over the past four years, the Fund has introduced active overlays on top of the core portfolio. These overlays may reflect explicit investment bets, risk-management decisions, or both.

In Section 2, we begin by documenting the realized value creation of the Fund, and by evaluating the quality of active management at the overall fund-portfolio level. In Section 3, we examine the managed-equity portfolio and its active strategies. Given the large number of underlying strategies, understanding their individual contributions strengthens confidence in the aggregate results. In Section 4, we assess the managed fixed-income portfolio and its corresponding active strategies.

The real-asset grouping includes both real estate and green infrastructure. Under the Fund's organizational model,

Figure 3. Active management strategies
This figure summarizes the structure of the Fund's investment activities and highlights the areas where active management takes place, shown in red. Starting from the total portfolio, the diagram outlines the main asset classes, equities, fixed income, and real assets, and the corresponding substrategies. Active management within each branch includes market exposure, security selection, and allocation choices. For real assets, the figure distinguishes between real estate and green infrastructure, where active selection and allocation enter.



the real-asset portfolio is treated as one of the active-management strategies. According to the *total portfolio approach*, the benchmark for the real-asset portfolio is a combination of listed equity and fixed income. These listed assets represent the opportunity cost of allocating capital to real assets. Consequently, the performance of *active* management in the real-asset portfolio depends on developments in both equity and fixed-income markets. The funding of the real-asset portfolio is defined as the difference between the asset-class and managed portfolios. Because investments in real assets reflect both a top-down asset-class allocation decision, and a bottom-up selection decision within the class, the active positions embed both allocation and selection dimensions. We explain and examine this portfolio in detail in Section 5.

For each portfolio, we follow a step-by-step *performance assessment*. While one could simply report realized outcomes, such an approach makes it difficult to distinguish luck from skill. The purpose of the evaluation is to assess whether the manager can be trusted to continue to deliver good results in the future. We therefore sharpen the analysis by examining whether the Fund delivers on the objectives it sets for its active strategies.

As illustrated in the second column of Table 1, we begin by describing the active strategy. We then measure the realized results. As concluded in Bauer et al. (2022), active management by NBIM should be evaluated with simple, understandable, and widely accepted performance-evaluation models. Since active management is about predicting asset return developments better than the average investor, separating skill from noise through statistical inference is a central part of the assessment.

Table 1. Roadmap of the review
This table provides an overview of the structure of the review. It shows how the performance assessment is organized across the total portfolio, equity, fixed income, and real assets, and lists the corresponding sections for each part of the analysis.

		Portfolio level			
		Total portfolio	**Equity**	**Fixed income**	**Real assets**
		Section 2	Section 3	Section 4	Section 5
Performance assessment	**Active strategy**	Sec. 2.1	Sec. 3.1	Sec. 4.1	Sec. 5.3 and Sec. 5.5
	Evaluation	Sec. 2.2	Sec. 3.2	Sec. 4.2	Sec. 5.4 and Sec. 5.6
	Summary	Sec. 2.3	Sec. 3.4	Sec. 4.4	Sec. 5.7

Finally, we evaluate the extent to which the strategies, and their outcomes, align with the stated comparative advantages. As indicated in the timeline in Figure 2, our analysis focuses on documents related to the strategies adopted by the Executive Board from 2010 onward. Links to these strategies are provided in Appendix B. We argue that this comparison allows for a more reliable assessment. In our view, sustained success in competitive global markets depends on identifying, cultivating, and effectively leveraging comparative advantages.

In Section 6, we summarize our findings and offer final remarks. Although the Fund's reporting is already comprehensive (see Chapter 6 in Ministry of Finance (2023)), we recommend providing additional detail on the real estate portfolio.

We consider the structure of this report to be consistent with the requirements set out in the MoF's mandate. The full review mandate is provided in Appendix A. Relative to previous assessments, we move more directly to the main findings, and place less emphasis on descriptive content. As a result, we make active use of the appendix to present supplementary results that are informative, but not essential to the main narrative. New data is continuously emerging, and for the most recent asset classes, such as real estate and green infrastructure, the number of observations is growing steadily. Compared with previous reviews, we now have a stronger empirical basis for assessing this part of the management activity.

The majority of the data we use come from NBIM. Some series are publicly available on NBIM's website, but we have also requested, and been granted access to, nonpublic data. For further details on the data, see Appendix C.

1.3 Ex-ante rationale for active management

Before proceeding to the actual ex-post analysis of the results, we first address point 4 of the mandate (see Appendix A) by examining whether the Fund's main strategies are based on comparative advantages available to the Fund.

Theoretical foundations

Active management presupposes some degree of market inefficiency. In a fully efficient market (Fama, 1970), prices reflect all available information, and no manager can consistently earn excess returns after costs. Because gathering and processing information is costly, prices cannot be perfectly efficient in equilibrium (Grossman & Stiglitz, 1980). Instead, there is a stable degree of disequilibrium in which informed investors are compensated for their research efforts. Subsequent models (e.g., Gârleanu & Pedersen, 2018) highlight how large institutional investors can earn rents by transforming information into prices, which provides a theoretical basis for active management.

Empirical findings

Empirical research generally finds that, in aggregate, active management is a zero-sum game before costs, and a negative-sum game after costs (Sharpe, 1991; French, 2008). Nevertheless, deviations from this benchmark can arise. For example, passive investors face transaction costs when rebalancing to reflect index changes (Pedersen, 2018; Berk & van Binsbergen, 2015a), and some institutional investors can exploit behavioral biases of less sophisticated market participants, often referred to as "noise traders" (Black, 1986; Barber & Odean, 2013).

Recent research shows that the expansion of passive investing is reshaping overall market quality. As index and ETF ownership increases, return co-movement rises, and episodes of volatility and illiquidity around ETF primary-market activity become more pronounced (e.g., Comerton-Forde et al., 2025). At the same time, prices appear to incorporate new information less efficiently. Firms with higher passive ownership show weaker pre-announcement price discovery, and muted reactions around earnings announcements (Sammon, 2025). Moreover,

the true passive share of equity ownership is substantially higher than previously measured (Chinco & Sammon, 2024), amplifying the influence of price-insensitive flows.

Taken together, these findings temper the traditional view of fully efficient markets, and suggest that temporary mispricings may arise. Such conditions can create opportunities for informed, patient active strategies to add value. In the next section, we examine the potential advantages of the Fund relative to other market participants, and how these can translate into value added from active management.

Potential advantage

NBIM's active strategies should build on structural features that set it apart from most other institutional investors. Because market prices reflect the combined views and transactions of all investors, an active manager can only expect to outperform if they possess some distinctive advantage. In the absence of an edge in information, skill, or execution, expected performance will not exceed that of the average participant in the market.

Drawing on, among other sources, NBIM's strategy documents and our discussions with the Fund, we have organized these potential advantages into three categories:

1. Scale

- The Fund's very large size allows it to invest in advanced data, technology, and analytical capabilities, and to internalize trading and implementation functions. This reduces marginal implementation costs, and makes it possible to run multiple active strategies at scale that would be uneconomic for smaller investors.
- As one of the largest investors in many markets, the Fund is an attractive counterparty for banks, brokers, and other institutions. This can provide access to block trades, syndication, corporate events, and negotiated transactions on terms that are generally not available to the average investor.
- The Fund's strong balance sheet supports scalable use of financing, collateral management, and securities lending. These activities can reduce financing costs, generate additional income, and improve the net performance of active strategies.
- The Fund often holds significant stakes in individual companies, and is a visible long-term owner. This position, combined with its reputation, facilitates access to company management, boards, and advisers, which can deepen its understanding of firms and sectors, and support both security selection and active

ownership.

- Scale also makes it worthwhile to build specialized internal teams across regions, sectors, and asset classes. This breadth of in-house expertise allows the Fund to analyze a wide opportunity set in a consistent way, and to allocate capital efficiently between strategies.
- The Fund can take on large ticket sizes in unlisted or less-liquid investments, such as real estate and infrastructure, where many investors are constrained by size, governance, or expertise. This creates access to transactions and partnerships not available to the average investor, and can provide additional sources of value added.

2. Long-term horizon

- The Fund's long investment horizon allows it to invest differently from many other investors, including during challenging market conditions, and to make investments where it may take considerable time for the underlying value to be realized.
- As a long-term committed owner, NBIM can build enduring relationships with individual companies. This strengthens access to management and boards, and improves understanding of firms' long-term prospects.
- Because short-term performance and liquidity needs are less binding, the Fund can tolerate temporary volatility in returns, and avoid forced sales in periods of market stress.
- This stability makes it possible to act in a contrarian manner, increasing risk exposure or buying assets when other investors must sell, particularly in stressed or less-liquid markets.
- A long horizon also supports strategies that seek to harvest time and illiquidity premia across asset classes, including in segments where payoffs are realized only over many years.
- The Fund can accept long lock-up periods and J-curve effects in unlisted investments in a way that many investors cannot, providing access to opportunities in private markets that are unavailable to shorter-horizon investors.

3. Limited liquidity needs

- The Fund can take allocation decisions at times when other investors are constrained by behavioral factors, regulatory requirements, or financing needs.
- It can act as a liquidity provider, and seek implementation alpha through advanced trading technology,

internal crossing, and selective participation in market events.

- Ability to hold positions long enough for valuation theses to play out, rather than being forced to react to short-term price movements.
- The Fund can maintain lower turnover and reduce trading frictions relative to more constrained investors.
- Because it does not face investor outflows, the Fund can commit capital to unlisted investments with long lock-up periods, and limited secondary-market liquidity, in a way that many investors cannot.

Taken together, these characteristics imply that NBIM's opportunity set differs from that of the average investor. In the next section, we examine the extent to which the Fund's active strategies appear to make use of these distinctive advantages.

1.4 Active strategies - selection, enhanced indexing, and allocation

As shown in Figure 3, active strategies consist of three main categories: market exposure (enhanced indexing), security selection, and allocation. These approaches are applied within and across equity, fixed income, and real-asset management. Grouping the activities in this way makes it easier to assess each strategy, both in terms of its potential advantages and in comparison with alternative approaches. In the following, we review the key characteristics of the different strategies.

Security selection

Security selection refers to identifying individual companies or issuers that are expected to deliver higher returns than the benchmark. It is one of the most established forms of active management and relies on detailed information, analytical skill, and judgment. This approach is primarily bottom-up and is most effective within a single asset class. The purpose is to exploit differences between market prices and underlying fundamentals, and to allocate capital toward companies with stronger prospects, higher quality, or better long-term characteristics. Within NBIM, this results in active over- and underweights relative to the benchmark at the company level.

NBIM has strong access to companies, and regularly meets with management teams, board members, and industry specialists. This access deepens its understanding of firm fundamentals, managerial quality, and sector dynamics. To exploit these advantages, internal managers follow a limited number of companies and run rela-

tively concentrated portfolios. This structure supports detailed analysis and close monitoring of each investment. Internal managers are sector specialists who have built expertise over time, in part through extensive dialogue with firms in the same sector or value chain.

External managers are used in markets and segments where local insight or specialized expertise can enhance returns. In emerging markets, for example, information is harder to obtain, making local presence particularly valuable. Most of the Fund's equity exposure in emerging markets is managed externally, except in the largest markets, which are also covered internally. External mandates are also used in segments requiring skills not available in-house, including small-cap strategies and sectors undergoing structural change.

Enhanced indexing (market exposure)

The enhanced indexing strategy includes both positioning and securities lending. Positioning aims to implement market exposures in ways that enhance returns and reduce transaction costs. NBIM manages most of the Fund's portfolio internally, including broad equity and fixed-income portfolios, active trading, and the handling of cash, currencies, and securities lending.

NBIM invests broadly in the instruments included in the benchmark, but to reduce transaction costs, it avoids implementing benchmark changes mechanically. New inflows, reinvested dividends, and benchmark revisions require continuous adjustments to the portfolio. These adjustments involve purchases and sales of securities, and such trading activity generates costs. For equities and fixed income, direct costs include commissions and transaction taxes. Indirect costs arise from price movements between trade initiation and execution.

Over time, NBIM has developed a range of systems to improve portfolio-management efficiency and keep trading costs low. Where possible, NBIM consolidates the Fund's overall trading needs, allowing different transactions to offset each other and thereby reducing total market volume. NBIM has also increased trading with other end-investors through block trades, where the Fund is less visible in the market and can obtain more favorable prices for large or less-liquid transactions. In addition, NBIM has developed systems that provide portfolio managers with insight into upcoming trading needs, allowing them to assess whether trades should be executed immediately or deferred until they can be offset against future flows.

NBIM also lends equities and fixed-income securities, earning income through improved cash-collateral manage-

ment and greater diversification of counterparties. Securities lending is not explicitly assessed in this evaluation, but was examined in detail by Bauer et al. (2022).

Allocation

The allocation strategy consists of activities designed to enhance the Fund's long-term balance between risk and return. It is mainly a top-down approach, and is often most effective when applied across asset classes, factors, or sectors. Given the Fund's current structure, this strategy covers allocations to real assets as well as allocations between and within the traditional asset classes. Within allocation, we therefore include dynamic tilts and decisions regarding whether, and to what extent, to invest in real assets. Investments in unlisted real estate and renewable-energy infrastructure are accordingly classified under allocation in the strategy framework.

These decisions aim to capitalize on fluctuations in risk premia and structural variations in expected returns, while remaining aligned with the Fund's overall risk parameters and long-term investment objectives. NBIM may assume allocation positions when exceptional market conditions offer attractive opportunities, or when adjustments to the Fund's general risk profile are necessary. Such positions can include overweight or underweight exposures in selected sectors or market segments. These opportunities often arise when other investors are constrained by behavioral factors, regulatory requirements, or financing needs.

Within the delegated mandate framework, it may also be necessary to modify the Fund's overall risk profile even when individual portfolios are appropriately positioned. According to our understanding, some allocation positions represent active investment bets, while others incorporate an element of risk management. We return to this topic in more detail in Section 6.

1.5 Summary

Standard attribution models separate the contribution to active return into allocation and security-selection components. Following Grinold and Kahn (2000), Døskeland (2025) compare various characteristics, see Table 2. As shown there, allocation (timing) bets involve higher risk than selection bets. It is also harder to justify that any given investor has a comparative advantage in timing. Therefore, we claim that competition for timing bets is substantially more intense than for selection bets.

Table 2. Attributes of active bets
This table summarizes key attributes of different forms of active bets. It compares timing across asset classes, timing across sectors, countries, and factors, and security selection, along dimensions such as breadth, the likelihood of skill, the typical duration of bets, and the potential gain or loss. The final row indicates where attractive active opportunities are most likely to be found that are aligned with the Fund's comparative advantages.

	Timing asset classes	Timing sectors/ countries/factors	Security selection
Breadth (# of bets)	One	Few	Many
IC Likely to have skill	Very low	Low	Large
Duration of bets	Multiple years	Years	Months
Potential gain/loss	Very large	Large	Low
Attractive bets?	No	Some	Yes!

Based on the analysis above, we find that selection and enhanced indexing check many of the boxes for why the Fund can be expected to generate excess returns. For allocation, the case is more uncertain. We would argue that the choice to hold real assets is essentially a strategic decision rather than an active one, so it does not fit neatly into this framework. However, there are features of the Fund that support holding real assets. For more short-term top-down bets, for example, between asset classes or within countries and sectors, we are more skeptical. These are strategies where it is difficult to obtain unique information and where the competition is intense.

2 Fund assessment

In this section, we examine the difference between the Fund's actual returns and the benchmark, which represents the value added generated by the Fund. We also assess an allocation strategy implemented at the top level.

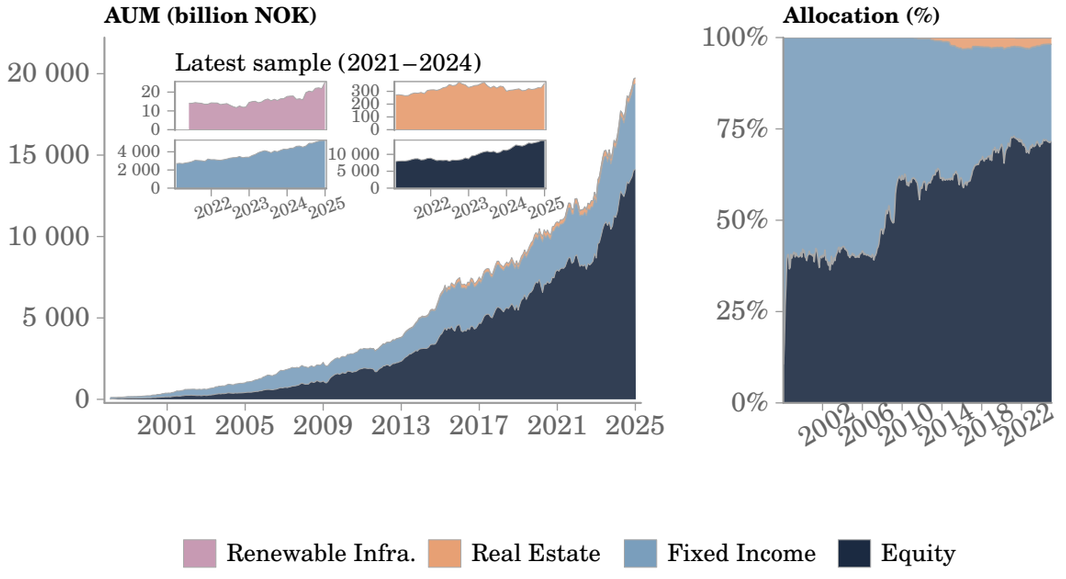
2.1 Overview

As shown in Figure 4 (left panel), the Fund's market value, or assets under management (AUM), has increased steadily, driven by both additional capital inflows and strong investment returns.

The Fund's initial investments were allocated to government fixed-income securities. As the Fund grew, allocations

Figure 4. Fund assets and allocation

This figure shows the development of the Fund's assets and the composition by asset class from 1998 through 2024. The left panel reports the value of assets under management, and the inset focuses on the most recent period from 2021 through 2024. The right panel shows the allocation across equity, fixed income, real estate, and renewable infrastructure. Each area reflects the share of net asset value held in each asset class at the end of each month.



expanded to other asset classes. In January 1998, the Fund began investing in equity, starting with a strategic asset allocation of 40% equity and 60% fixed income. This is also the starting point for our analyses. As shown in Figure 4 (right panel), the allocation to equity has continued to rise, and the strategic allocation today is 70%. The asset weights of the MoF benchmark drift within a rebalancing band.[1] In 2010, the MoF authorized the inclusion of unlisted real estate in the portfolio, and in the summer of 2021, the first renewable-infrastructure investment was made.

2.2 Evaluation

At the Fund, equity, and fixed-income levels, we use monthly returns and AUM data from January 1998 through December 2024, which gives us 324 observations. In most of the analysis, we also examine the 48 observations from the most recent period, January 2021–December 2024.[2] The Fund provides returns in USD, NOK, and in the Fund's currency basket. We present value added in NOK, and returns in USD.[3]

2.2.1 Fund level

When documenting realized value creation, we present both gross and net active returns, together with gross and net value added. Active return is defined as the difference between the portfolio return of the Fund and the benchmark return.[4] Formally, the active return at time t, R_t^{A}, equals the portfolio return R_t^{P} minus the benchmark return R_t^{B}.

Costs fall into two main categories. Transaction costs arise from trading activities, and management costs reflect the operational expenses of running the Fund. Transaction costs are deducted directly from reported portfolio returns. Gross portfolio returns are therefore after transaction costs but before management costs, while net portfolio returns are after both categories of costs. Net active returns are the active returns after all these costs.

For the benchmark, expected transaction costs and management costs are assumed to be offset by income from

[1] The MoF's mandate determines the rebalancing bands. The benchmark with fixed weights is the strategic benchmark.
[2] We explicitly note analyses based on data available only for other periods.
[3] As highlighted in footnote 18 of Bauer et al. (2022), average returns are comparable across currencies, but standard deviations differ. Since our performance analysis relies on active returns, currency discrepancies at the level of total returns have a limited effect on the findings.
[4] In some practical contexts, *excess return* refers to return relative to a benchmark. Here we follow the academic convention, where excess return refers to return relative to the risk-free rate.

securities lending. As a result, the benchmark's gross and net returns are identical. NBIM's own assessment (NBIM, 2025) assumes higher cost levels than those used in our evaluation. Our cost estimates lie at the lower end of the relevant range. For clarity, the gross active return we report compares the Fund's actual portfolio return after transaction costs, but including securities-lending income, with the unadjusted benchmark. Details on these assumptions and on the cost framework appear in Appendix C. Keeping costs low is not the objective in itself. The objective is cost efficiency, ensuring that any cost incurred contributes to maximizing returns after costs.

Value added measures how much additional wealth the Fund extracts from financial markets for its owner relative to a passive benchmark (Berk & van Binsbergen, 2015b). We report this both before and after the costs associated with extracting that wealth.

We measure value added in monetary terms as the amount generated in a given period (typically one month) by deviating from the benchmark. The monthly value added for period $t+1$ is defined as the product of the active return in month $t+1$ and the assets under management at time t:

$$V_{t+1} = AUM_t \cdot R^{\mathrm{A}}_{t+1}, \tag{1}$$

using monthly AUM and active returns.[5] We report value added both before and after costs using gross and net active returns.

The cumulative value added, $CumV$, is constructed recursively as a value-added wealth account, as shown in Equation (2). The value added in each month is added to the compounded total from previous months. Between months, accumulated value added grows or shrinks with the benchmark return, ensuring consistency with the benchmark-relative wealth path:

$$CumV_{t+1} = CumV_t\left(1+R^{B}_{t+1}\right) + V_{t+1} = CumV_t\left(1+R^{B}_{t+1}\right) + AUM_t \cdot R^{\mathrm{A}}_{t+1}, \tag{2}$$

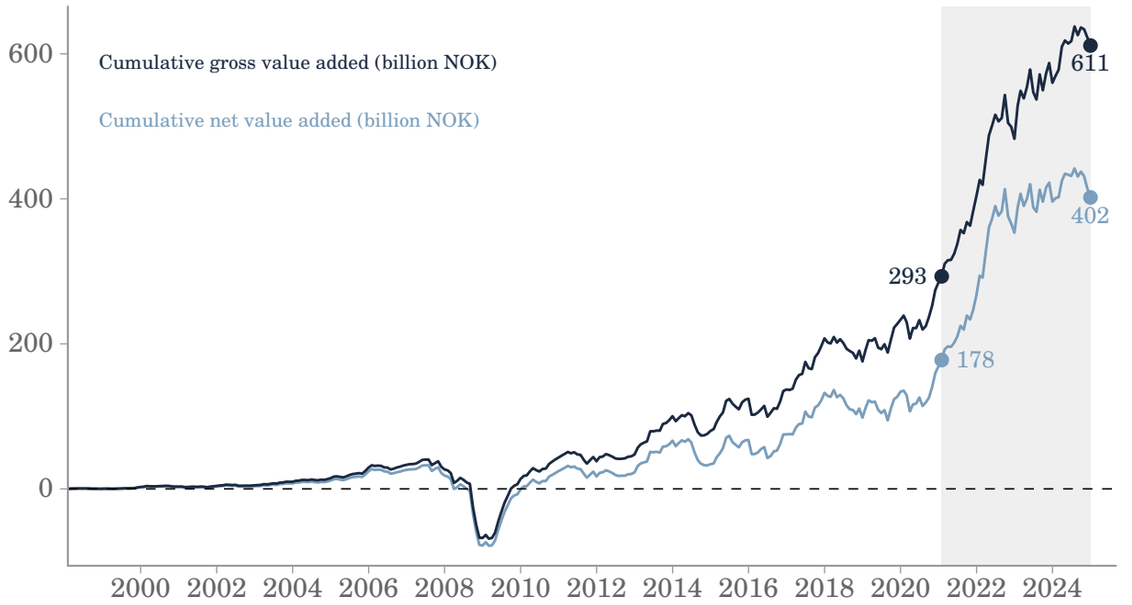
where $CumV_{t+1}$ is the cumulative value added in period $t+1$. In the appendix, we also show value added in

[5] At the Fund, equity, fixed-income, and real estate levels, returns and AUM are available in NOK, and value added is calculated in NOK. For some substrategies, we do not have returns in NOK, so we use USD, which produces value added measured in NOK while the underlying returns are based on USD. In all table notes, we state the currency used.

summed form, that is, without compounding.

Value added

Figure 5. Fund: Cumulative value added
This figure shows the cumulative gross and net value added for the Fund from 1998 through 2024, expressed in billion NOK. Cumulative value added is constructed as a value added wealth account according to Equation (2), which compounds monthly value added over time. Gross value added is measured before management costs, and net value added is measured after all reported costs. The shaded area highlights the most recent sample period from 2021 to 2024, and the labeled endpoints show the change in cumulative gross value added from 293 to 611 billion NOK, and in cumulative net value added from 178 to 402 billion NOK, over this sub period. All returns and asset values are measured in NOK.



As the saying goes, "percentages don't pay the bills — cash does." Figure 5 shows the cumulative gross and net value added for the Fund since 1998, constructed using the consistent compounding of benchmarks described in Equation (2). Gross value added reflects results before costs, while net value added accounts for the cost of extracting this value. At the end of 2024, cumulative gross value added had reached approximately 611 billion NOK, and cumulative net value added approximately 402 billion NOK.

From 2021 to the end of 2024, cumulative gross value added increased from 293 billion NOK to 611 billion NOK, an increase of 318 billion NOK. Over the same period, cumulative net value added increased from 178 billion NOK to 402 billion NOK, an increase of 224 billion NOK. These developments show that active management has

contributed substantially to the Fund's results in recent years. Figure D.1 in Appendix D shows the value added in summed form.

Active returns

Figure 6. Fund: Cumulative gross and net active returns
This figure shows cumulative gross and net active returns for the Fund from 1998 through 2024, expressed in percent and measured in USD. Cumulative active returns are constructed by compounding monthly active returns over time. Gross active return is measured before management costs, and net active return is measured after all reported costs. The shaded region highlights the period from 2021 to 2024, and the labeled points report the cumulative gross and net active returns at the start and end of this interval.

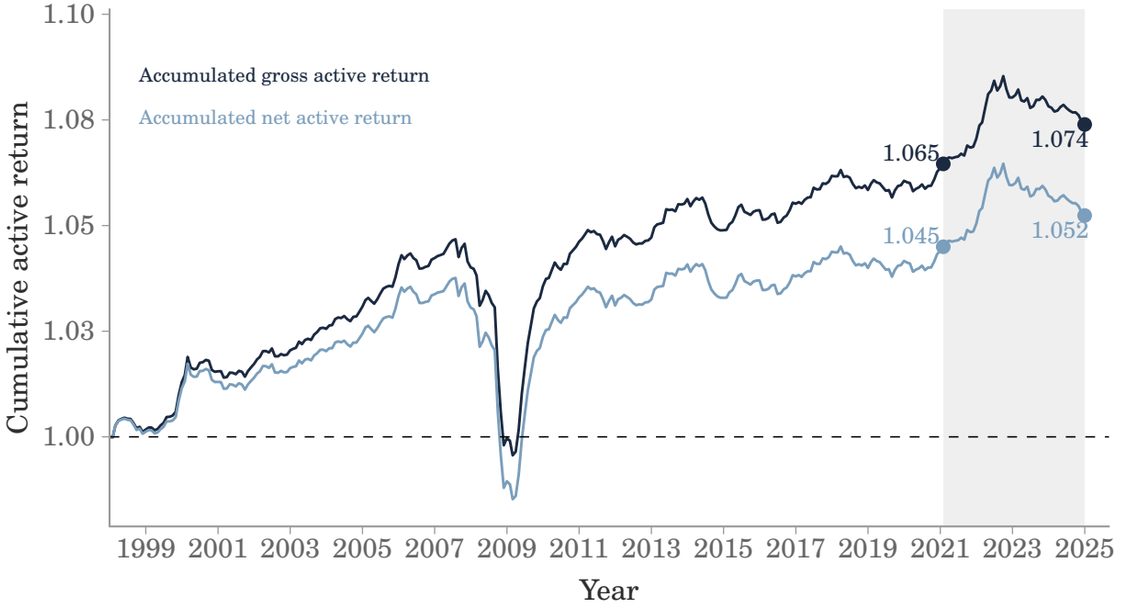


Figure 6 shows the accumulated active returns of the Fund. If 1 USD had been invested in the active portfolio at inception, the investment would have grown to 1.074 USD before costs, and 1.052 USD after costs, by the end of 2024. This reflects the additional return earned by investing in the Fund rather than in its benchmark. The last four years, highlighted in gray, show two years of positive active performance followed by two years of negative active performance. The main factor behind the recent weakness is that real estate returns have fallen short of the funding benchmark.

Figure 7. Active return before and after cost
This figure presents a breakdown of the Fund's total return into a benchmark component, the gross active return component, the cost component, and the resulting net active return. The upper panel shows results for the full sample from 1998 through 2024, and the lower panel shows results for the recent sample from 2021 through 2024. The y axis is broken, so the relative heights of the bars do not represent the differences in magnitudes across components. Returns are expressed in percent and measured in USD.

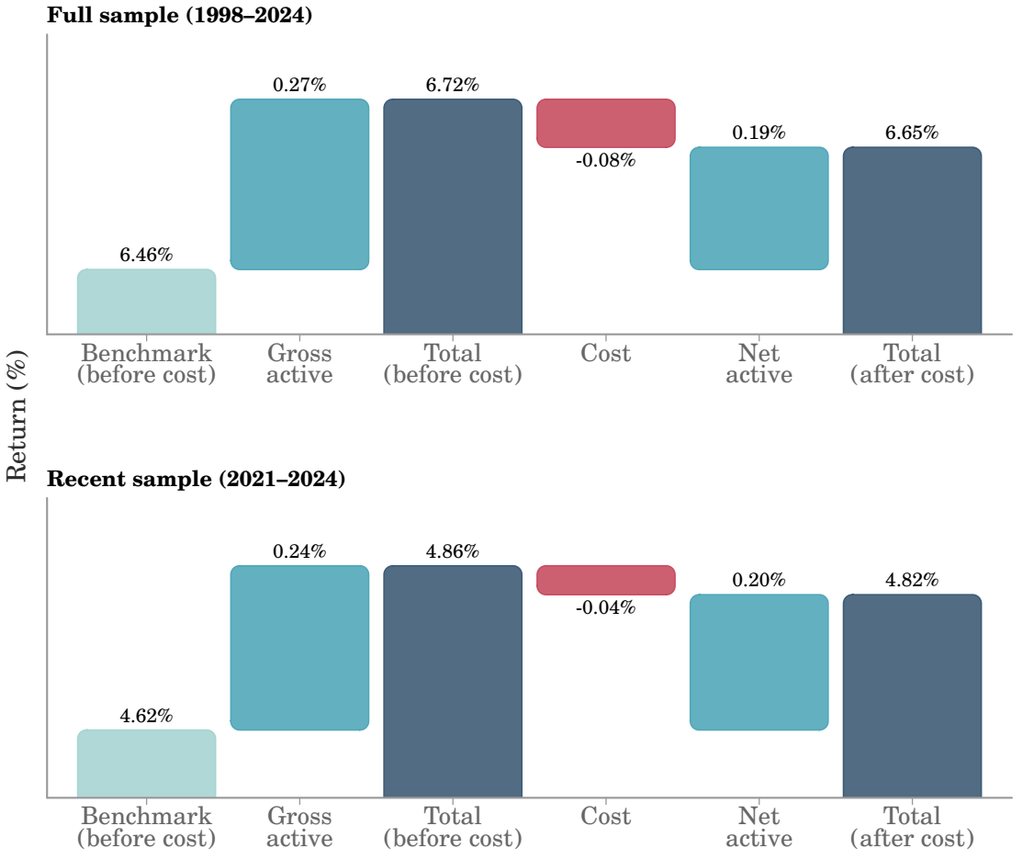


Figure 7 decomposes the total portfolio return of the Fund into its benchmark component, the gross active return, costs, and the resulting net active return for the full period (1998−2024) and the recent period (2021−2024). As discussed in Appendix C, we use arithmetic means (similar to Dahlquist & Ødegaard, 2018). We annualize returns by multiplying monthly returns by 12, and monthly standard deviations by the square root of 12.

The upper panel shows the long-run contribution of active management. From 1998 to 2024, the benchmark returned 6.46%, and active strategies added 0.27% before costs. After subtracting costs of 0.08%, the net active return is 0.19%, resulting in a total return of 6.65%. This indicates that active management has provided a

modest but positive contribution over a long horizon, with costs remaining low enough that most of the gross value added is retained.

The lower panel shows a similar pattern over the recent period. From 2021 to 2024, the benchmark returned 4.62%, and gross active management contributed 0.24%. Costs of 0.04% reduce this to a net active return of 0.20%, resulting in a total return of 4.82%. Although overall return levels are lower than in the full sample, the active-return components are similar, suggesting consistent performance across market environments. The results indicate that the Fund has maintained a stable active contribution while keeping costs contained.

Statistical evaluation and risk adjustment

A natural next step is to move from reporting realized returns to applying statistical methods, since active returns contain substantial noise, and we must account for this to evaluate the results with any confidence.

Table 3. Fund: Summary statistics of active returns
This table reports descriptive statistics for annualized active returns, expressed in percent and measured in USD. IR refers to the mean divided by the standard deviation, the hit ratio is the fraction of months with a positive active return, and AC(1) is the first order autocorrelation. N is the number of observations in the sample. Statistics are shown for the full period from 1998 through 2024 and for the recent subperiod from 2021 through 2024.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
Mean	0.27	0.19	0.24	0.20
Standard deviation	0.63	0.63	0.47	0.47
IR	0.42	0.31	0.51	0.42
Hit ratio	0.63	0.60	0.56	0.54
AC (1)	0.45	0.45	0.17	0.17
Skewness	−1.99	−2.03	0.07	0.07
Excess kurtosis	17.20	17.37	0.00	0.00
N	324	324	48	48

Table 3 reports summary statistics for the Fund's active returns. The first risk-adjusted performance measure is the information ratio (IR; Grinold, 1989), defined as the mean active return divided by its standard deviation. The standard deviation of active returns is often referred to as the tracking error or active risk. For the full sample,

the annualized tracking error is 0.63%, giving an annual gross IR of 0.42 and a net IR of 0.31. For the most recent period, the annualized tracking error is 0.47%, and the gross and net IRs are 0.51 and 0.41. For a broader discussion of active risk taking, see Section 6 and Figure 47.

A hit ratio greater than 0.50 indicates that positive active returns occur more often than negative ones, consistent with a pattern of frequent small gains rather than infrequent large gains. The first-order autocorrelation, AC(1), is noticeably lower in the most recent period. This suggests that active-return outcomes have become less clustered and is consistent with more diversified sources of active return.

The full-sample distribution exhibits strong negative skewness and high excess kurtosis, features commonly associated with crisis periods such as 2008 and 2020, and indicative of tail-risk events. From 2021 onward, skewness and kurtosis are close to zero, suggesting that the recent distribution of active returns has been more stable and symmetric. A histogram of active returns is shown in Figure D.2 in Appendix D.

The upper panel of Figure 8 shows results for the entire sample (1998–2024), and the lower panel shows results for the recent period (2021–2024). We test whether the mean active return is significantly different from zero, using standard errors adjusted for autocorrelation and heteroskedasticity following Newey and West (1987). More details on the testing procedure can be found in Appendix D.

The vertical error bars above the active-return estimates show the annualized mean active return and 95% confidence intervals for both gross and net returns. The Fund shows small positive mean active returns in both samples, but none are statistically significant. As reported in Table D.2, for the entire period, the p-values are 0.20 for gross returns and 0.35 for net returns, and for the recent period they are 0.39 and 0.48. Thus, we cannot reject the hypothesis that the mean active return is zero in either sample.

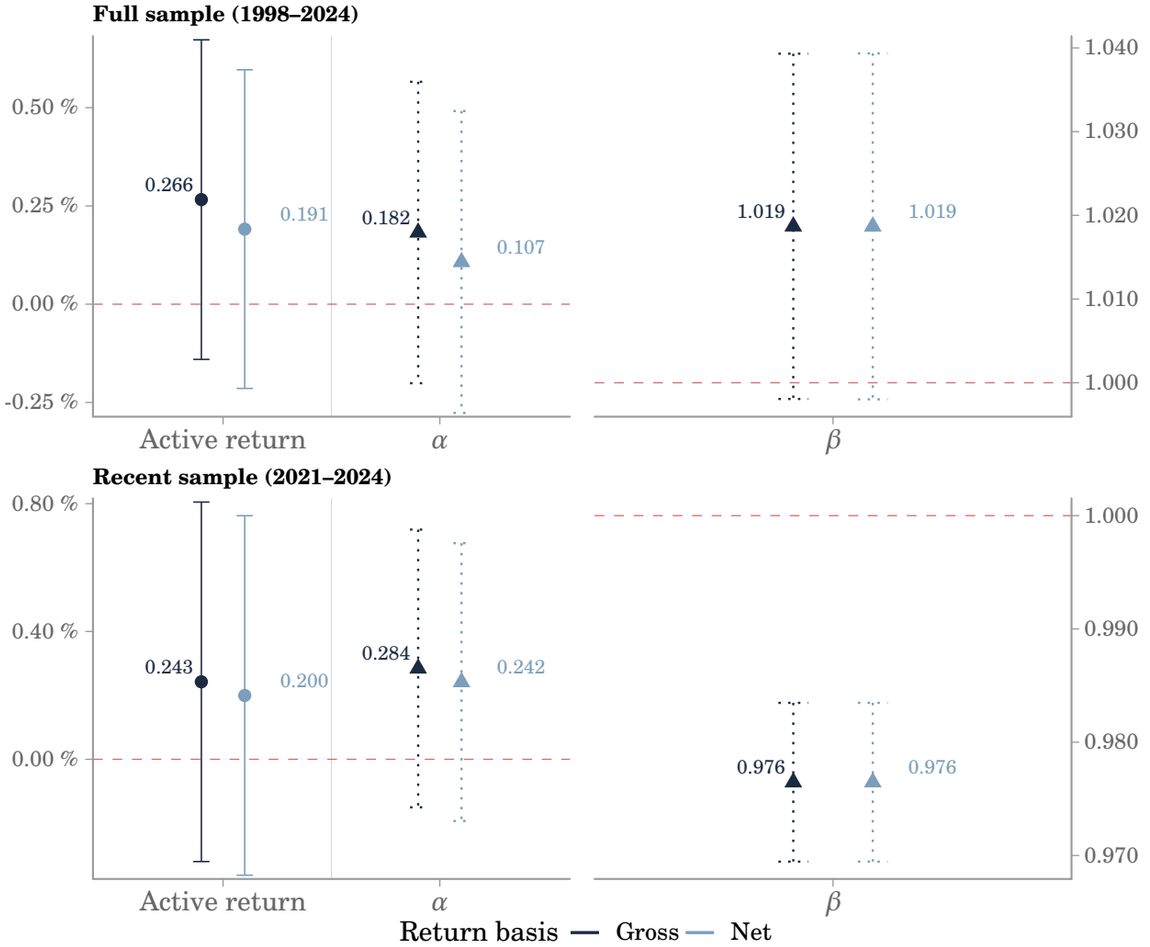
The vertical error bars above the α and β estimates show the estimated alpha and beta of the Fund relative to the benchmark. Performance is adjusted for risk using a CAPM specification in which the Fund's benchmark serves as the market portfolio, as defined in Equation (3) in Appendix D. These estimates are annualized and are based on Newey-West standard errors.[6]

For the full sample, the estimated alphas are positive but not statistically different from zero. The estimated

[6]See Table D.2 for additional details.

Figure 8. Fund: Active return decomposition

This figure presents coefficient estimates and 95% confidence intervals for the Fund's active return decomposition. All error bars are based on Newey and West (1987) standard errors, and all estimates are annualized from monthly returns, expressed in percent and measured in USD. Bars labeled active return show the gross and net mean active returns. Bars labeled α and β show the estimated coefficients from Equation (3). Active return and α estimates use the left y axis, and β estimates use the right y axis. Dark blue markers represent estimates based on gross returns, and light blue markers represent estimates based on net returns. The upper panel show results for the full sample from 1998 through 2024 and the lower panel for the recent sample from 2021 through 2024.



beta is 1.02, indicating that the active positions of the Fund have had slightly higher exposure to benchmark risk than one. In the recent period, the estimated alphas remain close to zero with wide confidence intervals, again providing no evidence of persistent alpha. The estimated betas are statistically significantly lower than one in this period, indicating that the Fund's exposure to benchmark risk has somewhat decreased. As a result, the benchmark-adjusted alpha for the recent period is slightly higher than in the full sample, even though neither estimate is statistically significant. This reduction in beta exposure will over time be costly given positive risk premiums.

Factor risk-adjusted performance

The second regression-based risk-adjusted performance measure is a factor model in which we adjust for exposures to a broader set of systematic risk factors. We regress the active returns on these factors, interpret the estimated slope coefficients as the Fund's active exposures to each factor over the sample period, and interpret the estimated intercept (alpha) as the component of performance not explained by those exposures. Details on the method are provided in Appendix D.

Figure 9 reports the estimated factor loadings, and the underlying regression estimates appear in Table D.3. For the full sample, shown in the upper panel, the Fund has a positive and statistically significant exposure to the market factor (MKT) and size factor (SMB), and significant negative exposures to the term (TERM) and investment (CMA) factors.

In the more recent period, two exposures stand out. The Fund has a statistically significant negative loading on the market factor (MKT), meaning that recent active positions have tended to move opposite broad equity-market returns. At the same time, the Fund has a positive loading on the default factor (DEF), indicating that active positions have benefited from credit-related returns. Other factor estimates are small and not statistically different from zero.[7]

[7]We also estimate a specification that includes the momentum factor (WML). As shown in Table D.5 and Table D.6 in Appendix D, including this factor does not materially change the economic interpretation or the statistical significance of the results.

