Investing in equities

Norges Bank Investment Management

Our mission is to safeguard and build financial wealth for future generations

Investing in equities

The 20-year history

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Equity holdings for the long term

The fund was set up to buy a slice of the world's financial assets. The aim was to diversify the nation's natural wealth by investing in global financial wealth. We converted oil to equities by acquiring a small stake in all publicly traded companies in all major markets.

This story is about investing in the equity market. It is about buying and holding the entire global equity market, not about selecting specific companies. Few know what it entails to "buy the market". This book provides that insight as it tells the story of how we started buying equities two decades ago and gradually built the world's largest single-owner global portfolio of listed companies.

Trading was in a way our first job, and so that is where the story begins. Trading has always had a central place in my thinking about the fund – in the early years because the inflows were so large, and in more recent years because assets under management have become so large. We took a different approach to trading from day one. We gave the traders full autonomy and emphasised trading analytics, risk pricing and an early move into electronic trading. Today, we trade equities across 45 markets for close to 1 billion dollars on an average day, executing 100,000 trades around the clock at our trading hubs in Singapore, Oslo London and New York.

As an asset owner, you want to capture the returns of the equity market in an efficient and systematic fashion. We decided to insource index management in 2001 to enhance our returns through corporate actions, index rebalancing, capital market events and relative value strategies. Today, given our size, corporate actions and capital market participation are most important. Attention to detail, knowledge of local markets and financial instruments, tailor-made systems and comprehensive databases have been essential.

When you are the world's largest single owner of listed equities, you are in a position to enhance your returns by lending your inventory to other market actors. Securities lending is sometimes overlooked when thinking about investment strategies. Lending is about risk management, but also about cash management and ownership rights. We have carefully managed the risk of our lending, while at the same time spearheading changes in market practices.

The market changes all the time – and change is what we will do going forward. Most important is the ability to think ahead and see the complex interplay between our fund strategy and market dynamics. We have built a team of outstanding traders and portfolio managers who have excelled at trading, indexing and lending our assets for the last two decades through constant reinvention of the way we execute our strategies. They have improved our returns while safeguarding our assets for future generations.

Oslo, 9 December 2020

Yngve Slyngstad
Chief Executive Officer
January 2008 – August 2020
Norges Bank Investment Management

Enhancing our equity market exposure

The fund owns 1.5 percent of the global equity market through a portfolio of more than 9,000 companies across most markets worldwide. Managing one of the world's largest equity portfolios comes with considerable responsibility and challenges.

We started investing in equities in January 1998 through external index managers. At the time, we did not have the necessary capabilities, systems, operational processes or market relationships to manage equities internally. We have since developed these capabilities, and around 95 percent of the fund's equity portfolio is now managed in-house. This has enabled us to generate excess return and keep cost low.

The marketplace has changed vastly over the last two decades, and the fund has grown much larger. During this time, we have gone from having zero equity market exposure to being the largest single holder of global listed equities. As the markets have evolved, so has our approach.

I joined Norges Bank as an index portfolio manager in 2007 and have been fortunate to lead our trading, indexing and lending activities since 2016. With our equity portfolio growing fivefold since I sent my first trade order, I have witnessed first-hand how the fund's size as well as market developments have brought both new demands and new opportunities.

The equity market is competitive. To outperform, we must constantly reinvent our strategy. Our approach has been to build up internal expertise and continuously challenge market practices to ensure good outcomes for the fund. This has enabled us to make some unconventional choices when we have seen opportunities for the fund that others were not yet ready to seize.

Over the past 22 years, we have focused on developing the necessary capabilities to trade, manage and lend the entire breadth of the equity market. In the early years, we did not expect the fund to grow as large as it has become, but some of the choices we made have guided us since. The most important was setting a clear ambition to outperform the equity market as specified by our benchmark index.

We built our trading, indexing and lending activities with the objective of achieving the best possible returns for the fund. Our efforts to outperform have so far proven worthwhile and contributed 60 billion kroner in excess return compared to the broad market. This would not have been possible without our global teams of traders and portfolio managers, who have been given significant responsibility for parts of the fund's performance and strive constantly to achieve the best results for the fund.

Oslo, 9 December 2020

Geir Øivind Nygård
Chief Asset Strategies Officer
Norges Bank Investment Management

1 | Trading

Trading in size

Our trading strategy has undergone multiple evolutions over the last 20 years as we have adapted to the growth of the fund and developments in the equity market, all with one objective: implementing the fund's investments efficiently at the best possible prices.

The fund's equity portfolio has grown significantly since our first equity purchases in January 1998. It has grown from an initial allocation of 40 percent in 1998 to 70 percent of a much larger fund in 2020 – making it the largest single-owner global equity portfolio in the world. Our trading activity has grown accordingly.

The trading function

We made the first equity investments for the fund in January 1998. The Ministry of Finance and Norges Bank had agreed an implementation plan that would bring the equity allocation to 40 percent by the end of May, increasing it by 8 percentage points per month until it reached the target level. The purpose of spreading equity purchases over time was to curb the costs associated with a rise in share prices as a result of a large concentration of purchases in a short period.

From first trade to a large fund

In the period from January to June 1998, 17,258 equity transactions were carried out in 21 countries, and equity futures were purchased in 12. The value of all the equity purchases was approximately 46 billion kroner, of which 83 percent went through the external index managers' crossing networks.

As we did not yet have the necessary internal capabilities – such as systems, brokerage relationships or operational processes – we made the fund's first equity purchases through external index managers, who were given the responsibility for all our equity trading and portfolio management. The external index managers, which were large asset managers with a global client base, enabled us to cross our investments with other investors, meaning that we could buy our broad equity portfolios directly from other investors looking to sell. This saved costs, as we avoided trading in the market.

First internal equity trade

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 1. Portfolio Code         NBGI    Portfolio    GLOBAL INTERIM PORTFOLIO
 2. Sedol Code        5-250-769    Stock Name   ABN AMRO HLDG NFL1.25
 3. Manager Code                   Manager
 4. Deal Date - Time  15/11/99 -            5. Settlement Date         18/11/99
 6. Buy/Sell                  B             7. Sub Type
 8. Special XD/CD                              Deal Reference
 9. Execution Type            G
10. Number of Shares           5,500.00       Curr Holding          5,500.00
11. Price(Cur)                24.678000 (EUR) Ref Price        24.800000 (EUR)
12. Broker Account Number  1256   Broker      WARBURG DILLON READ - EUR
    Broker's Commission Rate  0.250000    Basis - (S)hares/(C)onsid  C
13. Consideration(Cur)                135,729.00 (EUR)
14. Accrued Interest(Cur)                      (    )
15. Commission(Cur)                       339.32 (EUR)
16. Total Cost/Proceeds(Cur)          136,068.32 (EUR)
17. Comment                  40 NBBOE AA NA



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As inflows into the fund continued, we saw a need to manage the timing of equity purchases internally, to ensure that these were implemented gradually. We also needed to manage the fund's equity allocation while waiting for opportunities to cross portfolios with other investors. Equity index futures were a good instrument for this task. Our first internal equity trade was an index futures trade in September 1998. As our processing systems had only been used for fixed-income instruments, it proved complicated to process the first trade, but we continued trading index futures to efficiently manage inflows and the regional rebalancing of the equity portfolio.

Knowing that we would manage significant parts of the equity portfolio internally, we set up our own brokerage relationships for equity trading in 1999. The fund was still small at the time, with an equity portfolio of 80 billion kroner, of which only 2 billion kroner was to be managed internally. Accordingly, establishing brokerage relationships meeting our requirements required us to convince our counterparties that the fund would continue growing significantly in the years to come. However, even our conservative estimates of the future growth of the fund were met with scepticism. Our counterparties doubted that the fund would last more than a few years and assigned relatively little importance to our relationship.

We executed our first equity trade on 15 November 1999, buying 5,500 shares in ABN Amro Holdings, a Dutch bank, at a price of 24.678 euros per share. The fund held these shares until 2007, when ABN Amro was taken over.

From the outset, we made the trading function an essential part of our mission. We defined the four tasks entrusted to us as being trading, market exposure management, excess return, and advice to the Ministry of Finance. The trading function would be responsible for investing the substantial inflows into the fund in the stock market – converting barrels of oil into equity ownership.

Our main priority in the early years was to implement the sizable inflows into the fund, as the equity portfolio received cash flows increasing its size by more than 50 percent each year from 2000 to 2002. Our two other priorities were to implement the quarterly rebalancing of the regional composition of the equity portfolio, and to use the cash flows we received to prepare portfolios for the active external mandates that were being funded. Accordingly, most of our trading was in equity index futures, which offered broad market exposure and were inexpensive to trade, and in program trades, where we delegated the execution of a basket of securities to a broker-dealer.

Chart 1 Cash flows into the equity portfolio, by origin.
Billion dollars.

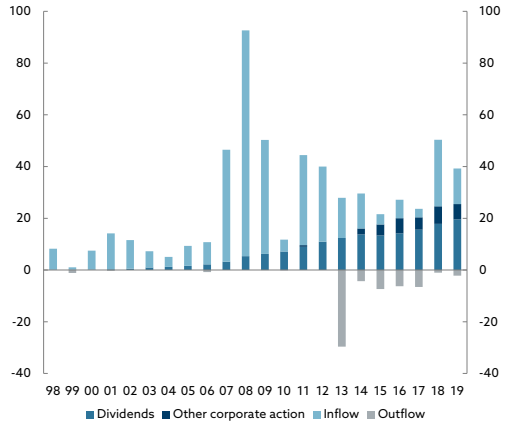


Chart 2 Equity trading volume, by instrument type.
Billion dollars.

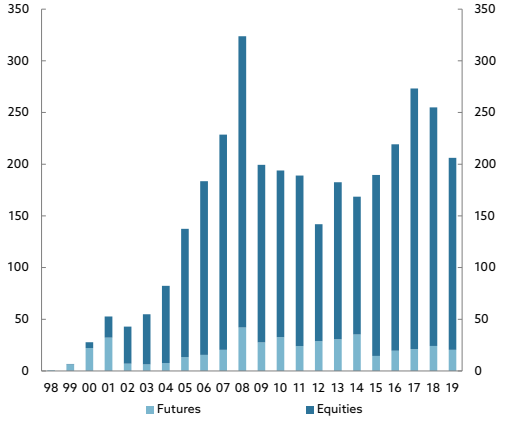


Chart 3 Cash flows into the equity portfolio, by origin.
Percent of equity portfolio.

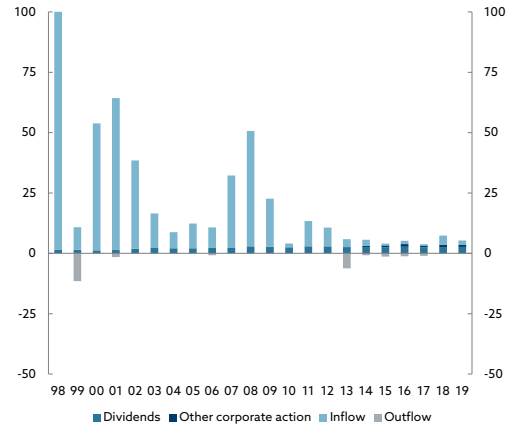
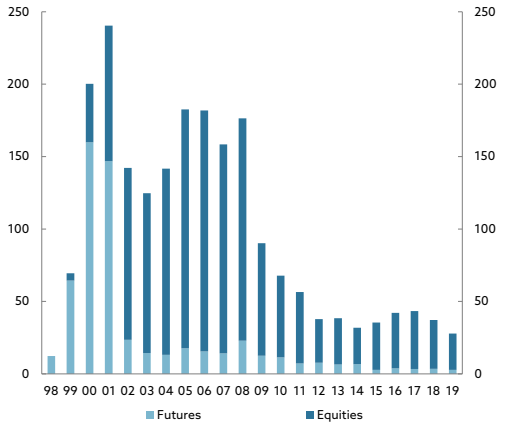


Chart 4 Equity turnover, by instrument type.
Percent of equity portfolio.



As inflows into the equity portfolio slowed down from 2003 and we increased the number and size of our internal security selection mandates, our focus increasingly turned to efficient implementation of active investment decisions in single stocks. This required a quick turnaround time and access to liquidity globally, in order to capture investment opportunities at the best price for the fund.

As most equity managers, we chose to separate the trading and portfolio management functions. Portfolio managers would be responsible for selecting which stocks to buy or sell, while the traders would have the responsibility for managing the implementation in the market. With this separation of duties, the portfolio managers could focus on analysing companies and portfolio composition. The traders, who knew the market best, could focus on timing and accessing liquidity. In addition, this separation ensured sufficient controls were in place for trades going to the market.

While a separation of portfolio management and trading was common, we departed from market practice in the autonomy we gave the trading function. In most asset management organisations, the portfolio manager was in command of the execution, down to the timing of individual trades. The trader was charged with the operational implementation of the trades in the market and the collection of market intelligence. We took the point of view that the trader would be best placed to make short-term decisions on the best implementation strategy. This also involved the traders making the crucial decisions on how to implement inflows and significant changes to the fund's asset allocation.

From 2007 to 2009, we implemented three major strategic transitions for the fund. In 2007, we expanded the investment universe to include small-cap companies, adding 4,400 new companies to the equity portfolio. In 2008, we expanded the universe to include 23 new emerging markets. And most importantly, from 2007 to 2009, we implemented the transition of the fund from 40 percent to 60 percent equities, at the height of the financial crisis. These transitions required a significant increase in the breadth of the trading function.

In the period since 2010, we have adapted our trading function to two major changes. First, the equity market has evolved significantly, with an increasing number of trading venues, and liquidity becoming more dispersed. Second, the equity part of the fund has grown to become the largest single-owner global equity portfolio in the world. These changes have required us to adapt our approach to the market.