Figure 9. Fund: Factor loadings

This figure presents coefficient estimates and 95% confidence intervals for the Fund's factor exposure. All error bars are based on Newey and West (1987) standard errors. Alpha estimates are annualized from monthly returns. All returns are expressed in percent and measured in USD. Each bar represents the estimated loading on one of the Fama–French factors, MKT, SMB, HML, RMW, CMA, TERM, and DEF, where DEF is adjusted in accordance with NBIM (2024a). Dark blue markers represent estimates based on gross returns, and light blue markers represent estimates based on net returns. The upper panel shows results for the full sample from 1998 through 2024, and the lower panel shows results for the recent period from 2021 through 2024.

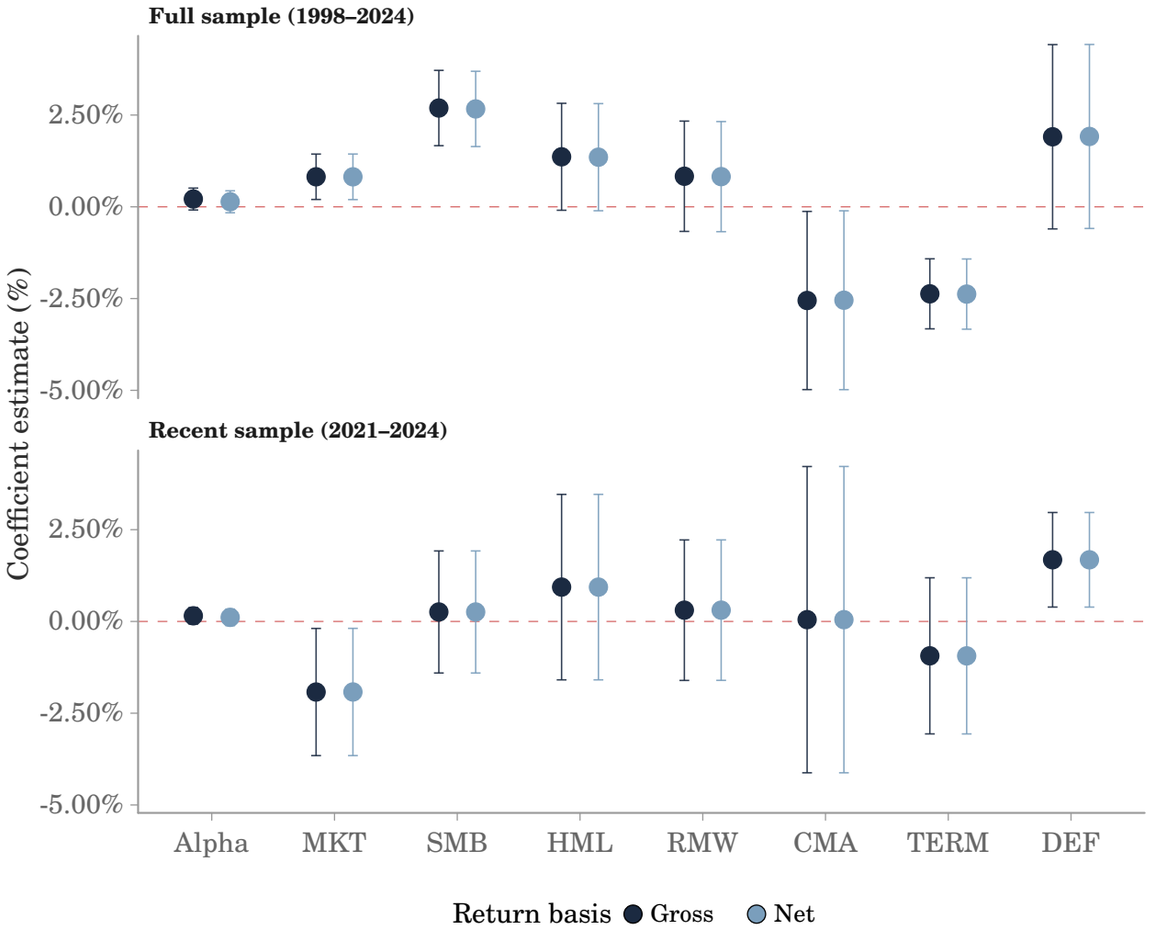


Figure 10. Fund: Factor exposure

This figure decomposes the Fund's annualized active return into contributions from factor exposures, costs, and net alpha. Bars show the incremental effect of each component, expressed in basis points, and are based on estimates from monthly returns measured in USD. The contributions labeled MKT, SMB, HML, RMW, CMA, TERM, and DEF correspond to the standard Fama–French factors. The bar labeled Factors represents the aggregate return attributable to these factor exposures. The bar labeled Alpha reflects the residual active return after accounting for factor contributions, and the bar labeled Costs shows the impact of reported management costs. The Total bar equals the sum of all components. The upper panel shows results for the full sample from 1998 through 2024, and the lower panel shows results for the recent sample from 2021 through 2024.

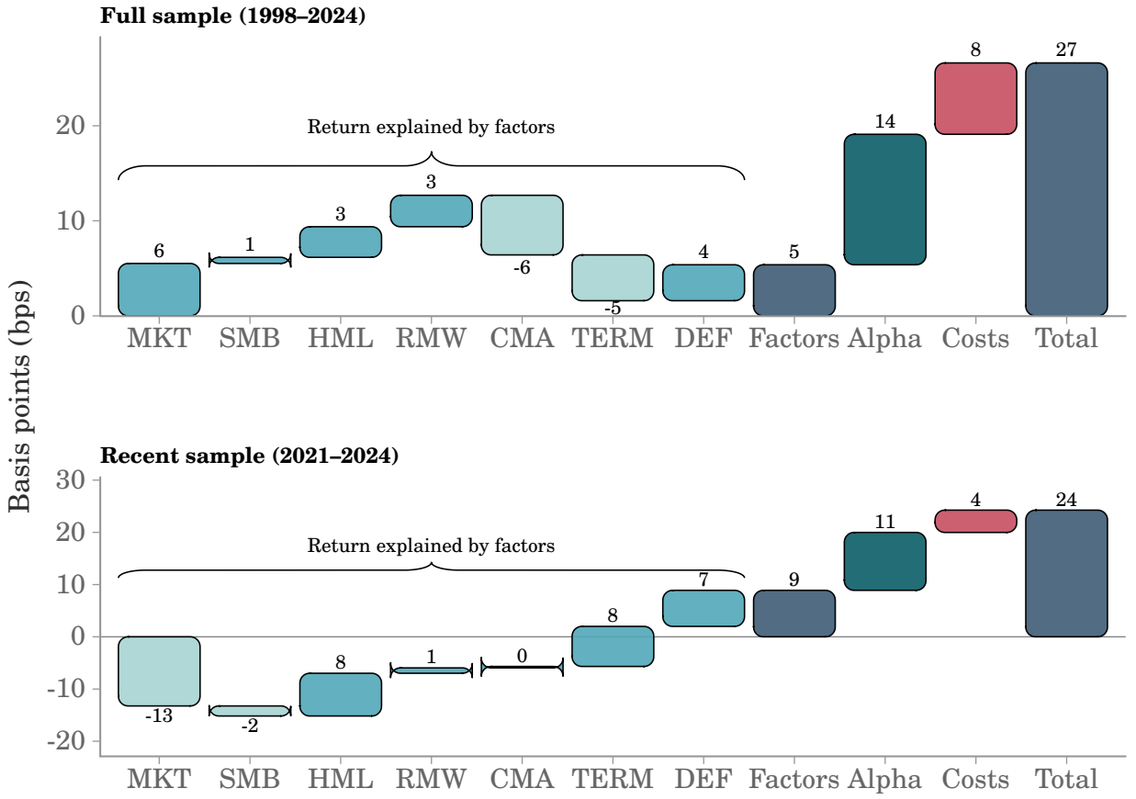


Figure 10 shows how the annualized active return of the Fund can be decomposed into three parts: the contribution of systematic risk factors, the costs of active management, and the remaining component, which we refer to as net alpha. The decomposition is based on the estimates reported in Table D.4 in Appendix D. Each bar reports

the number of basis points a given factor or component adds to, or subtracts from, the Fund's total active return. The bar labeled "Factors" summarizes the combined effect of exposures to the standard set of Fama–French and fixed-income factors (MKT, SMB, HML, RMW, CMA, TERM, and DEF).

The upper panel shows that the combined contribution of the factors over the full sample is 5 basis points, with positive contributions from MKT, SMB, HML, RMW, and DEF, partly offset by negative contributions from CMA and TERM. After adjusting for these factor exposures, the Fund's alpha contribution is 14 basis points. Costs subtract 8 basis points, leaving a total annualized active return of 27 basis points. The pattern indicates that factor tilts play a role, but that most of the long-run active return is explained by "pure" alpha rather than by systematic exposures.

The lower panel shows that the recent period has a different factor profile but a similar overall structure. From 2021 to 2024, the aggregate factor contribution is 9 basis points, driven by positive exposures to HML, TERM, and DEF, and a negative contribution from MKT. In this period, a negative exposure to MKT reduced active returns by 13 basis points, while a positive exposure to TERM contributed about 8 basis points. The alpha estimate is 11 basis points, and costs reduce this by 4 basis points, resulting in a total active return of 24 basis points. Although the mix of factor contributions differs across periods, the magnitude of alpha and the net active return remain stable. In Section 6, we revisit and discuss these findings.

2.2.2 Substrategy - fund-level allocation

We have monthly return data for the various substrategies starting in early 2013. At the fund level, the only active strategy is an allocation strategy. This represents a new type of strategy that was not reported separately in the evaluation carried out four years ago.

Overview

This strategy reflects high-level allocation decisions, that is, how capital is distributed across broad asset classes. The positions consist of an equity component offset by a fixed-income component and are therefore not placed within either of those management areas.

To the best of our knowledge, the core element of this strategy in recent years has been an underweight to equities;

see, for instance, NBIM (2023b) and NBIM (2024b). Ex ante, such a low beta implies a negative expected return, since risk premiums should be positive over the long run. Put differently, maintaining a persistent short position in the equity market would require strong justification.

According to NBIM's own evaluation (NBIM, 2025):

> *The management team at Norges Bank Investment Management holds a weekly investment meeting, where representatives from various investment areas also participate. The investment meeting is a discussion forum for decisions that lie with the CEO. Market developments are a regular topic discussed in these meetings, and the CEO can, on the basis of assessments of the fund's overall risk profile, take allocation positions. Examples of other decisions that are not delegated and that are discussed in the meetings are investments that are larger than given threshold amounts.*

As noted in Section 1.5, we are uncertain whether the Fund has an advantage in carrying out such strategies. In our view, it is difficult for the Fund to build a genuine edge here, and many other investors pursue similar activities. For this reason, we find it challenging to link this strategy to the Fund's comparative advantages. The documentation also describes these positions as both active strategies and risk management. A strategy labeled as risk reduction is puzzling for the Fund. Its characteristics suggest instead that it may have an advantage in *selling* rather than *buying* insurance. To clarify, in this context, taking a short position in the market is economically equivalent to purchasing insurance. For a more detailed discussion of factor investing, see Ang (2014) or Døskeland (2025). We return to a discussion of this strategy in Section 6.

Value added and returns

Figure D.3 in Appendix D shows the cumulative gross value added from the Fund's fund-level allocation strategy. Cumulative value added increased steadily for several years and peaked at about 15 billion NOK around 2021. Since then, performance has weakened and cumulative value added has declined steadily. At the end of 2024, cumulative gross value added stands at roughly −21 billion NOK.

Figure 11 shows the cumulative gross active return from the Fund's allocation strategy. The series reached a clear peak in early 2017. After that, cumulative active returns fluctuate within a narrow range for several years, remaining slightly above one and showing no strong trend. By the end of 2020, the cumulative active return is

Figure 11. Fund - allocation: Cumulative gross active returns

This figure shows cumulative gross active returns for the Fund's allocation strategy from 2013 through 2024, expressed in percent and measured in USD. Cumulative active returns are constructed by compounding monthly active returns over time. Gross active return is measured before management costs. The shaded region highlights the period from 2021 to 2024, and the labeled points report the cumulative gross returns at the start and end of this interval.

about 1.002, indicating that the strategy had added only a very small amount over the full sample up to that point. The shaded area highlights the recent period, in which cumulative active returns decline. From 2021 onward, the series moves from slightly positive territory to a final value of 0.9996.

Table D.7 in Appendix D reports the performance achieved during 2013–2024. The average annualized active return is −0.004%.

Statistical evaluation and risk adjustment

Summary statistics for the active returns are given in Table D.7 in Appendix D.

Figure 12 presents estimates of the components of the Fund's allocation strategy together with 95% confidence intervals. The left panels show annualized active-return estimates, while the middle and right panels show the estimated coefficients α and β from Equation (3). For the full sample (2013–2024), the estimated mean active return is close to zero, and the confidence interval includes both positive and negative values, indicating no statistically significant effect. The estimate of α is slightly positive but statistically indistinguishable from zero. The estimated coefficient β is less than one. More details are provided in Table D.8 in Appendix D.

In the recent period (2021–2024), the estimated active return is significantly negative, although the confidence interval remains wide. The estimate of α is also negative and is statistically different from zero. The β estimate remains below one.

Figure 12. Fund - allocation: Active return decomposition

This figure presents coefficient estimates and 95% confidence intervals for the allocation strategy's active return decomposition. All error bars are based on Newey and West (1987) standard errors, and all estimates are annualized from monthly returns, expressed in percent and measured in USD. Bars labeled active return show the gross and net mean active returns. Bars labeled α and β show the estimated coefficients from Equation (3). Active return and α estimates use the left y axis, and β estimates use the right y axis. Dark blue markers represent estimates based on gross returns. The upper panel show results for the full sample from 2013 through 2024 and the lower panel for the recent sample from 2021 through 2024.

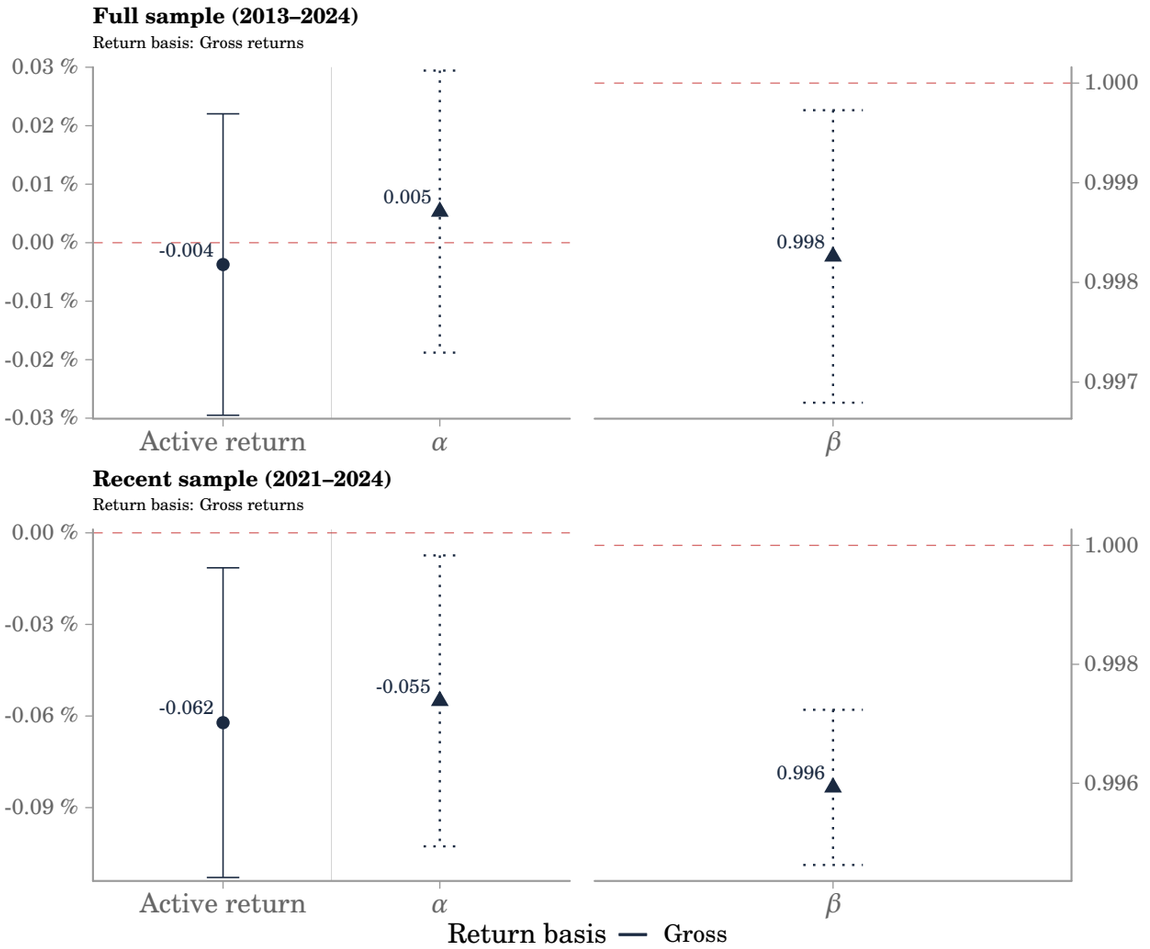


Figure 13. Fund - allocation: Factor loadings

This figure presents coefficient estimates and 95% confidence intervals for the Fund's allocation strategy. All error bars are based on Newey and West (1987) standard errors. Alpha estimates are annualized from monthly returns. All returns are expressed in percent and measured in USD. Each bar represents the estimated loading on one of the Fama–French factors, MKT, SMB, HML, RMW, CMA, TERM, and DEF, where DEF is adjusted in accordance with NBIM (2024a). The upper panel shows results for the full sample from 2013 through 2024, and the lower panel shows results for the recent period from 2021 through 2024.

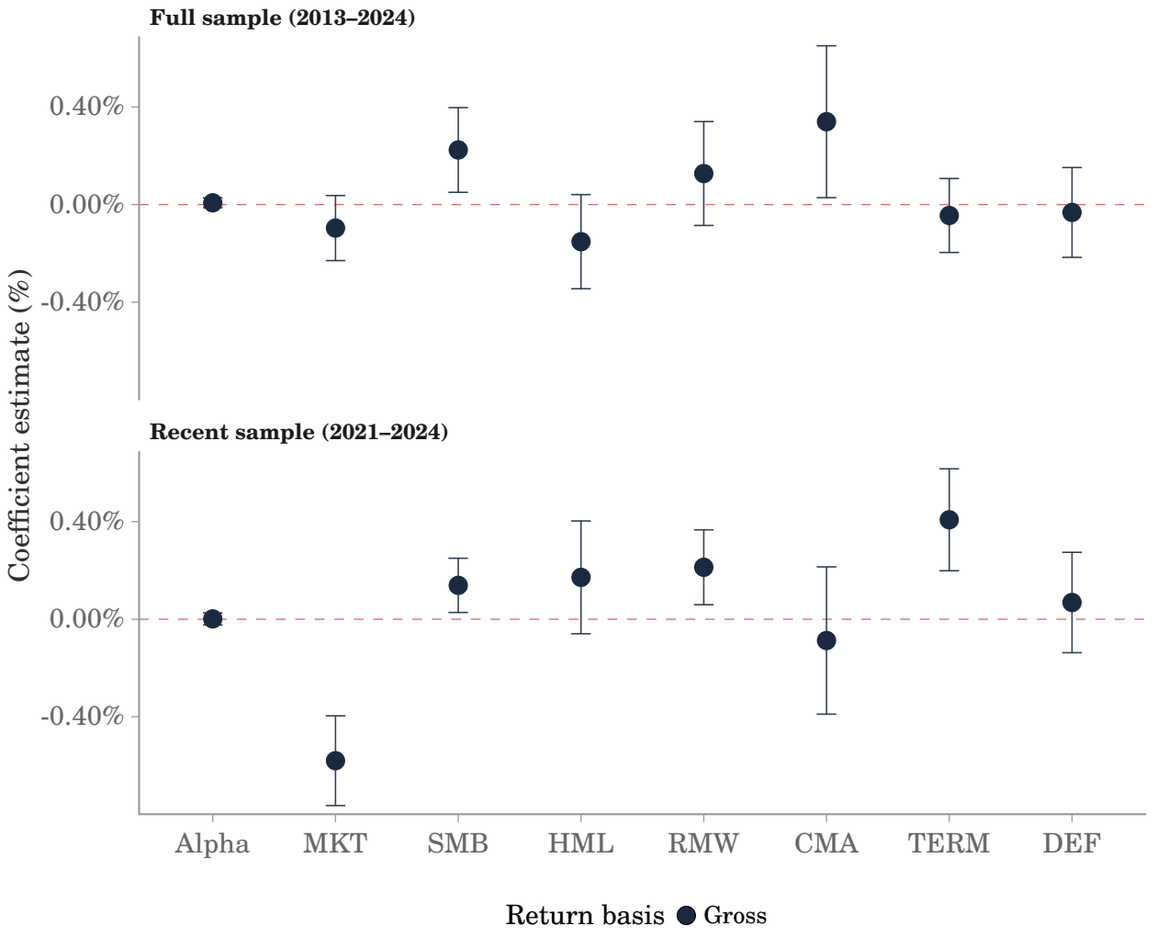
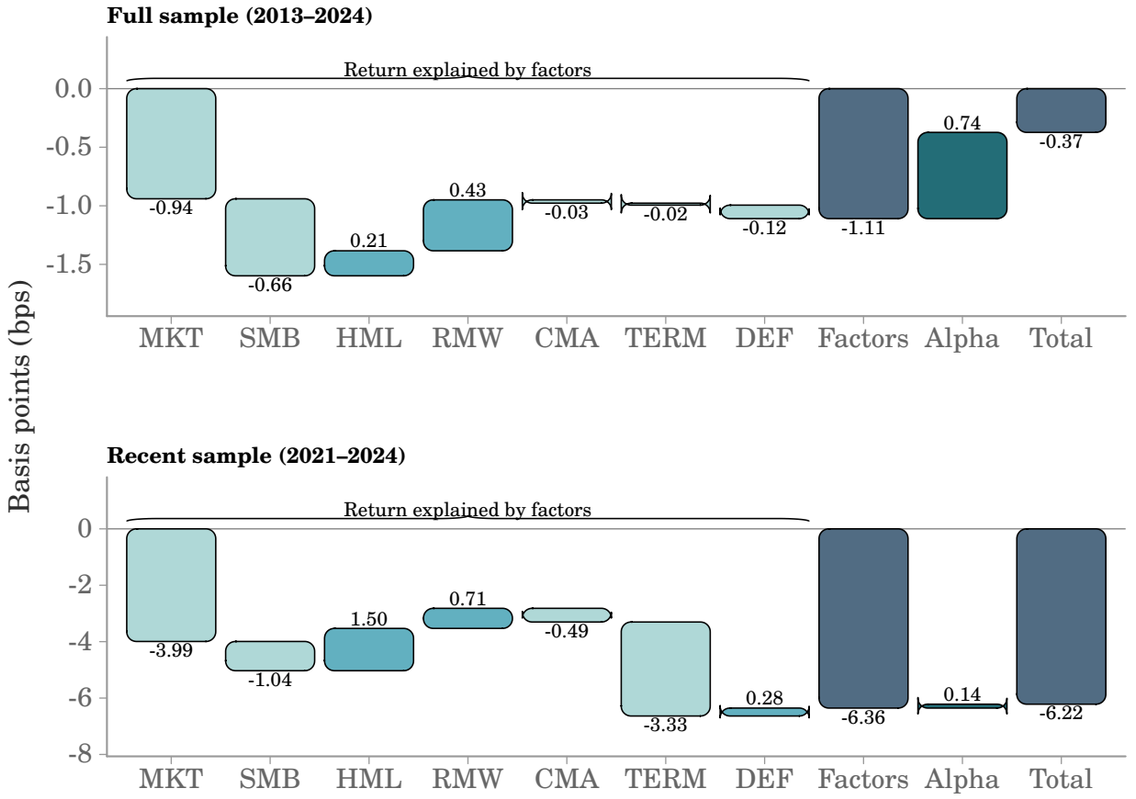


Figure 14. Fund - allocation: Factor exposure

This figure decomposes the Fund allocation strategy's annualized active return into contributions from factor exposures, and net alpha. Bars show the incremental effect of each component, expressed in basis points, and are based on estimates from monthly returns measured in USD. The contributions labeled MKT, SMB, HML, RMW, and CMA correspond to the standard Fama–French factors. The bar labeled Factors represents the aggregate return attributable to these factor exposures. The bar labeled Alpha reflects the residual active return after accounting for factor contributions. The Total bar equals the sum of all components. The upper panel shows results for the full sample from 2013 through 2024, and the lower panel shows results for the recent sample from 2021 through 2024.



When we apply a seven-factor model to risk-adjust the active return, as reported in Table D.9 and shown in Figure 13, the resulting alpha is statistically indistinguishable from zero. For the recent subsample, we identify a pronounced negative loading on the market factor (MKT), as shown in Figure 14 and summarized in Table D.10.

For this period, the R^2 of the full regression increases to 0.76. Untabulated results indicate that the R^2 of a regression on MKT alone is 0.64, highlighting the close link between this strategy and taking a short position on the equity market.

2.3 Summary

Compared with the Fund's strategic benchmark, we find that cumulative gross value added reached approximately 611 billion NOK, and cumulative net value added approximately 402 billion NOK, at the end of 2024. From 2021 to the end of 2024, cumulative gross value added increased by 318 billion NOK, while cumulative net value added increased by 224 billion NOK. The average annualized active return is 0.27% before costs and 0.19% after costs. These averages have also been positive since 2021. Because active returns are noisy, we cannot detect that these estimates are significantly different from zero. The same conclusion holds after risk adjustment.

At the overall level, the Fund has generated robust performance over time. Active management has clearly been rewarded, and this conclusion is supported across multiple forms of analysis. However, achieving statistical significance in asset management is inherently challenging. In our view, what deserves closer consideration is the role of top-level allocation strategies.

3 Equity assessment

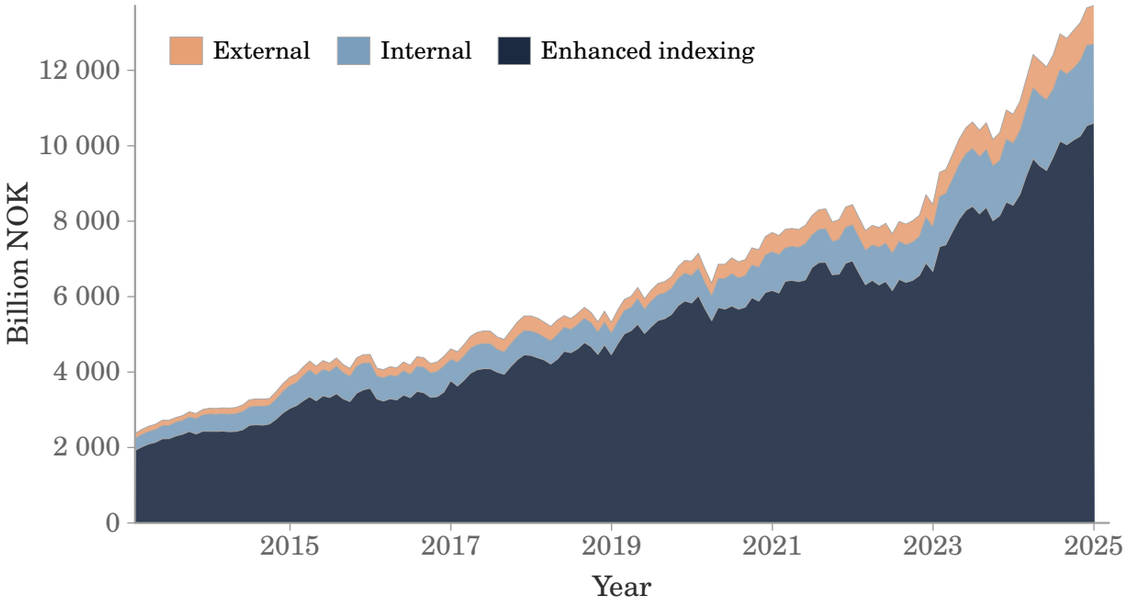
We now examine the value generated by the Fund's equity portfolio. We first assess the overall equity portfolio and then examine the individual active equity strategies. This analysis follows the outline of the preceding section and uses the same empirical performance metrics. Our focus is on the managed-equity portfolio, excluding the portion allocated for real-asset funding.

3.1 Overview

For equity, the active strategy consists of three primary components: security selection, enhanced indexing, and allocation. We describe these strategies in the subsequent sections.

An important consideration is the amount of capital allocated to the different substrategies. Figure 15 shows the

Figure 15. Equity portfolio: AUM
This figure shows the development of assets under management for the Fund's equity portfolio from 2013 through 2024, expressed in billion NOK. Assets are decomposed into external, internal, and enhanced indexing mandates, and each area represents the assets allocated to that mandate at the end of each month.



development of three main components: internal security selection, external security selection, and enhanced indexing. Enhanced indexing manages by far the largest share of capital. Most of the growth of the equity portfolio is also attributed to this strategy, highlighting the structural challenge of scaling security selection. Allocation operates as an overlay strategy and uses total equity AUM as its base.

3.2 Evaluation

3.2.1 Equity level

Value added

Figure 16. Equity portfolio: Cumulative value added
This figure shows the cumulative gross and net value added for the Fund's equity portfolio from 1998 through 2024, expressed in billion NOK. Cumulative value added is constructed as a value added wealth account according to Equation (2), which compounds monthly value added over time. Gross value added is measured before management costs, and net value added is measured after all reported costs. The shaded area highlights the most recent sample period from 2021 to 2024, and the labeled endpoints show the change in cumulative gross value added from 323 to 737 billion NOK, and in cumulative net value added from 227 to 541 billion NOK, over this sub period. All returns and asset values are measured in NOK.

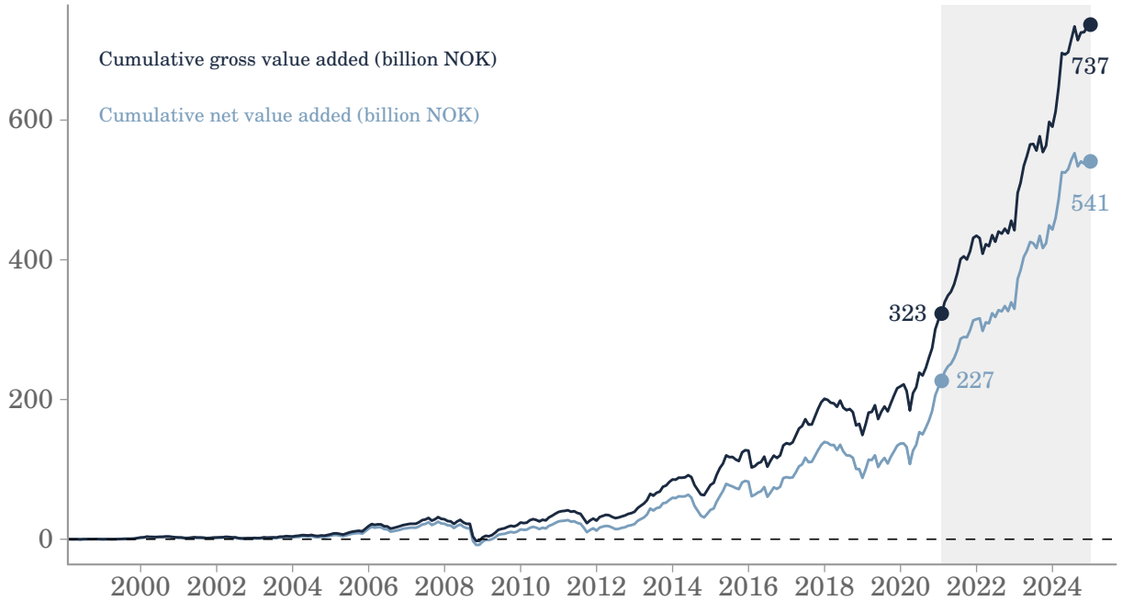


Figure 16 shows the cumulative gross and net value added to the equity portfolio since 1998, constructed using the consistent compounding of benchmarks described in Equation (2). Gross value added reflects results before

costs, while net value added accounts for the costs of extracting this value. At the end of 2024, cumulative gross value added reached approximately 737 billion NOK, and cumulative net value added reached approximately 541 billion NOK. Therefore, if equities were not actively managed, the Fund would be approximately NOK 541 billion smaller in size.

From 2021 to the end of 2024, gross cumulative value added increased from 323 billion NOK to 737 billion NOK, an increase of 414 billion NOK. Net cumulative value added increased from 227 billion NOK to 541 billion NOK, an increase of 314 billion NOK. These developments show that active equity management has contributed substantially to the Fund's results in recent years. For a non-compounded version, see Figure E.1 in Appendix E.

Returns

Figure 17. Equity portfolio: Cumulative gross and net active returns
This figure shows cumulative gross and net active returns for the equity portfolio from 1998 through 2024, expressed in percent and measured in USD. Cumulative active returns are constructed by compounding monthly active returns over time. Gross active return is measured before management costs, and net active return is measured after all reported costs. The shaded region highlights the period from 2021 to 2024, and the labeled points report the cumulative gross and net active returns at the start and end of this interval.

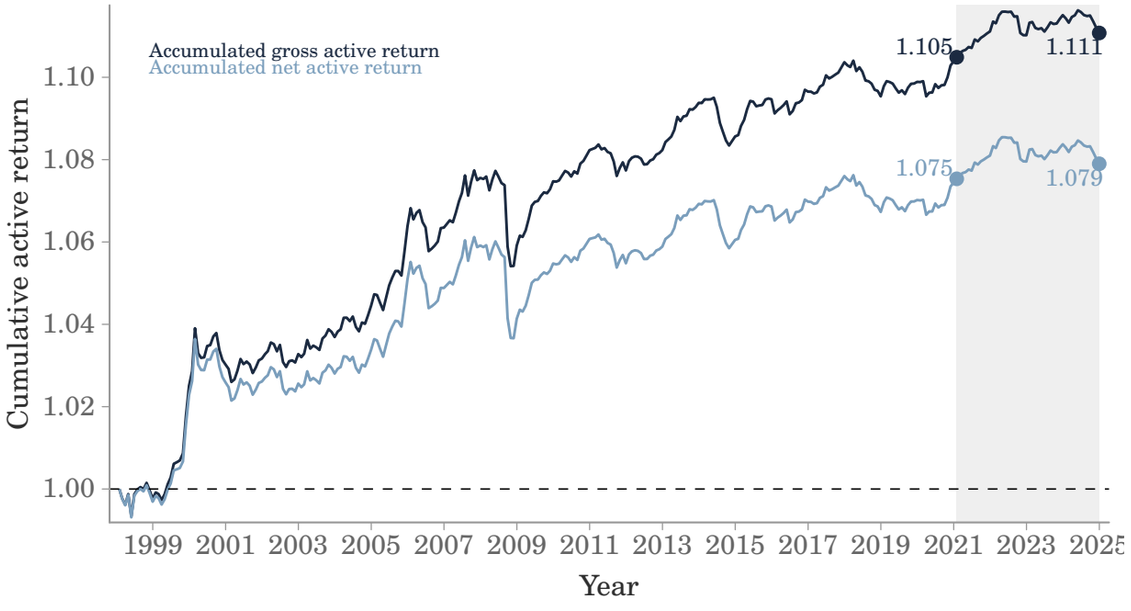


Figure 17 shows the cumulative gross and net active returns for the equity portfolio from 1998 through 2024. Both series rise gradually over time, with noticeable fluctuations during major market events. An investment of 1

USD in the Fund's active-equity portfolio at inception would have grown to 1.11 USD before costs and 1.08 USD after costs, relative to an equivalent investment in the benchmark. In the shaded period from 2021 to 2024, both series continue to rise but show a modest decline near the end of the sample.

Figure 18. Equity portfolio: Active return before and after cost
This figure presents a breakdown of the equity portfolio's total return into a benchmark component, the gross active return component, the cost component, and the resulting net active return. The upper panel shows results for the full sample from 1998 to 2024, and the lower panel shows results for the recent sample from 2021 through 2024. The y axis is broken, so the relative heights of the bars do not represent the differences in magnitudes across components. Returns are expressed in percent and measured in USD.

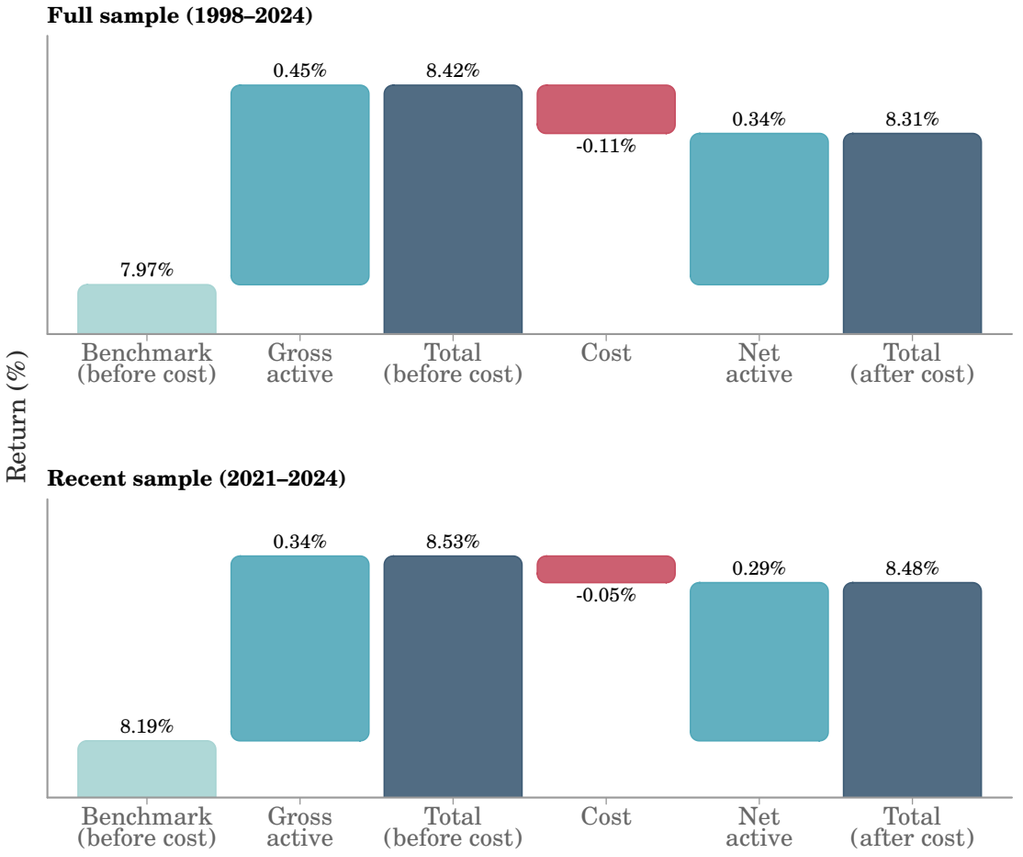


Figure 18 decomposes the equity return into four components: the benchmark return, the gross active return, costs, and the resulting net active return, covering both the full period (1998–2024) and the recent period (2021–2024). The upper panel shows the long-run contribution of active management. From 1998 through 2024, the benchmark returned 7.97%, and gross active management added 0.45%. This raises the total return before costs

to 8.42%. Costs of 0.11% reduce the net active return to 0.34%, bringing the total return after costs to 8.31%. The pattern indicates that equity management has delivered a steady positive contribution over the full sample.

The lower panel shows a similar structure in the recent period. From 2021 through 2024, the benchmark returned 8.19%, and gross active management contributed 0.34%. Costs of 0.05% reduce the net active return to 0.29%, resulting in a total return after costs of 8.48%. The levels are close to the long-run averages, and the relationship between gross active return, costs, and net active return remains stable. This suggests that the active strategies within the equity portfolio have performed consistently across different market environments while keeping costs contained. Further details are provided in Table E.1 in Appendix E.

Statistical evaluation and risk adjustment

Table E.1 in Appendix E reports descriptive statistics for the active returns.

Figure 19 reports the coefficient estimates and 95% confidence intervals for the active-return decomposition of the equity portfolio. The left panels show annualized active returns based on gross and net returns. The middle panels show the estimated intercepts (α) from Equation (3), and the right panels show the estimated slope coefficients (β), which capture the sensitivity of the equity portfolio to its benchmark. Dark blue markers represent estimates based on gross returns, and light blue markers represent estimates based on net returns.

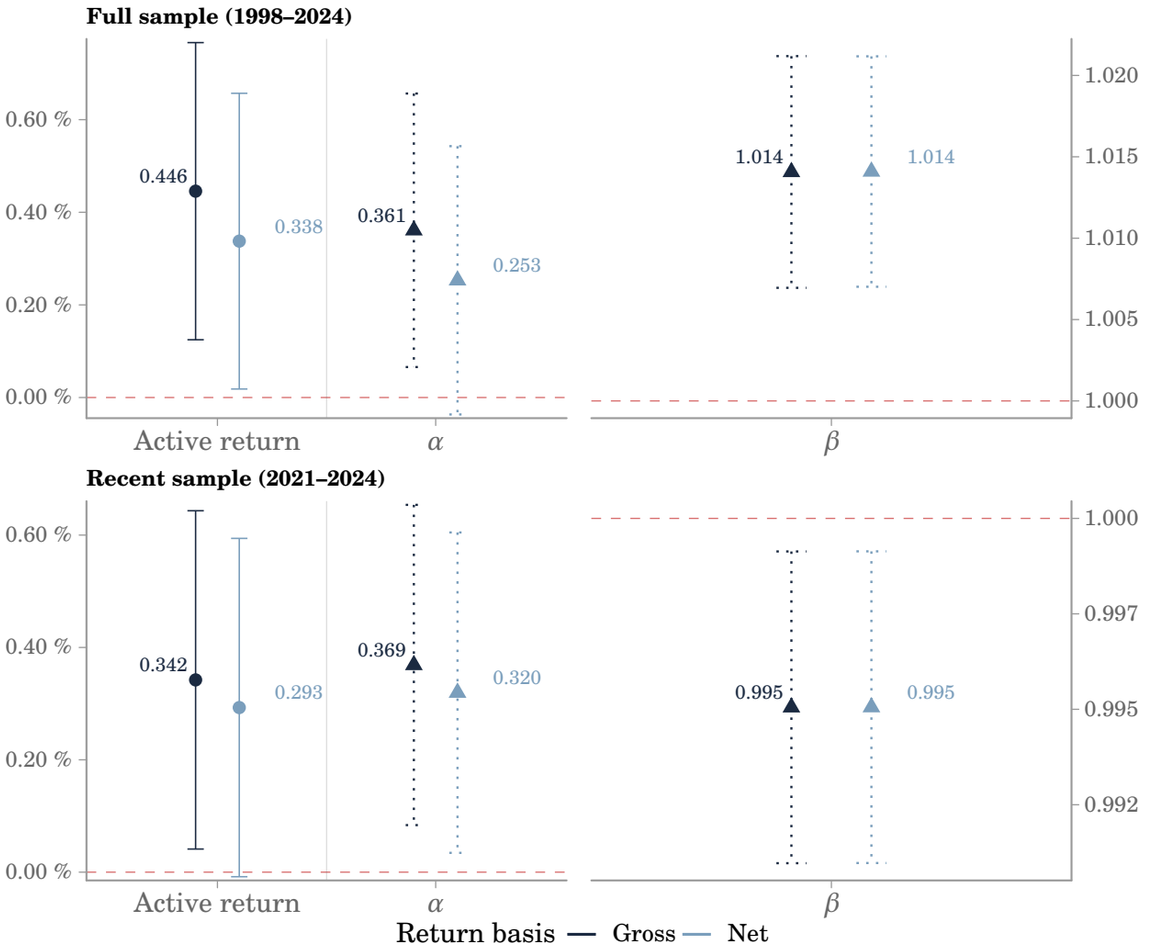
In the full sample (1998–2024), the gross and net active-return estimates are positive, with confidence intervals that lie above zero. The estimated α is also positive, although the net estimate is not statistically different from zero. The estimated β is above one for both gross and net returns.