From first objective to core capability

The trading function serves as the fund's interface with the market. The objective of the trading desk is to implement investment decisions in the market successfully at the lowest possible cost to the fund. There are two cost elements to take into account: explicit and implicit. The explicit cost consists of commissions paid to brokers, market fees and transaction taxes. The implicit cost consists of the difference between the price at the time of the investment decision and the price obtained in the market, known as implementation shortfall. Trading is, on average, costly. As investors, we pay for liquidity from the market in order to obtain the necessary exposure for the fund. Given the size of the fund and our trading volume, these costs can be significant, turning into a drag on the fund's performance. We were aware of these costs from an early stage and have actively sought to manage them for the last 20 years.

Our main priority in the early years was to invest cash inflows in the equity market. This resulted in using equity index futures as the first instrument to manage the fund's equity exposure, followed by the trading of broad baskets of equities, known as program trading. This set us apart from the trading desks at other asset managers, which were set up to implement the investment decisions of active portfolio managers in single securities. Our traders, on the other hand, carried the full responsibility for implementing the fund's inflows – and subsequently implementing the portfolio managers' orders. Our initial focus on futures and program trading required different choices in terms of hiring, organisation and strategic priorities.

Program trading required a different skillset to trading in single stocks, which was more common. It required us to prioritise quantitative analysis of our trade executions to ensure we achieved the best possible results. As early as our first year of program trading, we measured the results of our execution to ensure our costs were in line with expectations. At the time, it was uncommon for asset managers to measure execution results.

In the early years, we used an external vendor to provide our trading analytics. This early focus on trading analytics gave us the tools and confidence to become early adopters of electronic trading – which we ramped up very quickly, starting in 2004. Our execution data allowed us to evaluate brokers regularly based on performance metrics rather than relationships. As our main trading activity related to investing cash flows in the market, we did not see the rationale for bundling equity research and execution payments, leading us to separate the two – 12 years before it became mandatory in Europe. These efforts have all served the same purpose: ensuring we executed our orders in the most efficient manner possible.

As we built out our trading desk from our base in Oslo, we deployed systems with global connectivity, allowing us to manage a continuous handover throughout the day. Today, we manage a global trading desk operating 24 hours per day, 5 days per week, with traders in Singapore, Oslo, London and New York covering their respective regional markets but also able to support other regions as required. We have developed internal systems and expertise to manage our trading volume, with feedback loops to review and refine our trading strategy, responding to changes in market structure.

Part of our success in handling the growth of the fund, in the context of an evolving equity market, has been due to the importance we gave the trading function in deploying our investment strategy, rather than seeing it as a cost centre. This enabled us to make early choices aimed at achieving our objective, namely implementing the fund's investments at the best possible prices.

The trading team

Towards the end of 2000, it became clear that the fund was set to grow substantially, and we decided that we would manage the bulk of the fund's equity assets internally. We established a separate trading team in Oslo in 2001. During the course of that year, we terminated most external index mandates and insourced index portfolio management. At the end of 2001, there were three internal index portfolio managers and eight active portfolio managers sending orders. In addition, we were actively preparing portfolios for external managers, as 12 new mandates were added during the year.

A small team

The trading team received the mandate to develop trading strategies that would further improve the performance of our investment decisions, executing orders across all investment strategies. The principle of a centralised, shared trading team has endured, even as the number of portfolio managers, investment groups and strategies has grown over time.

As we hired team members for the trading function, we did not look for experienced traders or brokers from the major investment banks with wide contact networks in the industry. As most of our activity was in program trading, we did not see such experience as particularly useful. Instead, we looked for people who were skilled at managing data and could think on their feet. We then sent them off to the major financial centres to understand the workings of equity markets by spending significant amounts of time with our counterparties. As they joined us from outside the financial industry, they were able to challenge the status quo, enabling us to stay ahead of the market as it evolved.

As a basic trait, our traders have had to be able to think fast. The role has required them to act intelligently, based on both data and experience. It has also required an ability to execute efficiently, as the volume of trades is large. Furthermore, our traders have had a personality making them able to resist pressure – from the market on the one hand and from internal portfolio managers on the other – to avoid executing orders too aggressively. Finally, we have fostered a culture where traders are not afraid of making mistakes but take responsibility for putting them right when they do occur.

Even though trading volume has continued growing with the size of the fund, the trading function's headcount has remained stable after the initial ramp-up through to 2007. This reflects our continued investment in technological solutions, enabling greater efficiency in handling increasing trading volume while keeping execution costs contained.

Setting up a trading team with significant autonomy proved to have positive effects over time. While trading can be seen as an extension of portfolio management – and would not exist without it – the skills and systems required to plan and execute trades are distinct from those of portfolio managers.

Executing 100,000 trades per day in the market requires excellent systems and operational integration. Our traders have worked closely with our internal operations and systems teams, as well as with our counterparties, to achieve the best execution results for the fund with limited resources.

A specialist team

As our internal active management grew in importance, we separated the trading desk's activity into two separate teams in 2003. One team focused on the broad trading activity coming from cash inflows, rebalancing and transition activity. The other team focused on implementing the active portfolio manager decisions. However, they continued working as one integrated trading desk with the same systems and objectives.

Our hiring was also guided by our early focus on trading analytics to inform our decisions. We hired our first quantitative analyst in 2005, and subsequently built up a dedicated trading analytics team in 2007. This allowed us to develop internal tools to benchmark the performance of our execution strategies.

As the market infrastructure evolved – and became increasingly fragmented – after the financial crisis in 2008, we realised that we could not focus solely on achieving optimal performance in the market – we also needed to ensure that we had a well-functioning equity market to invest in. This prompted us to step up our efforts with the establishment of a market structure team, providing research and recommendations to regulators and stock exchanges globally on the best way to achieve a well-functioning market for long-term institutional investors.

A global team

The trading team was initially based in Oslo and responsible for global trade execution. The traders worked shifts to cover the global time zones we invested in, from Australia and Japan in the early morning to the US in the late evening. Increasing trading volumes and differences in regional market structures meant that we soon had to expand geographically. In 2003, two traders rotated to ensure a local presence in New York, and we established a permanent local presence there the next year to cover trading for America. After opening an office in Shanghai in 2007, we were able to cover trading in Asia locally. The global trading desk was now able to cover all regions from local offices, which became increasingly important as our liquidity requirements increased. In 2011, we opened an office in Singapore. As Singapore became our regional hub in Asia, the traders for the Asia region relocated there.

Even as we expanded to multiple regions, we maintained a strong focus on global cohesion. While the local traders became experts at their regional market structure, we continued to encourage global mobility. This served three objectives: ensure appropriate staffing throughout the year, increase knowledge sharing, and continuously challenge our local processes. We encouraged our traders to develop further by rotating between different product types and roles.

Chart 5 Number of equity traders.

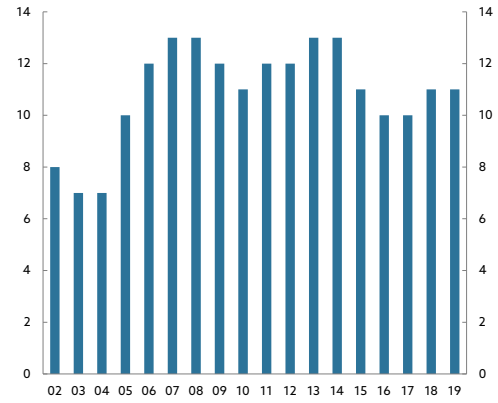


Chart 6 Number of equity portfolio managers per trader.

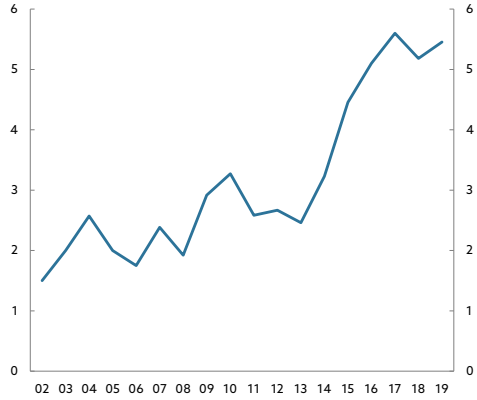


Chart 7 Number of traded equity orders.

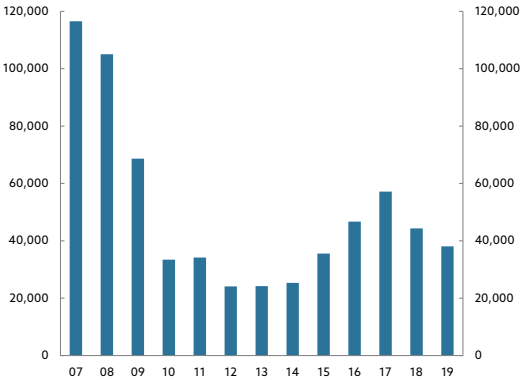
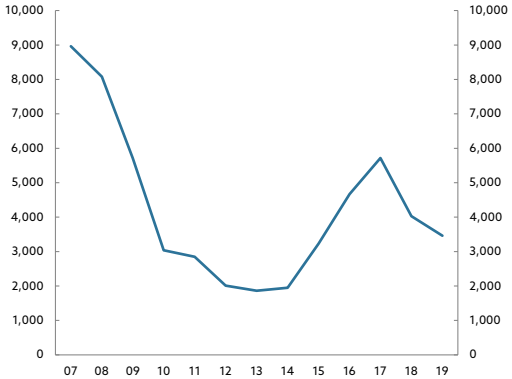


Chart 8 Number of equity orders per trader.



The trading activity

From relatively small beginnings, the fund has grown enormously, and so has our trading activity. Today, the fund is a large and active participant in most equity markets around the world, with, at times, a considerable share of the local market volume. Our trading volume is driven by multiple factors – cash flows, strategic changes in asset allocation, active investment strategies, and risk management. The relative importance of these activities for our trading volume has varied over time according to the strategic changes the fund has gone through.

A global trader

As the fund's investment mandate has expanded to include more markets, so has our trading activity. When we set up our internal trading in 1999, the fund was only invested in 21 developed markets. We have successively increased the number of countries the fund invests in through the addition of emerging markets in 2001, 2004 and 2008, and certain frontier markets from 2012 to 2018.

While most of our investments in emerging markets, and all those in frontier markets, have been managed through external managers since 2014, we have retained the capability to trade in these markets through our internal trading desk. This has been an important criterion in the approval of new equity markets and ensures that we can terminate any external mandate on a day's notice, to manage the portfolio in-house if needed.

This expansion into new markets has led us to be active in more than 45 markets today, with the capability to trade in all the fund's more than 60 equity markets when needed. Each of these markets has a different operational and regulatory framework, broker landscape and set of market participants. In addition, many of the markets have multiple venues where trades are executed. This has required us to learn the intricacies of each market and find the most efficient way to implement investment decisions for a large investor. We have also increasingly worked with regulators and stock exchanges to ensure a well-functioning market infrastructure, adapted to facilitating long-term investment.

The fund's trading day starts at 11pm Oslo time, when the New Zealand stock exchange opens, and ends at 10pm, when the New York stock exchange closes. During those 23 hours, we execute an average of 113,000 trades in the market. We trade actively 240 days per year, seeking to take advantage of as many liquidity windows as possible.

A large trader

As the manager of a growing fund, we have become an increasingly large participant in global equity markets. In the first years, from 1998 to 2001, the major part of our activity involved trading equity index futures, which we used to manage the timing of inflows into the fund and efficiently rebalance between regions. In 2001, as we moved the major part of our index management in-house, we significantly ramped up our activity in physical stocks. Our activity increased further from 2002 to 2006 as we increased our internal active management activity.

Starting in 2007, we expanded the fund's investments to include 4,400 new small-cap companies added to the equity index in October that year. As small-caps are generally less liquid than the companies the fund was already invested in, this strategic transition required further collaboration between the index portfolio managers and the trading team to ensure that we accessed liquidity in the most efficient manner.

Chart 9 Number of equity markets traded in, by region.

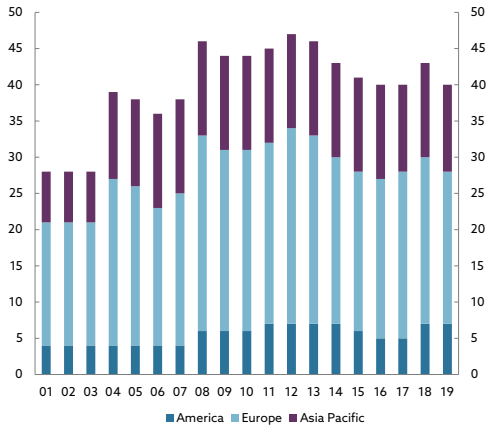


Chart 10 Number of stocks traded in, by region.

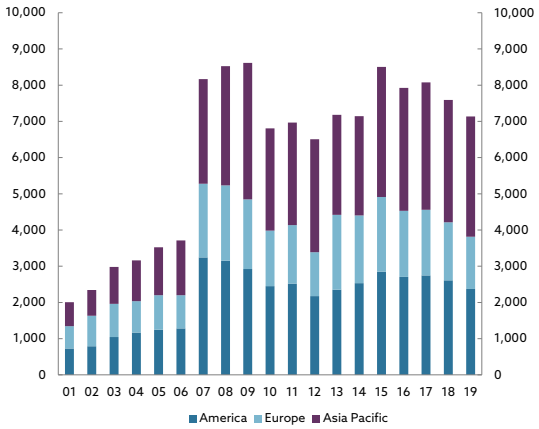


Chart 11 Equity trading volume, by region. Billion dollars.