In the recent period (2021–2024), the pattern is broadly similar. Both gross and net active returns remain positive, and the estimated α is positive and statistically significant. The estimated β coefficients are now below one. Thus, the beta of the equity portfolio is lower at the managed-portfolio level, and not due to top-level risk-management bets or smoothed real-asset returns. We return to this point in Section 6.

As reported in Table E.1 in Appendix E, the R^2 value round to 1.00 across all periods and portfolio definitions. This indicates that benchmark movements account for nearly all variation in the Fund's equity returns. This reflects a very low level of active equity risk. The AR is positive for each of the four alternatives. It is lower than

Figure 19. Equity portfolio: Active return decomposition

This figure presents coefficient estimates and 95% confidence intervals for the equity portfolio's active return decomposition. All error bars are based on Newey and West (1987) standard errors, and all estimates are annualized from monthly returns, expressed in percent and measured in USD. Bars labeled active return show the gross and net mean active returns. Bars labeled α and β show the estimated coefficients from Equation (3). Active return and α estimates use the left y axis, and β estimates use the right y axis. Dark blue markers represent estimates based on gross returns, and light blue markers represent estimates based on net returns. The upper panel show results for the full sample from 1998 through 2024 and the lower panel for the recent sample from 2021 through 2024.



the IR over the full sample, but higher than the IR in the most recent period.

Factor risk-adjusted performance

Figure 20. Equity portfolio: Factor loadings
This figure presents coefficient estimates and 95% confidence intervals for the equity portfolio's factor exposure. All error bars are based on Newey and West (1987) standard errors. Alpha estimates are annualized from monthly returns. All returns are expressed in percent and measured in USD. Each bar represents the estimated loading on one of the Fama–French factors, MKT, SMB, HML, RMW, and CMA. Dark blue markers represent estimates based on gross returns, and light blue markers represent estimates based on net returns. The upper panel shows results for the full sample from 1998 through 2024, and the lower panel shows results for the recent period from 2021 through 2024.

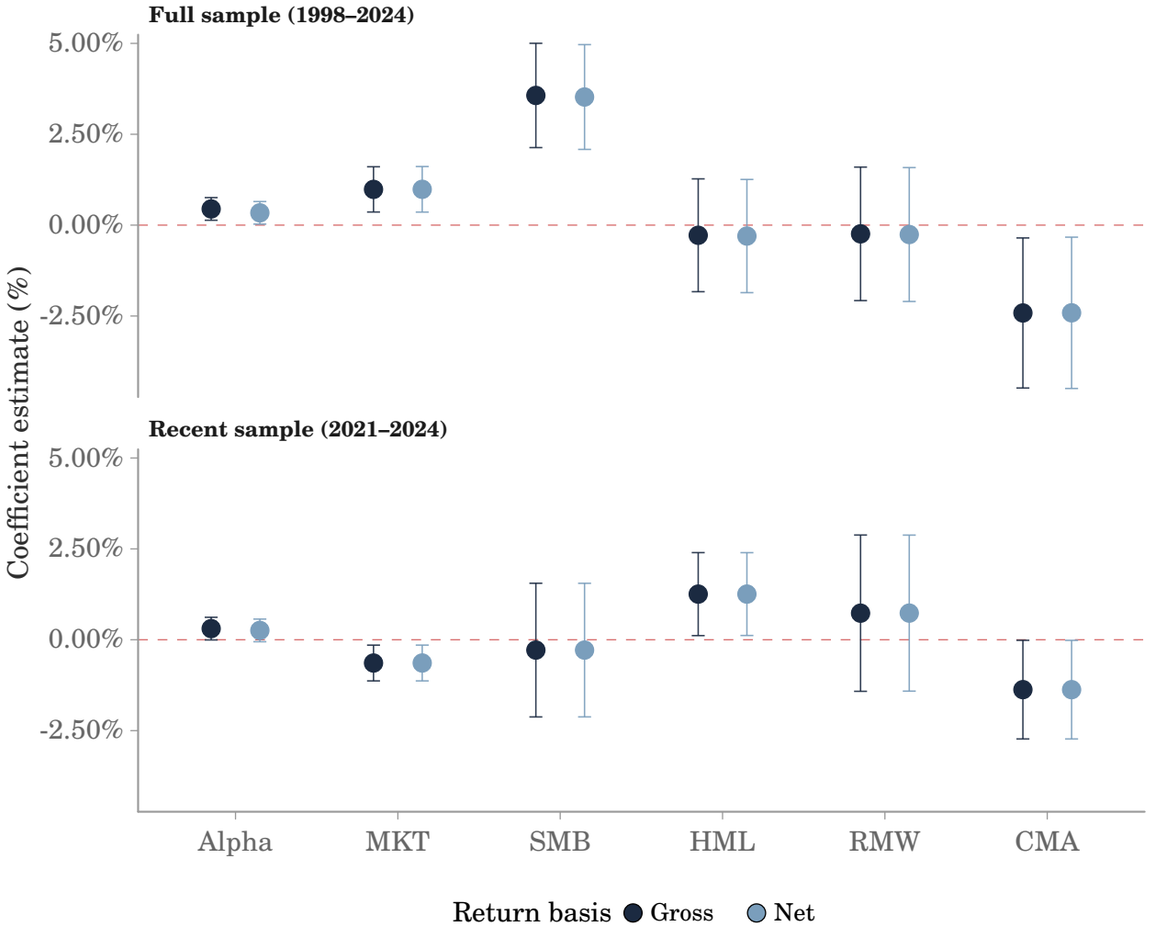


Figure 20 reports the estimated factor loadings together with 95% confidence intervals. Each bar shows exposure

to one of the standard Fama–French factors (MKT, SMB, HML, RMW, and CMA), with dark blue markers representing gross-return estimates and light blue markers representing net-return estimates. The upper panel shows results for the full sample (1998–2024), and the lower panel shows results for the recent period (2021–2024).

In the full sample, the portfolio displays consistently positive exposures to the market factor (MKT) and the size factor (SMB). Exposures to value (HML) and profitability (RMW) are close to zero and not statistically significant. Exposure to investment (CMA) is negative.

In the recent sample, the overall pattern is similar, except that the loading on MKT turns negative. Across both periods, factor loadings are stable. The estimated alphas remain positive in both the full and recent samples and are positive for both gross and net returns. In the full sample, the estimated alpha is 0.21% for gross returns and 0.14% for net returns, while in the recent period the estimates are 0.15% and 0.11%. Further details appear in Table E.4 in Appendix E.

Figure 21 decomposes the annualized active return of the equity portfolio into contributions from systematic factors, costs, and net alpha.[8] Each bar shows the incremental effect of one component, measured in basis points. The bar labeled "Factors" summarizes the combined contribution of the portfolio's exposures to the standard Fama–French factors. The upper panel shows the full sample (1998–2024), and the lower panel shows the recent period (2021–2024).

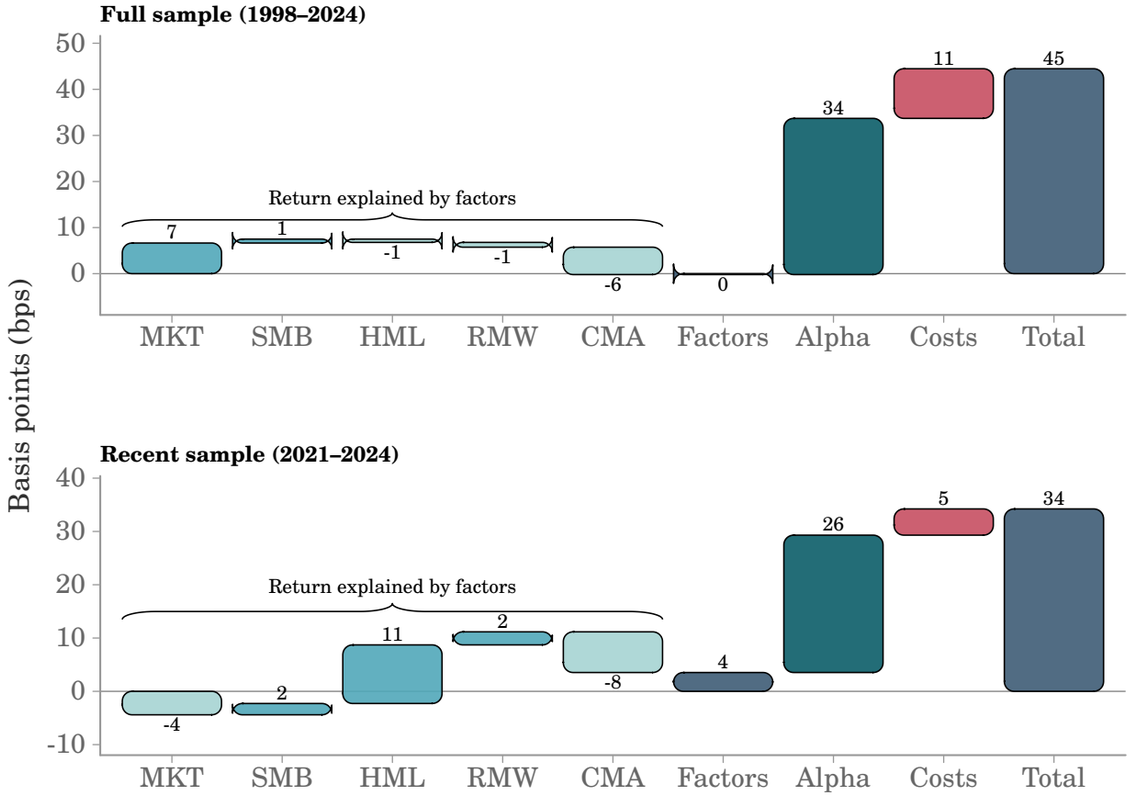
In the full sample, the aggregate factor contribution is close to zero, with modest positive contributions from MKT and SMB partially offset by negative contributions from HML, RMW, and CMA. Costs reduce performance by 11 basis points, resulting in a gross active return of 45 basis points. This indicates that the long-term active return of the equity portfolio is primarily driven by "pure alpha" rather than systematic factor tilts.

In the recent period, the structure is similar. The main difference is that the contribution from MKT has shifted from positive to negative. The total factor contribution is 4 basis points. Alpha contributes 26 basis points, and costs subtract 5 basis points, yielding a gross active return of 34 basis points. Although factor contributions shift slightly, the main conclusion remains unchanged: most of the active return of the equity portfolio reflects pure alpha rather than exposure to systematic factors.

[8]Details are provided in Table E.5 in Appendix E.

Figure 21. Equity portfolio: Factor exposure

This figure decomposes the equity portfolio's annualized active return into contributions from factor exposures, costs, and net alpha. Bars show the incremental effect of each component, expressed in basis points, and are based on estimates from monthly returns measured in USD. The contributions labeled MKT, SMB, HML, RMW, and CMA correspond to the standard Fama–French factors. The bar labeled Factors represents the aggregate return attributable to these factor exposures. The bar labeled Alpha reflects the residual active return after accounting for factor contributions, and the bar labeled Costs shows the impact of reported management costs. The Total bar equals the sum of all components. The upper panel shows results for the full sample from 1998 through 2024, and the lower panel shows results for the recent sample from 2021 through 2024.



3.3 Substrategies

In this section, we examine the Fund's active equity strategies in more detail. Our review is organized around the three main substrategies: security selection, enhanced indexing, and allocation. Each of these contains several underlying activities. For security selection, the distinction between internal and external mandates is clear, and the associated strategies are relatively uniform. Enhanced indexing, consisting of asset positioning and securities lending, is likewise well defined. By contrast, the allocation strategies are more diverse, which makes them harder to categorize. However, this heterogeneity within the allocation strategy diminishes over time.

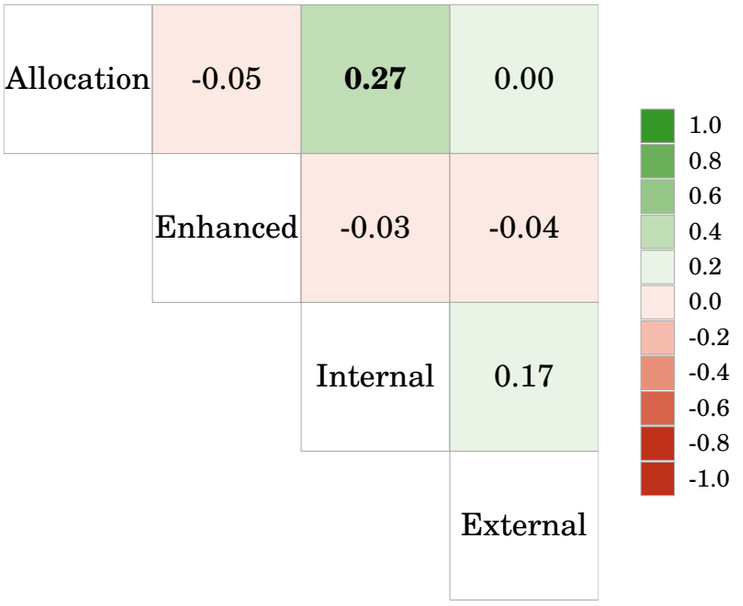
Costs also play a key role in evaluating equity substrategies. We have already shown the total management costs for the equity portfolio in Figure C.1, but the expenses associated with individual substrategies differ. We treat NBIM's allocation of costs across substrategies as given. In the security-selection analysis, we report value creation both before and after costs. Because NBIM has not supplied cost data split between equity and fixed income for internal security selection, we allocate costs in proportion to assets under management. For external security selection, we use the actual reported costs. The remaining substrategies have lower associated costs, and for these we restrict the analysis to gross value creation.

The substrategies are structured such that each portfolio manager is assigned an internal benchmark. The components of these internal benchmarks are drawn from the overall equity benchmark, ensuring that the individual sub-benchmarks together match the total equity benchmark. NBIM evaluates managers by comparing their actual portfolios with these internal benchmarks.

Table E.6 in Appendix E reports mean total returns, standard deviations, and Sharpe ratios for the strategies and their benchmarks. The benchmark for the external security-selection strategy has delivered lower total returns than the overall equity benchmark.

Before turning to a detailed analysis of each substrategy, we examine how the substrategies are correlated with one another. Figure 22 presents the unconditional correlation matrix of active returns. The correlations are generally small. For example, the enhanced-indexing strategy shows weak correlations with internal security selection (-0.03) and external security selection (-0.04). This is encouraging for NBIM, as low correlations suggest that the substrategies are not pursuing the same profit opportunities and therefore contribute to diversification within the

Figure 22. Equity portfolio: Correlation matrix
This figure shows the correlation matrix of active returns across strategies within the Fund's equity portfolio for the period 2013 through 2024. Each cell reports the pairwise correlation between two strategies, and the color scale reflects the magnitude and sign of the correlation.



active-equity program. However, the sample contains few episodes of severe negative shocks, such as recessions or crises, so these correlations should be interpreted with appropriate caution.

3.3.1 Security selection

Overview

NBIM organizes its security-selection activity into two main substrategies: internal and external mandates. Security selection is based on fundamental research, and direct access to companies is an important comparative advantage. Individual portfolio managers who engage directly with firms make most investment decisions, and each mandate specifies the responsibilities for a particular subportfolio of the Fund.

External managers are used in markets and segments where local knowledge and specialized expertise can enhance returns. In these cases, NBIM acts as an investor in that they delegate their investment decisions to external parties. Active decisions therefore take place in a multistage structure that allocates capital across substrategies and then selects securities within each manager's universe. NBIM has built considerable expertise in selecting and monitoring external managers who specialize in identifying firm-level return opportunities.

Value added and returns

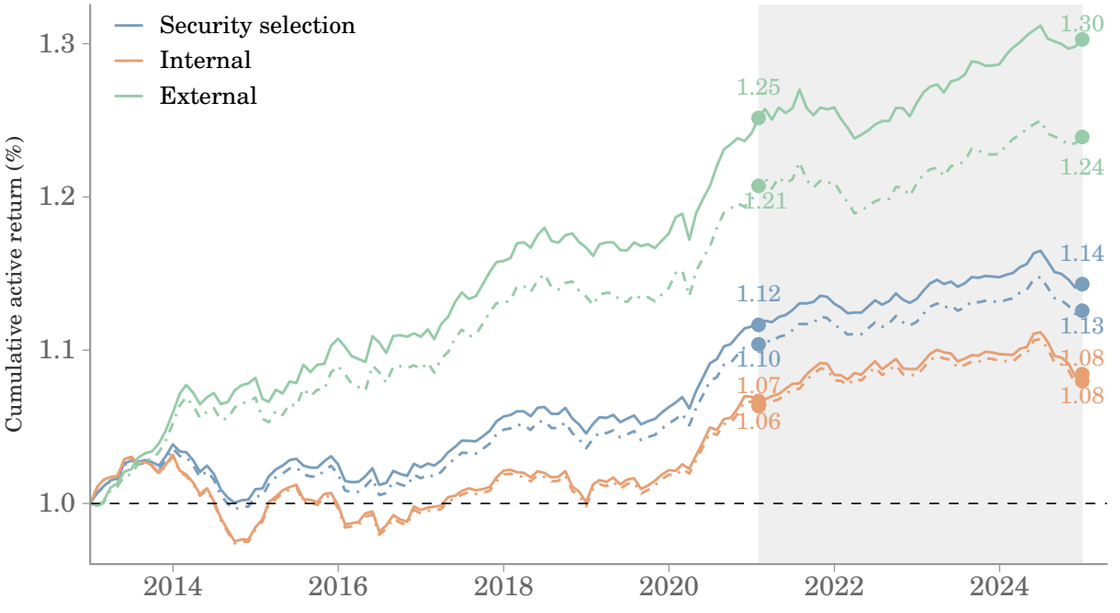
As shown in Figure E.2 in Appendix E, the combined security-selection strategy generates cumulative value added of about 210 billion NOK before costs and 186 billion NOK after costs. Internal management contributes roughly 82 billion NOK before costs and 78 billion NOK after costs. External management contributes about 113 billion NOK before costs and 91 billion NOK after costs. Thus, the two strategies have created similar total value added despite the substantially lower AUM associated with external mandates.[9]

Figure 23 shows the cumulative gross and net active returns of the security-selection strategies. The blue lines show the combined strategy, the orange lines represent internal management, and the green lines represent external management. Solid lines show gross active returns, and dot-dashed lines show net active returns. All series begin at 1 and trend upward. The shaded region highlights the most recent period.

By the end of the sample, all three series show clear positive outperformance. Combined security selection reaches

[9]For these strategies, returns are measured in USD, while assets under management are measured in NOK.

Figure 23. Equity portfolio - security selection: Cumulative gross and net active returns
This figure shows cumulative gross and net active returns for the Fund's security selection strategy in equity management from 2013 through 2024, expressed in percent and measured in USD. Cumulative active returns are constructed by compounding monthly active returns over time. Gross active return, shown with solid lines, is measured before management costs, and net active return, shown with dot-dashed lines, is measured after all reported costs. The shaded region highlights the period from 2021 to 2024, and the labeled points report the cumulative gross and net active returns at the start and end of this interval.



a cumulative gross active return of about 1.14 and a net return of about 1.12. Internal security selection ends at roughly 1.13 gross and 1.08 net. External security selection performs best, at approximately 1.30 gross and 1.24 net. The visible but modest gap between gross and net lines indicates that costs reduce, but do not overturn, the gains from security selection, and that external mandates have been a particularly strong source of return.

Table 4. Equity portfolio - security selection: Realized performance
This table reports realized mean annualized active returns, expressed in percent and measured in USD, for individual strategies within security selection in the equity management area. Results are shown for the full sample from 2013 through 2024, and gross returns, costs, and net returns are reported for the overall security selection strategy and for the internal and external mandates.

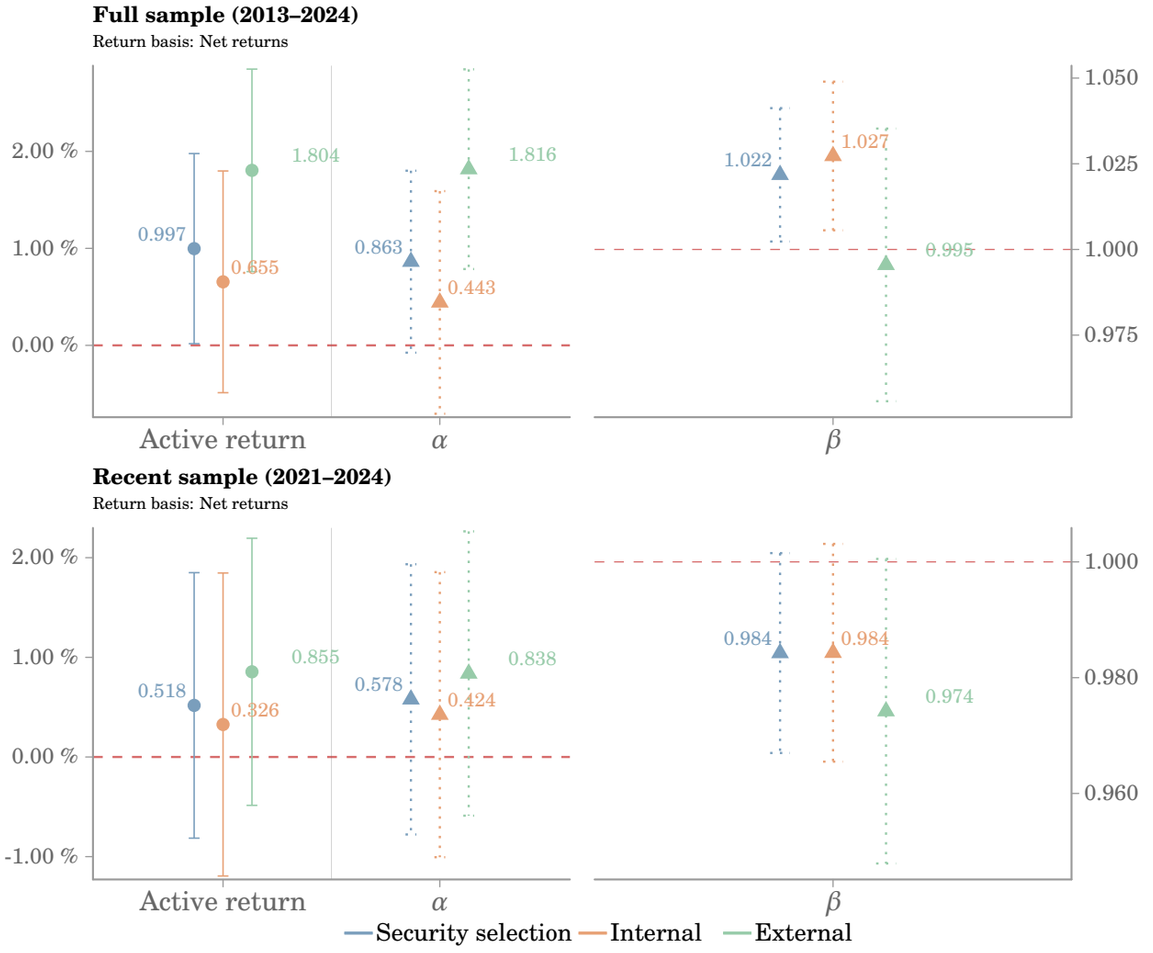
	Security selection	Internal	External
Gross	1.12	0.69	2.22
Costs	0.13	0.03	0.42
Net	1.00	0.65	1.80

Table 4 reports the monthly average active return, before and after costs. The total security-selection strategy delivers an annualized active return of 1.12% before costs and 1.00% after costs. Internal security selection produces 0.69% before costs and 0.65% after costs. External security selection produces 2.22% before costs and 1.80% after costs. External mandates deliver higher active returns but also incur higher costs than internal management.

Statistical evaluation and risk adjustment

Table E.7 in Appendix E reports summary statistics for gross and net active returns. All average active returns are positive, and the resulting information ratios are also positive. Tracking error for security selection is relatively low, at just under 2%, which is substantially below the level typically observed for actively managed mutual funds. As expected, the tracking error of the combined strategy is lower than the average of the two individual strategies, confirming the diversification gains shown in Figure 22.

Figure 24. Equity portfolio - security selection: Active return decomposition
This figure presents coefficient estimates and 95% confidence intervals for the active returns in the Fund's security selection strategy in equity management. All error bars are based on Newey and West (1987) standard errors, and all estimates are annualized from monthly returns, expressed in percent and measured in USD. Bars labeled active return show the gross and net mean active returns. Bars labeled α and β show the estimated coefficients from Equation (3). Active return and α estimates use the left y axis, and β estimates use the right y axis. The upper panel shows results for the full sample from 2013 through 2024, and the lower panel shows results for the recent sample from 2021 through 2024.



We also evaluate the statistical significance of active returns and alpha after adjusting for systematic benchmark risk. The net results are shown in Figure 24.[10] The left panels show annualized active returns, the middle panels report intercepts (α), and the right panels report slope coefficients (β) from Equation (3). Results are shown for

[10]Further details, including p-values and gross-return results, are provided in Table E.8.

the full sample (2013–2024) and for the recent period (2021–2024), and separately for the combined, internal, and external strategies.

In the full sample, all three components have positive active-return and α estimates. The combined strategy shows a net mean annualized active return of 1.00% and a beta-adjusted alpha of 0.86%, with p-values of 0.05 and 0.07, respectively. Internal security selection delivers a mean active return of 0.65% and a beta-adjusted alpha of 0.44%, although neither estimate is statistically significant (p-values of 0.26 and 0.45). External security selection stands out with a mean active return of 1.80% and a beta-adjusted alpha of 1.82%, both significant at the 1% level. The estimated β coefficients are 1.02 for the combined strategy and 1.03 for internal management, both significantly above one, while the external strategy has a β of 1.00 that is not statistically different from one.

In the recent subperiod (2021–2024), active-return and α estimates remain positive across all strategies, but the confidence intervals are wider and typically span zero, reflecting the shorter sample. External management still has the highest point estimates, though with reduced statistical precision. The estimated β coefficients fall below one for all components, indicating lower benchmark exposure in the recent period. We are unable to identify a specific reason why both internal and external mandates exhibit lower betas. It also implies that further reductions in beta at the top level are unnecessary.

We estimate the five-factor model from Equation (5) for the combined, internal, and external security-selection strategies over 2013–2024. Table E.9 in Appendix E reports the results. Factor risk-adjusted alphas are positive but insignificant for internal mandates (p-value of 0.28) and significant for external mandates (p-value below 0.01). Table E.10 reports the factor exposures. For internal (external) security selection, the gross mean return of 0.69% (2.22%) can be decomposed into 0.02% (−0.03%) from factor exposures and 0.62% (1.83%) from net alpha. Furthermore, most of the factor contribution over 2013–2024 reflects gains from overexposure to the market factor and losses from positive exposure to the SMB factor.

3.3.2 Enhanced indexing

Overview

Most of the Fund's equity and fixed-income exposure is managed internally through broad market exposure or enhanced indexing. Enhanced indexing aims to track the benchmark while capturing incremental returns without

increasing tracking error. For a fund of this scale, efficient portfolio management and trading are essential to keep costs low, and the enhanced-indexing framework relies primarily on asset positioning and securities lending.

The Fund holds a wide set of benchmark constituents but avoids mechanical replication that would generate unnecessary turnover. Returns are improved through diversified index-refinement activities, including corporate-action strategies and capital-market transactions. The Fund's size makes it an attractive counterparty in such transactions, which helps secure preferred allocations and reduces execution costs.

The key idea is that broad and diversified holdings allow NBIM to exploit pricing gaps between similar securities, often created by the constraints of other investors. Providing liquidity to less patient market participants, when compensated appropriately, is an important source of value. Relative-value strategies are integrated to maintain intended benchmark exposures.

NBIM seeks to limit transaction costs and avoid the frictions associated with strict replication. Rebalancing is executed patiently, using natural market liquidity and capital-market events to achieve long-term goals.

Securities lending is carried out both internally and through external agents. Lending involves a counterparty risk, which is mitigated through collateralization and diversification of borrowers. The Fund's size and credit strength make it a preferred lending counterparty.

Value added and returns

As shown in Figure E.3 in Appendix E, from 2013 onward enhanced indexing has generated a cumulative gross value added of 162 billion NOK, of which 102 billion NOK stems from asset positioning.

Figure 25 shows that enhanced indexing and asset positioning both deliver positive cumulative gross active returns over the period. By the end of the sample, enhanced indexing reaches a cumulative active return of approximately 1.021 and asset positioning reaches about 1.014.

Figure 25. Equity portfolio - enhanced indexing and allocation: Cumulative gross active returns
This figure shows cumulative gross active returns for the Fund's enhanced indexing and allocation strategies in equity management from 2013 through 2024, expressed in percent and measured in USD. Cumulative active returns are constructed by compounding monthly active returns over time. Gross active return is measured before management costs. The shaded region highlights the period from 2021 to 2024, and the labeled points report the cumulative gross active returns at the start and end of this interval.

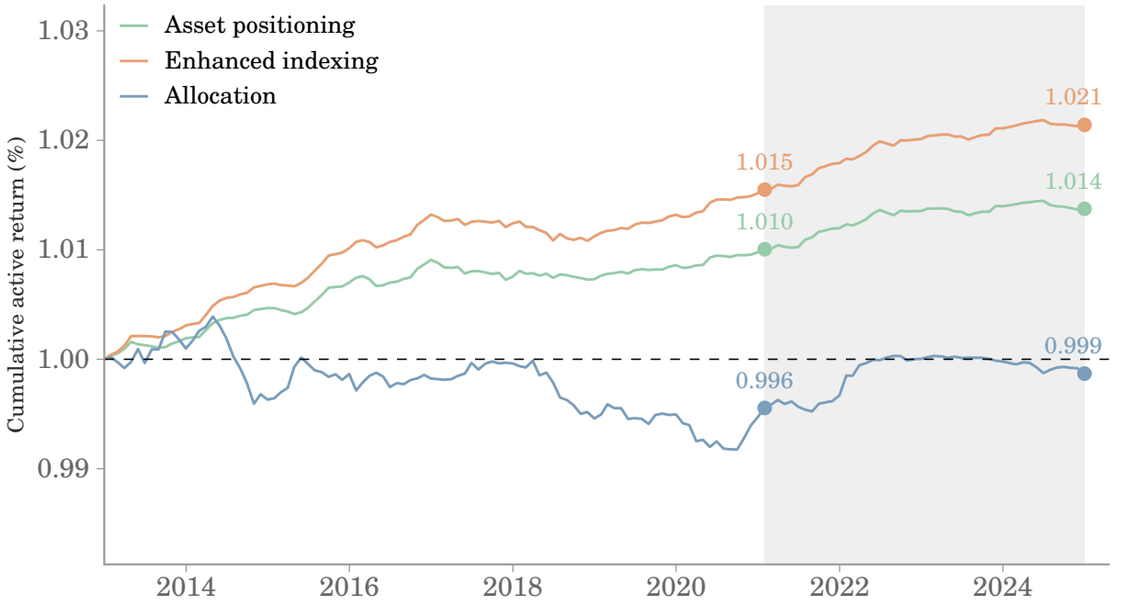


Figure 26. Equity portfolio - enhanced indexing and allocation: Active return decomposition
This figure presents coefficient estimates and 95% confidence intervals for the active returns in the Fund's enhanced indexing and allocation strategies in equity management. All error bars are based on Newey and West (1987) standard errors, and all estimates are annualized from monthly returns, expressed in percent and measured in USD. Bars labeled active return show the gross and net mean active returns. Bars labeled α and β show the estimated coefficients from Equation (3). Active return and α estimates use the left y axis, and β estimates use the right y axis. The upper panel shows results for the full sample from 2013 through 2024, and the lower panel shows results for the recent sample from 2021 through 2024.

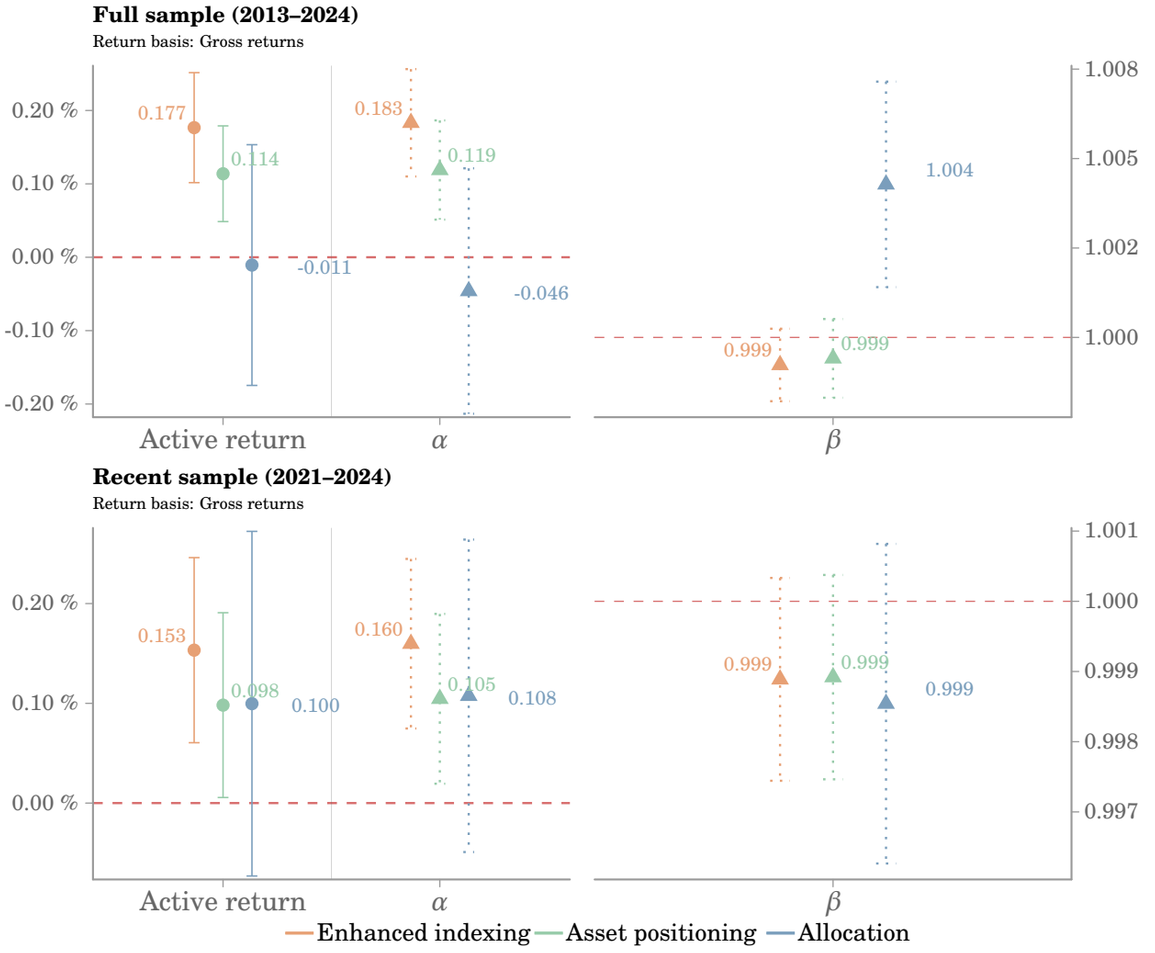


Figure 26 indicates that these strategies deliver an average annualized active return of 0.18%.[11] Although this figure is small, the cumulative value added is comparable to that of internal or external security selection because the enhanced-indexing portfolio is substantially larger.

[11]See Table E.8 and Table E.7 in Appendix E for additional details. Hit ratios for these strategies are very high.

Figure 26 decomposes active returns into mean active return, alpha, and beta for 2013–2024 (top panel) and 2021–2024 (bottom panel). Each point shows the annualized estimate, with vertical lines indicating 95% confidence intervals.

For the full sample, enhanced indexing and asset positioning both exhibit positive and statistically significant gross mean active returns. The alpha estimates are of similar magnitude and are also statistically significant. The beta estimates are close to one with tight confidence intervals, indicating that neither strategy takes meaningful directional risk relative to the benchmark.

In the recent period, point estimates for enhanced indexing remain positive and statistically significant despite the shorter sample. Taken together, the results show that enhanced indexing and asset positioning have generated persistent and statistically significant positive alpha while maintaining benchmark-like risk exposure.

Statistical evaluation and risk adjustment

Table E.8 in Appendix E reports mean active returns and beta-adjusted alphas. In all cases, active returns and alphas are positive and statistically significant (p-values near zero), reflecting the low volatility of these strategies. Table E.9 and Table E.10 show that factor exposures are close to zero, and the factor risk-adjusted alphas remain significantly positive. Thus, the active returns do not arise from systematic factor exposures but from the underlying enhanced-indexing activities.

3.3.3 Allocation

Overview

The equity-portfolio allocation strategy consists of targeted top-down positions that deviate from the benchmark and is distinct from the broader allocation across equities, fixed income, and real assets. These positions typically involve temporary sector or regional over- or underweights. Recent examples include an overweight in the energy sector at the beginning of 2022 and a reduced exposure to large U.S. technology companies in 2024. The allocation framework also reflects historical initiatives that were not maintained, such as systematic factor strategies and environmental mandates.

Value added and returns

As shown in Figure E.3 in Appendix E, allocation has generated a cumulative gross value added of approximately −19 billion NOK since 2013.

Figure 25 shows that the allocation strategy produced negative returns earlier in the sample, followed by a partial recovery toward the end. Active returns benefited from an overweight in energy during 2021–2022 (NBIM, 2024b), but these gains were partly offset by subsequent losses associated with an underweight in the technology sector (NBIM, 2024b).[12]

Statistical evaluation and risk adjustment

Table E.8 in Appendix E reports the mean active returns and beta-adjusted alphas. For the allocation strategy, both are close to zero and statistically insignificant. Table E.9 and Table E.10 show that the strategy exhibits positive and statistically significant exposures to MKT and HML, although the combined contribution of these factors has only a minor effect on the gross active return.

3.4 Summary

The equity portfolio has generated large and persistent value added over time. Since 1998, cumulative gross value added amounts to approximately 737 billion NOK, and cumulative net value added to approximately 541 billion NOK. Active returns have been positive in both the long sample and in recent years, with net contributions of roughly 30 to 35 basis points per year. Benchmark exposure remains very close to one, and systematic factor tilts explain little of the active return. The portfolio carries low active risk and delivers stable results in all market environments.

Three substrategies drive the Fund's active equity performance: security selection, enhanced indexing, and allocation. Both internal and external security selection add value, but external managers generate the strongest alpha. Enhanced indexing produces small but highly stable returns that scale with the large capital base of the Fund. Allocation reflects top-down deviations from the benchmark in regions or sectors and has contributed little on average, with offsetting gains and losses across subperiods.

[12]Table E.7 in Appendix E reports summary statistics for gross active returns.

Viewed through the lens of comparative advantage, the strongest results are generated by strategies that align with the Fund's structural strengths. Security selection draws on NBIM's access to companies, analytical depth, and ability to run focused mandates. Enhanced indexing leverages the size, long horizon, and liquidity capacity of the Fund to provide liquidity when other investors are constrained or impatient, converting small pricing discrepancies into steady value added at scale. Allocation, by contrast, depends more on macro- or thematic timing and less on these comparative advantages, which is consistent with its weaker and more variable performance.

4 Fixed-income assessment

In this section, we first examine the overall fixed-income portfolio before turning to the substrategies in Section 4.3. As in the equity portfolio, the funding of the real estate portfolio complicates the fixed-income benchmark. Since 2017, NBIM's internal fixed-income benchmark has been adjusted for real-asset funding. This benchmark is the basis for our assessment of the fixed-income portfolio.

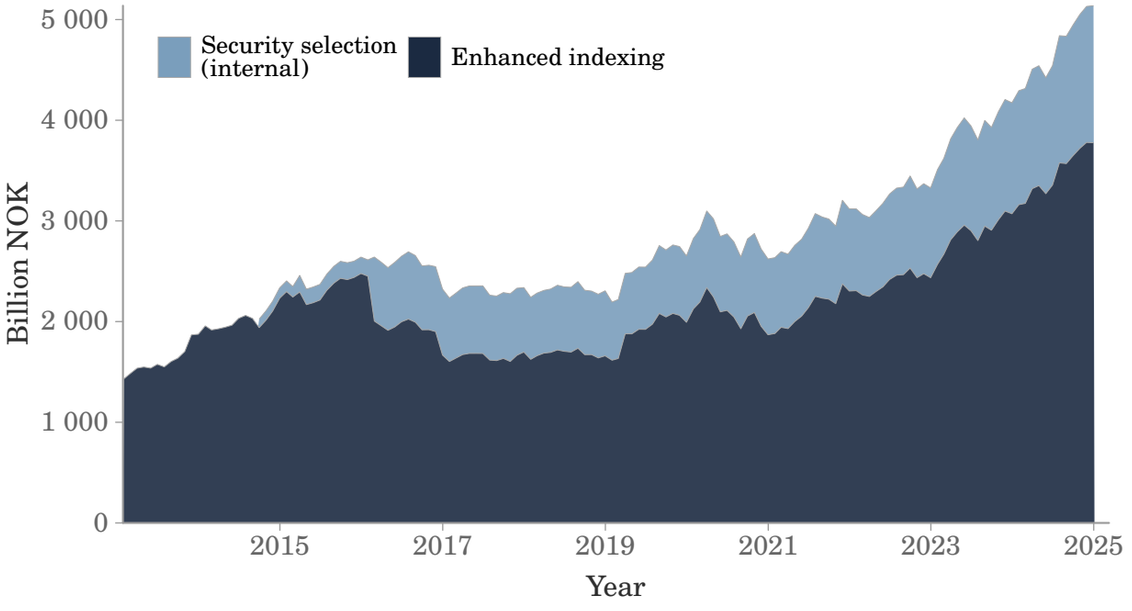
4.1 Overview

The main purposes of the fixed-income portfolio are to dampen fund-level volatility, provide liquidity, and harvest risk premia in the bond market. Active management within fixed income is organized around three primary strategies: security selection, market exposure, and allocation. The following sections describe these strategies in detail.

Figure 27 shows the development of assets under management in the fixed-income portfolio from 2013 through 2024, divided into internal security-selection and enhanced-indexing mandates. Total AUM has grown steadily over the period, with particularly strong increases after 2020. Both security selection and enhanced indexing have expanded, although enhanced indexing represents the larger share for most of the sample.

Figure 27. Fixed-income portfolio: AUM

This figure shows the development of assets under management for the Fund's fixed-income portfolio from 2013 through 2024, expressed in billion NOK. Assets are decomposed into internal, and enhanced indexing mandates, and each area represents the assets allocated to that mandate at the end of each month.



4.2 Evaluation

4.2.1 Fixed-income level

Value added

Figure 28. Fixed-income portfolio: Cumulative value added
This figure shows the cumulative gross and net value added for the Fund's fixed-income portfolio from 1998 through 2024, expressed in billion NOK. Cumulative value added is constructed as a value added wealth account according to Equation (2), which compounds monthly value added over time. Gross value added is measured before management costs, and net value added is measured after all reported costs. The shaded area highlights the most recent sample period from 2021 to 2024, and the labeled endpoints show the change in cumulative gross value added from 30 to 132 billion NOK, and in cumulative net value added from 10 to 107 billion NOK, over this sub period. All returns and asset values are measured in NOK.

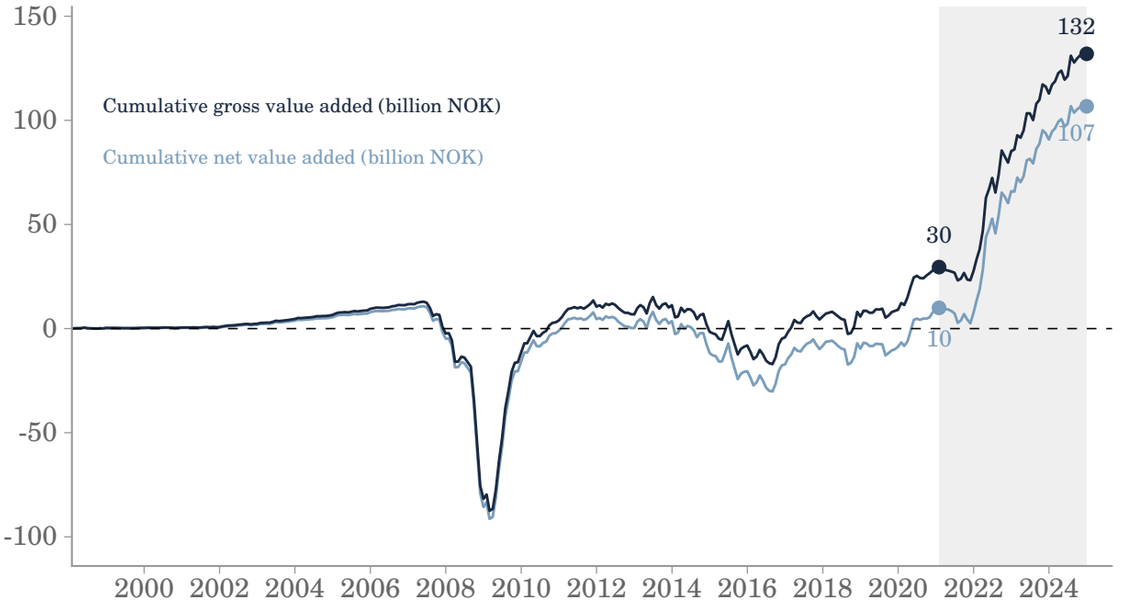


Figure 28 shows the cumulative gross and net value added for the Fund's fixed-income portfolio since 1998, constructed using the consistent compounding of the benchmark in Equation (2). Gross value added reflects results before costs, while net value added accounts for the costs of extracting this value. At the end of 2024, cumulative gross value added reached approximately 132 billion NOK, and cumulative net value added reached approximately 107 billion NOK. From 2021 to the end of 2024, gross cumulative value added increased from 30 billion NOK to 132 billion NOK, an increase of 102 billion NOK, while net cumulative value added increased from 10 billion NOK to 107 billion NOK, an increase of 97 billion NOK. These developments show that active

management has contributed positively to the Fund's fixed-income results in recent years.

Figure F.1 in Appendix F presents cumulative value added without compounding. The similarity between the two figures indicates that compounding is not the primary driver of the results shown in Figure 28.

Returns

Figure 29. Fixed-income portfolio: Cumulative gross and net active returns
This figure shows cumulative gross and net active returns for the fixed-income portfolio from 1998 through 2024, expressed in percent and measured in USD. Cumulative active returns are constructed by compounding monthly active returns over time. Gross active return is measured before management costs, and net active return is measured after all reported costs. The shaded region highlights the period from 2021 to 2024, and the labeled points report the cumulative gross and net active returns at the start and end of this interval.

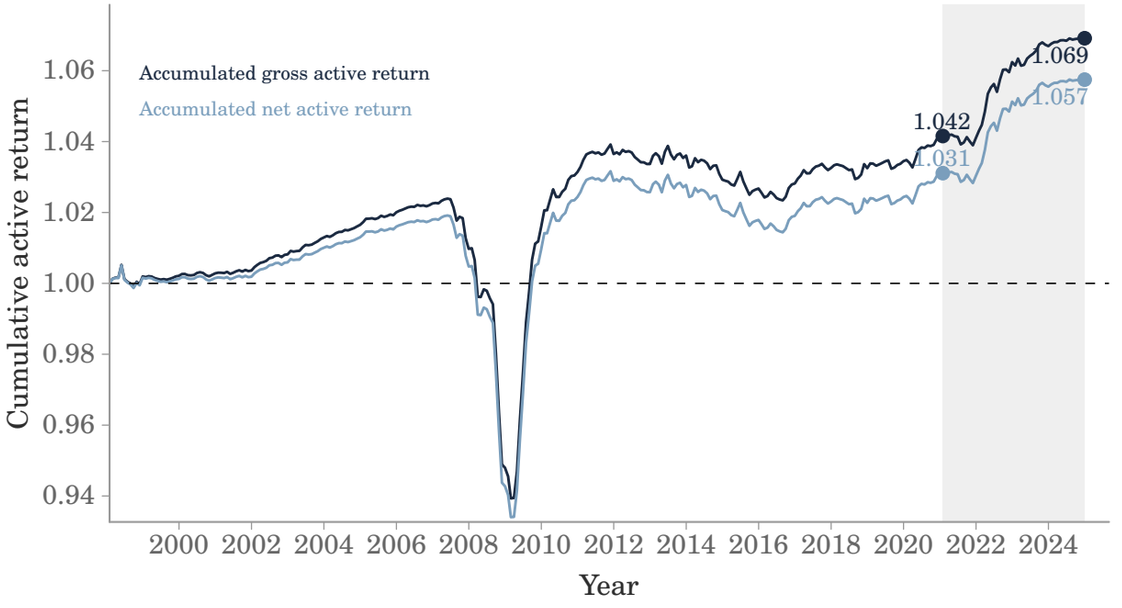


Figure 29 illustrates the development of the fixed-income portfolio's gross and net active returns over time. A 1 USD investment in this portfolio at inception would have generated 1.069 USD above the benchmark before costs, and 1.057 USD after costs, by the end of 2024. Over the past four years, the portfolio has experienced a strong increase in cumulative active returns.

Figure 30. Fixed-income portfolio: Active return before and after cost
This figure presents a breakdown of the fixed-income portfolio's total return into a benchmark component, the gross active return component, the cost component, and the resulting net active return. The upper panel shows results for the full sample from 1998 to 2024, and the lower panel shows results for the recent sample from 2021 to 2024. The y axis is broken, so the relative heights of the bars do not represent the differences in magnitudes across components. Returns are expressed in percent and measured in USD.

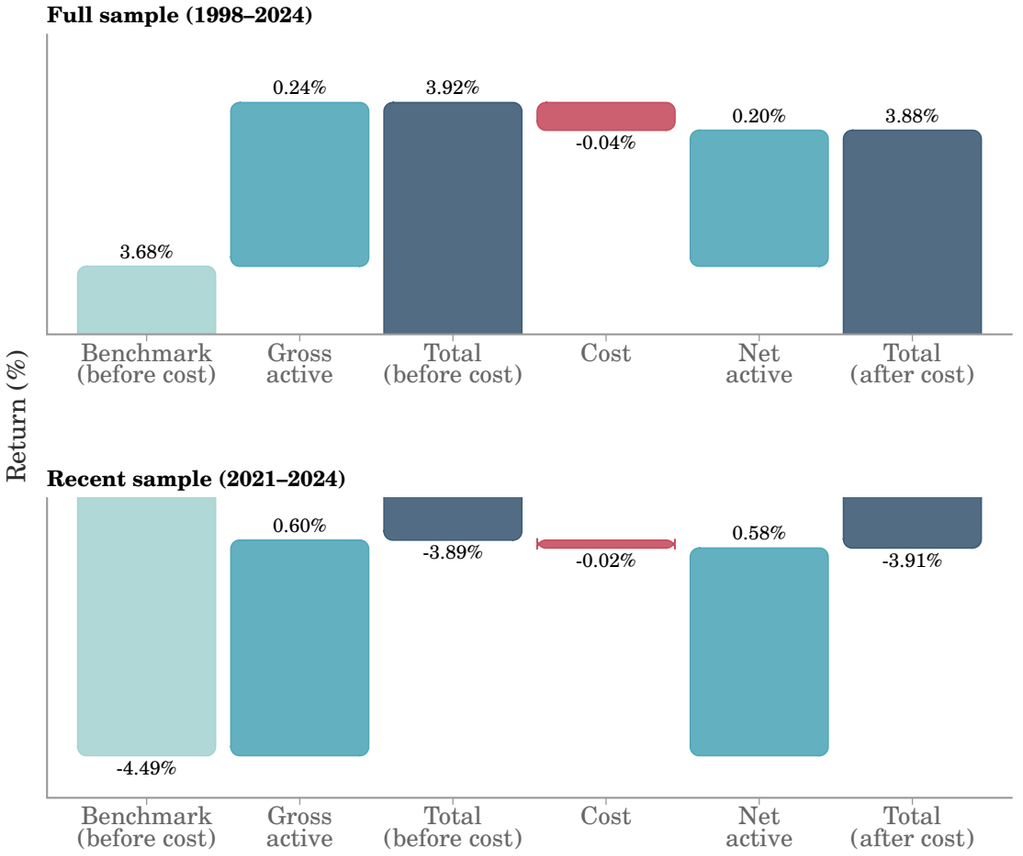


Figure 30 breaks down the return of the fixed-income portfolio into the benchmark return, the gross active return, costs, and the resulting net active return. The figure covers both the entire period from 1998 through 2024 and the recent period from 2021 through 2024. The upper panel shows the long-run contribution of active management. Over the full sample, the benchmark returned 3.68%, and gross active management added 0.24%, bringing the total return before costs to 3.92%. Costs amount to 0.04%, leaving a net active return of 0.20% and a total return after costs of 3.88%. These results indicate that fixed-income management has generated a small but positive contribution throughout the period.

The lower panel shows that the recent period differs markedly in overall level, but the pattern of active returns remains consistent. From 2021 through 2024, the benchmark delivered a return of −4.49%, driven by sharply rising global interest rates. Gross active management contributed 0.60%, and after subtracting costs of 0.02%, the net active return is 0.58%, yielding a total return after costs of −3.91%. Despite the challenging environment for fixed income, the positive active return shows that fixed-income strategies mitigated the portfolio's losses relative to the benchmark. Additional details are available in Table F.1 in Appendix F.

Statistical evaluation and risk adjustment

Table F.1 in Appendix F reports summary statistics for gross and net active returns. Autocorrelation is high over the full sample but considerably lower in the more recent period.

Figure 31 shows the decomposition of active returns for the entire period (1998−2024) and the recent period (2021−2024). For each sample, the left panel reports the mean active returns (gross and net), the middle panel reports the estimated alpha from Equation (3), and the right panel shows the corresponding beta estimate relative to the benchmark. All estimates are annualized and include 95% confidence intervals.

Over the full sample, the portfolio delivers a small but positive active return, with both gross and net estimates above zero, although confidence intervals are wide. Alpha estimates are modest, indicating that only part of the active return is attributable to skill after adjusting for factor exposures. Beta estimates are slightly above one, implying marginally higher sensitivity than the benchmark. In the recent period, active returns are higher and statistically positive. Alpha estimates also increase, though they remain below the level of the active returns, and beta falls slightly below one. Since the benchmark return is negative and the portfolio is underweight the benchmark, the active return exceeds alpha. In general, recent years show stronger performance and more clearly positive active returns relative to the long-run sample.[13]

[13] Details of the active return significance tests are reported in Table F.2, while beta-adjusted active returns (Jensen's alpha) are provided in Table F.3.

Figure 31. Fixed-income portfolio: Active return decomposition

This figure presents coefficient estimates and 95% confidence intervals for the fixed-income portfolio's active return decomposition. All error bars are based on Newey and West (1987) standard errors, and all estimates are annualized from monthly returns, expressed in percent and measured in USD. Bars labeled active return show the gross and net mean active returns. Bars labeled α and β show the estimated coefficients from Equation (3). Active return and α estimates use the left y axis, and β estimates use the right y axis. Dark blue markers represent estimates based on gross returns, and light blue markers represent estimates based on net returns. The upper panel show results for the full sample from 1998 through 2024 and the lower panel for the recent sample from 2021 through 2024.

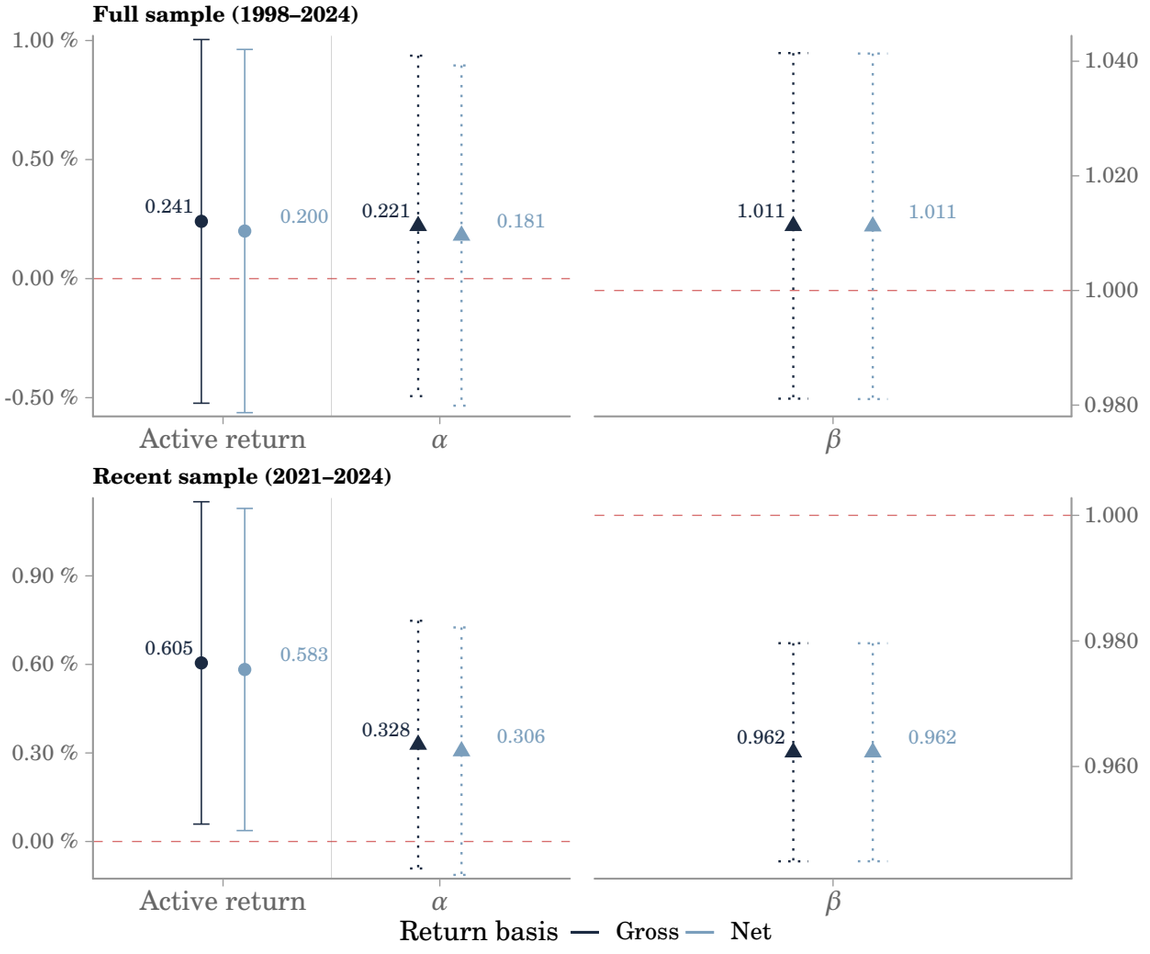


Figure 32. Fixed-income portfolio: Factor loadings

This figure presents coefficient estimates and 95% confidence intervals for the fixed-income portfolio's factor exposure. All error bars are based on Newey and West (1987) standard errors. Alpha estimates are annualized from monthly returns. All returns are expressed in percent and measured in USD. Each bar represents the estimated loading on one of the Fama–French factors, TERM, and DEF, where DEF is adjusted in accordance with NBIM (2024a). Dark blue markers represent estimates based on gross returns, and light blue markers represent estimates based on net returns. The upper panel shows results for the full sample from 1998 through 2024, and the lower panel shows results for the recent period from 2021 through 2024.

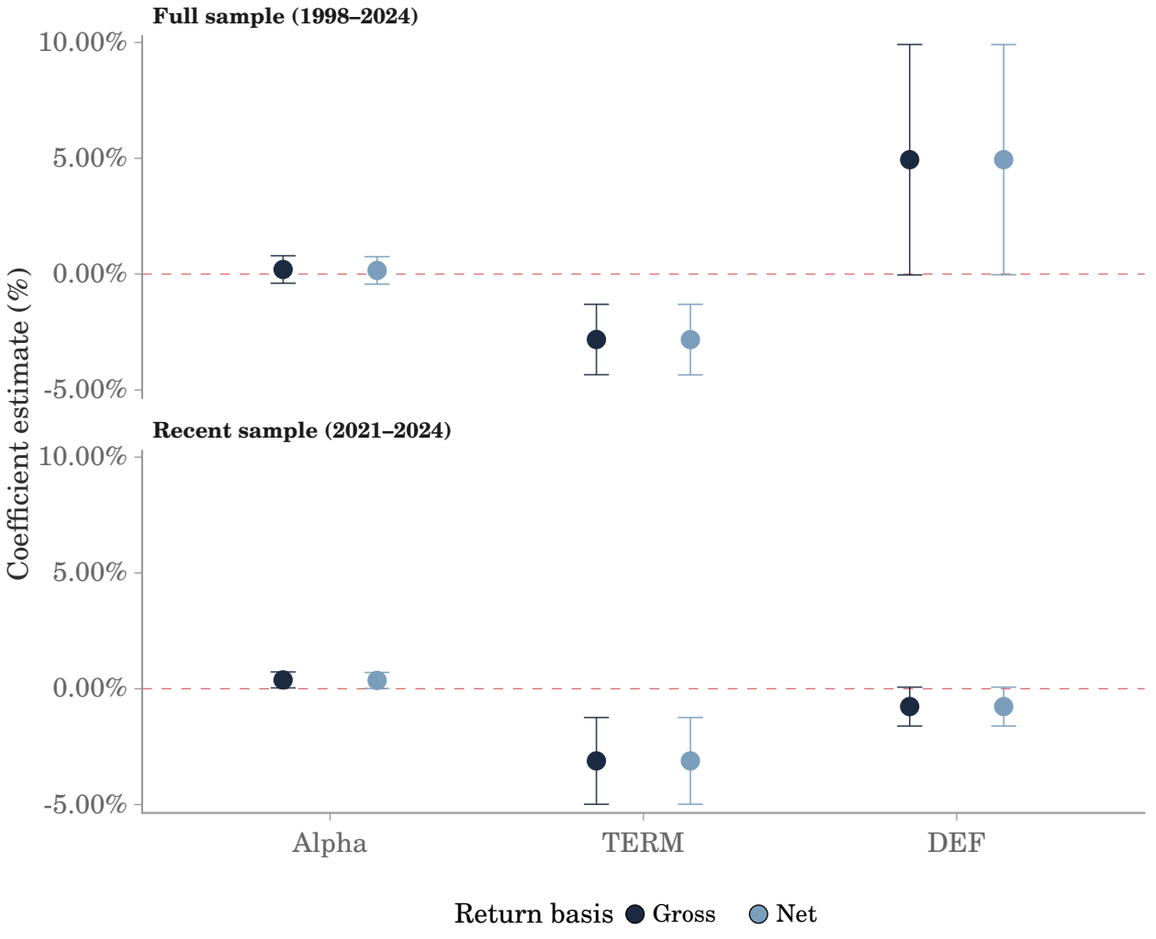


Figure 33. Fixed-income portfolio: Factor exposure
This figure decomposes the fixed-income portfolio's annualized active return into contributions from factor exposures, costs, and net alpha. Bars show the incremental effect of each component, expressed in basis points, and are based on estimates from monthly returns measured in USD. The contributions labeled TERM and DEF correspond to the standard Fama–French factors. The bar labeled Factors represents the aggregate return attributable to these factor exposures. The bar labeled Alpha reflects the residual active return after accounting for factor contributions, and the bar labeled Costs shows the impact of reported management costs. The Total bar equals the sum of all components. The upper panel shows results for the full sample from 1998 through 2024, and the lower panel shows results for the recent sample from 2021 through 2024.

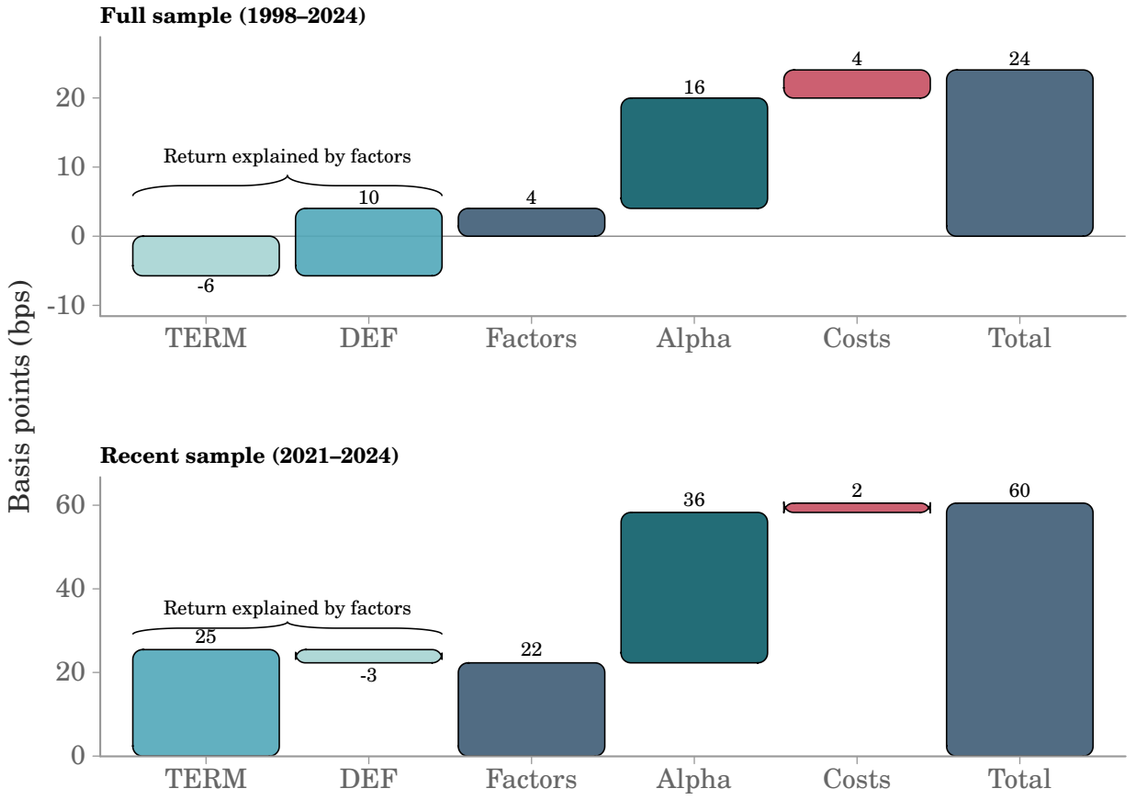


Figure 32 presents the factor loadings of the fixed-income portfolio on the TERM and DEF factors, together with alpha, for both the full sample (1998–2024) and the recent period (2021–2024). In each period, the estimated alpha is close to zero with narrow confidence intervals, indicating little unexplained outperformance after accounting for factor exposures. The portfolio exhibits a small negative TERM loading in both samples, suggesting

slightly lower duration exposure than the benchmark and relatively better performance during periods of rising yields. The DEF loading is positive and statistically significant in the full sample but smaller and statistically indistinguishable from zero in the recent period. Since DEF often correlates with MKT, this pattern also reflects a reduction in equity-like risk.

As reported in Table F.4 in Appendix F, the R^2 is 0.98 in the full sample and rises to 1.00 in the recent subperiod. This again indicates that benchmark movements account for virtually all of the variation in the Fund's fixed-income returns, implying limited active risk relative to the internal fixed-income benchmark. The AR is positive across all specifications, but remains lower in the full sample than in the recent period.

Figure 33 decomposes the annualized active return into contributions from factor exposures (TERM and DEF), their combined effect, net alpha, and costs. Across the full sample, TERM subtracts about 6 basis points, while DEF adds roughly 10 basis points, for a combined factor contribution of about 4 basis points. Most of the 24 basis point total active return derives from alpha of approximately 16 basis points, partly offset by costs of 4 basis points.

In the recent period, factor contributions are much larger and clearly positive. TERM adds roughly 25 basis points, while DEF subtracts about 3 basis points, yielding a net factor effect of 22 basis points. We will return to these results when describing the allocation strategy. Alpha is also stronger, at about 36 basis points, and costs remain low at around 2 basis points. Overall, the figure shows that the fixed-income portfolio has delivered positive active returns in both periods, with recent performance driven by a combination of favorable factor tilts and strong net alpha after costs.[14]

4.3 Substrategies

In this section, we take a closer look at the Fund's active fixed-income strategies. As with equities, our assessment is structured around three main substrategies: security selection, enhanced indexing, and allocation. The overall architecture mirrors that of the equity substrategies, except that fixed-income management does not include external security selection. In the analysis of security selection, we report value creation both gross and net of costs. Since NBIM has not provided a split of internal security-selection costs between equity and fixed income,

[14]Details underlying the calculations are presented in Table F.5 in Appendix F.

we allocate costs proportionally based on AUM for the asset classes.

Table F.6 in Appendix F reports mean returns, standard deviations, and Sharpe ratios for the total gross returns of each strategy and its benchmark. The enhanced-indexing and allocation benchmarks delivered lower total returns than the broad fixed-income benchmark, whereas security selection delivered higher returns. Due to data availability, we analyze monthly returns for the various strategies starting in 2013, noting that not all substrategies were active from the outset; the internal security-selection strategy began in October 2014.

Figure F.2 shows the unconditional correlation matrix of active returns. Correlations are generally low. For example, the enhanced-indexing strategy has only a moderate correlation with internal selection (-0.42).

4.3.1 Security selection

Overview

The Fund seeks to enhance fixed-income performance through in-depth credit research and by harvesting risk premia in the corporate bond market. The strategy aims to capture credit and liquidity premia by taking distinct positions at the security, issuer, and sector levels, while keeping the overall fixed-income risk profile broadly aligned with that of the benchmark.

Value added and returns

As shown in Figure F.3, the security-selection strategy has generated a cumulative value added of about 10 billion NOK gross and 8 billion NOK net.[15]

[15]For these strategies, returns are measured in USD, whereas assets under management are measured in NOK.

Figure 34. Fixed-income portfolio - security selection: Cumulative gross and net active returns
This figure shows cumulative gross and net active returns for the Fund's security selection strategy in fixed income from October 2014 through 2024, expressed in percent and measured in USD. Cumulative active returns are constructed by compounding monthly active returns over time. Gross active return is measured before management costs, and net active return is measured after all reported costs. The shaded region highlights the period from 2021 through 2024, and the labeled points report the cumulative gross and net active returns at the start and end of this interval.

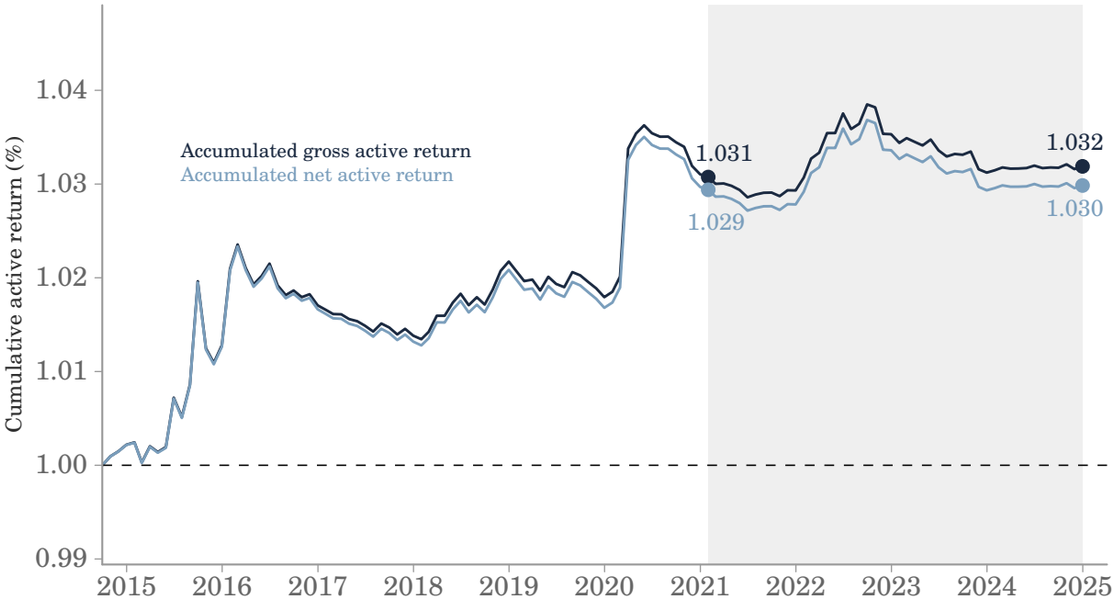


Figure 34 displays cumulative gross and net active returns for fixed-income security selection from late 2014 through 2024. Active returns rise steadily during 2015–2016, level off, and then increase sharply around 2020, reaching a peak slightly above 1.03. The shaded region marks 2021–2024, during which the gross and net series begin at roughly 1.031 and 1.029 and end at about 1.032 and 1.030. Thus, nearly all value added was generated before the most recent interval.

Security selection performed particularly well during the Covid-related credit shock in early 2020, when spreads widened sharply in February–March and then retraced later in the year. Internal credit teams were able to acquire fundamentally sound issuers at distressed prices while avoiding the weakest credits, so the subsequent rebound delivered strong relative performance (NBIM, 2022). This episode illustrates how the Fund's limited liquidity needs can be an advantage; see Section 1.3 for a detailed discussion.

Statistical evaluation and risk adjustment

Figure 35. Fixed-income portfolio - security selection: Active return decomposition
This figure presents coefficient estimates and 95% confidence intervals for the active returns in the Fund's security selection strategy in fixed-income management. All error bars are based on Newey and West (1987) standard errors, and all estimates are annualized from monthly returns, expressed in percent and measured in USD. Bars labeled active return show the gross and net mean active returns. Bars labeled α and β show the estimated coefficients from Equation (3). Active return and α estimates use the left y axis, and β estimates use the right y axis. Dark blue markers represent estimates based on gross returns, and light blue markers represent estimates based on net returns. The upper panel show results for the full sample from October 2014 through 2024 and the lower panel for the recent sample from 2021 through 2024.

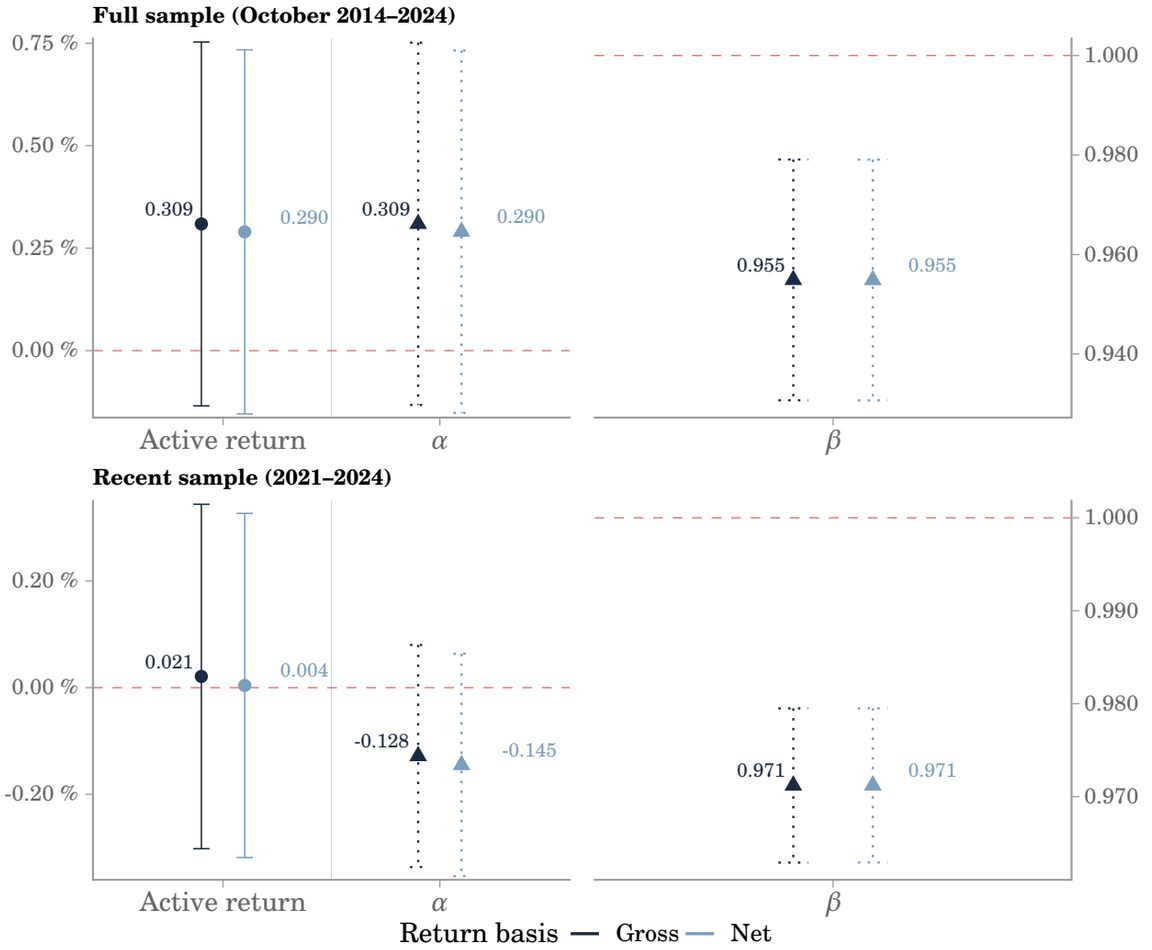


Figure 35 presents the decomposition of active returns for the full period 2014–2024 and the recent period 2021–2024. Over the full sample, the strategy delivers an annualized active return of about 0.30% gross and 0.29%

net.[16] The confidence intervals are wide, so the statistical evidence for persistent skill is limited. Alpha estimates are very close to the mean active returns, and the estimated beta is slightly below one, indicating marginally lower systematic risk relative to the benchmark.[17]

In the recent period, performance is weaker. Average active returns are close to zero, alpha estimates are slightly negative, and beta remains just below one. Security selection did not meaningfully contribute to performance in 2021–2024.

Table F.9 in Appendix F reports factor-model estimates for security selection. The regression yields economically and statistically significant alpha, with estimates of approximately 0.53% per year gross and 0.51% net, both significant at the 1% level.

The factor loadings show a slightly positive exposure to TERM and a significantly negative DEF loading of about −0.06, indicating that the portfolios have generally taken less credit risk than the benchmark. This is somewhat unexpected given the Fund's risk-bearing capacity. Table F.10 in Appendix F shows that the short credit-risk tilt reduces average returns by roughly 0.22% (see the "Product" column).

4.3.2 Enhanced indexing

Overview

In the market exposure strategy (also referred to as enhanced indexing), the Fund combines asset positioning with securities lending. Our assessment focuses primarily on asset positioning.

The objective is to replicate the benchmark exposure as cost-efficiently as possible while ensuring that the fixed-income portfolio continues to meet its investment mandate. The strategy seeks to enhance returns by participating in capital-market transactions and by taking additional short- to medium-term positions informed by fundamental analysis and temporary pricing discrepancies between comparable bonds.

[16] Table F.7 in Appendix F reports summary statistics for gross and net returns.
[17] See Table F.8 for average active returns before and after costs and for beta-adjusted alpha.

Value added and returns

As shown in Figure F.4, accumulated gross value added from 2013 onward amounts to 69 billion NOK, of which 62 billion NOK stems from asset positioning.

Figure 36. Fixed-income portfolio - enhanced indexing and allocation: Cumulative gross active returns

This figure shows cumulative gross active returns for the Fund's enhanced indexing and allocation strategies in fixed-income management from 2013 through 2024, expressed in percent and measured in USD. Cumulative active returns are constructed by compounding monthly active returns over time. Gross active return is measured before management costs. The shaded region highlights the period from 2021 through 2024, and the labeled points report the cumulative gross active returns at the start and end of this interval.

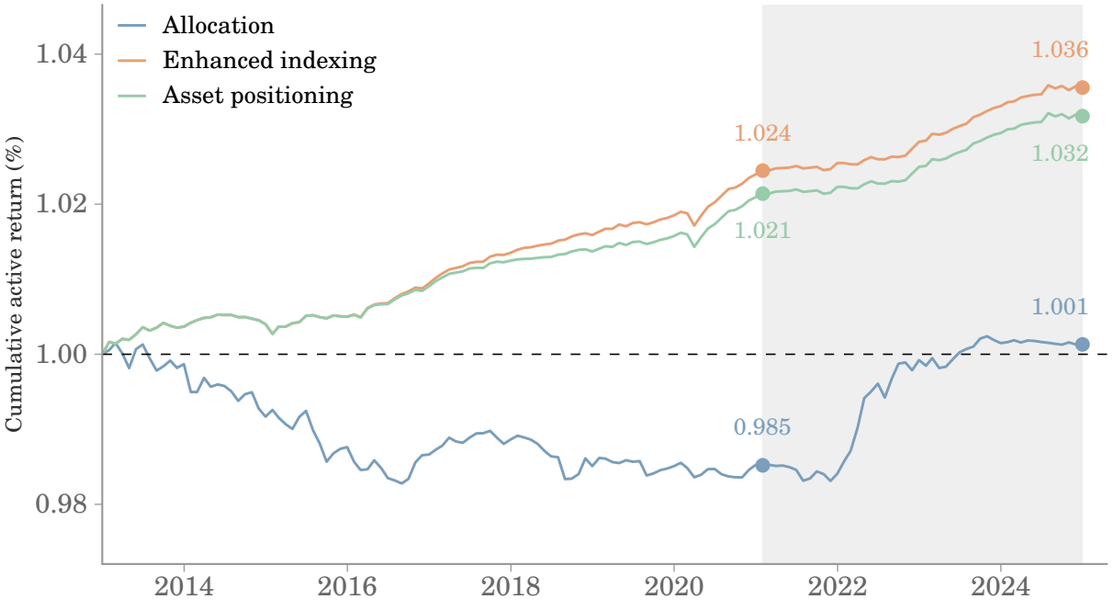


Figure 36 shows a steadily rising path of cumulative gross active returns from 2013 to 2024. Both enhanced indexing and asset positioning generate value almost continuously, with a temporary dip around 2020. By the end of the sample, enhanced indexing reaches roughly 1.036 and asset positioning roughly 1.032, showing modest but persistent cumulative outperformance before costs.