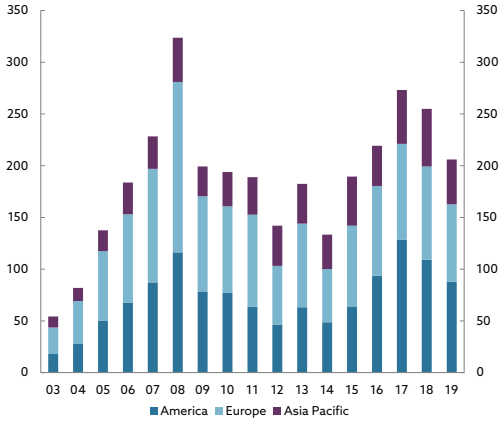
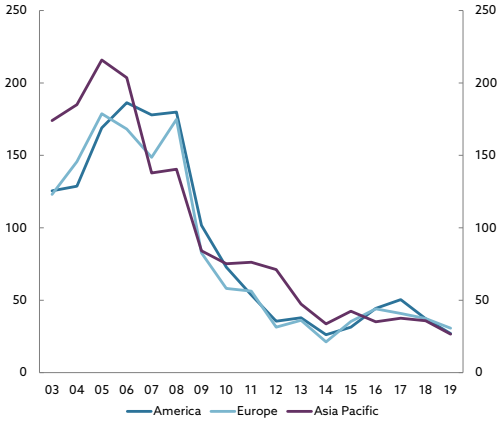


Chart 12 Equity turnover, by region. Percent of regional portfolio value.



In 2008, we phased in 23 new emerging markets included in the equity index in September that year. In addition to having their own regulatory and operational specificities, liquidity was more challenging, leading us to adapt our trading strategy.

Between 2007 and 2009, we managed one of the most significant changes for the fund, as we transitioned the asset allocation from 40 percent to 60 percent equities. The strategic asset allocation had been changed by the Ministry of Finance in 2007, with an implementation period of 20 months between June 2007 and February 2009, and a subsequent rebalancing of the equity share from March to May 2009. During this period, we bought a net amount of 1,010 billion kroner in equities, equivalent to 123 percent of the equity portfolio's value in 2007. The bulk of our buying occurred as equity prices fell at the end of 2008 and beginning of 2009. During the rebalancing period from 2007 to 2009, we tripled the fund's ownership of global equity markets, from 0.3 percent at the end of 2006 to 1 percent at the end of 2009.

Because of these transitions, as well as the financial crisis leading to higher turnover in our investment strategies, 2008 was the year with the highest turnover for the fund, at 324 billion US dollars, equivalent to 171 percent of the equity portfolio's value.

As the financial crisis abated, our equity turnover decreased somewhat, even though the fund received substantial inflows in 2011 and 2012.

Chart 13 Net buying of global equities. Percent of free float market capitalisation.

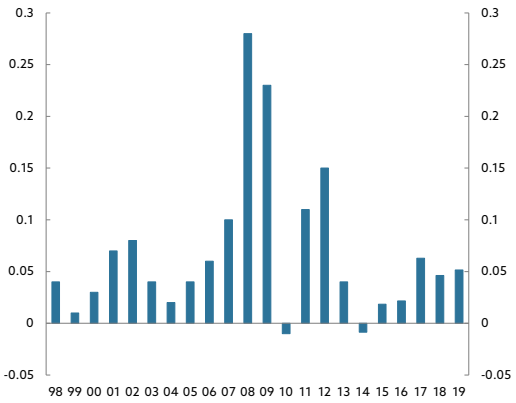
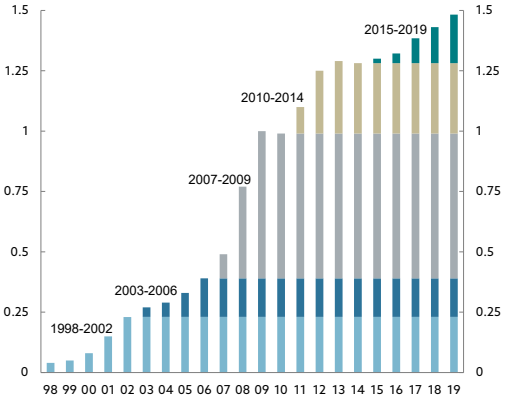


Chart 14 Ownership of global equities, by period bought. Percent of free float market capitalisation.



With a risk factor strategy introduced in 2012, and significant changes in the active strategies, our equity trading volumes then increased again, reaching 273 billion dollars in 2017 – a large volume but still below the 2008 level and a much smaller share of the equity portfolio's size.

A patient trader

From the outset, we have used the fund's relative risk budget to implement investment decisions in an optimal manner. Being patient lowers costs, as we increase the likelihood of finding natural liquidity, through other investors seeking to trade in the opposite direction from us. We have sought to avoid paying for liquidity, considering our risk capacity to be higher than that of our counterparties.

Having a single client, we have been able to see our execution risk in the broader context of the fund's relative risk. Our capacity to hold risk for extended periods of time has differentiated us from most other asset managers – where trading desks usually manage orders over a single day. The other trading desks with comparable risk capacity have been within our broker-dealers' market-making activities. Accordingly, as the fund has grown, we have extended our implementation periods beyond what would be possible for most of our peers.

Given our risk capacity, we have been in a position to seek the optimal trade-off between risk and cost. We have weighed the additional risk of trading patiently versus the increased cost of sourcing liquidity quickly, depending on the market conditions and the objective of the order. Our capacity to hold off on trading if needed has brought significant benefits as we have handled large, illiquid transitions for the fund, and increased our activity in more illiquid segments such as emerging markets and small caps.

Our patient approach has led us to increase our use of block trading, even offering to price blocks intraday for other market participants with lower risk capacity starting in 2015. The size of the fund has allowed us to become important partners for our counterparties. We have worked constantly with them to ensure that we are shown the entire flow of relevant blocks, to maximise our probability of trading at an attractive price. This has required us to show that we are a long-term and active investor in the equity market – and that we have a risk capacity commensurate with the size of the fund.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Trading in the market

The trading function acts as the interface between the fund and the equity market. Accessing the market is a complex task, and more so given the typical size of our orders. Our objective is to source the liquidity needed while minimising price impact and information leakage. Traders often have to access multiple venues simultaneously, interact with many counterparties, and spread executions over time to ensure they can source sufficient liquidity.

An equity trade starts with a portfolio manager sending an order to buy or sell a specific quantity of a certain stock. At this point, the trader takes over. To execute the order successfully, we need to navigate a complex market which has evolved rapidly over the last 20 years. Our trades are executed on exchanges or similar venues matching buying and selling interest. To execute the orders efficiently, we utilise the services of broker-dealers, mainly major investment banks, which serve as intermediaries between investors and exchanges. There are multiple ways to execute trades through the broker-dealers, each with their advantages and disadvantages. We have addressed this complexity by considering the best strategy for us, given the market situation and our unique characteristics. We have measured the outcomes and adapted quickly when necessary, sometimes taking a leading role in the market, such as when we very quickly ramped up electronic trading from 2004 to 2007.

The trading venue

Equity markets have changed significantly over the last 20 years. As the fund has also grown enormously, we have had to adapt our strategy to ensure we could continue to efficiently deploy our investment strategy.

Market evolution

The start of our trading activity in 1998 coincided with a period of market consolidation and globalisation. Local stock exchanges merged to form national entities, while broker-dealers increased their global reach as a result of market liberalisation. This made it easier for us to access global equity markets through a limited set of major broker-dealers.

Technology also advanced quickly during this period. The communication between investors and broker-dealers was transforming quickly, from phone to electronic protocols. While most exchanges had shifted to electronic order matching by 1998, some trading – such as large blocks of equity index futures – still occurred on the floors of exchanges.

In 2001, stock quotes in the US changed from fractions to decimals, allowing for narrower bid/ask spreads. Combined with technological developments, this led to a period of market fragmentation. New venues and electronic communication networks emerged, competing on speed and lower cost. Market fragmentation, trading automation and tighter bid/ask spreads led to a decrease in average quote and trade sizes. The New York Stock Exchange's average trade size has fallen from around 2,200 shares when we started investing in equities in 1998 to around 200 shares today.

The participants in equity markets have also changed. The institutionalisation of asset management – households increasingly delegating wealth management to professional asset managers – has been a long-running feature of asset markets. The fund's growth has coincided with an acceleration of this trend. As a result, the ownership of equities has changed – the proportion of US listed equities held by institutional managers in the US has risen from an average of 55 percent in 2001 to more than 80 percent in 2020.

The composition of the institutional investor base has also consolidated, with fewer but larger firms playing a prominent role in the ownership of global equities. Passive investment has grown in importance, through exchange-traded funds or index mutual funds. This has meant a decrease in turnover for many institutionally managed portfolios. As an example, the turnover of US mutual funds, which was around 60 percent per annum in 1998, dropped to 28 percent in 2019. Therefore, more and more assets are held by institutions that trade less and less.

After the introduction of Regulation NMS in the US in 2005 and MiFID in Europe in 2007, equity markets have become increasingly fragmented. The same stock can now be traded across a multitude of trading venues and exchanges. There are now more than 50 such venues in the US alone, a tenfold increase over the last 20 years. This is a global phenomenon and has been reflected in the number of trading venues that we use to execute trades globally.

Chart 15 Number of venues traded in.

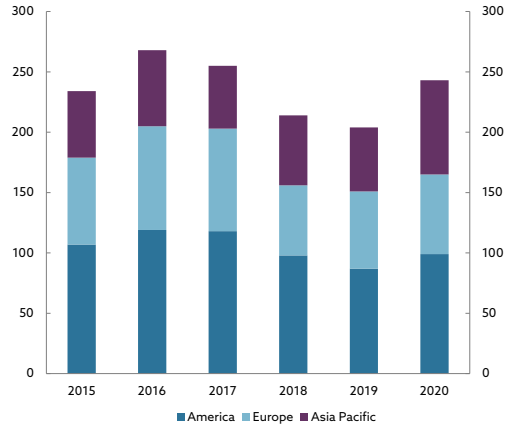
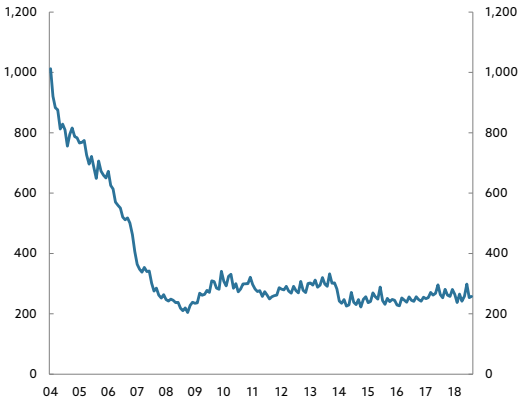


Chart 16 Average trade size on New York Stock Exchange. Number of shares.



Source: New York Stock Exchange

While fragmentation has no direct impact on liquidity – a share bought on one trading venue is the same as a share bought on another – it can have a significant impact on our trading costs, as the level of transparency and potential for information leakage vary across venues.

The evolution of equity markets and the asset management industry has given rise to a paradox. On the one hand, the asset management industry has consolidated, in an accelerating trend since the financial crisis. On the other hand, the average trade size on exchanges has reduced. With increasing order sizes, asset managers have faced more difficulties executing their orders on exchanges. In an effort to solve this, venues have developed to facilitate trading between large institutional investors – but unfortunately many of these, known as dark pools, have not offered the necessary transparency to investors. In addition, some of these pools have not been successful in increasing the average trade size.

In parallel, high-frequency traders have developed strategies which provide liquidity to small orders in calm markets, but attempt to identify larger orders with high urgency to position in the same direction as the order being traded, to benefit from the investor's market impact.

As our orders are large, and require execution over multiple days to months, our biggest concern is information leakage. As we came out of the financial crisis and volatility abated, we saw that our trading costs did not come down accordingly. We concluded that this was the effect of the evolution of the market structure. While the changes have benefited the trading of small orders, they became a threat to our objective of investing efficiently in the market.

We have sought to address this through an evolution in our trading strategy. We have imposed restrictions on which venues we use for execution in an effort to limit information leakage and preferential treatment of certain investors over others. We have also supported the development of innovative solutions, seeing that some new exchanges, such as IEX, or initiatives, such as Plato Partnership, sought to address the needs of institutional investors. Through an increasingly patient approach to trade execution and an expansion of block trading, we have adapted our trading to the new environment.

Venue selection

The new venues offered different ways to access the market and transact. They competed on which order types they offered, matching algorithms, pre- and post-trade transparency, and how they disseminated their trade reporting. Based on their transparency, venues received new classifications, and some became known as dark pools. The complexity and network speed necessary to communicate between different venues has led to a technological arms race that has transformed equity markets. It has led broker-dealers to become technology companies, investing heavily in network infrastructure, computing power and IT talent.

The fund's interests were not necessarily aligned with those of the broker-dealers we use as intermediaries. We have broadly viewed innovation as beneficial for the market. However, the competition in access fees, particularly the introduction of access fee rebates, can create additional agency mismatches between the fund and our broker-dealers. The broker-dealers may route our order flow to the trading venue charging them the lowest access fees – potentially even paying them for the flow – rather than to the

venue that has the highest chance of minimising our implementation shortfall, i.e. the difference between the price achieved in the market and the price at the time of the order.

To address these risks, we saw the need to work with our broker-dealers to define which venues and order types could be used to execute our trades. We saw that, without restrictions, there was a risk that our order flow would be routed through venues or order types that would hurt our overall trade execution.

We therefore developed several new tools and guidelines. In addition to reviewing the routing decisions taken by broker-dealers, we established clear venue interaction rules, which we deployed in 2008. Our approval of venues is based on a multi-faceted analysis, taking into account market share, matching engine logic and order types, as well as the potential for information leakage. Starting with a relatively small set of approved US venues in 2008, our list of approved venues grew to 18 in 2010, versus 17 that were not approved. We replicated the same analytical approach in Europe, as regulatory reform and the introduction of multilateral trading facilities led to increased fragmentation there as well. We began with only a few exclusions, but by 2014, there were 12 European venues that we did not route orders to.

In retrospect, our systematic approach has benefited the fund. Several venues and brokers have been investigated and fined by regulators. In the period from 2015 to 2018, multiple fines were imposed on dark pool operators for misleading investors on the treatment of their orders. In many cases, we had never used these venues or order types; in others, we had stopped using them because we suspected that our orders were at risk of being handled inappropriately. There were also cases where brokers were fined for not providing enough information on certain aspects of their trading strategies. Our broker questionnaires had helped us adjust our interactions with those brokers.

In addition to a top-down approach to venue approval, we developed research and analytics on execution quality for each trading venue. This gave us an indication of adverse selection effects and influenced our use of these venues. It also allowed us to monitor the routing behaviour of our broker-dealers to ensure best execution in sourcing liquidity at low cost. These models included both our own transaction data and market data, as well as information supplied by broker-dealers on orders routed but not filled. Using these data, we could monitor the impact of access fees on the routing behaviour of our broker-dealers.

This analysis has not only shown significant differences in broker routing strategies but also ensured that broker-dealers have routed our trades on a best-execution basis. This level of analysis has been helpful in our broker review discussions and has aided understanding of the design principles behind the broker-dealers' algorithms.

The trading counterparty

Managing a complex market environment requires robust systems and processes. It is not necessary to manage the entire process in-house, as broker-dealers and other service providers offer products which allow us to outsource all, or parts, of our trading activity. However, using external providers as intermediaries has required us to select and monitor them to ensure we received efficient outcomes.

Execution

Broker-dealers undertake trade execution on our behalf, acting as our counterparties and agents. There are several reasons for this. First, broker-dealers preserve our anonymity and prevent information leakages about our trading intentions. Second, broker-dealers can provide economies of scale and specialist expertise that may be difficult or expensive to replicate within our own organisation. Third, broker-dealers can act as an additional risk check on our trading activity, helping to prevent mistakes.

For our earliest equity transactions, our main focus was on efficiently managing cash inflows into the fund, with a limited amount of staff. Due to our limited internal capacity, we were dependent on outsourcing the execution to broker-dealers. As we were building an index portfolio, we sought to buy diversified baskets of equities, hence our primary execution approach was to utilise program trades offered by broker-dealers in an agency capacity. The broker-dealer was then responsible for planning and executing our trades in the market. As our order sizes were small, we saw outsourcing as an efficient and low-risk execution avenue.

However, we quickly realised that there were substantial and fundamental agency problems in this market access approach. The agency problem is the result of different incentives. From the fund's perspective, the successful execution of a basket order is characterised by an optimal trade-off between minimising the implementation cost and finding the necessary liquidity to complete the order within a given time period. If the execution of the trades is done too quickly, a large share of the volume will be used, and the trades will be more costly. If they are executed over a longer time period, there will be more liquidity available, but there is a higher risk of an unfavourable outcome due to price moves. With large basket orders, the execution risk increases, as the trades need to be extended over time.

Broker-dealers, on the other hand, have a different incentive structure. They are paid through commissions on completed trades, which tends to favour greater urgency in execution than might be in the fund's interests. Our experience suggested that we could not rely on broker-dealers as agents to perform trade planning that was compatible with our patience and interest in minimising the implementation shortfall. As a small client of the large investment banks, we quickly understood that our requirements would not be sufficiently taken into consideration. This led us to avoid some of the largest investment banks in the early years.

Managing these potential agency problems is a key responsibility of the trading desk. This involves the development of professional interactions and clear rules of engagement, transparent specification of our expectations, and management of the economics of the services provided. We have focused on the development of long-term collaboration with broker-dealers, combined with regular qualitative and quantitative broker evaluation and feedback to ensure that agency risks are managed and that the fund's interests are upheld.

Selection

The trading desk selects the set of broker-dealers that we utilise. From the beginning, we made a strategic decision to develop an extensive interaction policy for all counterparties to guide the management of these relationships. Broker-dealers would be selected based on their ability to provide cost-effective execution services – execution performance and trading value added – rather than historical relationships or provision of equity research. The selection process has included quantitative elements, such as historical execution performance, as well as qualitative aspects such as collaboration, responsiveness and flexibility of systems.

The broker selection and evaluation process has multiple purposes. The number of brokers should be high enough that no broker-dealer is the exclusive provider of services in each market. At the same time, the number of brokers should be low enough that the trading volume each broker receives is significant enough to ensure appropriate levels of service. Finally, turnover of brokers should be high enough to allow us to explore the product offerings across the market and ensure that we engage with the broker-dealers best able to deliver us best execution.

We started out with a relatively small list of broker-dealer counterparties – fewer than ten per region – including the global investment banks and some regional specialists, which allowed us to provide frequent and detailed feedback on performance and efficiency. Starting in 2002, we provided broker-dealers with indications of their relative rank amongst their peers, and their expected trading volume. We did not hesitate to remove brokers from the list, regardless of our established relationship or their market share.

Our ability to monitor our broker-dealers was a result of our efforts in trading analytics. These enabled us to provide quarterly feedback on their performance versus their peers and by region and execution types. Thanks to the transparency we gave our counterparties, they strove continually to be competitive providers, knowing that if they underperformed their peers, they would be removed from our broker-dealer selection.

Over time, our panel of broker-dealers has grown. In 2020, we have between 25 and 29 brokers per region, with the top ten brokers receiving more than 90 percent of our volume. This is on the low side compared to other large asset managers. We have benefited from building up close collaboration with a smaller number of broker-dealers. This has enabled us to set and communicate long-term expectations and to improve the cost-efficiency of our trading implementation. These strong business interactions are reflected in the distribution of trading volume.

This does not mean that the list of broker-dealers, let alone that of the top broker-dealers, is static over time. There is continued turnover in the list of broker-dealers we use across the different product categories. This is particularly true for the electronic algorithm products, where rapid technological development and capital investments can substantially change the relative ranking of a broker's execution quality. Starting in 2008, we have conducted regular surveys of the electronic algorithm broker-dealers, including broker questionnaires, on-site due diligence interviews, asset manager references, and technology testing. Compared to high-touch agency trading, where flexibility and compatibility with our trading process are paramount, we expect greater turnover in our electronic algorithm broker-dealers. We also

Chart 17 Number of broker-dealer counterparties, by geographical coverage.

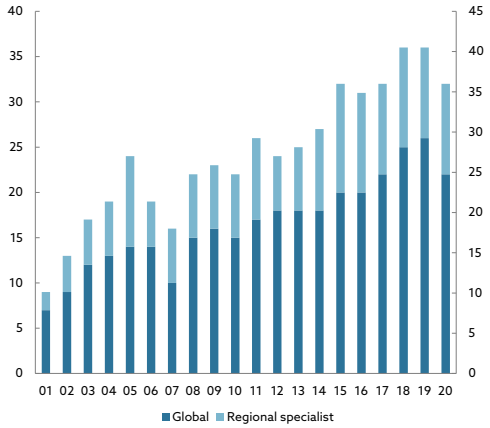


Chart 18 Number of broker-dealer counterparties, by region.

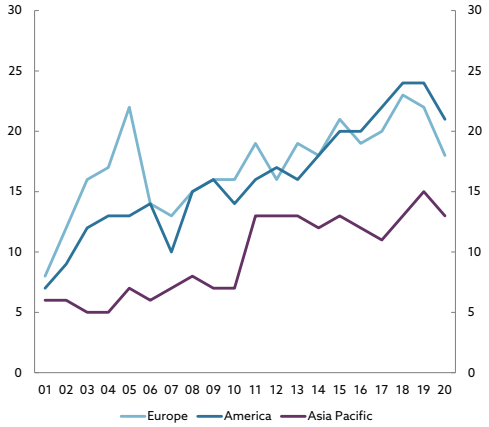


Chart 19 Share of trading volume facilitated by top broker-dealers. Percent.

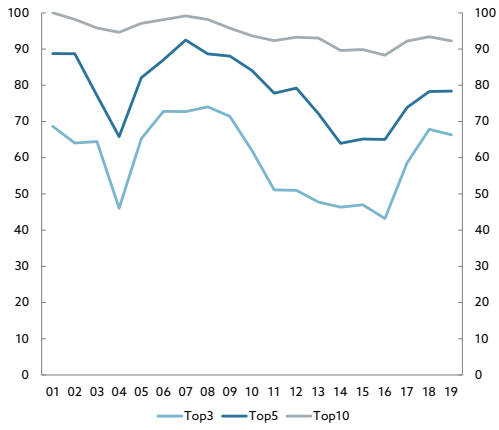
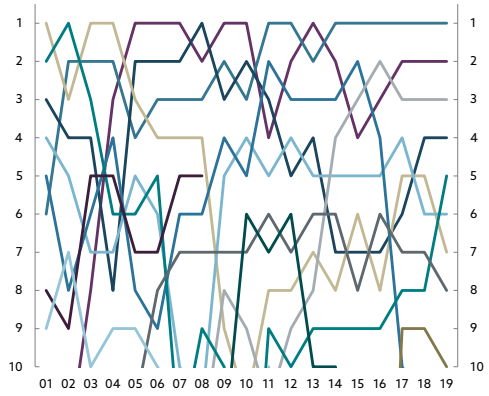


Chart 20 Rotation of top broker-dealers. Rank.



limit the number of electronic algorithm counterparties to ensure we have sufficient execution data for rigorous performance evaluation.

Measurement

The cost of trading in the market was a concern from an early stage. This was a natural result of our initial focus on investing cash into the market. As we did not invest with a specific view on the direction of equity markets, our main concern was to achieve the lowest possible execution cost.

Our initial estimate of the trading cost of buying equities in the market was 25 basis points of the traded value. As the cash we received to invest amounted to more than 50 percent of the portfolio's value each year from 2000 to 2002, the annual cost to the portfolio from investing the cash flows alone would have been 13 basis points, a significant headwind.

A prerequisite to achieving our objective was to measure and understand our execution results. Thus, one of the first tasks for the trading team was the development of capabilities in trading analytics. We sought to estimate how much we expected a trade to cost, given stock characteristics and the market environment. We also sought to evaluate how this cost would vary based on different execution strategies and urgencies. Based on data we collected, we could also investigate whether certain broker-dealers achieved lower costs for specific types of orders and should therefore be favoured to execute them.

Our efforts in trading analytics led us to develop our capabilities in trade planning. Based on our data, we could select the optimal combination of broker-dealers and execution strategies. This allowed us to bring a greater portion of the trade execution process in-house, relying on broker-dealers only for products where they had a clear comparative advantage. This meant that, instead of delegating broad basket trades, we could use the broker-dealers for single-stock trades on their agency desk and, increasingly, for their electronic execution capabilities. In every case, the trader could select the most appropriate execution strategy, reflecting our requirements.

Using the data we collected, we were also able to present our broker-dealers with the results of their execution services. Over time, this created a positive feedback loop, where broker-dealers worked to improve their performance to remain among our top counterparties. As they were aware that we would measure results, their behaviour changed – usually for the better.

Unbundling

Our focus on execution quality in our broker selection also led to our decision to unbundle our payments for research and execution services. This approach, which we implemented in 2006, has since become the norm following the introduction of MiFID II in Europe in 2018.

Broker-dealers offer multiple services to clients in addition to trade execution, including equity research. Historically, the payment for these services was often bundled into the trading commissions. Broker-dealers would expect sufficient trading volume from an asset manager's trading desk to compensate for the equity research that was delivered to analysts and portfolio managers. Alternatively, trading commission rates were adjusted to ensure adequate payment for equity research. Payment for research through trading commissions can be a source of friction between portfolio managers and trading desks. It can also potentially lead to a misalignment of incentives.

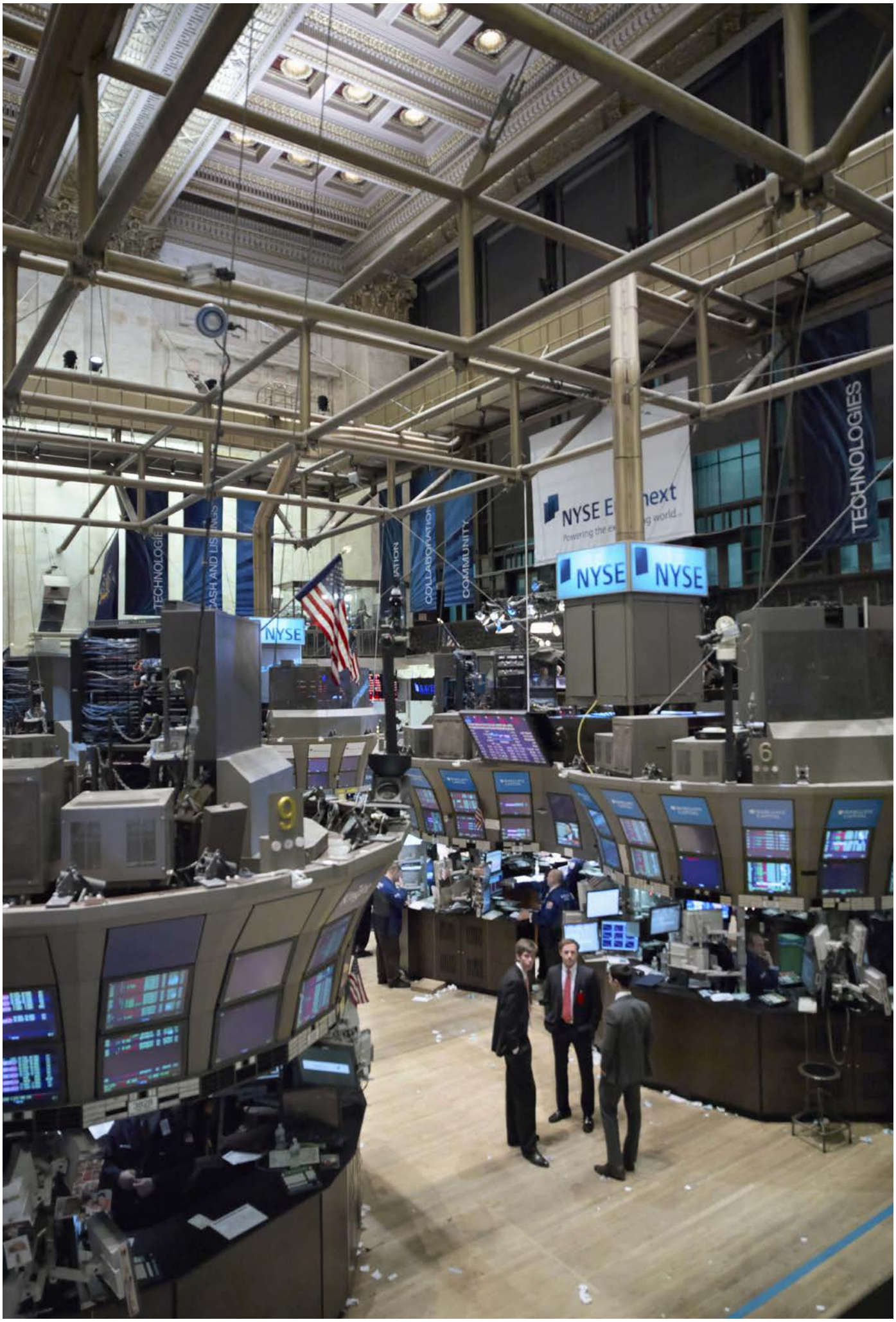
We started tracking our research interaction in 2004, by attributing the research share of our trading commissions. In early 2006, we saw that there was a risk of over-payment from our increasing trading volume. As a large part of our trading volume related to inflows, rebalancing or transitions – and not to active decisions supported by sell-side research – we did not see any reason to pay for equity research for this part of our trading. As our trading volume was set to continue growing, standard market practice was no longer appropriate for us.