Statistical evaluation and risk adjustment

Figure 37. Fixed-income portfolio - enhanced indexing and allocation: Active return decomposition
This figure presents coefficient estimates and 95% confidence intervals for the active returns in the Fund's enhanced indexing and allocation strategies in fixed-income management. All error bars are based on Newey and West (1987) standard errors, and all estimates are annualized from monthly returns, expressed in percent and measured in USD. Bars labeled active return show the gross and net mean active returns. Bars labeled α and β show the estimated coefficients from Equation (3). Active return and α estimates use the left y axis, and β estimates use the right y axis. The upper panel shows results for the full sample from 2013 through 2024, and the lower panel shows results for the recent sample from 2021 through 2024.

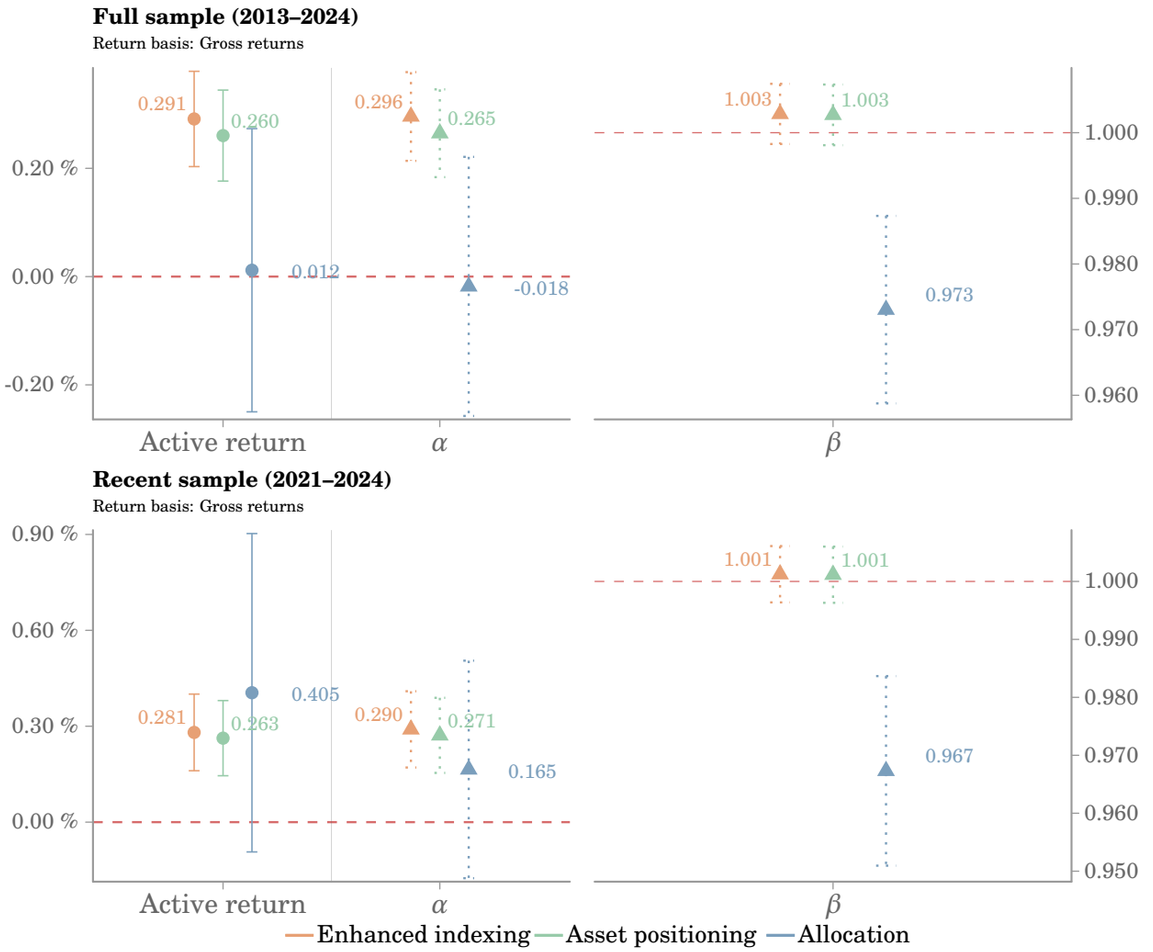


Figure 37 shows that enhanced indexing and asset positioning deliver stable performance in both the full sample and the recent subsample. Confidence intervals are narrow. Estimated gross active returns lie around 0.25–0.30% per year in each period, indicating modest but consistent excess returns. Alpha estimates are of similar magnitude,

and beta coefficients are essentially one, implying that outperformance is not driven by systematic deviations in benchmark exposure. As reported in Table F.7 and Table F.8, these strategies have very low return volatility, resulting in statistically significant positive active returns and alphas, with p-values below 0.01.

Factor-model results in Table F.9 and Table F.10 indicate that factor exposures explain little of the performance. The factor-adjusted alphas are nearly identical to the average active returns.

4.3.3 Allocation

Overview

The top-down allocation strategy in fixed income consists of broad benchmark-relative positioning decisions across interest rate exposure, sectors, currencies, and regions, rather than selecting individual bonds. This strategy reflects the belief that the Fund can anticipate variations in asset prices, for example by tilting the portfolio toward or away from certain segments or maturities when pricing appears stretched. This approach embeds the well-documented short-duration stance, that is, an underweight to the TERM factor.

Value added and returns

As shown in Figure F.4, the accumulated gross value added from the allocation strategy amounts to 21 billion NOK. Figure 36 illustrates how the allocation series declines from 1 in the early years to a low near 0.985 around 2021, reflecting a modest cumulative loss from these top-down positions. During the shaded interval from 2021 to 2024, the strategy partially rebounds toward 1. This pattern underscores the long verification horizon inherent to such strategies.

Statistical evaluation and risk adjustment

From Figure 37, we observe that active returns are close to zero and slightly negative over the entire sample, accompanied by a small negative alpha estimate. In the most recent period, both active return and alpha turn modestly positive. Across both samples, beta remains clearly below one.[18]

Table F.9 in Appendix F shows that the allocation strategy exhibits a negative exposure to TERM throughout

[18] See Table F.7 and Table F.8 for details.

the sample. Consequently, as reported in Table F.10, the TERM contribution to active return is negative. It is important to note that these values are sample averages, and that previous analyses document time variation in this exposure.

4.4 Summary

The Fund's fixed-income investments have generated 132 billion NOK in gross value added and 107 billion NOK after costs. On an annualized basis, the average active return has been 0.24% before costs and 0.20% after costs.

At the strategy level, enhanced indexing accounts for most of the value creation, delivering about 69 billion NOK in gross excess return alongside a steadily increasing cumulative active return. Internal security selection has contributed a smaller but still positive amount of roughly 10 billion NOK gross and 8 billion NOK net, with most of this earned during the Covid period when credit spreads first widened and then normalized.

The top-down allocation strategy has a weaker profile. Its cumulative return dipped below one in the years leading up to 2021 before recovering, a pattern consistent with its negative average exposure to TERM and the well-known short-duration stance.

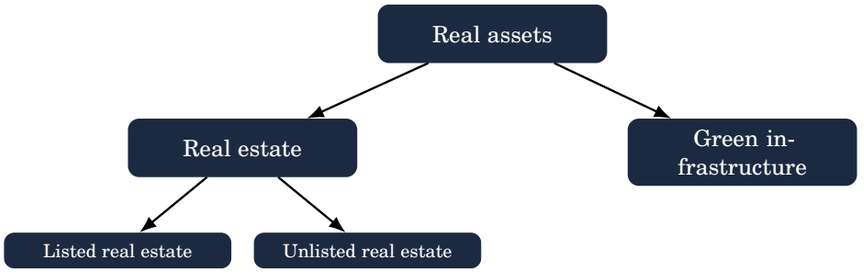
From a comparative-advantage perspective (see Section 1.3), the strongest fixed-income results stem from strategies that exploit the Fund's structural strengths, namely its scale, long horizon, and limited liquidity needs. The execution-plus-research model used in enhanced indexing and asset positioning rests on an efficient platform for managing market exposure, keeping implementation costs low, providing liquidity when appropriately compensated, and exploiting small mispricings at scale.

By contrast, the allocation approach, including the short-duration tilt and other broad macro positions, relies more on timing asset-price movements than on these inherent advantages. We interpret this strategy in much the same way as the Fund-level allocation strategy discussed in the summary in Section 2.3.

5 Real assets assessment

As illustrated in Figure 3, the real-asset portfolio is placed within the Fund's active management. Section 9.4 of Bauer et al. (2022) notes that this structure can create a potential conflict of interest, since real assets were

Figure 38. Active real asset strategies
This figure illustrate the composition of the real asset strategy area of the Fund.



introduced primarily for diversification while being treated as an active strategy. NBIM's own evaluation (NBIM, 2025) indicates that the upcoming strategy plan will place stronger emphasis on generating active returns. At the time this report was finalized, the new plan had not yet been published.

5.1 Overview

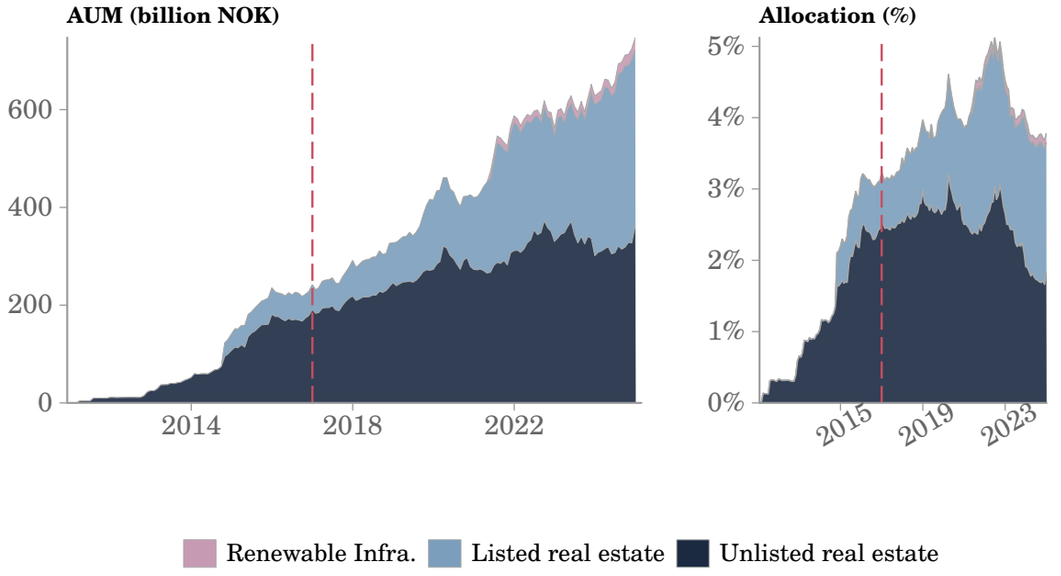
The Fund invests in real assets through real estate and renewable energy infrastructure. Real estate investments can be listed or unlisted, while infrastructure investments are unlisted only. Because real assets are excluded from the reference index, the associated exposures are treated as active positions that draw on the Fund's tracking–error allowance.

The left panel of Figure 39 shows the time series of AUM, in billion NOK, for the overall real-asset portfolio as well as for unlisted real estate, listed real estate, and renewable infrastructure. Additional details are provided in Figure 4. NBIM has invested in real estate since 2010. From 2010 to 2017, the upper limit on real estate allocation was 5% of the total AUM. The current real estate investment framework (including its benchmark design) was introduced in 2017, marked by the vertical red line. The key change was the introduction of internal real estate benchmarks composed of equity and fixed-income instruments.

The right panel of Figure 39 shows the same development expressed as shares of the total AUM. During the past four years, unlisted real estate has declined the most, while listed real estate has increased gradually. Green infrastructure, introduced more recently, has edged upward, but still represents only about 0.2–0.3% of the Fund. As a result, today's real-asset portfolio is dominated by listed and unlisted real estate, with green infrastructure forming only a small additional layer.

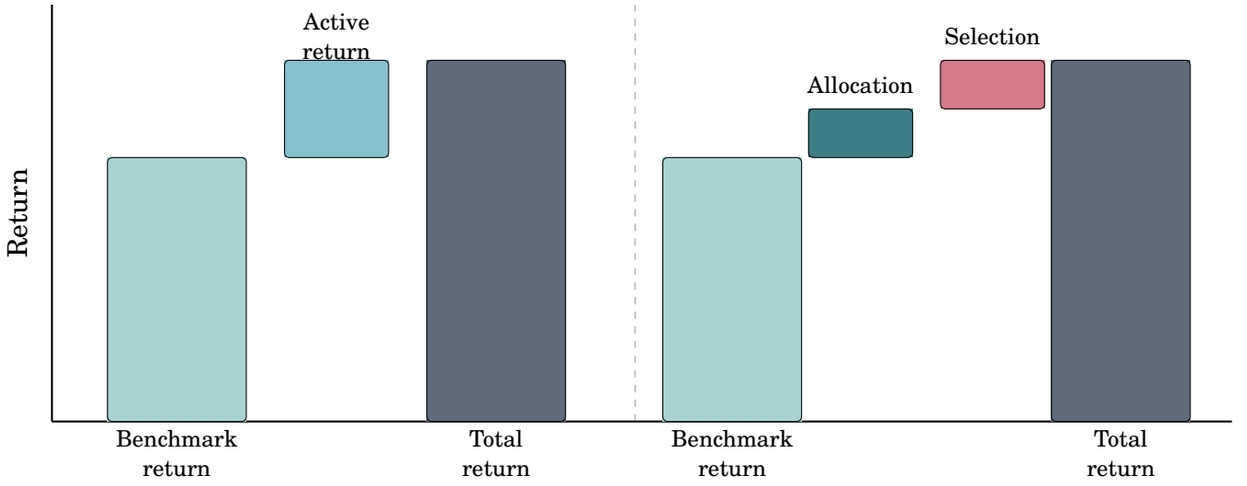
Figure 39. Real assets and allocation

This figure shows the development and composition of the Fund's real-assets portfolio from 2011 through 2024. The left panel reports assets under management in billion NOK, and the right panel shows the share of renewable infrastructure, listed real estate, and unlisted real estate as a percentage of total fund size. The vertical line at 2017 marks the introduction of the new funding model for real estate, when listed real estate was transferred from the equity portfolio to the real estate portfolio.



5.2 Attribution real assets

Figure 40. Illustration: Value bridge
This figure illustrates how the gap between benchmark returns and realized returns can be decomposed. The left side shows total active return as the difference between the benchmark return and the realized total return. The right side separates this active return into allocation and security selection components, which together bridge the gap between the benchmark return and the total return.



Throughout the analysis, we have defined the active return as the difference between the actual return and the benchmark return. This is shown on the left-hand side of Figure 40. In the context of the funding model for real assets, specifically the total portfolio approach, interpreting the active return is more complex than for the earlier asset classes. Real assets are financed through a mix of equity and fixed income, so relying solely on the funding return as a benchmark blurs the source of variation: is it driven by equity and fixed-income market movements, or by decisions within the real-asset portfolio itself?

Attribution analysis separates active return into allocation and security selection effects, providing accountability at the decision-making level in asset management (Brinson et al., 1995). We develop an analogous framework for real assets. Rather than reporting only the return gap between the benchmark and the actual portfolio, we insert intermediary proxy indices between them. As illustrated on the right-hand side of Figure 40, the active return then splits into:

- *allocation effect*, arising from the difference between the funding return and the return of the asset class, and

- *selection effect*, arising from the difference between the portfolio's actual return and the return of the chosen asset class.

A key design choice is the selection of appropriate proxy benchmarks. In practice, we may be forced to trade off investability and assess skill using measures that were not specified ex ante. Some segments of the real-asset portfolio are not publicly traded, which means their performance is based on transaction data or model-derived values rather than market prices. Even if the attribution is imperfect, the exercise still provides useful insight.

Before evaluating each component of the real-asset portfolio, we first outline a recent change within CPP Investments (Canada Pension Plan Investment Board). We believe this development offers relevant context for several of the challenges associated with the current funding model.

Example: CPP Investments

CPP Investments manages the assets of the Canada Pension Plan on behalf of more than 20 million contributors and beneficiaries. The fund is known for being an early adopter of the total portfolio approach, that is, measuring its investment against a "basis" funding benchmark.

However, as can be found in their CPP annual report, a new benchmark, the so-called "Benchmark Portfolios" has replaced the old "Market Risk Targets" (previously called the reference portfolio).

For the portion of the portfolio invested in real assets, CPP evaluates performance by comparing these holdings to a mix of public market indices that together form the benchmark portfolio. The benchmark for real estate is built from a set of *listed* real estate, infrastructure, energy, and fixed income indexes:

- FTSE EPRA NAREIT Global
- Dow Jones Brookfield Global Infrastructure Ex Oil and Gas Storage & Transportation
- S&P Infrastructure EM ex-China
- S&P Developed BMI Renewable Electricity
- S&P Developed LargeMidCap Energy
- Barclays CA AAA Gov Bond 10Y+
- ICE BofA US 3-month T-Bill
- S&P Emerging BMI Renewable Electricity ex-China

As stated on page 19 of their annual report:

> The Benchmark Portfolios are a better measure of the relative performance of our Investment Portfolios because their more diversified composition reflects our efforts to enhance resiliency and achieve higher returns compared to our Market Risk Targets. The Benchmark Portfolios have slightly higher long-run expected absolute returns over simple two-asset portfolios like the Market Risk Targets, associated with the benefits of diversification. The Benchmark Portfolios are also more resilient to equity market downturns versus the Market Risk Targets. As a result, to better reflect our comprehensive investment strategies and improve performance assessment, we have transitioned to the Benchmark Portfolios as our primary performance benchmarks. The incentive compensation plan, (⋯), uses the Benchmark Portfolios to help assess performance.

Based on this, we understand that the Canadians have concluded that a "new" benchmark should sit between

the reference portfolio and the actual portfolio. In line with our mandate from the MoF, we next evaluate what constitutes appropriate measures of active management in real assets going forward.

5.3 Real estate

5.3.1 Overview

The Fund's real estate strategy can be divided into two main periods: the build-up phase from 2010 to 2017 and the consolidation and refinement phase from 2017 to the present. In the first period, the Fund focused on establishing a global unlisted real estate portfolio with a long-term target of 5%. Investments began in Europe and gradually expanded to 10–15 major cities worldwide, concentrated in office and retail properties with some exposure to logistics. Approximately 80% of the holdings were structured as joint ventures, while properties in Europe were fully owned. Listed investments targeted high-quality companies with comparable underlying assets.

From 2017 onward, the strategy shifted toward simplification and cost efficiency, with a combined listed–unlisted allocation. The Fund concentrated its investments in eight strategic cities, diversified across sectors, and emphasized partnerships rather than full ownership. Since 2020, the approach has broadened again, combining listed and unlisted exposure to exploit market dislocations while maintaining strict cost discipline.

The Fund's financing model implies that real estate in a given country (for example, the United Kingdom) is financed by selling equity and fixed income from the same country and currency, typically in proportions of approximately 70% fixed income and 30% equity (see NBIM, 2020). Then, NBIM constructs its real estate benchmarks to mirror this financing model.

These benchmarks are derived from the overall benchmark provided by the MoF, adjusted by altering the mix between equity and fixed income. The resulting benchmarks differ between the listed and unlisted segments, with listed real estate typically receiving a higher equity share. As recommended by Bauer et al. (2022), this procedure is difficult to interpret and creates challenges for incentive alignment. We understand that the equity portion of the funding will be reduced going forward (NBIM, 2025).

5.4 Evaluation

5.4.1 Real estate level

Because the MoF overhauled the real estate benchmarking framework in 2017, it is natural (and consistent with our mandate) to begin our performance assessment in that year.

Some data sources provide monthly returns, which we compound to obtain quarterly returns, while others report quarterly returns directly. When converting quarterly returns to annual figures in our main results, we do not apply additional compounding and instead multiply quarterly returns by four. This aligns with the approach used elsewhere in the report. For robustness, we also compute geometric annualization for real assets. Qualitative conclusions are unchanged, although the magnitudes differ. These geometric results appear in the appendix.

The differences between the USD returns and returns in the Fund's currency basket are small in the sample. Since active return is defined as a difference, currency effects are further muted. For this reason, we deem it reasonable to use USD-denominated returns for real assets.

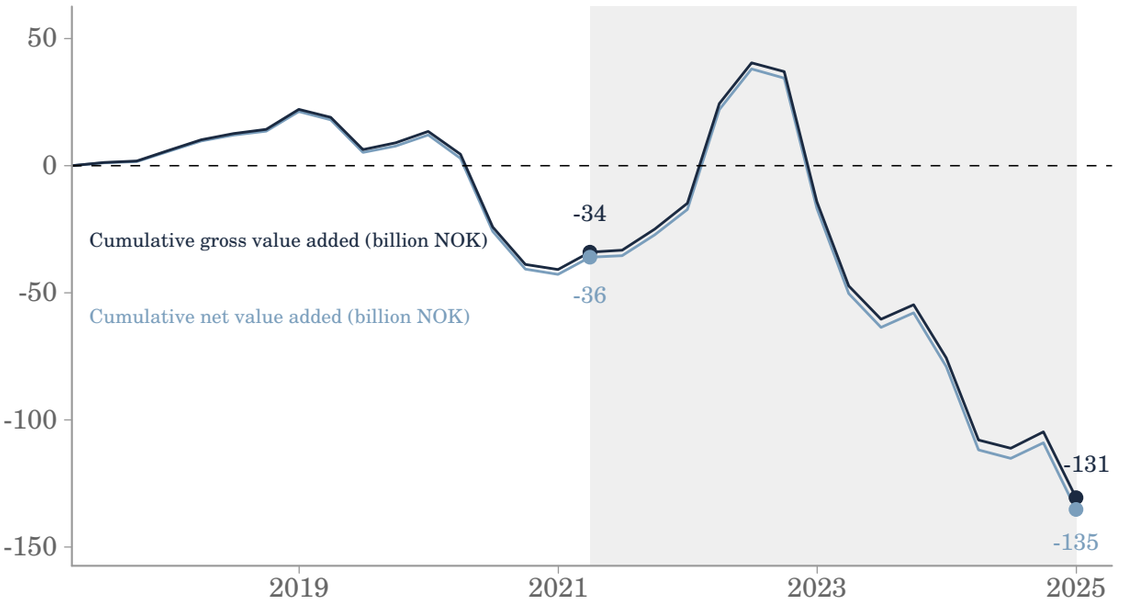
A final consideration is the inherent stickiness of unlisted returns, which complicates statistical inference. Therefore, all statistical results should be interpreted with appropriate caution. Results for listed real estate are subject to fewer measurement issues.

Value added

Figure 41 shows the cumulative gross and net value added for the real estate portfolio since 2017, constructed using the consistent compounding in Equation (2). At the end of 2024, cumulative gross value added was approximately −131 billion NOK and cumulative net value added approximately −135 billion NOK. From 2021 to 2024, gross cumulative value added fell from −34 billion NOK to −131 billion NOK, a decline of 97 billion NOK, while net value added declined by 99 billion NOK. These developments underscore the significant underperformance of real estate relative to its benchmark in recent years.

Figure 41. Real estate portfolio: Cumulative value added

This figure shows the cumulative gross and net value added for the Fund's real estate portfolio from 2017 through 2024, expressed in billion NOK. Cumulative value added is constructed as a value added wealth account according to Equation (2), which compounds monthly value added over time. Gross value added is measured before management costs, and net value added is measured after all reported costs. The shaded area highlights the most recent sample period from 2021 to 2024, and the labeled endpoints show the change in cumulative gross value added from −34 to −131 billion NOK, and in cumulative net value added from −36 to −135 billion NOK, over this sub period. All returns and asset values are measured in NOK.



Returns

Figure 42. Real estate portfolio: Cumulative gross and net active returns
This figure shows cumulative gross and net active returns for the real estate portfolio from 2017 through 2024, expressed in percent and measured in USD. Cumulative active returns are constructed by compounding quarterly active returns over time. Gross active return is measured before management costs, and net active return is measured after all reported costs. The shaded region highlights the period from 2021 to 2024, and the labeled points report the cumulative gross and net active returns at the start and end of this interval.

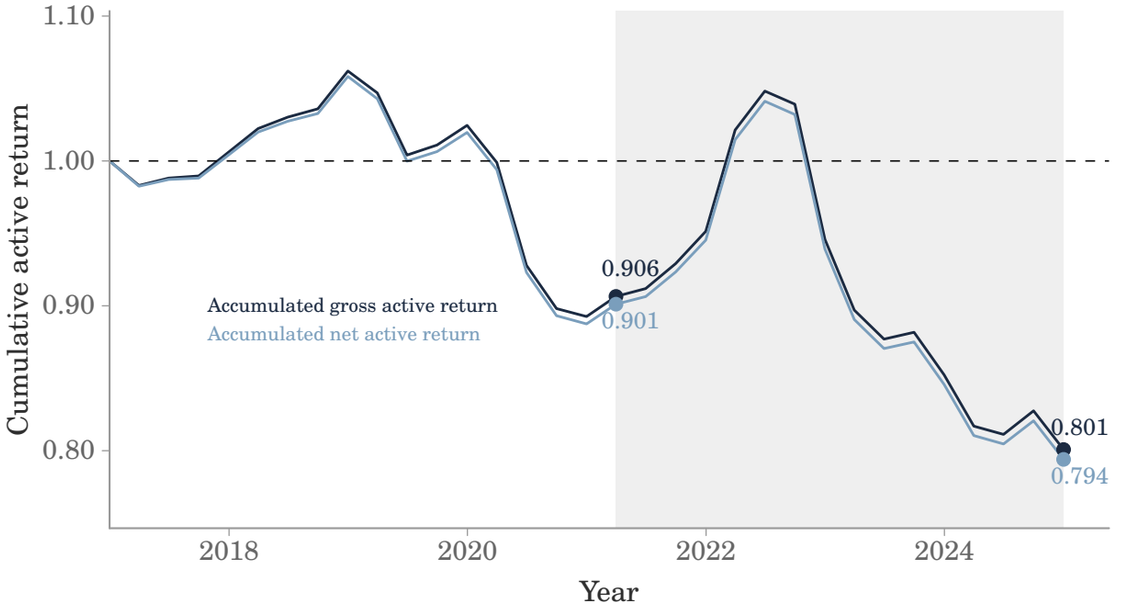


Figure 42 shows the cumulative active return of the real estate portfolio, gross and net of costs, from 2017 through 2024. The series declines sharply from 2020, reaching about 0.906 and 0.901 in late 2021. This reflects weaker real estate performance during the pandemic and strong funding-benchmark returns. A temporary recovery appears in 2022, as listed and unlisted segments reacted differently to changes in interest-rate expectations. As private-market valuations adjusted more fully through 2023, cumulative active returns again weakened.

By the end of the sample, cumulative active returns are roughly 0.801 gross and 0.794 net, implying an underperformance of about 20% relative to the benchmark. The small difference between gross and net results shows that costs play only a minor role in the overall pattern.

Table 5 summarizes the annualized quarterly returns of the portfolio, its benchmark, and the resulting active returns. The portfolio's annualized gross return is 2.87% and the net return 2.77% (real estate NAV return in

Table 5. Real estate portfolio: Summary statistics of returns
This table reports gross and net annualized total returns, benchmark returns, and active returns for the aggregate real estate portfolio, expressed in percent and measured in USD from 2017 through 2024. Quarterly returns are annualized by multiplying by four. AC(1) denotes the first-order autocorrelation coefficient. Inference for active returns relies on Newey and West (1987) standard errors. N is the number of quarterly observations.

	Gross return	Net return	Benchmark return	Gross active return	Net active return
Mean (%)	2.87	2.77	5.58	−2.56	−2.67
SD/TE (%)	9.42	9.41	10.71	6.43	6.43
Sharpe ratio/IR	0.09	0.07	0.33	−0.40	−0.42
AC(1)	0.00	−0.002	0.04	0.46	0.45
Std.error				3.89	3.88
p-value				0.51	0.50
N	32	32	32	32	32

USD), while the benchmark return is 5.58%. This produces active returns of about −2.56% gross and −2.67% net. Costs are materially higher than in other strategies (Figure C.1 in Section C).

Since 2017, real estate has delivered lower returns than the equities and bonds sold to finance these investments. The past five years should also be interpreted against strong equity performance, the 2020 pandemic, and the sharp rise in interest rates in 2022, all of which weighed heavily on real estate.

Attribution

Section 5.2 outlines the rationale for attribution analysis. Here, we describe its implementation for real estate.

Our objective is to benchmark NBIM's real estate results against a peer group of institutional investors. This allows the attribution to be separated into (i) an allocation effect, comparing NBIM's funding structure with the average investor, and (ii) a selection effect, comparing NBIM's real estate performance with the peer group.

There are different proxies for an "average" real estate return. Let us be clear from the beginning, there is no single perfect index. After reviewing several alternatives, we use the MSCI Global Quarterly Property Index (MSCI Global). Details appear in Appendix G.

MSCI Global is, in our view, the most comprehensive available benchmark for institutional real estate. Still, like all real estate indices, it has limitations. The index itself is not directly investable. In addition, the Fund has not

been designed to align its portfolio holdings with the MSCI Global index. As with all unlisted assets, valuations are uncertain. MSCI Global is constructed based on valuations reported by other institutional investors for their unlisted real estate holdings.

Figure 43. Real estate: Active return decomposition
This figure decomposes the annualized return of the Fund's real estate portfolio into contributions from the funding benchmark, allocation, selection, and costs from 2017 through 2024. The funding benchmark reflects the return on global equities and fixed income sold to finance the real estate strategy. The allocation component measures the effect of differences between the MSCI Global real estate benchmark and the funding benchmark, while the selection component measures the difference between the Fund's realized real estate returns and MSCI Global. Subtracting reported costs from the gross return yields the net return. All returns are measured in USD and are annualized by multiplying quarterly arithmetic averages by four.

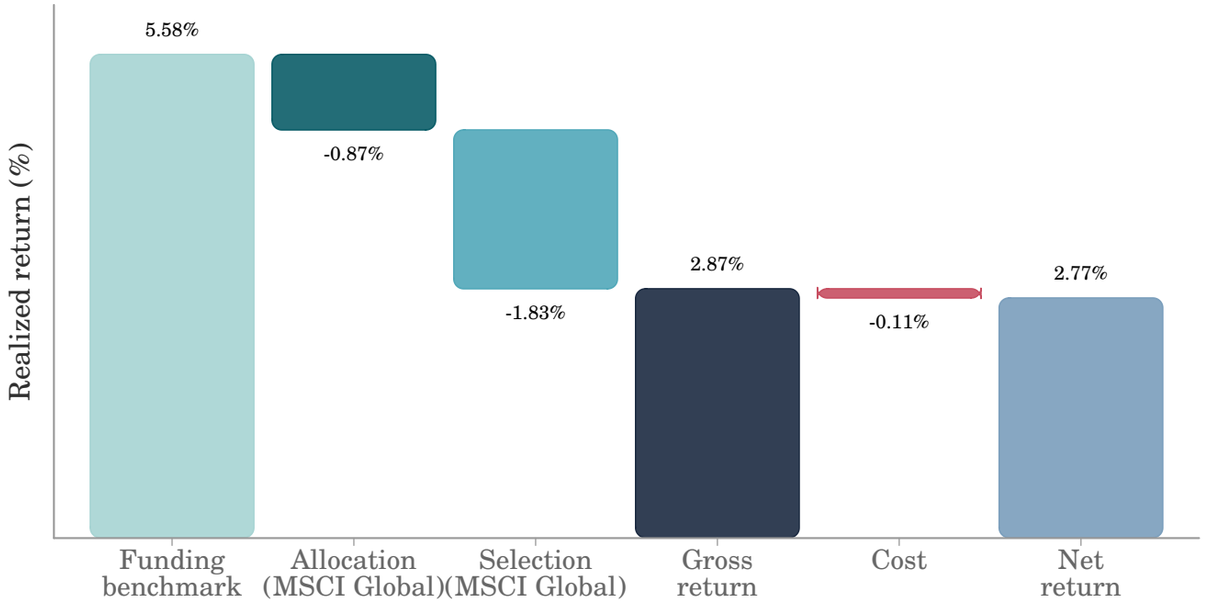


Figure 43 decomposes the active return into allocation and selection components. Starting from a funding-benchmark return of 5.58%, the allocation step subtracts 0.87%, reflecting that the Fund's chosen real estate exposure underperformed the combined equity and fixed-income benchmark. If we assume that the Fund had no discretion over investing in real estate, such a loss could *not* be attributed to active management.

The selection step subtracts an additional 1.83%, indicating that the portfolio underperformed the MSCI Global benchmark. With a gross portfolio return of 2.87%, both allocation and selection detracted from performance.[19]

[19]Figure G.1 shows the geometric version.

Figure G.2 in Appendix G shows the cumulative decomposition. Both effects remain close to 1.00 until 2021. The allocation component briefly rises to about 1.30 in 2023 before falling back to roughly 0.90, while the selection component declines more steadily to about 0.85. Both effects detract from performance over the full period, with only a temporary boost from allocation in 2022–2023.

Statistical evaluation and risk adjustment

Finally, we conduct a statistical analysis and thus a form of risk adjustment. We are aware that unlisted investments present challenges in data quality for statistical analysis. However, we choose to carry out parts of the analysis, as we have done for equity and fixed income, but we avoid placing too much emphasis on components that produce unreliable estimates. More advanced approaches that convert unlisted data into synthetic market data would also contain sources of error.

In Table G.1 in Appendix G, we additionally report the standard deviation and autocorrelation. In Table G.2, we perform a risk adjustment relative to the benchmark.

5.4.2 Substrategies - listed and unlisted real estate

Listed portfolio

Returns

Table 6 reports summary statistics for the listed real estate portfolio, including gross and net returns, benchmark returns, and active returns. The mean annualized total return is 3.79% gross and 3.73% net, far below the benchmark's 8.10%, implying a negative mean active return of roughly −4.2% on both a gross and net basis. Volatility is high relative to the benchmark, with standard deviations of about 20% for the portfolio compared to roughly 13% for the benchmark. The realized annualized tracking error is large at 11.69%, absorbing a material share of the overall tracking-error budget. The sample covers 32 quarterly observations.

Overall, the listed real estate portfolio exhibits persistent underperformance, higher volatility than its benchmark, and weak risk-adjusted returns.

Table 6. Real estate portfolio - listed: Summary statistics of returns
This table reports gross and net annualized total returns, benchmark returns, and active returns for the listed real estate portfolio, expressed in percent and measured in USD from 2017 through 2024. Quarterly returns are annualized by multiplying by four. AC(1) denotes the first-order autocorrelation coefficient. Inference for active returns relies on Newey and West (1987) standard errors. N is the number of quarterly observations.

	Gross return	Net return	Benchmark return	Gross active return	Net active return
Mean (%)	3.79	3.73	8.10	−4.21	−4.27
SD/TE (%)	19.95	19.95	12.74	11.69	11.69
Sharpe ratio/IR	0.09	0.08	0.47	−0.36	−0.36
AC(1)	−0.13	−0.13	−0.02	−0.06	−0.06
Std.error				3.85	3.85
p-value				0.28	0.28
N	32	32	32	32	32

Attribution

Figure 44 decomposes the return on the listed real estate portfolio into its underlying components.

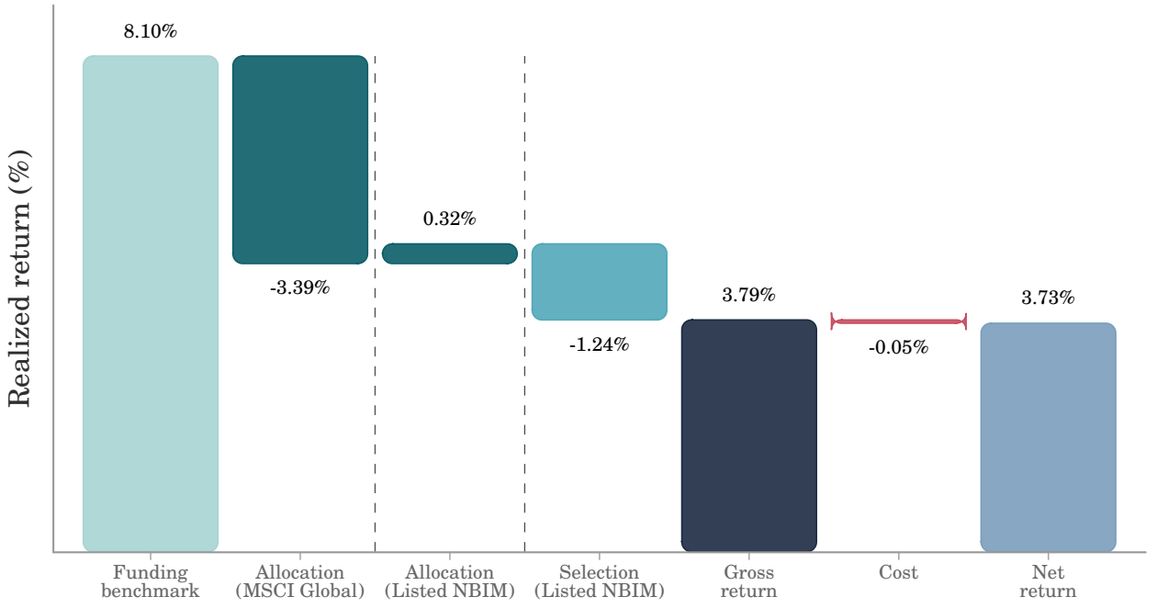
Two benchmarks are used in the analysis. The first is MSCI Global, which also serves as a benchmark for the total real estate portfolio. The second is NBIM's listed real estate benchmark, a custom USD-denominated index derived from the real estate companies in the NBIM FTSE universe. Firms outside the designated sectors and countries are removed, a single-name filter ensures alignment with the mandate, and small-cap firms are excluded to maintain investability. Further details are provided in Table G.1 in Appendix G.

The figure decomposes total return into the funding benchmark, two allocation effects, and one selection effect. The first allocation effect compares MSCI Global with the funding benchmark for global equities and fixed income, and is strongly negative at approximately −3.39%. The second allocation effect compares MSCI Global with NBIM's listed benchmark, and is mildly positive at about 0.32%, indicating modest outperformance of NBIM's listed benchmark relative to MSCI Global.

The selection effect measures the return of the listed real estate portfolio relative to NBIM's custom benchmark and is clearly negative, around −1.24%. This reflects weaker performance from security and mandate choices within listed real estate relative to the chosen benchmark. Combined, these effects explain why the gross portfolio return of 3.79% is well below the 8.10% funding benchmark return, before a small cost adjustment reduces the

Figure 44. Real estate - listed: Active return decomposition

This figure decomposes the annualized return of the Fund's listed real estate portfolio into contributions from the funding benchmark, allocation, selection, and costs from 2017 through 2024. Allocation is divided into two components. The first measures the effect of allocating into listed real estate by comparing the return on MSCI Global with the funding benchmark. The second measures the difference between MSCI Global and the custom listed real estate benchmark constructed by NBIM. The selection component captures the relative performance of the Fund's portfolio compared with NBIM's listed benchmark. The final bar adjusts for costs to arrive at the reported net return. All returns are measured in USD and are annualized by multiplying quarterly arithmetic averages by four.



net return to 3.73%.[20]

Figure G.4 in Appendix G shows the cumulative active return decomposition. The two allocation components and the selection component remain close to one between 2017 and 2020, with limited variation and no trend.[21] Performance deteriorates sharply in 2022, driven primarily by weak selection relative to the NBIM listed benchmark.

Taken together, the decomposition shows that the listed real estate portfolio ends well below the funding benchmark, mainly due to a negative allocation effect and weak selection relative to the NBIM listed benchmark.

Unlisted portfolio

Returns

Table 7. Real estate portfolio - unlisted: Summary statistics of returns
This table reports gross and net annualized total returns, benchmark returns, and active returns for the unlisted real estate portfolio, expressed in percent and measured in USD from 2017 through 2024. Quarterly returns are annualized by multiplying by four. AC(1) denotes the first-order autocorrelation coefficient. Inference for active returns relies on Newey and West (1987) standard errors. N is the number of quarterly observations.

	Gross return	Net return	Benchmark return	Gross active return	Net active return
Mean (%)	2.29	2.16	4.07	−1.60	−1.73
SD/TE (%)	5.62	5.61	9.98	9.77	9.77
Sharpe ratio/IR	0.04	0.02	0.20	−0.16	−0.18
AC(1)	0.39	0.39	0.04	0.34	0.34
Std.error				4.91	4.91
p-value				0.75	0.73
N	32	32	32	32	32

Table 7 presents summary statistics for the unlisted real estate portfolio, covering gross and net returns, benchmark returns, and active returns. The mean annualized return is 2.29% gross and 2.16% net, substantially below the benchmark's 4.07%. Consequently, active returns are negative at −1.60% gross and −1.73% net.

Volatility is low, with a standard deviation of roughly 5.60% compared with close to 10% for the benchmark. This is consistent with the valuation smoothing commonly observed in unlisted real estate. Autocorrelation is positive

[20] Figure G.3 shows the same decomposition using geometric compounding.

[21] The "Listed NBIM" allocation component appears slightly positive in Figure 44 because it is based on an *arithmetic* average of quarterly contributions. The time-series plot in Figure G.4 compounds returns *geometrically*, producing a consistently negative path.

for both the portfolio and the benchmark. Overall, the table indicates that the unlisted real estate portfolio has lagged behind its benchmark.

Attribution

Figure 45. Real estate - unlisted: Active return decomposition
This figure decomposes the annualized return of the Fund's unlisted real estate portfolio into contributions from the funding benchmark, allocation, selection, GAV to NAV adjustments, and costs from 2017 through 2024. Allocation is divided into two components. The first measures the effect of allocating into unlisted real estate by comparing the return on MSCI Global with the funding benchmark. The second captures differences in sector and city allocation, measured using the MSCI Global adjusted benchmark. The selection component reflects the performance contribution from property selection, and the GAV to NAV component captures the return difference arising from differences in gross and net asset values. The final bar adjusts for costs to arrive at the reported net return. All returns are measured in USD and are annualized by multiplying quarterly arithmetic averages by four.