To alleviate this, we set up commission-sharing agreements with a select group of our top brokers, which effectively separated the commission for trade execution from that for research. Top brokers, executing a large share of our orders, received payment for both execution and research. All other brokers received execution commissions only. The top brokers then redistributed research payments to other providers, including smaller brokers, based on our instructions. This arrangement was not popular with our counterparties, as quite a few objected to sending cheques to their competitors. However, we eventually reached a mutually agreeable arrangement. This enabled us to base our broker selection on execution quality only, while continuing to use equity research from multiple providers.

The impact of commission-sharing agreements on overall commissions paid to brokers was relatively modest. While our global high-touch commission rates declined in 2006 and 2007, they had also declined substantially in the years prior to unbundling because of greater market competition.

In 2013, we replaced commission-sharing agreements with direct, invoiced payments for research – as the first global asset manager to do so. Paying for research in this way had the benefit of allowing us to negotiate rates for equity research directly. It also levelled the playing field for research providers, allowing us to diversify our usage of research to smaller, niche providers.

We were very early in unbundling research and execution services. While we had already separated the two in 2006, it did not become mandatory in the EU until 2018, through the introduction of MiFID II. Most global asset managers have now unbundled research payments, selecting brokers solely based on execution performance.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The trading type

Broker-dealers and trading venues offer us a large array of execution strategies – from single-stock agency trading to basket trades, from electronic algorithms that split large orders into small "child" orders to infrequent but large liquidity events such as block trades and auctions. Within these types of execution strategies, there are often multiple different flavours available, allowing further customisation of the trading approach.

We have had to develop and refine a process to use these execution strategies optimally. Over time, multiple considerations have influenced the process. These include the trading desk's capacity and system development, our liquidity needs, the state of the market, and the quality and efficiency of broker-dealers' product offerings. The interaction of these considerations has led to an evolution in our execution strategy. This evolution has been characterised by the trading desk performing an increasing portion of trade planning and execution in-house, instead of depending on the product offerings of broker-dealers. However, there is always a trade-off between the cost and complexity of developing expertise and systems in-house, and the potential savings in trading cost.

Principal

When we set up the trading desk, we were quickly offered the option of using the principal liquidity offering of our broker-dealers. In a principal trade, the broker-dealer offers to execute a trade instantaneously, at a price compensating the broker-dealer for the risk he is taking. This can be an attractive proposition for an active manager seeking to adjust his position quickly, with an expectation of excess returns beyond the cost of the principal trade.
However, the price we were offered was often significantly above what we were willing to accept. As the majority of our trading volume was related to inflows and rebalancing, we usually did not have any excess return expectations and were mostly concerned with cost. In addition, we would often have more volume to be traded over the following days, and we did not want to compete with the broker-dealer for liquidity in the market.

Most importantly, the price that was offered was generally significantly higher than the cost we expected through our execution cost models. Hence, we expected to be able to execute the trades at a lower cost ourselves. By paying for principal liquidity, we would be paying the broker-dealer to take execution risk in our place. We considered that we were better placed to take this risk and did not focus on using principal liquidity as a trading strategy. While we have used it on some occasions, principal liquidity has been an insignificant part of our volume.

Program

When we started trading for the fund in 1998, our priority was to manage inflows into the fund, and the rebalancing between different regions, in the most efficient manner. We used equity index futures to manage the risk, which allowed us to gain the required exposure quickly while waiting for the external index managers to buy our physical equity portfolios in the market or through crossing with their other clients.
As we set up our internal trading capabilities, we quickly took on a related responsibility, which was to manage the transitions into new external active equity mandates. The fund was receiving significant cash flows, and we considered it to be more efficient to prepare the equity portfolios for the external managers internally and then transfer the portfolios to the managers when they were ready. This gave us control of the implementation of the fund's equity exposure, rather than delegating it to the external managers.

With a small internal trading desk, we focused our efforts on planning the implementation schedule for these transitions. We outsourced the execution in the market to our broker-dealers, acting as agents. They executed trades in broad baskets of stocks based on our instructions and parameters.

This basket trading, known as program trading, is very common among index managers. As they seek to obtain exposure to broad segments of the market, it is efficient to outsource the execution of such programs to their brokers. The brokers then execute these baskets based on parameters given by their clients, such as the benchmark and the time horizon.

While we saw that program trading was an operationally efficient way for us to execute our trades, we were concerned about the agency costs. We were early to measure the performance of our broker-dealers' execution, against the parameters we had given them. Given our risk capacity, and cost-reduction objective, we would have preferred our broker-dealers to take significant risk versus their benchmark. Through our trading measurement, we saw that some individual program traders performed well – but subsequently moved on to other roles. With others, the distribution of outcomes was unfavourable to us as an investor, as there were too many negative outcomes compared to positive ones.

This inability to add value beyond pure execution led us to abandon program trading in developed markets, preferring to internalise our execution further. In emerging markets, we have continued using program trading in markets and situations where we have not had the capacity to manage the entire trading process internally, as knowledge of the local market participants is more important than in developed markets.

Chart 21 Principal. Volume.
Billion dollars.

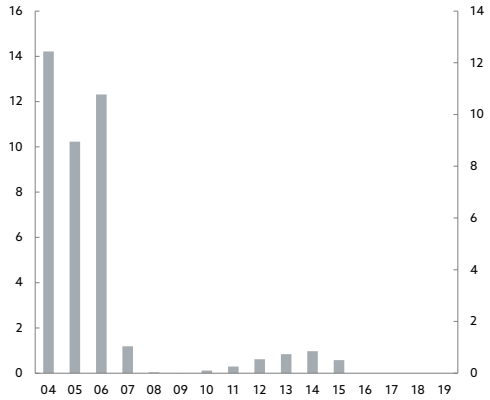


Chart 22 Principal. Share of total volume.
Percent.

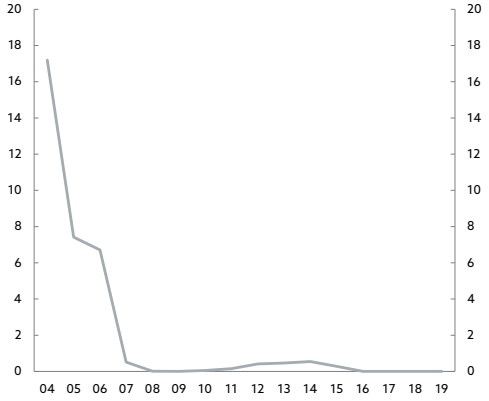


Chart 23 Program. Volume.
Billion dollars.

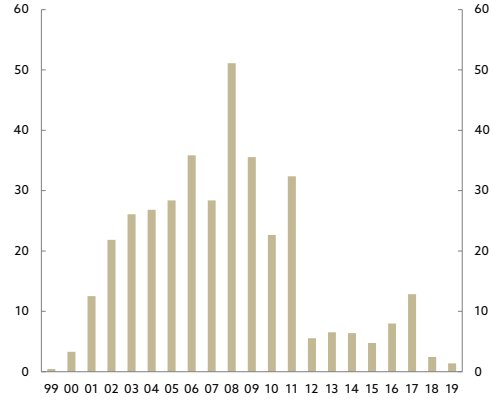
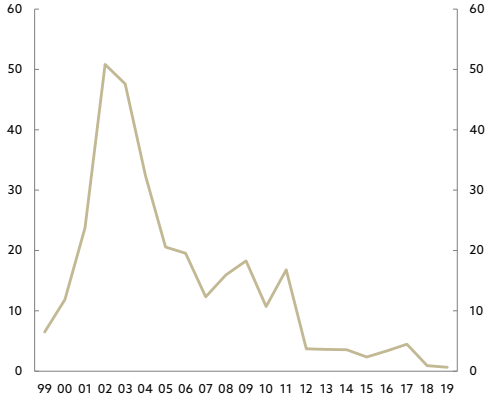


Chart 24 Program. Share of total volume.
Percent.



Single-stock agency

As we collected more trading analytics data, we were able to develop our internal trade planning capabilities, gradually replacing program trading with a more diverse set of execution strategies. While we still relied on broker-dealers acting as agents, we could make a more granular use of their different execution strategies, adapting them to the situation. This led us to use broker-dealers for execution of single stocks, on an agency basis.

The development of single-stock agency trading also coincided with the development of our internal active management activity. Our internal active managers selected single stocks based on fundamental analysis. The execution of active portfolio manager orders was different from the trading we had performed previously. As the active portfolio managers sought to capture the excess performance of single stocks, our execution could not focus solely on cost minimisation – we needed to capture as much as possible of the excess returns. This could be challenging when other active managers were also seeking to trade the same stocks, creating competition for liquidity.

Agency trading of single stocks increased to account for a larger share than program trading in 2004. Managing these orders, from an increasing number of portfolio managers, required better systems support than program trading, as each order needed to be handled individually. In 2005, there were a total of 91,000 portfolio manager orders executed in the market, up from 50,000 the year before. Having invested in scalable systems, we were well equipped to manage this large volume. As our trading volume became significant, we sought to

Chart 25 Single-stock agency. Volume. Billion dollars.

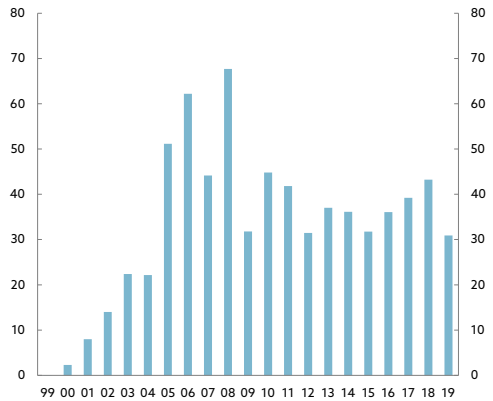
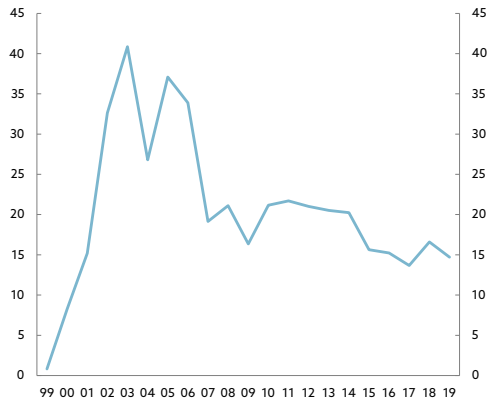


Chart 26 Single-stock agency. Share of total volume. Percent.



find the most efficient execution strategies for the fund in terms of costs and operation.

Electronic

We were early adopters of electronic execution strategies, completing our first electronic trade in June 2004 in a US stock. Having seen the success of electronic trading in the US, we pioneered its use in other regions, encouraging the development of broker capabilities. As our trading needs and order sizes grew, the efficiency gains offered by electronic order submission and straight-through processing became increasingly attractive. In addition, the algorithmic execution strategies offered by broker-dealers were often a useful complement to our other execution strategies.

Direct access to trading on exchanges and other venues is restricted to members and subscribers who have sufficient trading volume to justify the substantial connectivity and compliance costs of connecting to those venues. Asset managers typically make use of broker-dealers' connectivity rather than developing their own. This is both for cost reasons and because using a broker-dealer as an intermediary preserves the anonymity of the asset manager initiating the trade. Particularly for large asset managers, this is of considerable value.

Broker-dealers can offer several layers of value-added products on top of direct market access. If there are multiple trading venues for a given asset, a smart order router can help to route orders to the most appropriate venues. If instantaneous liquidity is insufficient to complete an order, broker-dealers can offer trade-planning algorithms that slice larger orders into smaller child orders that are executed over a period of time. Our electronic trading has made use of the whole array of execution services, with a focus on using algorithms provided by the broker-dealers.

Electronic trading quickly became a large portion of our overall order flow. It delivered significant cost savings, through both lower commission rates and lower implementation shortfall. As we ramped up electronic trading, we estimated it would offer a cost reduction of approximately 25 percent compared to our earlier reliance on agency and program trades. This was largely a result of us being very early, which gave us a significant first-mover advantage.

These estimates proved to be correct. As we already had significant trading analytics capabilities, we were comfortable that we would be able to monitor the performance of our electronic trading. This allowed us to increase our use of electronic trading very quickly from the first trade in 2004 to 30 percent the year after, reaching a peak of 70 percent in 2007. Since then, the adoption of electronic trading by the rest of the market, along with changes in market structure, has eroded some of the cost advantages of electronic, algorithmic execution strategies. Our liquidity needs have also changed, leading to a preference for complementing electronic trading with other execution strategies.

Electronic broker-dealers have developed a variety of trading algorithms which are intended to satisfy different execution objectives. These objectives include the urgency of execution, the pricing benchmark and the desired transparency (e.g. dark-only executions). The choice of algorithm will have a significant impact on the implementation shortfall of an order, depending on the size of the order, the participation rate and stock characteristics.

We set out to develop proprietary execution algorithms in 2007. Our plan was to host our own software which would slice our orders based on real-time information, and then send these to the exchange through connections

provided by the brokers. However, we realised that we could not move forward because of the cost of real-time data and the difficulty in keeping up with the market. New venues appeared quickly, the time taken to execute an order was lowered, and average order sizes dropped drastically. As we saw the infrastructure investments the broker-dealers made, we decided that we could not participate in such a race.

We therefore put our efforts into selecting the best algorithms that our broker-dealers could offer. Choosing an appropriate algorithm for a given order requires thorough analysis and modelling of algorithmic trading outcomes. Optimal selection of trading algorithms is a topic that has received little attention in the financial literature, perhaps due to the highly technical and confidential nature of the data and technologies involved. Asset managers have historically been reluctant to share their transaction data and may not have invested sufficiently in their technology platforms to enable the necessary data storage, integrity testing and forward-looking analysis. Similarly, brokers have sound commercial reasons not to disclose the intellectual property invested in their trading and implementation strategies. Over the last decade, however, there have been significant changes – both technological and regulatory – that have allowed market participants to conduct thorough analysis of the quality of electronic executions.

In 2015, we introduced further changes to streamline our usage of algorithms and align the brokers' incentives with our objectives as a large global investor. This was achieved through four initiatives: the standardisation of customised algorithms to a core set, enabling fair comparisons between algorithms; the development – in partnership with our brokers – of a transparent performance review process for algorithms; the creation of an "algo wheel" to select algorithms probabilistically; and the creation of an incentive scheme whereby brokers achieving superior performance receive additional flow. An on-boarding process for emerging brokers has also been established, and existing brokers showing persistent poor performance are replaced. As a result, our broker list has become more dynamic; this allows us to benefit more rapidly from sell-side firms' investments in their algorithmic technology. This process has been rolled out to all the regions in which we actively trade.

Electronic trading, using algorithms developed by our broker-dealers, has been an essential part of our implementation strategy over the last 15 years. As the market landscape has evolved, volume has migrated to quantitative trading strategies, such that electronic trading has become the only way to access it. It has allowed us to execute larger volumes as the fund has grown. With the possibility to set precise parameters for our implementation, we have been able to research and deploy optimal implementation strategies adapted to our flow. Overall, this has led to significant cost savings over alternative trading strategies in terms of both reduced broker commissions and implementation shortfall.

Electronic trading has proven to be an important part of the trading desk's arsenal, given the efficiency and scalability it provides. However, while it helps make our trading more efficient, it might not be a perfect match for the objectives of our investment process. The nature of our investment process requires us to be patient in our trading. Our evolving mix of execution strategies reflects this need for patience.

Chart 27 Electronic. Volume. Billion dollars.

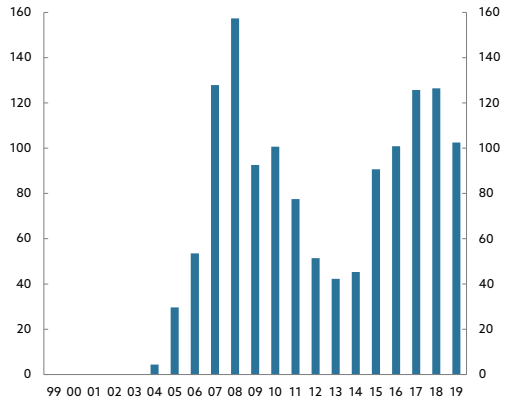


Chart 28 Electronic. Share of total volume. Percent.

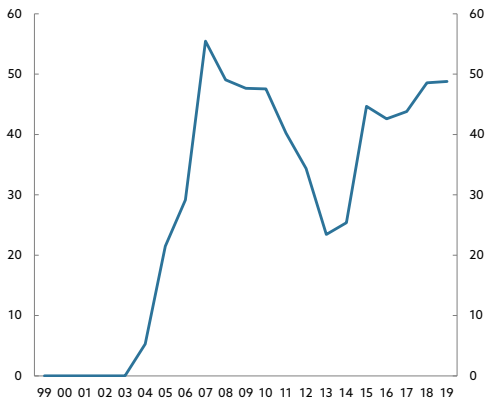


Chart 29 Electronic. Number of algorithm types used.

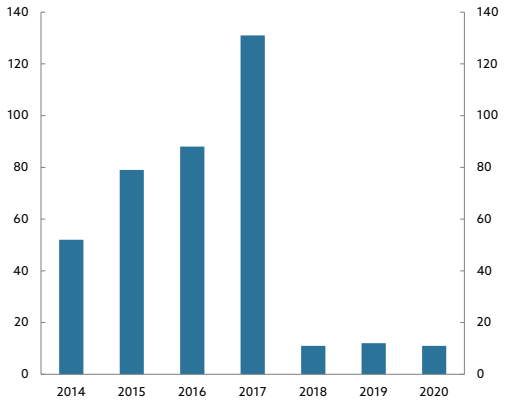
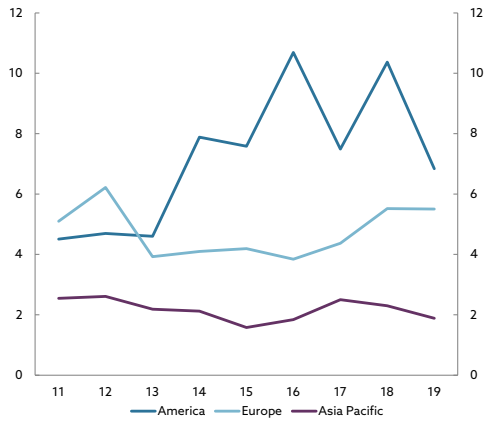


Chart 30 Electronic. Median execution size, by region. Thousand dollars.



Block

Block trades are interactions with one or more institutional investors leading to trades in sizes that are significantly above the standard market size, without the broker-dealer being a principal to the transaction. Such trades are typically negotiated at mid-price, allowing both parties to execute at a fair price with minimum market impact. Over time, we have developed our block-trading activity as a complement to our electronic trading.

Our choice of execution strategy is driven by level of urgency, expected market impact and level of anonymity provided during the trade. Trading blocks with other investors has the advantage of enabling us to transact a large part of our order in one go, which avoids the information leakage that may happen if we trade repeatedly in the same direction. For large order sizes, this is an important advantage. However, waiting for a block trade to happen means that we incur the risk of the price moving unfavourably. In addition, we face the risk of trading with another investor who is better informed than us.

Having an experienced trading desk with full ownership of implementation decisions, we set out to expand our block-trading activity in 2011. This was based on our experience and analysis showing continuous participation in markets had become more expensive. As the equity portfolio was growing, we had to adapt our liquidity-sourcing strategy.

Working with our brokers, we were able to increase block trading from 3 percent of our volume in 2010 to 11 percent in 2011, reaching a peak of 27 percent in 2016. Finding matching blocks requires patience, which has lengthened the average duration of our equity trades. This has been facilitated by the trading team offering instantaneous pricing to internal active portfolios, thereby taking full ownership of the execution risk.

Finding blocks also requires an active presence in the market if we are to be shown active blocks by our counterparties. With our broad equity portfolio, our counterparties know that we have an interest in most blocks in the markets we are active in. We have developed and standardised such communication through indications of interest, where our brokers send us regular data feeds of stocks where they have active buying or selling interest, which we match with our internal interest. In certain cases, we have partnered with our broker-dealers to take risk off other investors who have a high urgency to trade – in an effort to provide liquidity to the market when needed, at an advantageous price for the fund.

We have also been early adopters of systems or venues that facilitate trading between large institutional asset managers, to enhance our ability to find liquidity.

Chart 31 Block. Volume by year. Billion dollars.

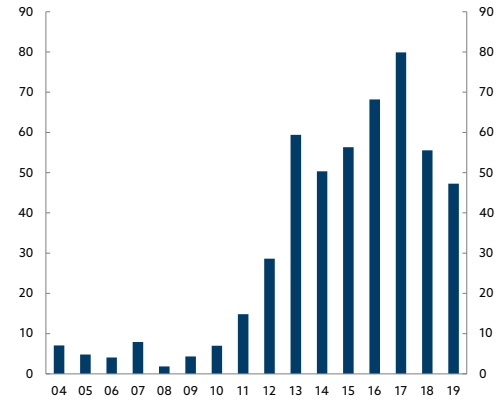


Chart 32 Block. Share of total volume. Percent.

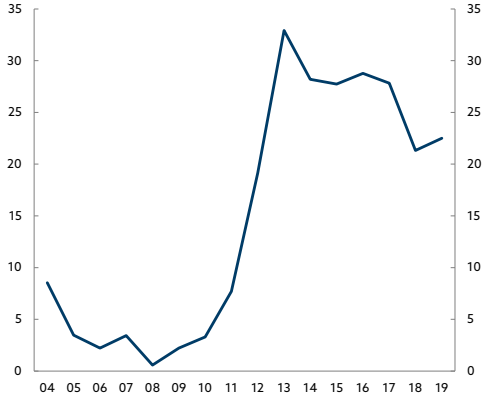


Chart 33 Block. Indications of interest. Number of unique stocks.

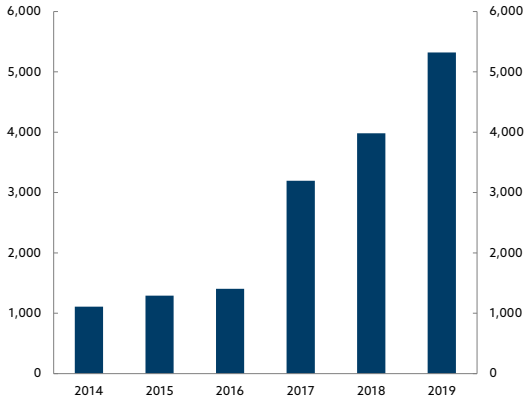
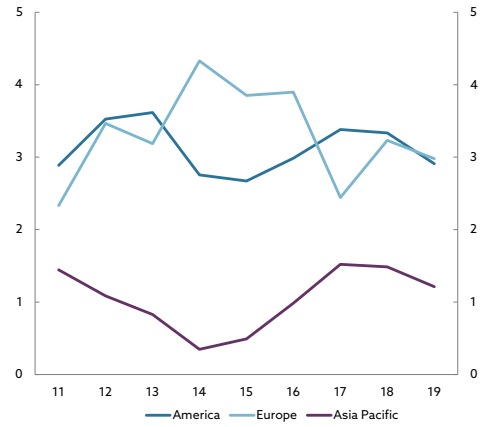


Chart 34 Block. Average trade size, by region. Million dollars.



Auction

Market structure and liquidity evolve over time as a function of both technological advances and market participants' needs. We have also had to adapt to reflect this evolution. One of the most significant developments in market structure has been the increasing importance of the closing auction as a source of liquidity. The trading desk has responded to this development by increasing our use of these auctions, which has required a new set of processes.

Closing auctions often serve as reference prices for the computation of portfolio and benchmark returns, particularly in the mutual fund industry. Establishing an efficient process for determining market-clearing closing prices is therefore important for investors and for well-functioning markets. Closing auctions provide a mechanism to source natural liquidity, as inflows, redemptions and rebalancing trades for mutual funds and passive investors are netted in the auction. However, implementation strategies at the close have required different approaches to the continuous trading session due to the more complex signalling strategy, greater price and volume variability, and different technology infrastructure in closing auctions.

We have been active in closing auctions since inception but have focused increasingly on their structure more recently. We believe the shift in volume from intraday, continuous trading to the closing auction is structural and goes beyond the growth in passive investing. From our perspective, well-designed closing auctions are becoming more attractive as both liquidity and price discovery events. By concentrating trading at focal points in time, auctions can serve to increase the probability of a natural liquidity match, even in cases where the number of market participants is relatively low. As with other trading technologies, we have supported innovation by both exchanges and brokers in this area.

Chart 35 Auction. Distribution of market volumes by time of day, 2019. Percent.

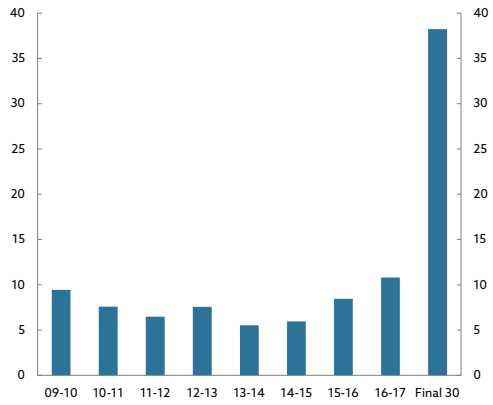
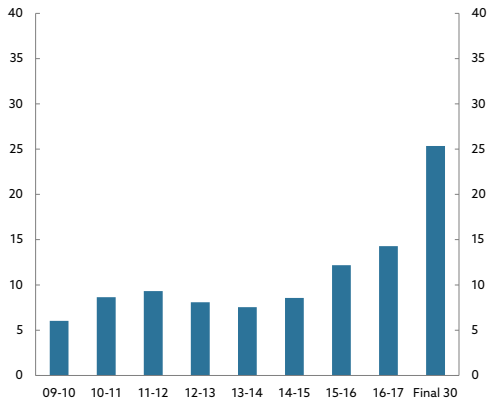


Chart 36 Auction. Example distribution of our market volumes by time of day, 2019. Percent.