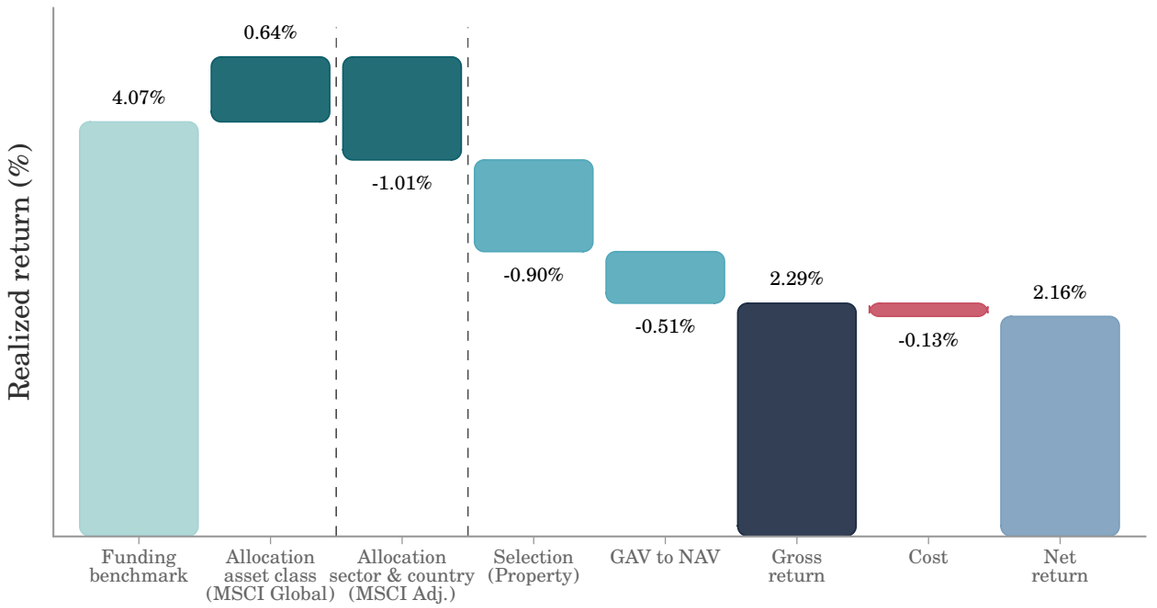


Figure 45 decomposes the return of the unlisted real estate portfolio by bridging the gap between the funding benchmark return of 4.07% and the portfolio's net return of 2.16%.

Two additional indexes are introduced. The first, MSCI Port weights USD, applies NBIM's quarterly country-sector weights to MSCI Global's quarterly property indexes. It reflects how the global property market would have performed if it had been weighted exactly as the NBIM portfolio. Transaction costs are adjusted using the

same methodology applied to MSCI Global in the listed analysis.

The second index, Property unlisted real estate return USD, measures unlevered asset-level performance using GAV as the denominator. GAV (gross asset value) is the total market value of all assets in the property portfolio before deducting debt or other liabilities. The series captures net operating income and fair-value changes following MSCI's property methodology and excludes transaction costs. Further details appear in Table G.1 in Appendix G.

We identify two allocation effects and two selection effects. The asset-class allocation effect, comparing MSCI Global with the funding benchmark, is slightly positive at about 0.64%. Thus, allocating to unlisted real estate has modestly improved returns relative to remaining in the funding benchmark. The effect of sector and country allocation is negative at approximately -1.01%, indicating that the chosen mix of cities and sectors has detracted from performance.

The first selection effect reduces the performance by another 0.90%. The GAV-to-NAV adjustment subtracts an additional 0.51%, reflecting the valuation differences between the values of the gross and net assets. Together, these components produce a gross return of 2.29%. After deducting 0.13% in costs, the net return is 2.16%.[22]

Figure G.6 in Appendix G shows the cumulative active return decomposition, separating the two allocation components and two selection components. The allocation to the real estate asset class, relative to MSCI Global, rises above 1.30 in 2022 and ends at around 1.022. The sector and country allocation component remains below one throughout and ends near 0.922.

The selection component stays close to one until 2021 and then declines steadily, ending at roughly 0.930. The GAV-to-NAV component also trends downward over time.

In cumulative terms, only the allocation to the real estate asset class has contributed positively. Sector and country allocation, selection, and valuation effects have all contributed negatively, resulting in cumulative underperformance relative to the funding benchmark.

[22]Figure G.5 illustrates the decomposition using geometric compounding.

5.5 Renewable energy infrastructure

5.5.1 Overview

In 2019, the Ministry of Finance allowed NBIM to allocate up to 2% of the Fund to unlisted renewable energy infrastructure as part of active management. NBIM has taken a gradual approach to exploring opportunities and building expertise, and the first investment was made in 2021. In recent years, NBIM has invested primarily in direct solar and wind projects across Europe.

Returns for unlisted green infrastructure are difficult to evaluate with confidence. Data availability is limited, valuations are infrequent and largely model-based, and reported returns are heavily smoothed rather than reflecting market movements. Transaction evidence is scarce, benchmarks remain underdeveloped, and the short time series makes statistical inference highly uncertain. As a result, reported returns can deviate significantly from the underlying economic performance of the assets. For these reasons, we present the available return figures but place limited weight on them and do not rely on them for statistical inference or attribution analysis.

5.6 Evaluation

Table 8. Renewable infrastructure portfolio: Summary statistics of returns
This table reports gross and net annualized total returns, benchmark returns, and active returns for the renewable energy infrastructure portfolio, expressed in percent and measured in USD from June 2021 through 2024. Quarterly returns are annualized by multiplying by four. AC(1) denotes the first-order autocorrelation coefficient. Inference for active returns relies on Newey and West (1987) standard errors. N is the number of quarterly observations.

	Gross return	Net return	Benchmark return	Gross active return	Net active return
Mean (%)	0.55	0.50	−6.73	6.35	6.30
SD/TE (%)	23.49	23.48	13.98	15.18	15.18
Sharpe ratio/IR	−0.11	−0.11	−0.70	0.42	0.41
AC(1)	−0.25	−0.26	0.02	−0.06	−0.06
Std.error				7.32	7.33
p-value				0.40	0.40
N	15	15	15	15	15

Table 8 reports the performance of the renewable infrastructure portfolio. The mean annualized return is 0.55%

gross and 0.50% net, while the benchmark return is markedly negative at −6.73%. The underlying funding consists almost entirely of fixed-income investments. Active returns are therefore strongly positive, at 6.35% gross and 6.30% net.

5.7 Summary

Performance in the real-asset portfolio has been weak since 2017. Real estate, which constitutes the majority of the allocation, has delivered markedly negative value added. The cumulative net value added is approximately −135 billion NOK, and cumulative active returns have declined steadily since 2020.

Both the listed and unlisted real estate portfolios underperform their benchmarks. Listed real estate shows large negative active returns of roughly −4.20% per year, and unlisted real estate lags with annualized active returns of around −1.70%.

Renewable infrastructure exhibits strongly positive active returns, driven mainly by a deeply negative benchmark. However, the results rely on sparse, smoothed, and model-driven valuations and must therefore be interpreted with caution. In general, real-asset investments have lowered overall Fund performance in recent years.

Active return can be divided into two components: allocation and selection. Given the current funding model, the Fund is held accountable for the allocation effect. In our view, a more appropriate portfolio framework would assume that this allocation is determined at a higher overarching level. This view is consistent with the long-term nature of real estate investments, which should not be considered part of an active management mandate.

From the perspective of NBIM's comparative advantages, real estate and green infrastructure are the types of long-horizon, large-scale, and less-liquid investments where NBIM's size, stable funding, and long perspective should provide an edge. The observed underperformance indicates that these advantages have not yet been translated into superior results in these asset classes.

6 Concluding comments

In this section, we summarize the findings and offer some general comments.

The setting

On behalf of the Norwegian people, the Storting and the Ministry of Finance have appointed Norges Bank as the manager of the Fund. They have also determined that equities shall constitute 70% of the portfolio and that the Fund may engage in a limited degree of active management.

Active management consists of investment decisions taken with the objective of generating returns above a specified market index. Put simply, the Fund is permitted to attempt to outperform the market. When such decisions are made on behalf of the public, it is important that they are scrutinized through thorough evaluations.

In total, value creation!

Active management involves substantial uncertainty, and it is not straightforward to determine whether observed outcomes reflect skill or luck. Periods of weak performance may simply reflect noise rather than a lack of ability.

The first and most important criterion is the actual results. Over time, the Fund has delivered strong results. It is "kroner and øre" that put food on the table, not percentages, so the total value added is what matters.

From 1998 to 2024, cumulative value added amounts to 611 billion NOK before costs and 402 billion NOK after costs (see Figure 5). Under a passive alternative (including securities lending), the Fund would therefore have been roughly 400 billion NOK smaller.

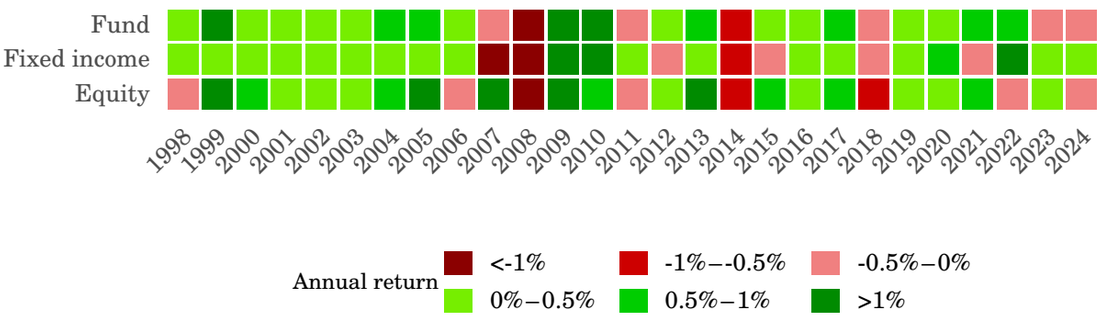
Expressed in percentage terms, the Fund's annual active return on the entire sample is 0.27% before costs and 0.19% after costs. During the most recent four-year period, the figures are similar, albeit marginally higher, consistent with management fees of only 0.04%.

For the entire sample, the p-values are 0.20 for gross active returns and 0.35 for net active returns; for the recent period, the corresponding values are 0.39 and 0.48. In both cases, we fail to reject the hypothesis that the average active return is zero.

Success both in equity and fixed income

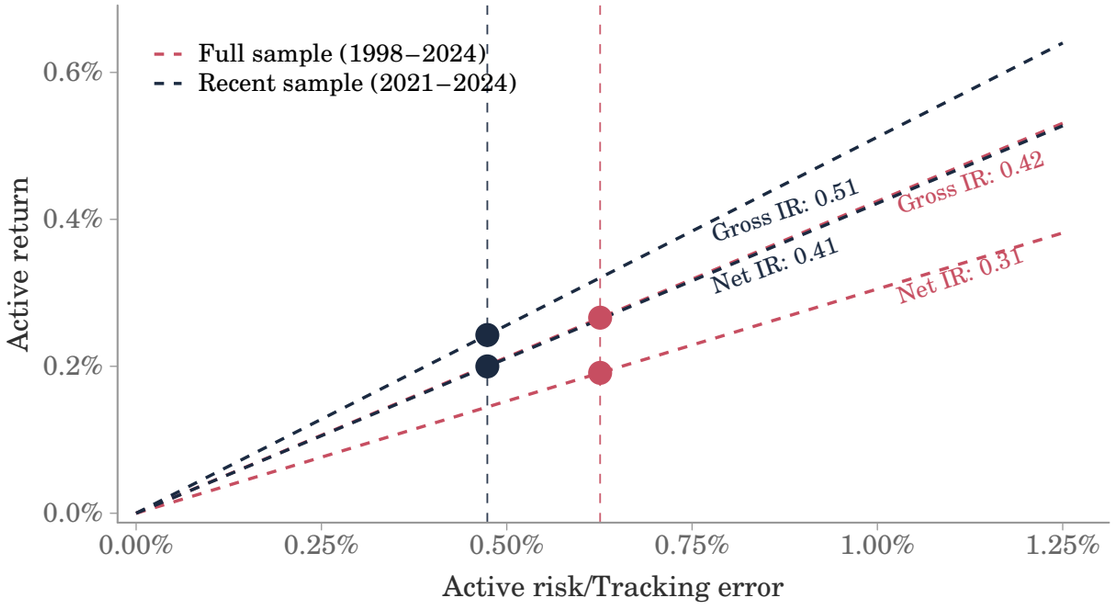
Even when results are strong, there are always elements that can be improved. In our evaluation, we assess the individual substrategies. At the fund level, value creation from active management in equities and fixed income has been solid, whereas the weakest results come from real estate. The heat map in Figure 46 shows the average annualized active return for each year in the sample period. Years with positive average active returns appear in shades of green, and negative years in shades of red. Over the 27-year sample, the Fund recorded only seven years with negative average active returns, corresponding to a hit ratio of 0.74. The fixed-income portfolio recorded seven such years as well, and the equity portfolio has a hit ratio of 0.70.

Figure 46. Heatmap of gross active returns
This figure shows calendar year gross active returns for the Fund, the equity portfolio, and the fixed income portfolio. Each cell reports the annual return relative to the benchmark and is color coded according to the performance range. All returns are expressed in percent and measured in USD.



If skill, why not more?

Figure 47. Fund information ratio
This figure shows the relationship between active risk, measured as the standard deviation of monthly excess returns, and active return for the Fund's gross and net returns. Results are shown for the full sample from 1998 through 2024 and for the recent sample from 2021 through 2024. The slope of each line corresponds to the Fund's Information Ratio.



As shown in Figure 47, the Fund's annualized tracking error for the entire period is 0.63%, with gross and net information ratios (IR) of 0.42 and 0.31, respectively. In the most recent period, the annualized tracking error is 0.47%, and the gross and net IR values are 0.51 and 0.41, respectively. Thus, active risk remains comfortably within the 1.25% limit.

A natural question is why the Fund does not take on more active risk, given its solid record. Our assessment is that it would be difficult to scale up active risk meaningfully within enhanced indexing or security selection. The remaining channels are top-down allocation decisions and real assets. As discussed below, we are more cautious about increasing active risk in these areas.

Capitalizing on advantages?

Another key question is whether the underlying story behind the results is credible. Specifically, does the Fund capitalize on its structural advantages relative to other investors? The Fund's strengths are that it is *long term*, *large*, and *not constrained by short-term liquidity needs*. These characteristics form the basis for a set of active strategies. In our assessment, two of these strategies align closely with the Fund's advantages, while two pose greater challenges.

Success 1: Market exposure strategy

This strategy consists of positioning around market events and lending out securities. In both the equity and fixed-income portfolios, it has delivered solid results. Although the percentage returns are often small, the Fund's large capital base means that even modest gains translate into substantial amounts in "kroner and øre." The Fund's distinctive characteristics also give it a clear advantage in this type of strategy.

Recent research examines how the rise of passive investing affects market competitiveness and institutional demand elasticity, with implications for price impact and liquidity provision. This literature, see, for example, Haddad et al. (2025), is directly relevant for understanding the economic foundations of enhanced-indexing strategies.

Success 2: Security selection strategy

This strategy involves selecting individual securities on the basis of the Fund's own research. The analysis is carried out either by internal managers or by external managers. External managers have delivered the majority of the active return, even after relatively high costs. Here too, there is a strong alignment between the Fund's structural advantages and the strategy. Security selection is also intended to integrate with the Fund's ownership activities, reinforcing the link between investment insight and active ownership.

Challenge 1: Allocation strategy

In contrast to selection, this strategy concerns more top-down active decisions, for example underweighting equities. Allocation strategies have produced more mixed results. In the last four-year period, the strategy

benefited from a successful position related to interest-rate developments, but the underweight in equities has so far cost a considerable amount of return. From Figure 10, which shows the total-fund factor exposure, we observe a clear shift across sample periods: whereas the earlier MKT exposure generated 6 basis points annually, it has resulted in an annual loss of 13 basis points in the most recent four years. The latter is larger than the net factor-adjusted alpha earned over the same period.

Independent of ex-post outcomes, such positions require a clear ex-ante rationale. Here, we find it difficult to identify a justification for top-down allocation bets that follows directly from the Fund's structural advantages. These positions can have large effects, and many other investors attempt to take similar bets. One feature that aligns with the Fund's characteristics is its capacity to carry strategies that require long verification horizons.

Maintaining a short position in equities over time is expected to be costly because equities are generally expected to earn a positive risk premium. One might argue that this is motivated by risk management, but the characteristics of the Fund suggest that it is structurally better suited to *selling* insurance rather than *buying* it, indicating that such positions are active choices rather than pure risk-management adjustments.

Moreover, if risk management were the primary driver of the allocation strategy, we would expect to observe higher market betas in the subportfolios. Our results do not support this. At the aggregate level, the Fund's beta with respect to MKT is lower, as shown in Figure 9. We also document a reduction in MKT exposure in the top-level allocation strategy itself; see Figure 13. This would imply that the remaining portfolios should exhibit *higher* MKT exposure. In contrast, the overall equity portfolio shows a decrease in MKT exposure, as presented in Figure 19 and Figure 20.

There is also an important cost dimension. Risk management at the aggregate level can unintentionally introduce new challenges. Suppose, for example, that individual portfolio managers adopt an overweight in technology, which is then offset at the aggregate level. In a rising market, the Fund may end up paying substantial performance fees to those managers, while the asset owner only earns the benchmark return. If technology underperforms, the Fund again ends up close to the benchmark. In effect, this constructs a costly index fund. Moreover, offsetting positions from the top of the organization can undermine trust internally.

Challenge 2: Real estate investments

Since 2017, the management model has evaluated real estate decisions in relation to a combination of equity and fixed income. Because equities have performed well, real estate investments appear weak. From Figure 41, the cumulative value added is negative, at about 130 billion NOK.

Following one of the suggestions in Bauer et al. (2022), we are skeptical of the current funding model. Within this framework, maintaining a more diversified portfolio consumes a greater portion of the active risk budget. We believe that the model encourages a short-term assessment of real estate and does not reflect the long-term role of the asset class in the portfolio. A large, long-term investor should dedicate part of its portfolio to the broad global investment universe, including real estate. Excluding real estate effectively amounts to taking an active position.

The primary rationale for investing in real estate is diversification. However, even with nearly 15 years of real estate investments, the period may still be too short to establish whether diversification has delivered a clear and measurable payoff.

Regardless of the benchmark choice, real estate investments have performed worse than both the combination of equities and fixed income and the broader real estate market.

We suggest introducing an additional, intermediate reporting step between the funding benchmark and the realized return. This would make it easier to communicate active returns for real assets. We acknowledge that there are challenges related to selecting an appropriate index, but we believe that the benefits outweigh these difficulties. The same reasoning applies to all unlisted asset classes, including any potential private equity allocation.

It is also our impression, based on NBIM (2025), that the new real estate strategy will reduce the scope for selection decisions, making the portfolio more similar to a real estate index. In that case, most deviations from the funding benchmark will stem from allocation. The proposed reduction in the equity share of the funding benchmark will also increase expected returns.

For active management, it is essential to establish clear accountability for the various positions taken. The separate accounts within the Fund clarify some of these responsibilities, but looking ahead, it remains crucial to

define who is responsible for the real-asset portfolio. In NBIM, 2025 different solutions are discussed with respect to the real estate portfolio; however, the question of whether to maintain the asset class or not is *not* discussed. Furthermore, the trade off between listed and unlisted real estates should be examined. A foundational discussion on this topic is provided in van Nieuwerburgh et al., 2015 and NBIM, 2023a.

Currently, it is not obvious where the ultimate responsibility lies. It appears that the Executive Board makes some of the key allocation decisions and then delegates implementation through the organization. This makes it difficult for any single party to be clearly responsible for the results. Furthermore, the challenge with a new strategy is that it needs time and new data before it can be evaluated.

All in all

In conclusion, the Fund continues to generate solid results. However, active management is not an area in which one can afford complacency, and there remains scope for further improvement. In environments with substantial noise, it is essential to evaluate performance over long horizons and to avoid simplistic interpretations. We hope that this report will serve as a constructive tool for continued development.

References

Akey, P., Robertson, A., & Simutin, M. (2021). *Noisy Factors* (tech. rep.). University of Toronto. Available at: https://ssrn.com/abstract=3930228.

Ang, A. (2014). *Asset Management: A Systematic Approach to Factor Investing*. Oxford University Press.

Ang, A., Brandt, M. W., & Denison, D. F. (2014). *Review of the Active Management of the Norwegian Government Pension Fund Global* (tech. rep.). Norwegian Ministry of Finance. Available at: https://www.regjeringen.no/globalassets/upload/fin/statens-pensjonsfond/eksterne-rapporter-og-brev/2014/angbrandtdenison_2014.pdf.

Ang, A., Goetzmann, W. N., & Schaefer, S. M. (2009). *Evaluation of active management of the Norwegian Government Pension Fund Global* (tech. rep.). Norwegian Ministry of Finance. Available at: https://www.regjeringen.no/globalassets/upload/fin/statens-pensjonsfond/eksterne-rapporter-og-brev/ags-report.pdf.

Barber, B. M., & Odean, T. (2013). The Behavior of Individual Investors. In *Handbook of the economics of finance* (pp. 1533–1570, Vol. 2). Elsevier.

Bauer, R., Christiansen, C., & Døskeland, T. (2022). *A Review of the Active Management of Norway's Government Pension Fund Global*. Available at: https://ssrn.com/abstract=4003433.

Berk, J. B., & van Binsbergen, J. H. (2015a). *Measuring Skill in the Mutual Fund Industry*. JOURNAL OF FINANCIAL ECONOMICS, 118(1), 1–20.

Berk, J. B., & van Binsbergen, J. H. (2015b). *Measuring skill in the mutual fund industry*. JOURNAL OF FINANCIAL ECONOMICS, 118(1), 1–20. https://doi.org/10.1016/j.jfineco.2015.05.002

Black, F. (1986). *Noise* [Publisher: Wiley Online Library]. JOURNAL OF FINANCE, 41(3), 528–543.

Brinson, G. P., Hood, L. R., & Beebower, G. L. (1995). *Determinants of Portfolio Performance* [Publisher: Taylor & Francis]. FINANCIAL ANALYSTS JOURNAL, 51(1), 133–138.

Chinco, A., & Sammon, M. (2024). *The passive ownership share is double what you think it is*. JOURNAL OF FINANCIAL ECONOMICS, 157, 103860. https://doi.org/10.1016/j.jfineco.2024.103860

Comerton-Forde, C., Duffie, D., & Zhao, X. (2025). *Etf effects: The role of primary versus secondary market activity*. JOURNAL OF FINANCIAL MARKETS, 73, 101890. https://doi.org/10.1016/j.finmar.2025.101890

Dahlquist, M., & Ødegaard, B. A. (2018). *A Review of Norges Bank's Active Management of the Government Pension Fund Global* (tech. rep.). Norwegian Ministry of Finance. Available at: https://www.regjeringen.no/contentassets/7fb88d969ba34ea6a0cd9225b28711a9/review_dahlquistodegaard_2018.pdf.

Dahlquist, M., Polk, C., Priestley, R., & Ødegaard, B. A. (2015). *Norges Bank's Expert Group on Principles for Risk Adjustment of Performance Figures – Final Report* (tech. rep.). Norges Bank Investment Management. Available at: https://www.nbim.no/contentassets/f04b97db0e704572bfbda10525a6a3fc/expert_group_final_report_nov_2015.pdf.

Døskeland, T. M. (2025). *Long-term asset management: Norwegian sovereign wealth fund examples* [Available at Amazon: B0DS8YYK6V]. Self published.

Fama, E. F. (1970). *Efficient Capital Markets: A Review of Theory and Empirical Work*. JOURNAL OF FINANCE, 25(2), 383–417.

Fama, E. F., & French, K. R. (2015). *A Five-Factor Asset Pricing Model*. JOURNAL OF FINANCIAL ECONOMICS, 116(1), 1–22.

French, K. R. (2008). *Presidential Address: The Cost of Active Investing*. JOURNAL OF FINANCE, 63(4), 1537–1573.

Gârleanu, N., & Pedersen, L. H. (2018). *Efficiently Inefficient Markets for Assets and Asset Management*. JOURNAL OF FINANCE, 73(4), 1663–1712.

Grinold, R. C. (1989). *The Fundamental Law of Active Management* [Publisher: Institutional Investor Journals Umbrella]. JOURNAL OF PORTFOLIO MANAGEMENT, 15(3), 30–37.

Grinold, R. C., & Kahn, R. N. (2000). *Active Portfolio Management*. McGraw Hill New York.

Grossman, S. J., & Stiglitz, J. E. (1980). *On the Impossibility of Informationally Efficient Markets*. AMERICAN ECONOMIC REVIEW, 70(3), 393–408.

Haddad, V., Huebner, P., & Loualiche, E. (2025). *How Competitive Is the Stock Market? Theory, Evidence from Portfolios, and Implications for the Rise of Passive Investing* [Publisher: American Economic Association]. AMERICAN ECONOMIC REVIEW, 115(3), 975–1018. https://doi.org/10.1257/aer.20230505

Jensen, M. C. (1968). *The Performance of Mutual Funds in the Period 1945–1964* [Publisher: JSTOR]. JOURNAL OF FINANCE, 23(2), 389–416.

Ministry of Finance. (2023). *GPFG's Investment Mandate* (tech. rep.). Norwegian Ministry of Finance. Available at: https://www.regjeringen.no/contentassets/9d68c55c272c41e99f0bf45d24397d8c/2023.02.27_gfpg_management_mandate.pdf.

NBIM. (2017). *Review of Norges Bank's management of the Government Pension Fund Global* (Letter to Ministry of Finance). Norges Bank Investment Management. Available at: https://www.nbim.no/en/publications/submissions-to-ministry/2017/review-of-norges-banks-management-of-the-government-pension-fund-global/.

NBIM. (2020). *Investing in Real Estate* (tech. rep.). Norges Bank Investment Management. Available at: https://www.nbim.no/contentassets/5e6fa39b89564c33b54935780416172d/investing-in-real-estate_the-10-year-history.pdf.

NBIM. (2021). *Review of the management of the Government Pension Fund Global* (Letter to Ministry of Finance). Norges Bank Investment Management. Available at: https://www.nbim.no/contentassets/d624c8017f2c4c2787b699e80db3c8a5/review-of-the-management-of-the-government-pension-fund-global.pdf.

NBIM. (2022). *Government Pension Fund Global Annual Report 2020* (tech. rep.). Norges Bank Investment Management. Available at: https://www.nbim.no/en/news-and-insights/reports/2022/annual-report-2022/.

NBIM. (2023a). *Drivers of listed and unlisted real estate returns* (tech. rep.). Norges Bank Investment Management. Available at: https://www.nbim.no/contentassets/906061453cf44ba5936f3e6c1dd0a1cd/drivers-of-listed-and-unlisted-real-estate-returns.pdf.

NBIM. (2023b). *Government Pension Fund Global Annual Report 2023* (tech. rep.). Norges Bank Investment Management. Available at: https://www.nbim.no/contentassets/594a78d6810040b8931d01306d502caa/gpfg-annual-report_2023.pdf.

NBIM. (2024a). *Factor and risk-adjusted return 2024* (tech. rep.). Norges Bank Investment Management. Available at: https://www.nbim.no/contentassets/fdd69abfff8445cc967c30322b2d3968/factor-and-risk-adjusted-return_2024.pdf.

NBIM. (2024b). *Government Pension Fund Global Annual Report 2024* (tech. rep.). Norges Bank Investment Management. Available at: https://www.nbim.no/contentassets/490f9f062cfc4694b12c45f4d04ab0a5/annual_report_2024.pdf.

NBIM. (2025). *Review of Norges Bank's management of the Government Pension Fund Global* (Letter to Ministry of Finance). Norges Bank Investment Management. Available at: https://www.nbim.no/contentassets/a4acf1b6b37d402c9959e27877ad0677/gpfg_review-of-norges-banks-management-of-the-government-pension-fund-global.pdf.

Newey, W. K., & West, K. D. (1987). *A Simple, Positive Semi-Definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix*. ECONOMETRICA, 55(3), 703–708. https://doi.org/10.2307/1913610

Pedersen, L. H. (2018). *Sharpening the Arithmetic of Active Management*. FINANCIAL ANALYSTS JOURNAL, 74(1), 21–36.

Sammon, M. (2025). *Passive ownership and price informativeness*. MANAGEMENT SCIENCE, 71(6), 4582–4598.

Sharpe, W. F. (1991). *The Arithmetic of Active Management*. FINANCIAL ANALYSTS JOURNAL, 47(1), 7–9.

van Nieuwerburgh, S., Stanton, R., & de Bever, L. (2015). *A Review of Real Estate and Infrastructure Investments by the Norwegian Government Pension Fund Global (GPFG)* (tech. rep.). Norwegian Ministry of Finance. Available at: https://www.regjeringen.no/contentassets/f353169233704a55b3af6b0b36fb3129/ekspertrapport_eiendom_infrastruktur.pdf.

Appendices

A Mandate

(translated from Norwegian):

The group shall analyze and assess the results of Norges Bank's active management of the Government Pension Fund Global (the Fund). The group may base its work on analyses that Norges Bank has published on its website or request additional analyses or data from Norges Bank. The analyses may use return figures up to and including December 2024. The findings shall be presented in a public report to be submitted to the Ministry of Finance by December 1, 2025. The report shall present and assess the following points:

1. **A review of the results and risk in Norges Bank's active management of the GPFG.** The review shall include analyses and assessments of:
   a) The return and risk of the Fund and its equity and fixed-income portfolios compared to relevant indices.
   b) The relative return and risk of Norges Bank's main strategies and key substrategies.
   c) The risk-adjusted relative return of the portfolios and strategies mentioned above.
2. **A review of the results and risk in Norges Bank's management of real assets** (real estate and unlisted infrastructure for renewable energy), within the limitations set by available data. The listed and unlisted real estate portfolios shall be assessed separately and together. The review shall include:
   a) Analyses and assessments of the results and risk of the Fund's real assets compared to the financing.
   b) Analyses and assessments of the results and risk of the Fund's real assets compared to relevant market indices.
   c) An assessment of the risk-adjusted relative return of the Fund's real assets.
   d) Analyses and assessments of the extent to which the Fund's investments in real assets and associated financing since 2017 have contributed to the Fund's return without significantly increasing the fund's overall long-term risk.
3. **A qualitative assessment of Norges Bank's current main strategies and significant substrategies in the management of the Fund.** The assessment shall include discussions on:

a) Theoretical and empirical basis,

b) Known return and risk characteristics,

c) Evaluation horizons,

d) Scalability.

4. **An assessment of Norges Bank's opportunities to achieve excess returns** in the management of the Fund compared to the current strategic index, given the Fund's characteristics as a large, state-owned fund with a long investment horizon.
5. **An assessment of whether Norges Bank's public reporting on strategies, returns, and risk is well-suited** to evaluate Norges Bank's achieved results in the management of the Fund.

B The Fund

The Fund was established in 1986 by the Norwegian government to accumulate surplus from Norway's petroleum revenues. The intention was that this windfall gain should benefit future generations. The first capital transfer to the Fund took place in 1996.

Figure 1 illustrates the governance structure that underpins the Fund's management. The Norwegian people, represented by the Parliament and associated institutions such as the Ministry of Finance (MoF), are the asset owner. The asset owner sets the risk tolerance, investment beliefs, and preferences that define the Fund's long-term strategy. The Ministry of Finance issues a mandate consistent with this strategy, and this mandate forms the foundation for NBIM's asset-management activities (see Ministry of Finance, 2023). The Executive Board of Norges Bank holds formal responsibility for the mandate, and operational implementation is delegated to Norges Bank Investment Management (NBIM), a specialized unit within Norges Bank. NBIM therefore acts as the asset manager on behalf of the Norwegian people.

Strategies

- Strategy 10
- Strategy 13
- Strategy 16

- Strategy 19
- Strategy 20
- Strategy 22

C Data

Investment returns for the Fund

Some of the data series for the Fund are available on NBIM's website. Other items were obtained directly from NBIM. For returns at the highest portfolio levels and the main investment strategies, see the Annual report 2024.

Factor variables

As a baseline, we use a seven-factor model with the following factors:

- MKT: Market, the return on a world market portfolio minus the US one-month T-bill rate
- SMB: Small minus big, the return on a small stock portfolio minus the return on a big stock portfolio.
- HML: High minus low, the return on a value portfolio minus the return on a growth portfolio.
- RMW: Robust minus weak, the return on a robust-operating-profitability portfolio minus the return on a weak-operating-profitability portfolio. Often labeled a quality factor.
- CMA: Conservative minus aggressive; the return on a conservative investment portfolio minus the return on an aggressive investment portfolio. Also, often labeled a quality factor.
- TERM: Term premium, the return on a global index of Treasuries with maturities above ten years minus the return on a global Treasury index with maturities of one to three years.
- WML: Momentum, the return on the winner portfolio minus the return on the loser portfolio.
- DEF: Duration-adjusted default premium, the return on a portfolio of corporate bonds minus the return on a portfolio of Treasury bonds. The maturities exceed ten years and are adjusted for differences in duration.

Factors from Kenneth French' data library

We obtained six factors, MKT, SMB, HML, RMW, CMA, and WML, on July 28th, 2025, from Kenneth French's data library: Five-factor, and MOM factor. As shown in Akey et al. (2021), these factors vary with factor vintage.

Factors from NBIM

We obtained two factors, TERM and DEF, from NBIM. These factors are used in, and further described in, the NBIM Factor and Risk Adjusted Report (NBIM, 2024a).

Realized total return and risk

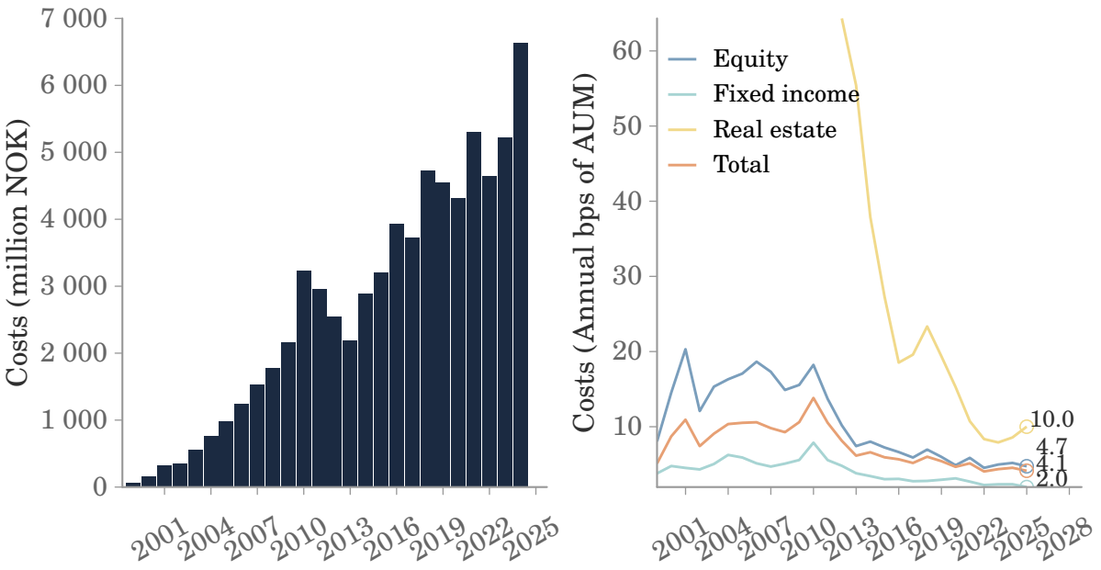
In this section, we examine the Fund's total gross and net returns and the benchmark's total returns. To identify net returns, we must account for costs.

Costs

For both the Fund and the fictitious benchmark portfolio, costs can be divided into two categories: transaction costs from trading financial assets, and management costs from operating the Fund. We discuss these categories separately.

- **Transaction costs:** The Fund's returns are reported net of transaction costs. Management costs are published separately. In the following, we use "costs" as shorthand for management costs.
- **Management costs:** Management costs include all costs related to operating the Fund and also include performance-related costs. An increase in costs may therefore reflect increased value creation from active management. NBIM publishes annual cost data. For monthly analysis, we distribute annual costs evenly across the twelve months. Figure C.1 shows the development of total costs.

Figure C.1. Fund annual management costs
This figure shows the development of fund level management costs. The left panel reports annual management fees in million NOK, and the right panel reports costs as annual basis points of total fund assets. Results are presented for the equity, fixed income, and real estate portfolios, as well as the aggregate fund.



The Fund allocates costs across its portfolios. We take the cost allocations in Figure C.1 as given, although the underlying allocation process can always be debated.

Benchmark

- **Transaction costs:** Although the Fund's returns account for transaction costs, benchmark returns do not. The benchmark portfolio would also incur costs from investing in companies and from changes in portfolio weights. True value creation should therefore be measured as active return net of all costs, compared with an estimate of the costs of implementing the benchmark. As benchmark returns reflect a fictitious portfolio, estimating passive implementation costs is not straightforward.
- **Security lending:** Because security-lending income is included in the Fund's returns, a similar income stream should also be attributed to the benchmark, as a passive index fund can lend securities as well.
- **Management costs:** Estimated management costs for a passive strategy are based on the Fund's actual annual management costs, with costs related to active strategies subtracted.

We assume that benchmark transaction costs, management costs, and security-lending revenues are of roughly similar magnitudes and therefore offset each other. Consequently, we leave the benchmark unadjusted for costs. This should be interpreted as a conservative assumption; see NBIM, 2025 for NBIM's own estimates.

Realized gross and net total return and risk

A commonly used risk-adjusted metric is the Sharpe ratio, which accounts for return and the associated level of risk. It is calculated by dividing the average excess return of the portfolio by the standard deviation of its returns. The Sharpe ratio therefore measures how much excess return is generated per unit of risk.[23] Throughout this report, we convert monthly figures to annual terms by multiplying monthly returns by 12 and monthly standard deviations by the square root of 12. Table C.1 reports summary statistics for annualized monthly Fund, equity, and fixed-income returns.

For the full sample, the annualized arithmetic mean returns of the Fund's total gross, net, and benchmark portfolios are 6.72%, 6.65%, and 6.46%, respectively. By construction, geometric mean returns are lower than arithmetic means. In most of the analysis, we rely on arithmetic means (for example, Dahlquist & Ødegaard, 2018). The annualized standard deviations of the Fund and benchmark portfolios are 11.13% and 10.91%, respectively. The higher return of the Fund has come with slightly higher risk. Sharpe ratios are marginally above the benchmark.

In the recent sample period, Fund returns exceed benchmark returns, while total risk is lower. Sharpe ratios are again similar, at a much lower level of about 0.15, reflecting returns below the long-term average.

For the equity portfolio in the full sample, average gross, net, and benchmark returns are 8.37%, 8.26%, and 7.98%. The corresponding standard deviations are 16.55% and 16.31%. Sharpe ratios are similar and slightly below 0.40. For the most recent sample, return and risk characteristics are broadly unchanged.

For fixed income in the full sample, average gross, net, and benchmark returns are 3.92%, 3.88%, and 3.67%. Standard deviations are 7.14% and 7.01%. Sharpe ratios are around 0.25. Sharpe ratios are higher for equities than fixed income because the return differential outweighs the difference in volatility.

[23] We use the US one-month Treasury bill rate as our measure of the risk-free rate. Data on the T-bill rate are obtained from Kenneth French's data library.

Table C.1. Fund: Total return and risk

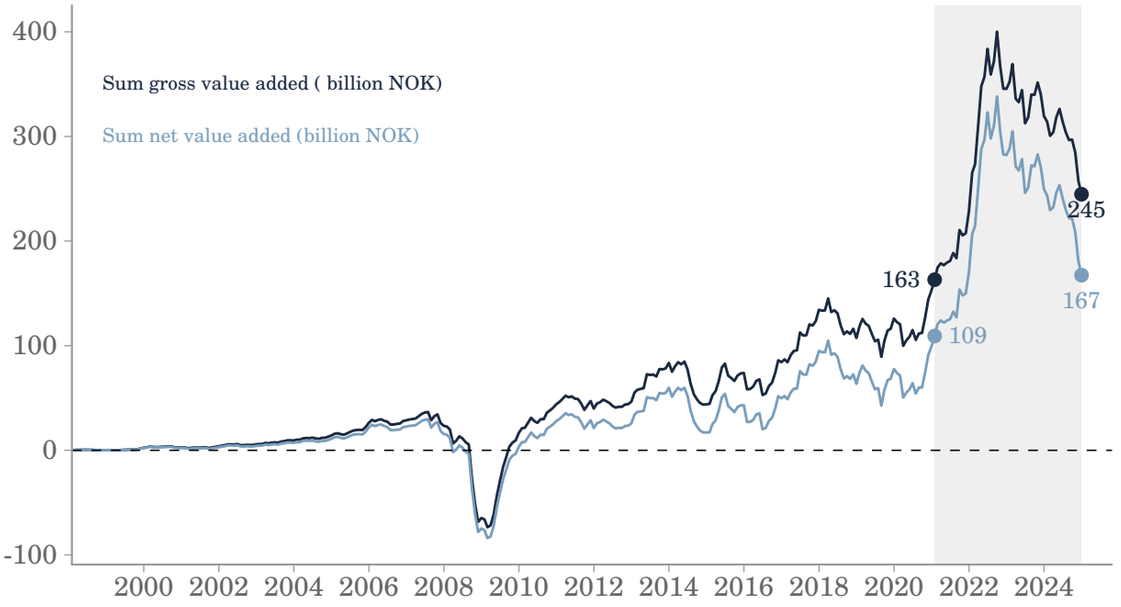
This table reports key return and risk statistics for the gross, net, and benchmark returns of the total Fund portfolio, the equity portfolio, and the fixed income portfolio. All returns are expressed in percent and measured in USD. Reported statistics include the annualized geometric mean, arithmetic mean, standard deviation, Sharpe ratio, and the number of observations, N. Results are presented for the full sample from 1998 through 2024 and for the most recent sample from 2021 through 2024.