Deal

Equity capital market (ECM) transactions, also known as deals, occur when a block of shares in a company is offered to investors in a book-building process. ECM transactions include the initial public offering (IPO) of a company's shares on the stock market. In follow-on capital raises, a listed company obtains additional equity capital from investors, usually to fund an acquisition or repair its balance sheet. In a placing, an owner sells a large block of shares in a listed company at a discount to market prices.

ECM deals represent important liquidity opportunities for us as a long-term investor. As we manage a portfolio with a global index, we will have an inherent interest in participating in most transactions. In the case of IPOs, we have participated in transactions with a view to the company being included in the index in the future. In the case of follow-on capital raises and placings, we have participated to avoid the dilution of our existing holdings.

In addition, deals have represented attractive liquidity events for the fund, especially when we have considered that the deal price is an attractive entry price. We have acted as consistent liquidity providers to the market in such events, expecting to earn excess returns thanks to our risk capacity. Deals have also served as a liquidity source to buy significant positions for the fund at a favourable price.

However, the main challenge in ECM transactions is to achieve consistent allocation outcomes. As deals that are expected to outperform are generally oversubscribed, the general practice by other investors has been to inflate their orders to achieve their desired allocation. We have taken the opposite approach, by consistently indicating our actual demand to the broker-dealers involved in the book-building process and expecting to be fully allocated. Achieving this objective has required us to demonstrate that we are long-term investors with a commensurate risk capacity, holding onto our positions for longer than most liquidity providers, and regardless of volatility.

Since 2004, we have tracked deals and allocation outcomes by broker-dealer. We have included deal allocations in our broker evaluation to identify any brokers that treated us unfairly, leading to a lower ranking for those that did not allocate to us as expected. As the fund's ownership of global equities has increased, our market share in the global ECM market has also grown, making us one of the largest and most consistent participants in the market today.

Chart 37 Deal. Volume. Billion dollars.

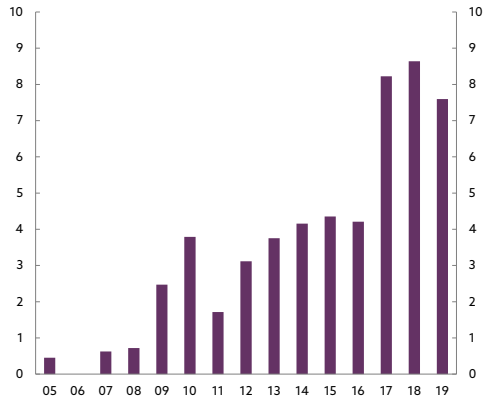


Chart 38 Deal. Share of total volume. Percent.

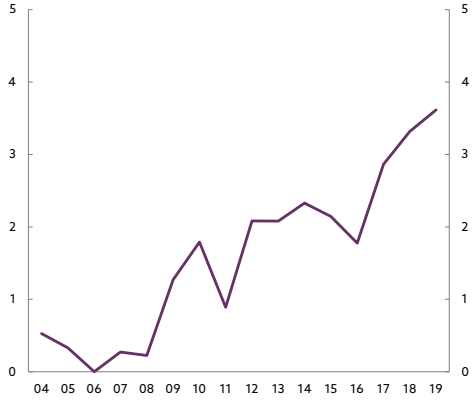


Chart 39 Deal. Number of IPOs participated in by internal equity portfolios, by region.

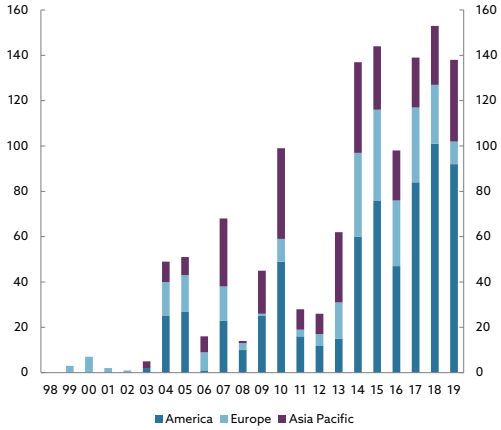
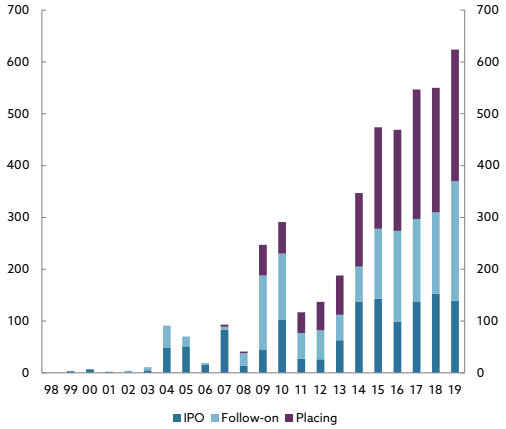


Chart 40 Deal. Number of ECM events participated in by internal equity portfolios, by deal type.



Derivatives

The derivatives markets have been a significant component of the overall listed markets over the last 20 years through a vast range of products offering the possibility to tailor exposure to market participants. We have been less active than many other asset managers in the more complex derivatives markets.

Our use of derivatives has largely involved equity index futures. Such futures allow us to gain exposure to a broad equity index through a single instrument. They have the advantage of being simple, liquid, traded on an exchange, and cleared – meaning that they carry little counterparty risk. Our first equity trade, in September 1998, was in an equity index future. We continued with significant trading activity in index futures in the early years, as they were necessary to manage inflows into the fund and regional rebalancing. As we insourced index portfolio management in 2001, futures became less important to achieve the correct exposure.

However, we have continued using them to manage our overall equity exposure, particularly in situations with significant inflows into, or outflows from, the equity portfolio.

In addition, we have used single-stock contracts for difference (CFDs) at times when they were a suitable instrument to gain the appropriate single-stock exposure. However, these contracts were mostly an operational challenge and did not significantly alter our execution strategies. We also executed some trades in simple call or put options between 2006 and 2008.

We have not engaged in more complex derivatives transactions, such as structured products. We have not utilised total return swaps to gain broad equity exposure, preferring to manage our broad equity index exposure internally.

By avoiding complexity in the instruments traded, we have been able to focus further on improving our equity execution capabilities.

Chart 41 Futures. Volume. Billion dollars.

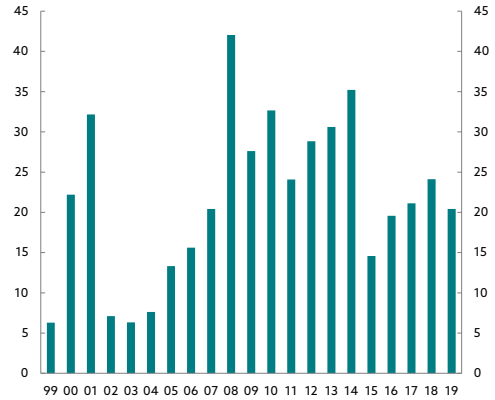
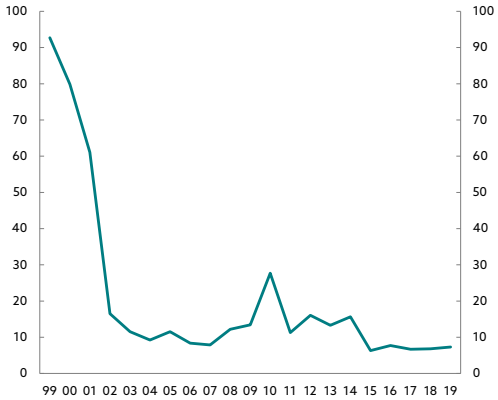


Chart 42 Futures. Share of total volume. Percent.

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18568 -0.09 天山纺织 11.67 11.90
6637 -0.10 美利纸业 6.27 6.36
32145 -0.14 江淮动力 5.72 5.95
8960 -0.13 *ST锦化 0.00 0.00
7337 -0.02 岳阳兴长 17.44 17.56
20804 0.11 *ST金城 4.44
4998 -0.01 京山轻机 6.45
21427 -0.03 山东海化 6.38
2715 -0.07 超声电子 11.34
3831 0.03 太钢不锈 5.97
10489 0.00 桑德环境 23.52
19082 -0.05 东莞控股 7.15
4409 -0.17 天音控股 16.38 16.60
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涨跌 股票 最新 最高 最低 成交量
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7.94 8.04 7.92 10527 -0.02
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13.02 13.07 12.90 9871 0.07
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93.18 93.50 92.51 345 0.42
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0.00 0.00 0000.00 0 -8.56
22.95 23.29 22.90 4565 0.07
20.76 21.00 20.72 19962 -0.05
15.83 16.15 15.81 9834 0.06
9.59 9.33 23018 0.08

Trading for efficiency

The trading desk enables the implementation of investment decisions for the fund. Early on, we identified trading as one of our four core tasks, which also included managing the fund's market exposure, creating excess returns and giving advice to the Ministry of Finance. Our objective has been to source the liquidity needed to implement the fund's investment decisions at the best possible price.

The trading process
Given the complexity and evolving nature of the market structure, we have adapted our trading process over time.

Benchmarking
To help achieve the objective of sourcing the liquidity needed to implement the fund's investment decisions while minimising trading costs, we ensured early on that our trading activity was measured, and that our brokers were selected based on their performance. We wanted to compare our trading costs to other asset managers, and the performance differences between our agency brokers. Based on these data, we also aimed to create models for our expected execution costs.

In 2001, we partnered with a third-party transaction cost analysis firm to provide us with cost estimates for our trades as well as comparisons with other asset managers' costs. This delivered valuable insights for the trading team, particularly when combined with traders' own notes.

Asset managers have traditionally relied on the volume-weighted average price (VWAP) to measure execution quality. As orders take time to execute, this has generally been considered a neutral comparison for the execution price.

As we asked our counterparties and peers for comparable data, most referred to the VWAP. To us, this seemed at odds with the real cost to the investor, i.e. the difference between the price when the order was sent, and the price achieved in the market. By comparing the execution price to the VWAP, the trader would not be incentivised to protect the fund's assets. In addition, the comparison would be too favourable for larger orders, as the measure did not consider the trader's own impact on the VWAP. Because of this, we preferred to measure our trading costs as implementation shortfall, i.e. the price achieved in the market versus the price at the time of the order.

As the fund and our order sizes grew, the analysis from the third-party provider became less useful because the set of comparable orders from other asset managers became smaller. In addition, we were increasingly sensitive about sharing our trading data with outside providers. We eventually decided to bring the expertise in trade benchmarking and cost analysis in-house, hiring our first quantitative analysts in 2005.

In 2007, we started up our own tick database, storing every trade quantity and price, as well as prevailing bid and offer prices across almost all the countries we were active in. Given the technology at the time, this was a serious

undertaking – during the first year of operation, we averaged 8 gigabytes of new data per day. Since then, the volume of data has only increased. Thankfully, technological capacity has also improved.

Our internal database has allowed us to measure our trading performance using multiple measures, such as implementation shortfall, alternative trading paths, and reversion metrics. It has also enabled us to attribute our costs in a granular manner, based on the fund's different investment strategies and portfolio manager order types. It has allowed us to pursue research into portfolio manager and trader behaviour in an effort to improve not just our execution costs, but also our investment decision making.

Today, our trading department includes dedicated analytics and research teams that focus on trading cost analysis and trade planning. Traders and portfolio managers know the cost of their trading and the main drivers of that cost, and have comparisons with alternative trading strategies. The team also actively develops new trading strategies and provides alternative approaches to measure execution quality. A key part of this effort has been the development of a robust and scalable benchmarking framework, anchored by a market impact model.

Market impact models are based on order size relative to traded volume in the market, on the liquidity and volatility characteristics of the stock, and on the desired urgency in trading. In addition, they take into account specific features of the markets the fund is active in. Based on these inputs, they provide an estimated implementation shortfall versus the prevailing price at the beginning of the order – the implicit cost of doing the trade. Our analytics and research teams have developed, refined and updated these market impact models based on our trading experience as well as evolving market features.

We started the development of our internal market impact model in 2008, in collaboration with academia. There were few publications about market impact models in academic research, as academics lacked access to the relevant data. On the other hand, brokers considered their model parameters to be sensitive, and were not open to sharing them. Hence, we sought to calibrate a standard functional form on our own execution data and validate the results against the range we inferred from existing studies.

The market impact model has certain features reflecting the effect of stock and market characteristics on implementation shortfall. Execution costs increase with volatility and bid-ask spreads, which reflect the liquidity of the stock as well as the stress of the market. In addition, execution costs increase with the order size. Lastly, execution costs increase with the aggressiveness of the execution – which may shorten the time needed to complete the order, but at an increased cost.

As the financial crisis roiled equity markets in 2008, volatility increased, and trading became more costly. Our market impact model reflected this, as trading costs are expected to increase with volatility. In the following years, as markets calmed down and volatility abated, we had expected our trading costs to come down. However, they did not fall as expected, and we needed to recalibrate our market impact models. We ascribed this to the increased fragmentation of the market and the higher cost of risk capital for our broker-dealers. For smaller investors, high-frequency traders stepped in as liquidity providers. But for larger investors, the risk capacity of the high-frequency traders was not

sufficient, leading to higher trading costs. We have addressed this development through an evolution of our trading strategy.