	Fund portfolio			Equity portfolio			Fixed-income portfolio		
Return:	Gross	Net	Bench	Gross	Net	Bench	Gross	Net	Bench
Full sample (1998–2024)									
Geo. mean	6.10	6.03	5.86	6.98	6.87	6.63	3.66	3.62	3.42
Arit. mean	6.72	6.65	6.46	8.37	8.26	7.98	3.92	3.88	3.67
Standard deviation	11.13	11.13	10.91	16.55	16.55	16.31	7.14	7.14	7.01
Sharpe ratio	0.43	0.42	0.41	0.39	0.38	0.37	0.27	0.27	0.24
N	324	324	324	323	323	323	324	324	324
Recent sample (2021–2024)									
Geo. mean	4.08	4.04	3.80	7.24	7.19	7.09	−4.22	−4.25	−4.91
Arit. mean	4.86	4.82	4.62	8.36	8.31	8.21	−3.89	−3.91	−4.55
Standard deviation	12.58	12.58	12.88	15.10	15.10	15.10	8.29	8.29	8.62
Sharpe ratio	0.16	0.16	0.14	0.37	0.36	0.36	−0.81	−0.81	−0.86
N	48	48	48	48	48	48	48	48	48

D Appendix fund assessment

Value added and returns

Figure D.1. Fund: Sum value added
This figure shows the time series of cumulative gross and net sum value added for the Fund from 1998 through 2024, expressed in billion NOK. Sum value added is constructed by taking the cumulative sum of monthly value added, without compounding. Gross value added is measured before costs, and net value added is measured after all reported costs. The shaded area highlights the most recent sample period from 2021 through 2024, and the labeled endpoints show the change in cumulative gross value added from 163 to 245 billion NOK and in cumulative net value added from 109 to 167 billion NOK over this subperiod. Returns and assets under management are measured in NOK.

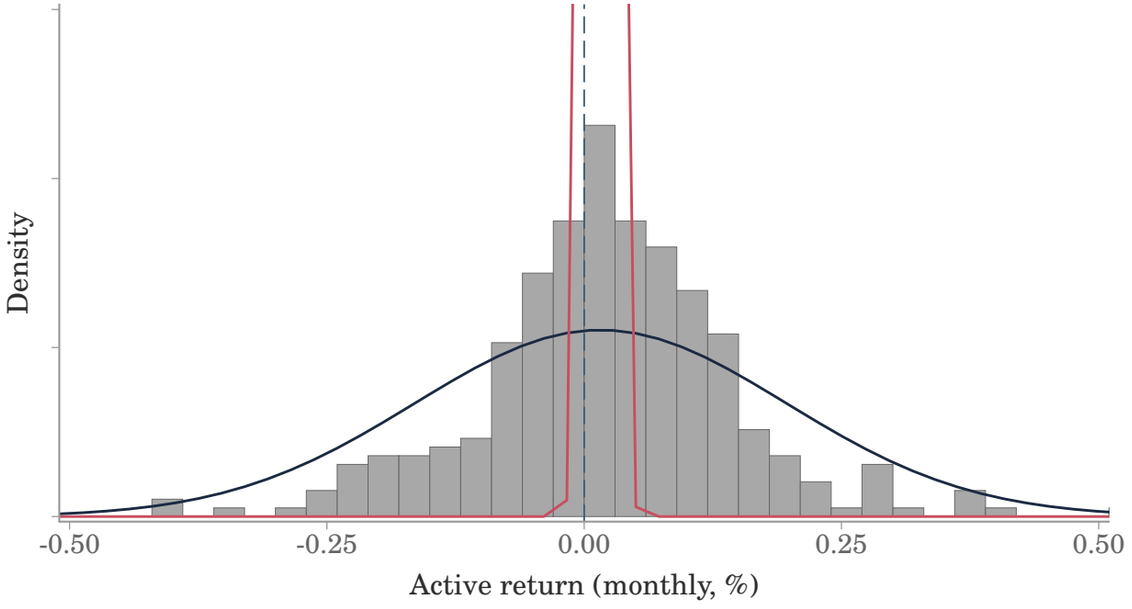


Histogram active returns

In Figure D.2, the gray bars show the histogram of monthly active returns. The green vertical line marks zero. The distribution is almost symmetric, with slightly more mass on the positive side. The blue curve is the density of a normal distribution with the same mean and standard deviation as the active returns. The red curve is the density with the same mean but a standard deviation equal to the standard deviation of the active returns divided by the square root of the number of observations, which serves as a proxy for the standard error. The main

Figure D.2. Fund: Histogram of net active returns

This figure shows the distribution of the Fund's monthly net active returns from 1998 through 2024, expressed in percent and measured in USD. The histogram displays the realized monthly returns, and the solid blue curve represents a normal density with the same mean and standard deviation as the sample. The red curve shows the corresponding sampling distribution of the mean under the assumption of independent monthly observations.



message is that active returns fluctuate substantially. As a result, statistical power is limited, and it is difficult to reject the null hypothesis of no skill, i.e., a zero mean.

Hypothesis testing

To avoid incorrect conclusions, we use statistical inference to assess whether performance measures reliably indicate skill. To evaluate active-return performance, we test the null hypothesis that the true average active return is zero against the alternative that it is nonzero. The null hypothesis attributes active returns to luck, while the alternative attributes them to skill. The p-value of the test statistic provides evidence against the null. A low p-value leads to rejection of the null. A commonly used significance level is 0.05, which implies that 1 in 20 rejections of the null hypothesis may be mistaken, i.e., conclusions about NBIM having skill when they in reality have been lucky.

The goal of separating skill from luck is to identify whether NBIM has created value beyond what could be generated by simple, well-known strategies that unskilled investors could implement. When we evaluate the returns, we do not know NBIM's original expectations or whether those expectations were reasonable. We only observe the realized returns and hope that the noise in the outcomes does not obscure the evaluation of the NBIM's true underlying ability. Because of this, we use statistical analysis to help us separate skill from luck. We also assume that the drivers of returns are stable over the sample period. In practice, the underlying regime may change, for example due to managerial turnover or macroeconomic shifts. To account for time variation, we evaluate the recent subsample separately.

Statistical evaluation and risk adjustment

Table D.1 reports mean active returns, before and after costs, for the full sample and the most recent period. Stars denote statistical significance at the 1%, 5%, and 10% levels. We also report p-values so readers may draw their own conclusions. For the full sample, mean active returns are not significantly different from zero at standard significance levels (the p-values are 0.20 and 0.35). Thus, we cannot reject the hypothesis that long-run active performance is neutral. For the recent period, the p-values are 0.39 for gross active returns and 0.48 for net active returns. Performance in the recent period is therefore also not significantly positive.

Table D.1. Fund: Mean active returns
This table reports the gross and net mean annualized active returns for the Fund, expressed in percent and measured in USD. Newey and West (1987) standard errors are shown in parentheses. N refers to the number of observations in the sample. Stars indicate statistical significance. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
Mean	0.27	0.19	0.24	0.20
	(0.21)	(0.21)	(0.28)	(0.28)
p-value	0.20	0.35	0.39	0.48
N	324	324	48	48

Benchmark risk-adjusted performance

The first regression-based, risk-adjusted measure is Jensen's alpha, where the only risk adjustment is for the benchmark, analogous to the CAPM. Jensen's alpha is the estimated intercept from regressing the portfolio's excess return on the benchmark's excess return (Jensen, 1968). It measures the average return on the portfolio minus the return predicted by the CAPM, which depends on the portfolio's estimated beta and its systematic risk. A related metric is the appraisal ratio (AR), defined as Jensen's alpha divided by the portfolio's unsystematic risk (the standard deviation of the regression residual).

We use CAPM to risk-adjust the performance of the Fund using the Fund's benchmark in place of the market portfolio. Within this model, all differences in expected return are explained by the beta that measures the systematic risk of the portfolio. We estimate CAPM-based performance by regressing the Fund's excess returns on the benchmark's excess returns:

$$R_t - R_t^{\mathrm{f}} = \alpha + \beta\left(R_t^{\mathrm{B}} - R_t^{\mathrm{f}}\right) + \epsilon_t, \tag{3}$$

where R_t^{f} is a proxy for the risk-free rate, and ϵ_t is the regression residual. The slope coefficient is the Fund's estimated beta relative to the benchmark, and the intercept is Jensen's alpha, which corresponds to the beta-adjusted mean active return. An equivalent interpretation is the amount by which the Fund outperforms a combination of the benchmark and borrowing or lending at the risk-free rate that has the same risk as the benchmark.

Table D.2. Fund: Mean beta-adjusted active returns

This table reports the estimated annualized α and β from Equation (3) using gross and net returns, expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. R^2 denotes the explanatory power of the regression, and AR denotes the appraisal ratio. Stars indicate whether α is significantly different from zero and whether β is significantly different from one. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
α	0.18	0.11	0.28	0.24
	(0.19)	(0.20)	(0.22)	(0.22)
p-value	0.35	0.58	0.19	0.27
β	1.02*	1.02*	0.98***	0.98***
	(0.01)	(0.01)	(0.003)	(0.003)
p-value	0.08	0.08	<0.01	<0.01
N	324	324	48	48
R^2	1.00	1.00	1.00	1.00
AR	0.31	0.18	0.77	0.65

Factor risk-adjusted performance

We estimate multivariate regressions of active returns, both before and after costs, on various sets of factor returns. The dependent variable is the active return. This allows us to examine which factors explain the difference between the portfolio's total returns and those of the benchmark. The estimated slope coefficients represent active exposures to systematic factors over the sample period and, therefore, describe the Fund's active investment style. For example, a positive exposure to the book-to-market factor indicates a value tilt, while a negative exposure indicates a growth tilt. The regression intercept measures performance attributable to value creation beyond the factor exposures, and we refer to it as alpha.

We evaluate performance using several specifications of the five-factor model introduced by Fama and French (2015). Given the large "factor zoo," we regard parsimonious versions of this framework as the prevailing benchmark in empirical finance. This model is also recommended by NBIM's factor-model expert group (Dahlquist et al., 2015). Therefore, NBIM might expect to be evaluated by it, although this is not explicitly stated by the MoF. The report recommends a seven-factor model that combines the global version of the Fama and French (2015) model with the term premium and default factors.

We therefore consider the seven-factor model

$$R_t^{\mathrm{A}} = \alpha + \beta_{MKT} MKT_t + \beta_{SMB} SMB_t + \beta_{HML} HML_t + \beta_{RMW} RMW_t + \beta_{CMA} CMA_t + \beta_{TERM} TERM_t + \beta_{DEF} DEF_t + \epsilon_t, \quad (4)$$

where the factors are excess returns or zero-cost portfolios, and ϵ_t is the regression residual. MKT is the market excess return, SMB is the small-minus-big portfolio, HML is the high-minus-low portfolio, RMW is the robust-minus-weak portfolio, CMA is the conservative-minus-aggressive portfolio, TERM is the term premium, and DEF is the duration-adjusted default premium. In robustness checks, we also include the momentum factor. For the equity and fixed-income portfolios, we use restricted versions of the model tailored to each asset class. Additional information on the factors is provided in Appendix C. Challenges and limitations of factor models are discussed in Bauer et al. (2022).

Table D.3. Fund: Factor-model risk adjustment

This table reports the estimated coefficients from the factor model in Equation (4) for the Fund. The intercept α is annualized, and all returns are expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. N denotes the number of observations, and R^2 reports the explanatory power of the regression. Stars indicate whether α or the factor loadings differ significantly from zero. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
α	0.21	0.14	0.15	0.11
	(0.15)	(0.15)	(0.11)	(0.11)
p-value	0.16	0.37	0.19	0.34
MKT	0.01***	0.01***	−0.02 **	−0.02 **
	(0.003)	(0.003)	(0.01)	(0.01)
p-value	0.01	0.01	0.04	0.04
SMB	0.03***	0.03***	0.003	0.003
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	<0.01	<0.01	0.76	0.76
HML	0.01*	0.01*	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.07	0.07	0.47	0.47
RMW	0.01	0.01	0.003	0.003
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.28	0.28	0.75	0.75
CMA	−0.03 **	−0.03 **	0.00	0.00
	(0.01)	(0.01)	(0.02)	(0.02)
p-value	0.04	0.04	0.98	0.98
TERM	−0.02 ***	−0.02 ***	−0.01	−0.01
	(0.005)	(0.005)	(0.01)	(0.01)
p-value	<0.01	<0.01	0.39	0.39
DEF	0.02	0.02	0.02***	0.02***
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.14	0.13	0.01	0.01
N	324	324	48	48
Adjusted R^2	0.37	0.37	0.42	0.42

Table D.4. Fund: Factor-exposure analysis

This table reports the Fund's factor exposures and the corresponding contribution of each factor to the Fund's average return. The Estimate column shows the estimated factor loadings, the Mean column shows the average factor returns, and the Product column reports the return contribution obtained by multiplying the two. All returns are expressed in percent and measured in USD. The bottom rows report the sum of all factor contributions, the resulting net α, the cost adjustment, and the gross mean active return.

	Full sample (1998–2024)			Recent sample (2021–2024)		
Factor	Estimate	Mean	Product	Estimate	Mean	Product
MKT	0.01	6.75	0.06	−0.02	6.89	−0.13
SMB	0.03	0.24	0.01	0.003	−7.47	−0.02
HML	0.01	2.38	0.03	0.01	8.75	0.08
RMW	0.01	4.02	0.03	0.003	3.34	0.01
CMA	−0.03	2.46	−0.06	0.00	5.56	0.003
TERM	−0.02	2.03	−0.05	−0.01	−8.18	0.08
DEF	0.02	1.97	0.04	0.02	4.11	0.07
Factor sum			0.05			0.09
Net α			0.14			0.11
Costs			0.08			0.04
Gross mean			0.27			0.24

Factor risk-adjusted performance including momentum factor

Table D.5. Fund: Factor-model risk adjustment (including momentum)

This table reports the estimated coefficients from the factor model in Equation (4) for the Fund. The intercept α is annualized, and all returns are expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. N denotes the number of observations, and R^2 reports the explanatory power of the regression. Stars indicate whether α or the factor loadings differ significantly from zero. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
α	0.20	0.12	0.16	0.12
	(0.17)	(0.17)	(0.12)	(0.12)
p-value	0.25	0.48	0.19	0.34
MKT	0.01**	0.01**	−0.02 **	−0.02 **
	(0.004)	(0.004)	(0.01)	(0.01)
p-value	0.02	0.02	0.04	0.04
SMB	0.03***	0.03***	0.00	0.00
	(0.005)	(0.005)	(0.01)	(0.01)
p-value	<0.01	<0.01	0.95	0.95
HML	0.02*	0.02*	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.08	0.08	0.63	0.63
RMW	0.01	0.01	0.00	0.00
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.30	0.31	0.96	0.96
CMA	−0.03 **	−0.03 **	0.003	0.003
	(0.01)	(0.01)	(0.02)	(0.02)
p-value	0.05	0.05	0.87	0.87
WML	0.002	0.002	−0.004	−0.004
	(0.002)	(0.002)	(0.01)	(0.01)
p-value	0.37	0.35	0.56	0.56
TERM	−0.02 ***	−0.02 ***	−0.01	−0.01
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	<0.01	<0.01	0.29	0.29
DEF	0.02*	0.02*	0.02**	0.02**
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.07	0.07	0.03	0.03
N	324	324	48	48
Adjusted R^2	0.37	0.37	0.41	0.41

Table D.6. Fund: Factor-exposure analysis (including momentum)
This table reports the Fund's factor exposures and the corresponding contribution of each factor to the Fund's average return. The Estimate column shows the estimated factor loadings, the Mean column shows the average factor returns, and the Product column reports the return contribution obtained by multiplying the two. All returns are expressed in percent and measured in USD. The bottom rows report the sum of all factor contributions, the resulting net α, the cost adjustment, and the gross mean active return.

	Full sample (1998–2024)			Recent sample (2021–2024)		
Factor	Estimate	Mean	Product	Estimate	Mean	Product
MKT	0.01	6.75	0.06	−0.02	6.89	−0.13
SMB	0.03	0.24	0.01	0.00	−7.47	−0.01
HML	0.02	2.38	0.04	0.01	8.75	0.05
RMW	0.01	4.02	0.03	0.00	3.34	0.002
CMA	−0.03	2.46	−0.07	0.003	5.56	0.02
WML	0.002	6.07	0.01	−0.004	3.78	−0.02
TERM	−0.02	2.03	−0.05	−0.01	−8.18	0.09
DEF	0.02	1.97	0.04	0.02	4.11	0.07
Factor sum			0.07			0.08
Net α			0.12			0.12
Costs			0.08			0.04
Gross mean			0.27			0.24

Fund allocation strategies

Figure D.3. Fund - allocation: Cumulative value added

This figure shows the cumulative gross and net value added for the Fund's allocation strategy from 2013 through 2024, expressed in billion NOK. Cumulative value added is constructed as a value added wealth account according to Equation (2), which compounds monthly value added over time. Gross value added is measured before management costs. The shaded area highlights the most recent sample period from 2021 to 2024, and the labeled endpoints show the change in cumulative gross value added from 15 to −21 billion NOK, over this sub period. Returns are measured in USD and assets under management are measured in NOK.

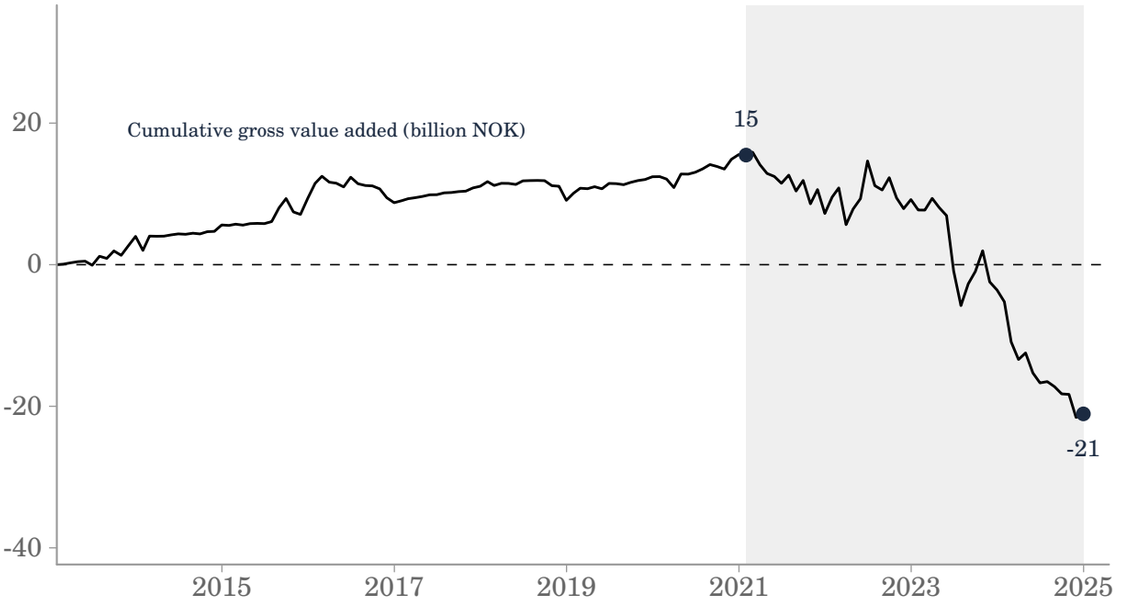


Table D.7. Fund - allocation: Summary statistics of active returns

This table reports descriptive statistics for annualized active returns, expressed in percent and measured in USD. IR refers to the mean divided by the standard deviation, the hit ratio is the fraction of months with a positive active return, and AC(1) is the first order autocorrelation. N is the number of observations in the sample. Statistics are shown for the full period from 2013 through 2024 and for the recent subperiod from 2021 through 2024.

	Full sample (2013–2024)	Recent sample (2021–2024)
	Gross returns	Gross returns
Mean	−0.004	−0.06
Standard deviation	0.06	0.07
IR	−0.07	−0.88
Hit ratio	0.49	0.38
AC (1)	−0.13	−0.22
Skewness	−0.17	−0.01
Excess kurtosis	1.61	0.13
N	144	48

Table D.8. Fund – allocation: Active return decomposition

This table reports the mean annualized active return and the estimated annualized α and β from Equation (3) in the CAPM adjustment column. All returns are expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. R^2 denotes the explanatory power of the regression, and AR denotes the appraisal ratio. Stars indicate whether α is significantly different from zero and whether β is significantly different from one. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (2013–2024)		Recent sample (2021–2024)	
	Mean	CAPM	Mean	CAPM
α	−0.004	0.01	−0.06 **	−0.06 **
	(0.01)	(0.01)	(0.03)	(0.02)
p-value	0.77	0.66	0.02	0.02
β		1.00**		1.00***
		(0.00)		(0.00)
p-value		0.02		<0.01
N	144	144	48	48
R^2		1.00		1.00
AR		0.10		−1.15

Table D.9. Fund - allocation: Factor-model risk adjustment

This table reports the estimated coefficients from the factor model in Equation (4) for the Fund's allocation strategy. The intercept α is annualized, and all returns are expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. N denotes the number of observations, and R^2 reports the explanatory power of the regression. Stars indicate whether α or the factor loadings differ significantly from zero. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (2013–2024)	Recent sample (2021–2024)
	Gross return	Gross return
α	0.01	0.001
	(0.01)	(0.01)
p-value	0.48	0.91
MKT	−0.0010	−0.01 ***
	(0.0007)	(0.0009)
p-value	0.16	<0.01
SMB	0.002***	0.001**
	(0.0009)	(0.0006)
p-value	0.01	0.02
HML	−0.002	0.002
	(0.0010)	(0.001)
p-value	0.13	0.15
RMW	0.001	0.002***
	(0.001)	(0.0008)
p-value	0.24	0.01
CMA	0.003**	−0.0009
	(0.002)	(0.002)
p-value	0.03	0.57
TERM	−0.0004	0.004***
	(0.0008)	(0.001)
p-value	0.56	<0.01
DEF	−0.0003	0.0007
	(0.0009)	(0.001)
p-value	0.73	0.52
N	144	48
Adjusted R^2	0.18	0.76

Table D.10. Fund - allocation: Factor-exposure analysis

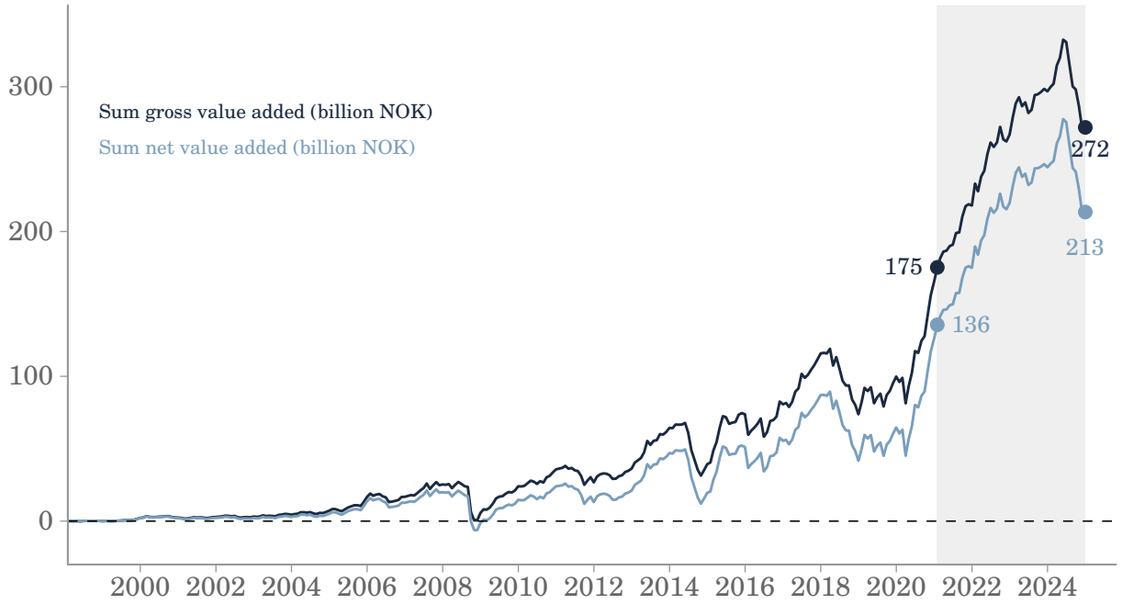
This table reports the Fund allocation strategy's factor exposures and the corresponding contribution of each factor to the Fund's average return. The Estimate column shows the estimated factor loadings, the Mean column shows the average factor returns, and the Product column reports the return contribution obtained by multiplying the two. All returns are expressed in percent and measured in USD. The bottom rows report the sum of all factor contributions, the resulting net α, and the gross mean active return.

	Full sample (2013–2024)			Recent sample (2021–2024)		
Factor	Estimate	Mean	Product	Estimate	Mean	Product
MKT	0.00	9.77	−0.01	−0.01	6.89	−0.04
SMB	0.002	−2.94	−0.01	0.001	−7.47	−0.01
HML	−0.002	−1.41	0.002	0.002	8.75	0.02
RMW	0.001	3.42	0.004	0.002	3.34	0.01
CMA	0.003	−0.08	0.00	0.00	5.56	−0.005
TERM	0.00	0.38	0.00	0.004	−8.18	−0.03
DEF	0.00	3.57	−0.001	0.00	4.11	0.003
Factor sum			−0.01			−0.06
Net α			0.01			0.001
Gross mean			−0.004			−0.06

E Appendix equity assessment

Value added and returns

Figure E.1. Equity portfolio: Sum value added
This figure shows the time series of cumulative gross and net sum value added for the equity portfolio from 1998 through 2024, expressed in billion NOK. Sum value added is constructed by taking the cumulative sum of monthly value added, without compounding. Gross value added is measured before costs, and net value added is measured after all reported costs. The shaded area highlights the most recent sample period from 2021 through 2024, and the labeled endpoints show the change in cumulative gross value added from 175 to 272 billion NOK and in cumulative net value added from 136 to 213 billion NOK over this sub period. Returns and assets under management are measured in NOK.



Statistical evaluation and risk adjustment

Table E.1. Equity portfolio: Summary statistics of active returns
This table reports descriptive statistics for annualized active returns, expressed in percent and measured in USD. IR refers to the mean divided by the standard deviation, the hit ratio is the fraction of months with a positive active return, and AC(1) is the first order autocorrelation. N is the number of observations in the sample. Statistics are shown for the full period from 1998 through 2024 and for the recent subperiod from 2021 through 2024.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
Mean	0.45	0.34	0.34	0.29
Standard deviation	0.70	0.69	0.26	0.26
IR	0.64	0.49	1.31	1.12
Hit ratio	0.65	0.63	0.71	0.71
AC (1)	0.17	0.17	0.17	0.17
Skewness	−0.65	−0.70	−0.23	−0.23
Excess kurtosis	10.37	10.47	−0.58	−0.58
N	323	323	48	48

Table E.2. Equity portfolio: Mean active returns
This table reports the gross and net mean annualized active returns for the equity portfolio, expressed in percent and measured in USD. Newey and West (1987) standard errors are shown in parentheses. N refers to the number of observations in the sample. Stars indicate statistical significance. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
Mean	0.45***	0.34**	0.34**	0.29*
	(0.16)	(0.16)	(0.15)	(0.15)
p-value	0.01	0.04	0.03	0.06
N	323	323	48	48

Table E.3. Equity portfolio: Mean beta-adjusted active returns

This table reports the estimated annualized α and β from Equation (3) using gross and net returns, expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. R^2 denotes the explanatory power of the regression, and AR denotes the appraisal ratio. Stars indicate whether α is significantly different from zero and whether β is significantly different from one. $^{***}p$<1%, $^{**}p$<5%, $^{*}p$<10%.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
α	0.36**	0.25*	0.37***	0.32**
	(0.15)	(0.15)	(0.14)	(0.14)
p-value	0.02	0.09	0.01	0.03
β	1.01***	1.01***	1.00**	1.00**
	(0.004)	(0.004)	(0.002)	(0.002)
p-value	<0.01	<0.01	0.02	0.02
N	323	323	48	48
R^2	1.00	1.00	1.00	1.00
AR	0.55	0.39	1.46	1.26

Factor risk-adjusted performance

For the equity portfolio, we consider the following five-factor model. This is a reduced form (no fixed-income factors) of Equation (4):

$$R_t^{\mathrm{A}} = \alpha + \beta_{\mathrm{MKT}}\,\mathrm{MKT}_t + \beta_{\mathrm{SMB}}\,\mathrm{SMB}_t + \beta_{\mathrm{HML}}\,\mathrm{HML}_t + \beta_{\mathrm{RMW}}\,\mathrm{RMW}_t + \beta_{\mathrm{CMA}}\,\mathrm{CMA}_t + \varepsilon_t. \tag{5}$$

Equity strategies

Figure E.2. Equity portfolio - security selection: Cumulative value added
This figure shows the cumulative gross and net value added for the Fund's security selection strategy in equity management from 2013 through 2024, expressed in billion NOK. Cumulative value added is constructed as a value added wealth account according to Equation (2), which compounds monthly value added over time. Gross value added, shown with solid lines, is measured before management costs, and net value added, shown with dot-dashed lines, is measured after all reported costs. The shaded area highlights the most recent sample period from 2021 through 2024, and the labeled endpoints show the change in cumulative gross and net value added over this sub period. Returns are measured in USD, and assets under management are measured in NOK.

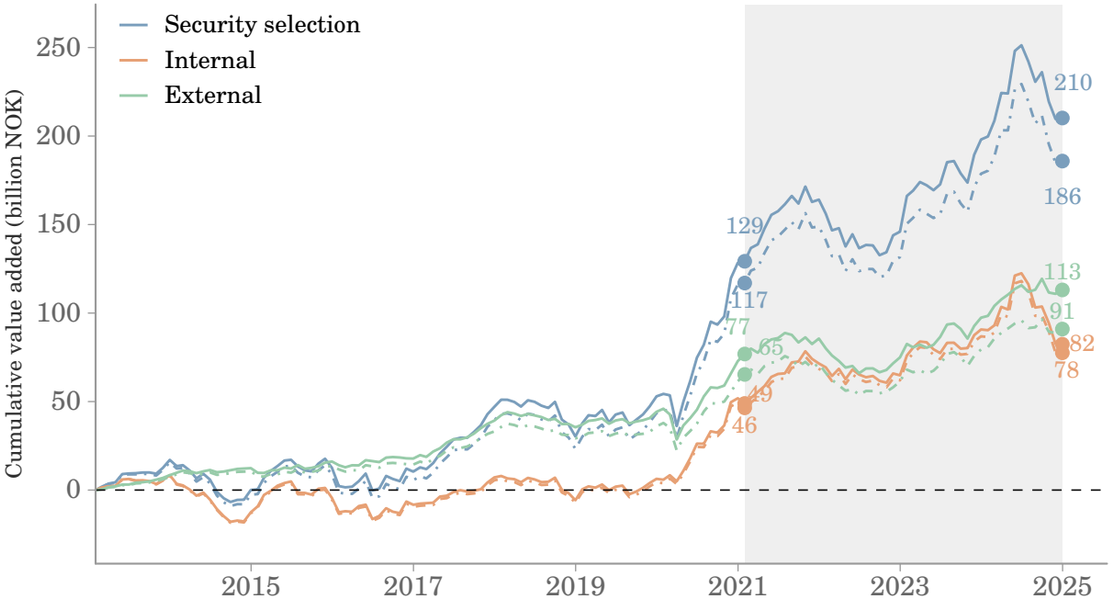


Table E.4. Equity portfolio: Factor-model risk adjustment

This table reports the estimated coefficients from the factor model in Equation (5) for the equity portfolio. The intercept α is annualized, and all returns are expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. N denotes the number of observations, and R^2 reports the explanatory power of the regression. Stars indicate whether α or the factor loadings differ significantly from zero. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
α	0.45***	0.34**	0.31*	0.26
	(0.16)	(0.16)	(0.16)	(0.16)
p-value	0.01	0.03	0.06	0.11
MKT	0.01***	0.01***	−0.01 ***	−0.01 ***
	(0.003)	(0.003)	(0.003)	(0.003)
p-value	<0.01	<0.01	0.01	0.01
SMB	0.04***	0.04***	−0.003	−0.003
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	<0.01	<0.01	0.76	0.76
HML	−0.003	−0.003	0.01**	0.01**
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.72	0.71	0.04	0.04
RMW	−0.002	−0.003	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.80	0.78	0.51	0.51
CMA	−0.02 **	−0.02 **	−0.01 **	−0.01 **
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	0.02	0.02	0.05	0.05
N	323	323	48	48
Adjusted R^2	0.30	0.30	0.06	0.06

Table E.5. Equity portfolio: Factor-exposure analysis
This table reports the equity portfolio's factor exposures and the corresponding contribution of each factor to the average return. The Estimate column shows the estimated factor loadings, the Mean column shows the average factor returns, and the Product column reports the return contribution obtained by multiplying the two. All returns are expressed in percent and measured in USD. The bottom rows report the sum of all factor contributions, the resulting net α, the cost adjustment, and the gross mean active return.

	Full sample (1998–2024)			Recent sample (2021–2024)		
Factor	Estimate	Mean	Product	Estimate	Mean	Product
MKT	0.01	6.75	0.07	−0.01	6.89	−0.04
SMB	0.04	0.24	0.01	−0.003	−7.47	0.02
HML	−0.003	2.38	−0.01	0.01	8.75	0.11
RMW	−0.003	4.02	−0.01	0.01	3.34	0.02
CMA	−0.02	2.46	−0.06	−0.01	5.56	−0.08
Factor sum			−0.002			0.04
Net α			0.34			0.26
Costs			0.11			0.05
Gross mean			0.45			0.34

Table E.6. Equity portfolio: Total return and risk
This table reports key return and risk statistics for the equity portfolio and its underlying strategies. All returns are annualized, expressed in percent, and measured in USD. For both the portfolio returns and their corresponding benchmarks, the table presents the annualized geometric mean, arithmetic mean, standard deviation, and Sharpe ratio. The number of observations, N, is also reported. Results cover the period from 2013 through 2024.

	Equity	Security selection	Internal	External	Enhanced indexing	Asset positioning	Allocation
Portfolio							
Geo. mean	8.97	7.46	8.53	5.08	9.25	9.23	8.63
Arit. mean	10.01	8.70	9.87	6.32	10.27	10.24	9.67
Standard deviation	14.45	15.72	16.39	15.59	14.29	14.28	14.39
Sharpe ratio	0.60	0.46	0.52	0.32	0.62	0.62	0.57
Benchmark							
Geo. mean	8.65	6.40	7.93	2.87	9.07	9.11	8.65
Arit. mean	9.68	7.58	9.18	4.09	10.09	10.13	9.68
Standard deviation	14.33	15.33	15.88	15.56	14.30	14.29	14.33
Sharpe ratio	0.58	0.40	0.49	0.17	0.61	0.61	0.58
N	144	144	144	144	144	144	144

Table E.7. Equity portfolio - strategies: Summary statistics of active returns

This table reports descriptive statistics for annualized active returns, expressed in percent and measured in USD. IR refers to the mean divided by the standard deviation, the hit ratio is the fraction of months with a positive active return, and AC(1) is the first order autocorrelation. N is the number of observations in the sample. Statistics are shown for the full period from 2013 through 2024 and for the recent subperiod from 2021 through 2024.

	Security selection		Internal		External		Enhanced indexing	Asset positioning	Allocation
Return:	Gross	Net	Gross	Net	Gross	Net	Gross	Gross	Gross
Mean	1.12	1.00	0.69	0.65	2.22	1.80	0.18	0.11	−0.01
Standard deviation	1.40	1.40	1.69	1.69	1.81	1.80	0.10	0.09	0.23
IR	0.80	0.71	0.41	0.39	1.23	1.00	1.77	1.25	−0.05
Hit ratio	0.62	0.62	0.59	0.59	0.67	0.65	0.73	0.67	0.49
AC (1)	0.20	0.20	0.19	0.19	0.02	0.02	0.24	0.23	0.14
Skewness	−0.40	−0.40	−0.37	−0.38	−0.16	−0.16	0.02	0.08	−0.06
Excess kurtosis	0.24	0.23	0.30	0.30	0.14	0.18	0.44	0.40	0.81
N	144	144	144	144	144	144	144	144	144

Table E.8. Equity portfolio - strategies: Active return decomposition

This table reports the mean annualized active return and the estimated annualized α and β from Equation (3) in the CAPM adjustment column. All returns are expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. R^2 denotes the explanatory power of the regression, and AR denotes the appraisal ratio. Stars indicate whether α is significantly different from zero and whether β is significantly different from one. $^{***}p$<1%, $^{**}p$<5%, $^{*}p$<10%.

	Security selection				Internal				External				Enhanced indexing		Asset positioning		Allocation	
	Gross return		Net return		Gross return		Net return		Gross return		Net return							
	Mean	CAPM	Mean	CAPM	Mean	CAPM	Mean	CAPM	Mean	CAPM	Mean	CAPM	Mean	CAPM	Mean	CAPM	Mean	CAPM
α	1.12**	0.99**	1.00**	0.86*	0.69	0.48	0.65	0.44	2.22***	2.23***	1.80***	1.82***	0.18***	0.18***	0.11***	0.12***	−0.01	−0.05
	(0.50)	(0.47)	(0.50)	(0.47)	(0.58)	(0.58)	(0.58)	(0.58)	(0.53)	(0.53)	(0.53)	(0.52)	(0.04)	(0.04)	(0.03)	(0.03)	(0.08)	(0.08)
p-value	0.02	0.04	0.05	0.07	0.24	0.41	0.26	0.45	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.90	0.59
β		1.02**		1.02**		1.03***		1.03***		1.00		1.00		1.00		1.00		1.00***
		(0.01)		(0.01)		(0.01)		(0.01)		(0.02)		(0.02)		(0.00)		(0.00)		(0.00)
p-value		0.03		0.03		0.01		0.01		0.82		0.82		0.14		0.29		<0.01
N	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144	144
R^2		0.99		0.99		0.99		0.99		0.99		0.99		1.00		1.00		1.00
AR		0.72		0.63		0.29		0.27		1.23		1.01		1.84		1.31		−0.21

Table E.9. Equity portfolio – strategies: Factor-model risk adjustment

This table reports the estimated coefficients from the factor model in Equation (5) for the strategies within the equity portfolio. The intercept α is annualized, and all returns are expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and are reported in parentheses. N denotes the number of observations, and R^2 reports the explanatory power of the regression. Stars indicate whether α or the factor loadings differ significantly from zero. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Security selection	Internal	External	Enhanced indexing	Asset positioning	Allocation
α	0.98**	0.64	1.83***	0.17***	0.10***	−0.01
	(0.44)	(0.59)	(0.49)	(0.04)	(0.03)	(0.07)
p-value	0.03	0.28	<0.01	<0.01	<0.01	0.87
MKT	0.02*	0.02*	0.005	0.00	0.00	0.003***
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.001)
p-value	0.09	0.08	0.73	0.65	0.81	<0.01
SMB	0.04**	0.04	0.05	−0.001	0.00	0.01*
	(0.02)	(0.03)	(0.03)	(0.001)	(0.001)	(0.004)
p-value	0.05	0.17	0.12	0.38	0.62	0.07
HML	0.02	0.03	−0.01	0.001	0.00	0.01***
	(0.02)	(0.02)	(0.03)	(0.002)	(0.002)	(0.003)
p-value	0.28	0.21	0.88	0.61	0.78	0.01
RMW	0.00	−0.01	0.02	0.003	0.003	0.00
	(0.04)	(0.04)	(0.05)	(0.003)	(0.003)	(0.004)
p-value	0.98	0.74	0.72	0.31	0.26	1.00
CMA	−0.08 **	−0.08 **	−0.08 *	0.003	0.003	−0.003
	(0.03)	(0.04)	(0.04)	(0.003)	(0.002)	(0.01)
p-value	0.02	0.05	0.07	0.33	0.31	0.53
N	144	144	144	144	144	144
Adjusted R^2	0.14	0.10	0.08	0.03	0.02	0.19

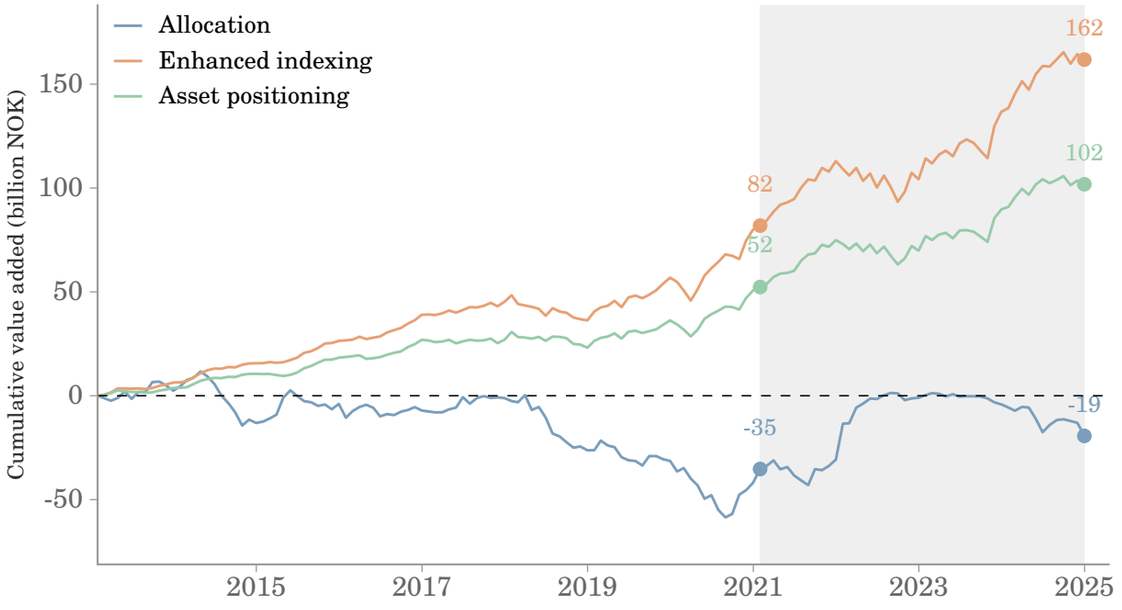
Table E.10. Equity portfolio – strategies: Factor-exposure analysis

This table reports factor exposures and the corresponding contribution of each factor to average returns for the strategies within the equity portfolio. The Mean column reports the average factor return, the Est column reports the estimated factor loading for each strategy, and the Prod column reports the implied return contribution obtained by multiplying the factor loading by the factor's mean return. All returns are expressed in percent and measured in USD. The bottom rows report the sum of all factor contributions, the resulting net α, the cost adjustment, and the gross mean active return for each strategy.

		Security selection		Internal		External		Enhanced indexing		Asset positioning		Allocation	
Factor	Mean	Est.	Prod.	Est.	Prod.	Est.	Prod.	Est.	Prod.	Est.	Prod.	Est.	Prod.
MKT	9.77	0.02	0.16	0.02	0.21	0.00	0.05	0.00	0.00	0.00	0.00	0.00	0.03
SMB	−2.94	0.04	−0.12	0.04	−0.11	0.05	−0.15	0.00	0.00	0.00	0.00	0.01	−0.02
HML	−1.41	0.02	−0.03	0.03	−0.04	−0.01	0.01	0.00	0.00	0.00	0.00	0.01	−0.01
RMW	3.42	0.00	0.00	−0.01	−0.05	0.02	0.06	0.00	0.01	0.00	0.01	0.00	0.00
CMA	−0.08	−0.08	0.01	−0.08	0.01	−0.08	0.01	0.00	0.00	0.00	0.00	0.00	0.00
Factor sum			0.01		0.02		−0.03		0.01		0.01		0.00
α			0.98		0.64		1.83		0.17		0.10		−0.01
Cost			0.13		0.03		0.42						
Gross mean			1.12		0.69		2.22		0.18		0.11		−0.01

Figure E.3. Equity portfolio - enhanced indexing and allocation: Cumulative value added

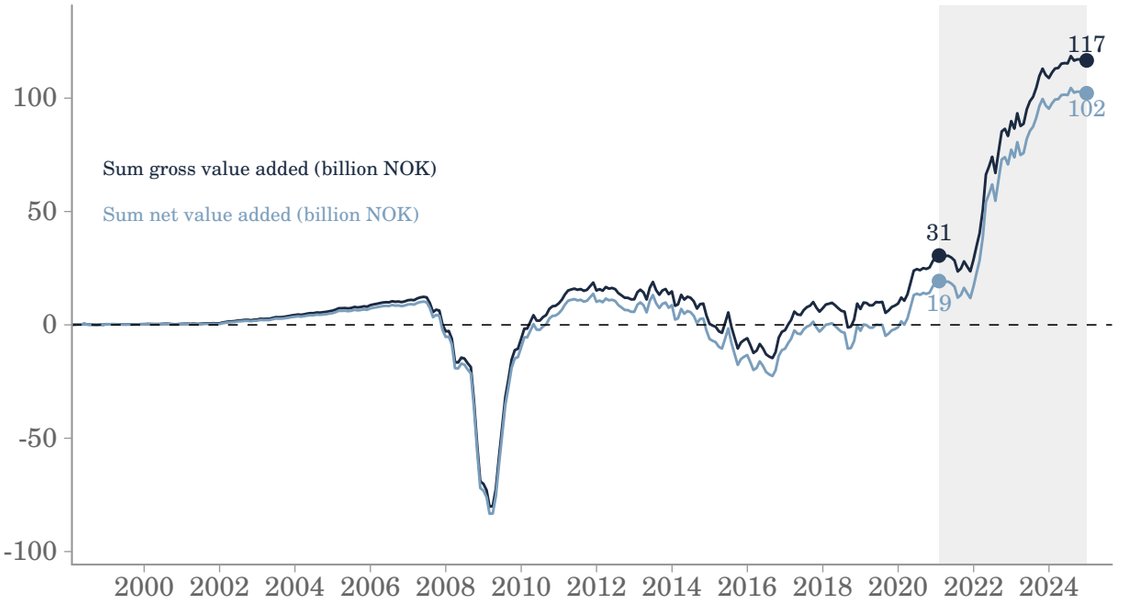
This figure shows the cumulative gross and net value added for the Fund's enhanced indexing and allocation strategies in equity management from 2013 through 2024, expressed in billion NOK. Cumulative value added is constructed as a value added wealth account according to Equation (2), which compounds monthly value added over time. Gross value added is measured before management costs. The shaded area highlights the most recent sample period from 2021 to 2024, and the labeled endpoints show the change in cumulative gross and net value added over this sub period. Returns are measured in USD, and assets under management are measured in NOK.



F Appendix fixed-income assessment

Value added and returns

Figure F.1. Fixed-income portfolio: Sum value added
This figure shows the time series of cumulative gross and net sum value added for the fixed-income portfolio from 1998 through 2024, expressed in billion NOK. Sum value added is constructed by taking the cumulative sum of monthly value added, without compounding. Gross value added is measured before costs, and net value added is measured after all reported costs. The shaded area highlights the most recent sample period from 2021 through 2024, and the labeled endpoints show the change in cumulative gross value added from 31 to 117 billion NOK and in cumulative net value added from 19 to 102 billion NOK over this sub period. Returns and assets under management are measured in NOK.



Statistical evaluation and risk adjustment

Table F.1. Fixed-income portfolio: Summary statistics of active returns

This table reports descriptive statistics for annualized active returns, expressed in percent and measured in USD. IR refers to the mean divided by the standard deviation, the hit ratio is the fraction of months with a positive active return, and AC(1) is the first order autocorrelation. N is the number of observations in the sample. Statistics are shown for the full period from 2013 through 2024 and for the recent subperiod from 2021 through 2024.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
Mean	0.24	0.20	0.60	0.58
Standard deviation	0.91	0.91	0.45	0.45
IR	0.27	0.22	1.36	1.31
Hit ratio	0.61	0.60	0.65	0.62
AC (1)	0.66	0.66	0.21	0.21
Skewness	−0.39	−0.41	0.80	0.80
Excess kurtosis	20.31	20.32	1.44	1.44
N	324	324	48	48

Table F.2. Fixed-income portfolio: Mean active returns

This table reports the estimated annualized α and β from Equation (3) using gross and net returns, expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. R^2 denotes the explanatory power of the regression, and AR denotes the appraisal ratio. Stars indicate whether α is significantly different from zero and whether β is significantly different from one. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
Mean	0.24	0.20	0.61**	0.58**
	(0.39)	(0.39)	(0.27)	(0.27)
p-value	0.54	0.61	0.03	0.04
N	324	324	48	48

Table F.3. Fixed-income portfolio: Mean beta-adjusted active returns

This table reports the estimated annualized α and β from Equation (3) using gross and net returns, expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. R^2 denotes the explanatory power of the regression, and AR denotes the appraisal ratio. Stars indicate whether α is significantly different from zero and whether β is significantly different from one. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
α	0.22	0.18	0.33	0.31
	(0.36)	(0.36)	(0.21)	(0.21)
p-value	0.54	0.62	0.12	0.15
β	1.01	1.01	0.96***	0.96***
	(0.02)	(0.02)	(0.01)	(0.01)
p-value	0.46	0.47	<0.01	<0.01
N	324	324	48	48
R^2	0.98	0.98	1.00	1.00
AR	0.25	0.20	1.05	0.97

Factor risk-adjusted performance

To analyze the Fund's fixed-income portfolio, we consider a restricted version of the seven-factor model in Equation (4) and use the following two-factor model:

$$R_t^{\mathrm{A}} = \alpha + \beta_{TERM} TERM_t + \beta_{DEF} DEF_t + \epsilon_t. \tag{6}$$

Table F.4. Fixed-income portfolio: Factor-model risk adjustment
This table reports the estimated coefficients from the factor model in Equation (6) for the fixed income portfolio. The intercept α is annualized, and all returns are expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and are reported in parentheses. N denotes the number of observations, and R^2 reports the explanatory power of the regression. Stars indicate whether α or the factor loadings differ significantly from zero. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Full sample (1998–2024)		Recent sample (2021–2024)	
	Gross return	Net return	Gross return	Net return
α	0.20	0.16	0.38**	0.36**
	(0.30)	(0.30)	(0.18)	(0.18)
p-value	0.51	0.60	0.04	0.05
TERM	−0.03 ***	−0.03 ***	−0.03 ***	−0.03 ***
	(0.01)	(0.01)	(0.01)	(0.01)
p-value	<0.01	<0.01	<0.01	<0.01
DEF	0.05**	0.05**	−0.01 *	−0.01 *
	(0.03)	(0.03)	(0.004)	(0.004)
p-value	0.05	0.05	0.08	0.08
N	324	324	48	48
Adjusted R^2	0.19	0.19	0.53	0.53

Table F.5. Fixed-income portfolio: Factor-exposure analysis
This table reports the fixed-income portfolio's factor exposures and the corresponding contribution of each factor to the average return. The Estimate column shows the estimated factor loadings, the Mean column shows the average factor returns, and the Product column reports the return contribution obtained by multiplying the two. All returns are expressed in percent and measured in USD. The bottom rows report the sum of all factor contributions, the resulting net α, the cost adjustment, and the gross mean active return.

	Full sample (1998–2024)			Recent sample (2021–2024)		
Factor	Estimate	Mean	Product	Estimate	Mean	Product
TERM	−0.03	2.03	−0.06	−0.03	−8.18	0.25
DEF	0.05	1.97	0.10	−0.01	4.11	−0.03
Factor sum			0.04			0.22
Net α			0.16			0.36
Costs			0.04			0.02
Gross mean			0.24			0.60

Fixed income strategies

Figure F.2. Fixed-income portfolio: Correlation matrix
This figure shows the correlation matrix of active returns across strategies within the Fund's fixed-income portfolio for the period 2013 through 2024. Each cell reports the pairwise correlation between two strategies, and the color scale reflects the magnitude and sign of the correlation.

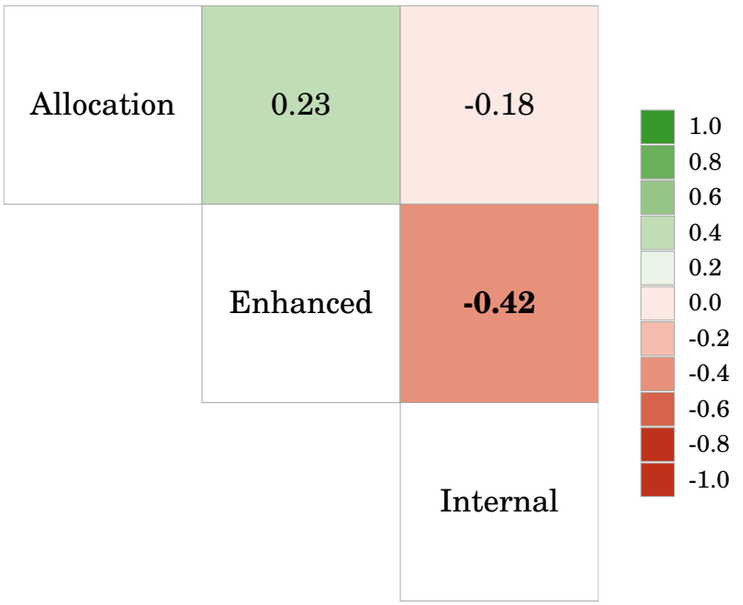


Table F.6. Fixed-income portfolio: Total return and risk
This table reports key return and risk statistics for the fixed-income portfolio and its underlying strategies. All returns are annualized, expressed in percent, and measured in USD. For both the portfolio returns and their corresponding benchmarks, the table presents the annualized geometric mean, arithmetic mean, standard deviation (SD), and Sharpe ratio. The number of observations, N, is also reported. Results cover the period from 2013 (October 2014 for security selection mandates) through 2024.

	Fixed income	Security selection	Internal	Enhanced indexing	Asset positioning	Allocation
Portfolio						
Geo. mean	0.35	1.72	1.72	−0.10	−0.12	0.10
Arit. mean	0.54	1.95	1.95	0.09	0.07	0.30
SD	6.21	6.82	6.82	6.18	6.18	6.23
Sharpe ratio	−0.14	0.08	0.08	−0.21	−0.21	−0.18
Benchmark						
Geo. mean	0.08	1.39	1.39	−0.39	−0.38	0.08
Arit. mean	0.29	1.64	1.64	−0.20	−0.19	0.29
SD	6.39	7.11	7.11	6.16	6.17	6.39
Sharpe ratio	−0.17	0.03	0.03	−0.26	−0.26	−0.17
N	144	123	123	144	144	144

Table F.7. Fixed-income portfolio - strategies: Summary statistics of active returns
This table reports descriptive statistics for annualized active returns, expressed in percent and measured in USD. IR refers to the mean divided by the standard deviation, the hit ratio is the fraction of months with a positive active return, and AC(1) is the first order autocorrelation. N is the number of observations in the sample. Statistics are shown for the full period from 2013 (October 2014 for security selection) through 2024.

	Security selection		Enhanced indexing	Asset positioning	Allocation
	Gross return	Net return	Gross return	Gross return	Gross return
Mean	0.31	0.29	0.29	0.26	0.01
Standard deviation	0.75	0.75	0.15	0.15	0.39
IR	0.41	0.39	1.92	1.72	0.03
Hit ratio	0.49	0.47	0.74	0.73	0.53
AC (1)	0.04	0.04	−0.03	−0.03	0.16
Skewness	2.94	2.94	−0.35	−0.28	−0.003
Excess kurtosis	16	16	2.64	2.72	1.37
N	123	123	144	144	144

Figure F.3. Fixed-income portfolio - security selection: Cumulative value added

This figure shows the cumulative gross and net value added for the Fund's security selection strategy in fixed-income management from October 2014 through 2024, expressed in billion NOK. Cumulative value added is constructed as a value added wealth account according to Equation (2), which compounds monthly value added over time. Gross value added is measured before management costs, and net value added is measured after all reported costs. The shaded area highlights the most recent sample period from 2021 to 2024, and the labeled endpoints show the change in cumulative gross value added from 11 to 10 billion NOK, and in cumulative net value added from 10 to 8 billion NOK, over this sub period. Returns are measured in USD, and assets under management are measured in NOK.

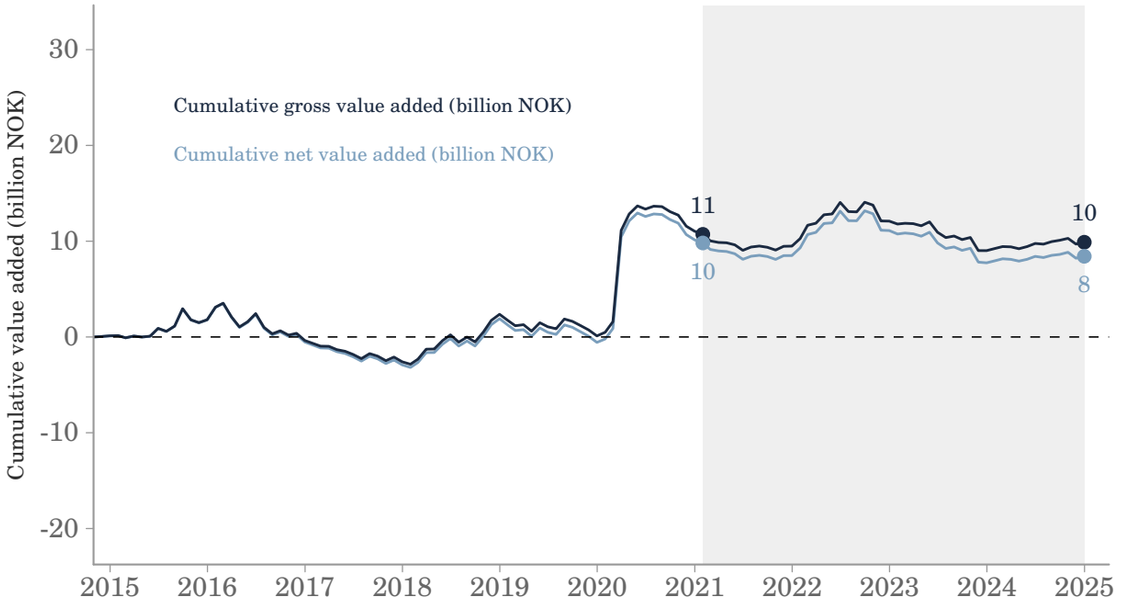


Table F.8. Fixed-income portfolio - strategies: Active return decomposition

This table reports the mean annualized active return and the estimated annualized α and β from Equation (3) in the CAPM adjustment column. All returns are expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and reported in parentheses. R^2 denotes the explanatory power of the regression, and AR denotes the appraisal ratio. Stars indicate whether α is significantly different from zero and whether β is significantly different from one. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Security selection				Enhanced indexing		Asset positioning		Allocation	
	Gross return		Net return				Gross return			
	Mean	CAPM	Mean	CAPM	Mean	CAPM	Mean	CAPM	Mean	CAPM
α	0.31	0.31	0.29	0.29	0.29***	0.30***	0.26***	0.26***	0.01	−0.02
	(0.22)	(0.22)	(0.22)	(0.22)	(0.04)	(0.04)	(0.04)	(0.04)	(0.13)	(0.12)
p-value	0.17	0.17	0.20	0.20	<0.01	<0.01	<0.01	<0.01	0.93	0.88
β		0.95***		0.95***		1.00		1.00		0.97***
		(0.01)		(0.01)		(0.00)		(0.00)		(0.01)
p-value		<0.01		<0.01		0.22		0.25		<0.01
N	123	123	123	123	144	144	144	144	144	144
R^2		0.99		0.99		1.00		1.00		1.00
AR		0.45		0.43		1.95		1.76		−0.05

Table F.9. Fixed-income portfolio - strategies: Factor-model risk adjustment

This table reports the estimated coefficients from the factor model in Equation (6) for the strategies within the fixed-income portfolio. The intercept α is annualized, and all returns are expressed in percent and measured in USD. Standard errors are computed using Newey and West (1987) and are reported in parentheses. N denotes the number of observations, and R^2 reports the explanatory power of the regression. Stars indicate whether α or the factor loadings differ significantly from zero. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Security selection		Enhanced indexing	Asset positioning	Allocation
	Gross return	Net return	Gross return	Gross return	Gross return
α	0.53***	0.51***	0.27***	0.24***	−0.003
	(0.20)	(0.20)	(0.04)	(0.04)	(0.10)
p-value	0.01	0.01	<0.01	<0.01	0.98
TERM	0.01*	0.01*	−0.005***	−0.005***	−0.03 ***
	(0.01)	(0.01)	(0.002)	(0.002)	(0.01)
p-value	0.09	0.09	0.01	0.01	<0.01
DEF	−0.06 ***	−0.06 ***	0.01**	0.01**	0.01**
	(0.01)	(0.01)	(0.003)	(0.003)	(0.004)
p-value	<0.01	<0.01	0.02	0.02	0.04
N	123	123	144	144	144
Adjusted R^2	0.39	0.39	0.13	0.14	0.34

Figure F.4. Fixed-income portfolio - enhanced indexing and allocation: Cumulative value added
This figure shows the cumulative gross and net value added for the Fund's enhanced indexing and allocation strategies in fixed-income management from 2013 through 2024, expressed in billion NOK. Cumulative value added is constructed as a value added wealth account according to Equation (2), which compounds monthly value added over time. Gross value added is measured before management costs. The shaded area highlights the most recent sample period from 2021 to 2024, and the labeled endpoints show the change in cumulative gross and net value added over this sub period. Returns are measured in USD, and assets under management are measured in NOK.

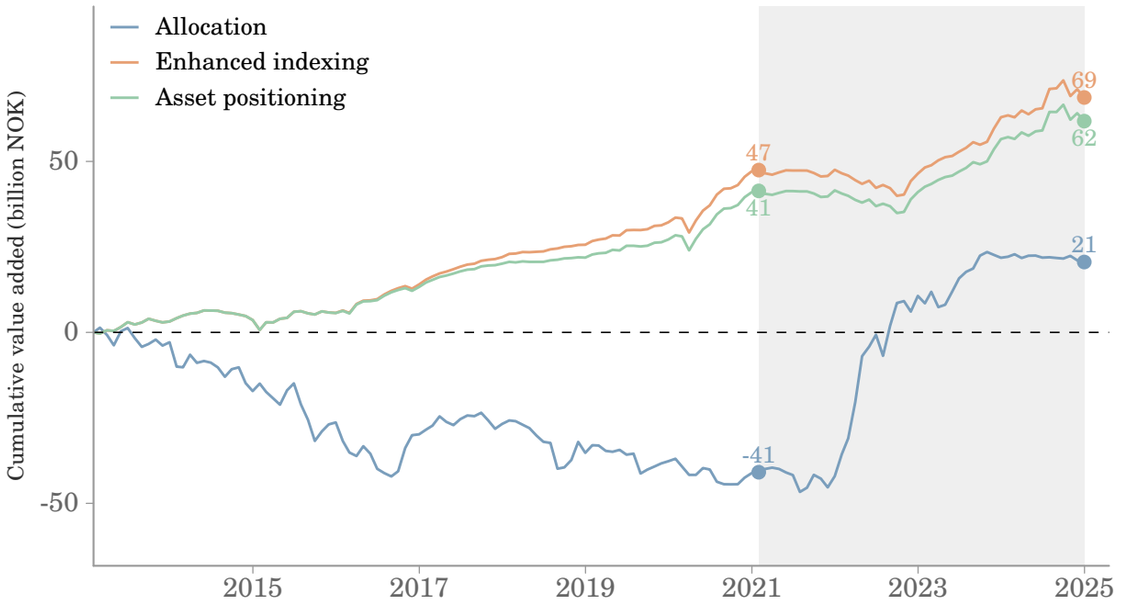


Table F.10. Fixed-income portfolio – strategies: Factor-exposure analysis
This table reports factor exposures and the corresponding contribution of each factor to average returns for the strategies within the fixed-income portfolio. The Mean column shows the average factor return, the Estimate column reports the estimated factor loading for each strategy, and the Product column reports the implied return contribution obtained by multiplying the factor loading by the factor's mean return. All returns are expressed in percent and measured in USD. Mean factor values refer to the full strategy period, except for security selection, which began in October 2014. For this subperiod, the average returns for TERM and DEF are −0.18 and 3.51 percent, respectively. The bottom rows report the sum of the factor contributions, the resulting net α, the cost adjustment, and the gross mean active return for each strategy.

		Security selection		Enhanced indexing		Asset positioning		Allocation	
Factor	Mean	Estimate	Product	Estimate	Product	Estimate	Product	Estimate	Product
TERM	0.38	0.01	0.00	0.00	0.00	0.00	0.00	−0.03	−0.01
DEF	3.57	−0.06	−0.22	0.01	0.03	0.01	0.03	0.01	0.03
Factor sum			−0.22		0.02		0.02		0.01
α			0.51		0.27		0.24		0.00
Cost			0.02						
Gross mean			0.31		0.29		0.26		0.01

G Appendix real assets assessment

MSCI property indexes

The MSCI property indexes are widely used global benchmarks for evaluating the performance of unlisted commercial real estate. They provide a standardized framework for measuring performance and risk based on a private-market database that includes more than 30 countries, more than 100 cities, and six core real estate sectors. The indexes are backed by underlying assets with an estimated value in the multi-trillion-dollar range, and many country series have histories of more than twenty years, which allows for long-term performance comparisons for institutional investors.

The MSCI framework separates its indexes into two tiers. Property-level indexes track unlevered performance at the individual asset level, using information from more than 50 000 properties worldwide and reporting results by geography, sector, and selected investment characteristics. Fund-level indexes measure the performance of open- and closed-end real estate funds, incorporating leverage, fee arrangements, and vehicle-specific features in order

to represent investor-level returns. In our analysis, we rely on property-level indexes. Annual data provide the broadest geographic coverage, while quarterly data are available for a more limited set of markets. Our analysis uses quarterly data.

MSCI measures performance at the asset level using a time-weighted return framework. In this approach, capital growth represents the change in asset value after deducting capital expenditures, while income return represents the net operating income. Total return combines these two elements and is calculated based on changes from one period to the next.

The total return for the MSCI indexes includes transaction costs, and NBIM adjusts the time series to make them comparable to the return on the NBIM property investments.

Real estate portfolio

Table G.1. Real estate portfolio: Return attribution
This table reports statistics for annualized quarterly returns for the Fund's real estate portfolio, expressed in percent and measured in USD. Quarterly returns are annualized by multiplying by four. Reported statistics include the mean, standard deviation (SD) or tracking error, Sharpe ratio or information ratio, AC(1), and the number of observations, N. Columns labeled Bench refer to the funding benchmark, BM Listed refers to NBIM's custom listed real estate benchmark, Global refers to the MSCI Global index, Adj refers to the MSCI Global index with adjusted portfolio weights, and Prop refers to the unlisted property return index. Results cover the period from 2017 through 2024.

	Portfolio			Listed				Unlisted			Unlisted (MSCI)		
	Gross	Net	Bench.	Gross	Net	Bench.	BM Listed	Gross	Net	Bench.	Global	Adj.	Prop.
Mean (%)	2.87	2.77	5.58	3.79	3.73	8.10	5.75	2.29	2.16	4.07	4.71	3.70	2.79
SD/TE (%)	9.42	9.41	10.71	19.95	19.95	12.74	17.47	5.62	5.61	9.98	4.75	4.62	5.55
Sharpe ratio/IR	0.09	0.07	0.33	0.09	0.08	0.47	0.21	0.04	0.02	0.20	0.55	0.35	0.13
AC(1)	0.00	−0.002	0.04	−0.13	−0.13	−0.02	−0.04	0.39	0.39	0.04	0.23	0.40	0.38
N	32	32	32	32	32	32	32	32	32	32	32	32	32

Figure G.1. Real estate: Active return decomposition (geometric compounding)
This figure decomposes the annualized return of the Fund's real estate portfolio into contributions from the funding benchmark, allocation, selection, and costs from 2017 through 2024. The funding benchmark reflects the return on global equities and fixed income sold to finance the real estate strategy. The allocation component measures the effect of differences between the MSCI Global real estate benchmark and the funding benchmark, while the selection component measures the difference between the Fund's realized real estate returns and MSCI Global. Subtracting reported costs from the gross return yields the net return. All returns are measured in USD. Annualized average quarterly returns are computed using geometric annualization, where quarterly returns are multiplied across the sample to obtain their geometric mean, which is then raised to the fourth power and converted back to a return.

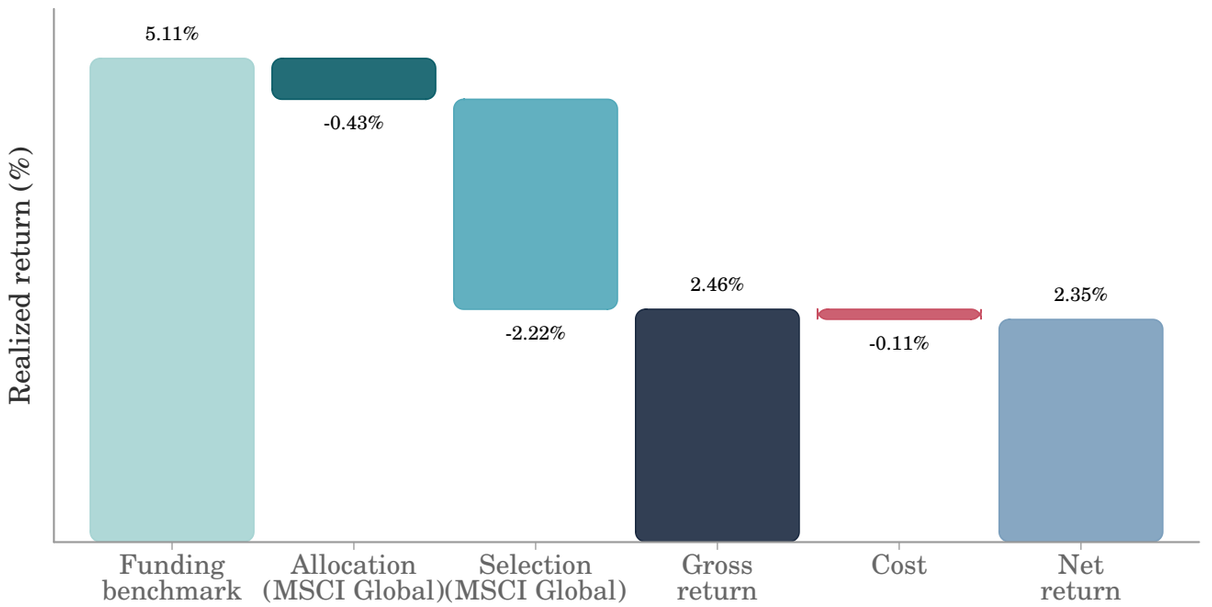


Figure G.2. Real estate portfolio: Cumulative active return decomposition
The figure shows the cumulative contribution of allocation and selection to the Fund's real estate active return. Allocation is defined as the difference between the MSCI Global real estate index and the funding benchmark. Selection is defined as the difference between the Fund's return and MSCI Global. Both components contribute to the difference between the funding benchmark based on global equities and fixed income, and the realized return on the Fund's real estate portfolio. The shaded area marks the recent sample period (2021–2024). All returns are expressed in percent and measured in USD.

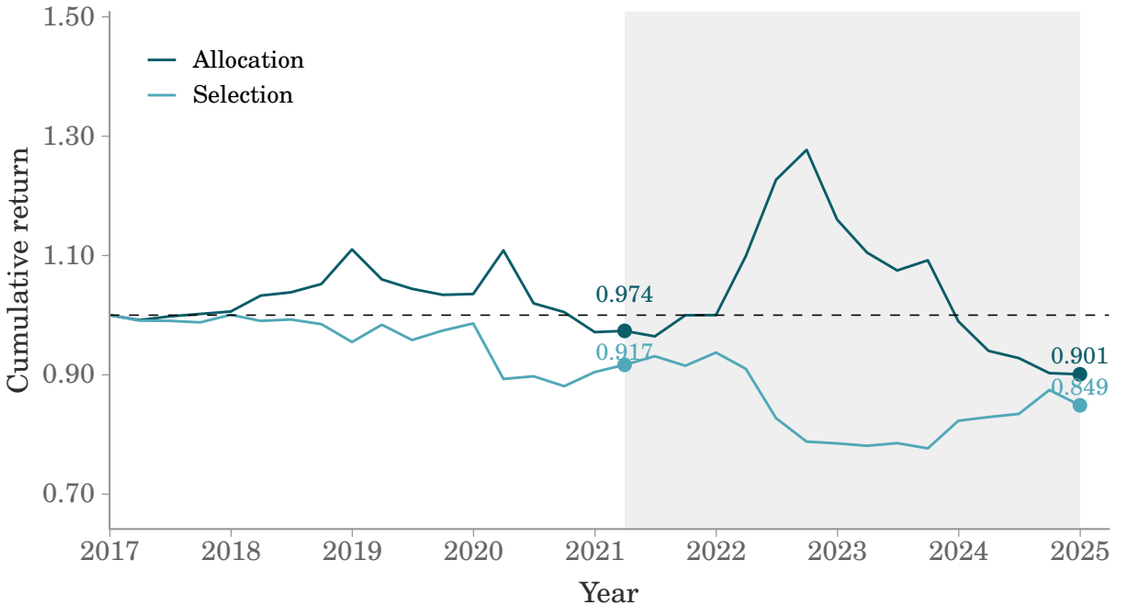


Table G.2. Real estate portfolio: Active return decomposition

This table reports the mean annualized active return and the estimated annualized α and β from Equation (3) in the CAPM adjustment column. All returns are expressed in percent and measured in USD from 2017 through 2024. Standard errors are computed using Newey and West (1987) and reported in parentheses. R^2 denotes the explanatory power of the regression, and AR denotes the appraisal ratio. Stars indicate whether α is significantly different from zero and whether β is significantly different from one. $^{***}p<1\%$, $^{**}p<5\%$, $^{*}p<10\%$.

	Portfolio		Listed		Unlisted	
	Mean	CAPM	Mean	CAPM	Mean	CAPM
α	−2.56	−1.71	−4.21	−6.16***	−1.60	−0.21
	(3.89)	(3.09)	(3.85)	(0.94)	(4.91)	(4.52)
p-value	0.51	0.58	0.28	<0.01	0.75	0.96
β		0.71***		1.31***		0.21***
		(0.09)		(0.03)		(0.09)
p-value		<0.01		<0.01		<0.01
N	32	32	32	32	32	32
R^2		0.62		0.69		0.08
AR		−0.29		−0.55		−0.03

Figure G.3. Real estate - listed: Active return decomposition (geometric compounding)
This figure decomposes the annualized return of the Fund's listed real estate portfolio into contributions from the funding benchmark, allocation, selection, and costs from 2017 through 2024. Allocation is divided into two components. The first measures the effect of allocating into listed real estate by comparing the return on MSCI Global with the funding benchmark. The second measures the difference between MSCI Global and the custom listed real estate benchmark constructed by NBIM. The selection component captures the relative performance of the Fund's portfolio compared with NBIM's listed benchmark. The final bar adjusts for costs to arrive at the reported net return. All returns are measured in USD. Annualized average quarterly returns are computed using geometric annualization, where quarterly returns are multiplied across the sample to obtain their geometric mean, which is then raised to the fourth power and converted back to a return.

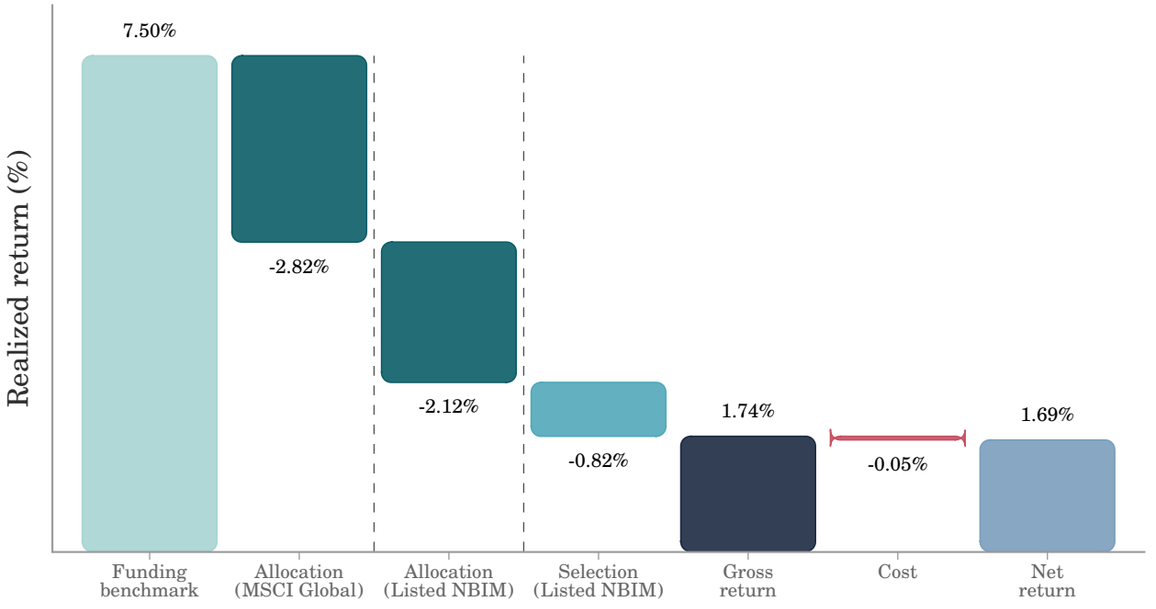


Figure G.4. Real estate portfolio - listed: Cumulative active return decomposition
The figure shows the cumulative contribution of allocation and selection to the Fund's listed real estate active return. Allocation is divided into two components. The first allocation component captures the effect of allocating into the asset class, measured as the difference between MSCI Global and the Fund's funding benchmark. The second allocation component reflects the difference between MSCI Global and NBIM's custom listed performance benchmark. The selection component measures the relative performance of the Fund's listed real estate holdings versus NBIM's listed performance benchmark. Together, these components decompose the difference between the funding benchmark based on global equities and fixed income, and the gross and net return on the Fund's listed real estate portfolio. The shaded region marks the recent sample period (2021–2024). All returns are expressed in percent and measured in USD.

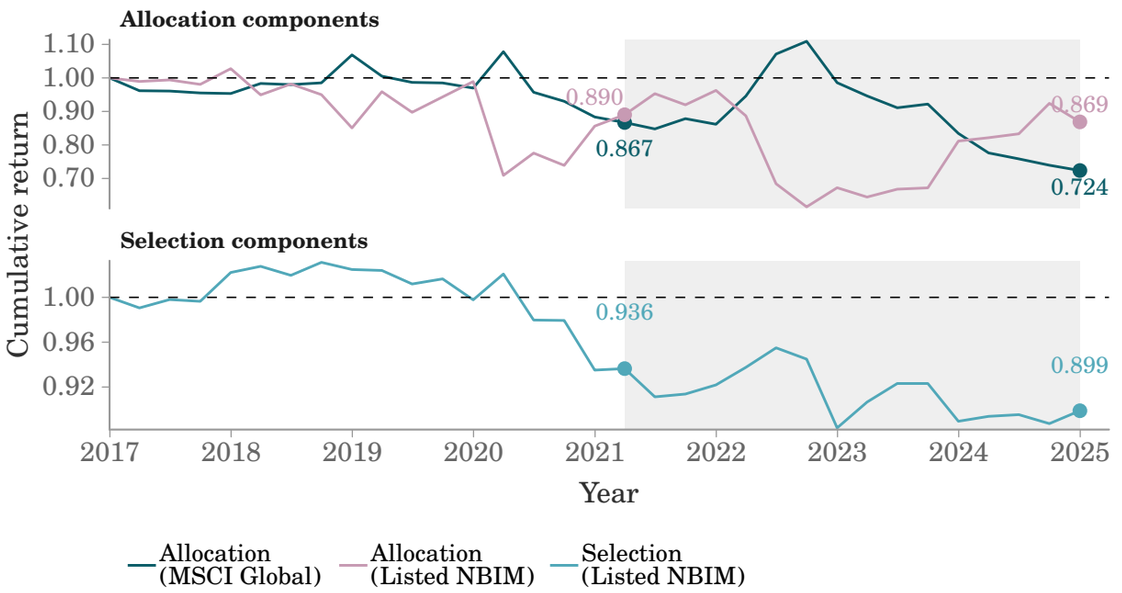


Figure G.5. Real estate - unlisted: Active return decomposition (geometric compounding)
This figure decomposes the annualized return of the Fund's unlisted real estate portfolio into contributions from the funding benchmark, allocation, selection, GAV to NAV adjustments, and costs from 2017 through 2024. Allocation is divided into two components. The first measures the effect of allocating into unlisted real estate by comparing the return on MSCI Global with the funding benchmark. The second captures differences in sector and city allocation, measured using the MSCI Global adjusted benchmark. The selection component reflects the performance contribution from property selection, and the GAV to NAV component captures the return difference arising from differences in gross and net asset values. The final bar adjusts for costs to arrive at the reported net return. All returns are measured in USD. Annualized average quarterly returns are computed using geometric annualization, where quarterly returns are multiplied across the sample to obtain their geometric mean, which is then raised to the fourth power and converted back to a return.

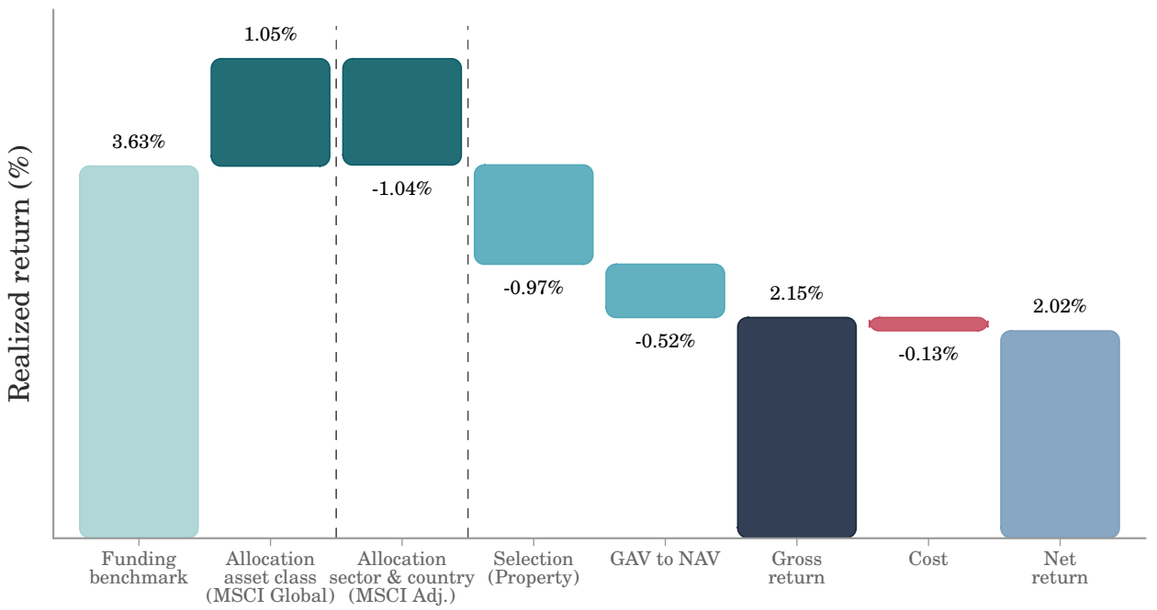


Figure G.6. Real estate portfolio - unlisted: Cumulative active return decomposition
The figure shows the cumulative contribution of allocation and selection to the Fund's unlisted real estate active return. Allocation is split into two components. The first allocation component captures the effect of allocating into the real estate asset class, measured as the difference between MSCI Global and the funding benchmark. The second allocation component is the difference between MSCI Global and MSCI Global adjusted, where the adjustment reflects NBIM's chosen sector, city, and country composition. The selection component measures the difference between the Fund's unlisted real estate returns and the property benchmark. The final series, labeled GAV to NAV, captures return differences arising from the transition from gross asset values (GAV) to net asset values (NAV). Together, these components decompose the difference between the funding benchmark based on global equities and fixed income, and the gross and net return on the Fund's unlisted real estate portfolio. The shaded area marks the recent sample period (2021–2024). All returns are expressed in percent and measured in USD.