The ability to benchmark trades against expected market impact and evaluate the relative performance of agency brokers has enabled us to plan trades more effectively and to continuously assess the trading strategies used. This provides a feedback loop for both the trading department and our agency brokers. In addition, trade benchmarking has demonstrated the benefit of being able to respond flexibly to liquidity opportunities in the market, which may enable us to reduce the trading costs of our orders.

Well-functioning markets

We interact with other participants in the financial ecosystem every time we trade. Even when we are not actively participating, we are still affected by the actions of others – for example through mark-to-market effects on the fund's portfolio. This financial ecosystem market structure is governed by a set of rules and regulations, by evolved customs and traditions, and by the economic self-interest of market participants.

As long-term participants in public markets, we care not only about the current market structure, but also about its future state. We have a vested interest in a regulatory environment that yields well-functioning markets in financial instruments, facilitates the efficient allocation of capital and risk, and promotes long-term economic growth. Such an environment requires balancing the interests and incentives of various types of market participants, ensuring a level playing field in financial markets.

Chart 43 Benchmarking. Actual and modelled implementation shortfall, as a function of order size.

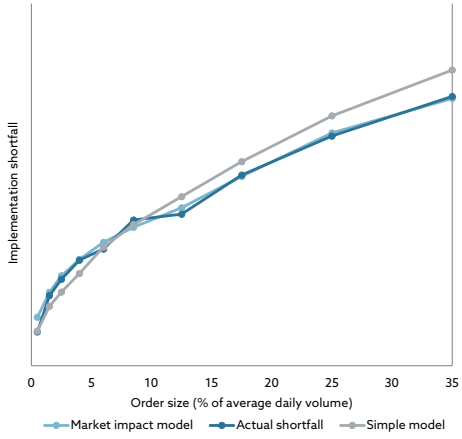
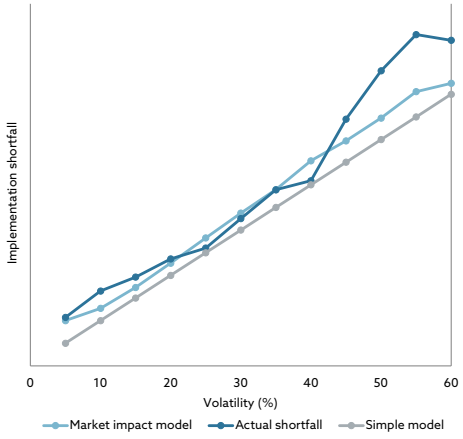


Chart 44 Benchmarking. Actual and modelled implementation shortfall, as a function of volatility.



Well-functioning markets: discussion notes and asset manager perspectives related to the trading ecosystem

Year	Title/Summary
2012	**Well-functioning markets**
	Establishes a blueprint for how the fund can promote well-functioning markets; and why this is important to our long-term interests. Proposed activities include the presentation of our views in published form, conducting our own research on market structure issues, promoting research through academic and practitioner collaboration, and responding to public consultations by regulators.
2013	**High-frequency trading – an asset manager's perspective**
	Reviews the academic literature on market microstructure and high-frequency and computer-based trading. Highlights the impact of these on the trading practices of the fund through implicit trading costs, the potential for market abuse, and the emergence of new endogenous systemic risks.
2015	**Sourcing liquidity in fragmented markets**
	Discusses the rise of dark pools and other off-exchange trading venues, and how they can form part of the fund's execution strategies. Examines differences in transparency across dark pools, and the need for venue toxicity analysis.
2015	**Role of exchanges in well-functioning markets**
	Discusses the critical role of exchanges in facilitating well-functioning markets, showing how exchanges' changing business models impact market structure – including a costly latency race and a drop in the number of new stock listings in developed markets.
2015	**Role of last look in foreign exchange markets**
	Reviews the common practice of "last look" in foreign exchange markets, where quotes are not firm. Highlights the potential for incentive misalignments and information leakages, arguing that the embedded optionality of last look is not priced fairly. Proposes a new quote type without last look features, potentially at wider spreads.
2016	**The listings ecosystem: aligning incentives**
	Discusses the challenges for companies going public through an IPO. Develops recommendations on incentive alignment for primary market participants.
2016	**The role of securities lending in well-functioning markets**
	Examines the importance of securities lending and short-selling for efficient price discovery in well-functioning markets. The impact of the growth of passive investment strategies and of the concentration in asset management makes securities lending even more important.
2017	**Managing informational asymmetries in foreign exchange markets**
	Identifies practices in foreign exchange markets that can disrupt the well-functioning of these markets. These include the last look practice, the lack of adequate risk controls and liability assignment in algorithmic trade executions, and the lack of pre- and post-trade transparency.
2020	**The role of closing auctions in well-functioning markets**
	Highlights the recent shift in trading volume from intraday continuous trading to closing auctions. Well-functioning closing auctions have defined mechanics, which we propose to be implemented across exchanges. We discuss the reasons for closing auctions' increased attractiveness as both liquidity and price discovery events. We also detail our expectations for brokers and buy-side firms to optimise executions across continuous trading and closing auctions.

In the early years of the fund, we took the market ecosystem as a given and focused on developing our trading and operations capabilities. The evolution of market structure was driven by other market participants, including broker-dealers, exchanges and new market entrants. We responded to this evolution but did not attempt to shape it – such as in our decision to develop our electronic trading capabilities in 2004.

As the fund grew, our liquidity requirements became more challenging. While we continued adapting our trading strategies to the market structure as it was, it became clear that we also needed to be more proactive in shaping it. A well-functioning market structure would contribute to lowering our trading costs over time and was in the fund's long-term interest. As the fund became larger, we also carried a stronger voice in the market.

In 2012, we expanded our trading and research efforts to include market structure strategies and developed a framework for articulating our views as a long-term investor. We focused on a range of market structure developments, including the speed race in equity trading, the changing role of exchanges, and challenges to the listing ecosystem. Our focus areas were chosen for their potential impact both on the market ecosystem and on the long-term interests of the fund. We sought to steer the evolution of the market ecosystem towards long-term fairness and efficiency by working not only with policy makers and regulators, but also with industry partners and academics.

We have published our research on market structure topics through discussion notes and asset manager perspectives (AMPs). Our 2013 discussion note on high-frequency trading reviewed the rapidly expanding literature in the area of market microstructure and high-frequency trading and provided a perspective on our views as an active institutional asset manager. The note addressed three aspects of computer-based trading – implicit transaction costs, market abuse and equality, and endogenous and systemic risk. We have since then published 13 AMPs on topics from the equity listing ecosystem to foreign exchange markets.

The AMPs serve a dual purpose. They not only drive our internal research efforts and contribute to the development of our capabilities, but also make public our views on what we consider to be important market structure topics, in an effort to shape the conversation about the market ecosystem.

In addition to AMPs, we also develop and disseminate our views on the evolution of market structure by responding to requests for comment and to consultations by regulators and other rule-setting entities. We also engage proactively with regulatory authorities and industry bodies where we have particular concerns. We are members of the consultative committees of certain industry bodies. We have also selectively chosen to support industry initiatives that we believe bring creative solutions and efficiencies to today's complex market structure.

Finally, we actively promote research into market structure issues through academic and practitioner collaboration. A key initiative in this respect has been to sponsor specific academic research activities through the Norwegian Finance Initiative (NFI) Market Structure Research Programme.

The trading book

Having a centralised trading desk, responsible for the implementation of all the fund's investment decisions, has been a significant efficiency gain. It has enabled us to implement innovative solutions to achieve lower implementation costs, taking advantage of the fund's structure with a single owner, an aligned strategy and largely internal management.

Crossing (1999)

One of our first efficiency gains was very simple. We decided that if the trading desk received buy and sell orders in the same stock from different portfolio managers, those would be netted at the trading desk at the prevailing market price. This avoided trading parts of our volume in the market, saving significant transaction costs.

While this seems simple, it is difficult to accomplish for most asset managers. Most asset management organisations with multiple portfolio managers operate a multitude of funds, each with different objectives and clients. This creates both regulatory and fiduciary hurdles. Trades between different funds need to be posted to the exchange and so need to go through a broker. In addition, having different clients makes it more difficult to ensure that all clients' interests are respected.

As the fund's equity portfolio uses one custody account, we created systems that would execute crosses through our internal systems, without going through an external broker. As the fund has a single owner, there could be no doubts about the benefit to the fund of avoiding trading costs. Hence, crossing became a simple, cheap way to save transaction costs.

Over time, we have encouraged crossing between portfolios for efficiency gains. This has

Chart 45 Crossing. Number of internal crosses.

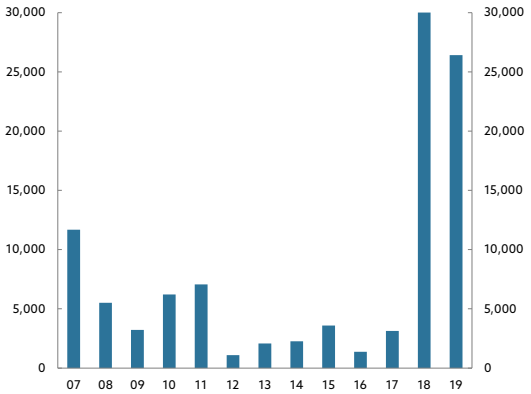
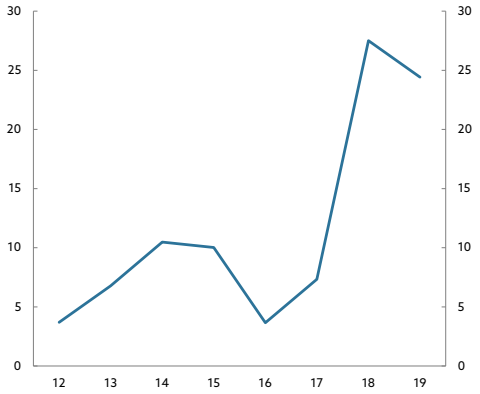


Chart 46 Crossing. Share of total volume. Percent.



been particularly successful with index portfolio managers, where we have been able to arrange crosses of broad baskets of stocks based on future rebalancing needs. On average, we crossed 7 percent of our equity volume between 2012 and 2017, and 26 percent of our volume in 2018 and 2019, as a separation of index, risk factor and transition management into multiple global portfolios created a need to cross more orders.

Transitions (1999)

With major changes to an investment portfolio, such as the funding of new mandates, termination of existing mandates or fundamental changes in asset allocation, investors manage what is called a transition. The changes generate a large list of securities that will need to be bought or sold across instruments and countries.

Our initial transition activity came with the funding of external active equity mandates, starting in 1999. As we were receiving large inflows of cash to invest in equity markets, we found it most efficient to receive wish lists of securities from the external managers and buy those portfolios internally, rather than delegating the implementation to the external managers.

The industry practice was to employ a transition manager for this. For a fee, transition managers could trade the transition optimally, ensuring timely delivery of the portfolios and reporting of the results against a predetermined benchmark. Early on, we saw that this was a suboptimal arrangement. The fees were high and there was insufficient alignment between the investor and the transition manager. In addition, there were risks of abuse of the arrangement and information leakage.

Given our internal capabilities in risk management and trading, we decided to manage all transition activity ourselves, rather than use a transition manager. Importantly, we decided not to optimise around future transition dates. The dates were random and only affected the relative performance, not the actual portfolio. We saw that trying to beat the closing price on the date of a transition event would be beneficial for our relative performance but would not necessarily be in the best interest of the fund. Therefore, we introduced implementation periods, stretching out our trading more than would be required.

As external manager transition activity was an important part of our traded volume between 1999 and 2010, we had separate traders dedicated to managing this activity, using separate portfolios.

We have also been responsible for the fund's other strategic transitions: ethical exclusions, expansion into small caps, and increases in the equity allocation. We have employed the same strategy for these transitions, implementing all changes over a long time period and announcing the transitions publicly only after they have been completed. As the fund has grown, we have stretched the implementation periods further.

In September 2001, the government established an exclusion mechanism for the fund. Subsequently, one company was excluded in 2002, and 13 companies in 2005. As we sold out our holdings in the company, we needed to ensure this was done discreetly to avoid other market participants speculating about forced selling. Hence, the exclusions were announced only once the transition was completed. Since 2001, we have managed 148 exclusions and 183 risk-based divestmentsfrom the fund. As companies have evolved their business

activities, some have been reincluded in the fund's investment universe, and we have purchased shares to buy back the fund's ownership in these companies. The first such re-inclusion happened in 2009. From 2010, the frequency of exclusions increased, as new exclusion criteria and risk-based divestments were introduced.

As the fund has grown, the potential impact of individual exclusions and re-inclusions has increased. Since the fund on average owns 1.5 percent of listed companies globally, and 2.5 percent in Europe, an exclusion or re-inclusion represents a significant purchase or sale of a company's equity. We have stretched out implementation periods accordingly to ensure a passive implementation, weighing the cost savings against the relative risk contribution of a long implementation period. The largest such transition was the re-inclusion of Rio Tinto in 2019, which saw us buying 16 billion kroner worth of Rio Tinto shares. As we were buying shares, we realised that our initial strategy of a discreet re-inclusion would not be successful. Given the time we needed to buy our full position, mandatory disclosures would necessarily make our investment known to the market. Accordingly, we now prefer to announce the re-inclusion of companies at an early stage to avoid speculation in the market about our progress.

In 2007, small-cap companies were included in the fund's equity index. This resulted in the addition of 4,400 new companies, representing a dollar volume of 10 percent of the new index. As small caps are generally more illiquid, we worked with the index portfolio managers to manage this transition efficiently over a long time period. Our initial strategy, buying stakes in most of the included small caps, was not satisfactory. As we analysed our performance numbers, we saw that the prices of those companies tended to fall after we had made our purchase, indicating that we had paid a price that was too high. Because of this, we saw a need to further develop our trading strategy in small caps and other less liquid segments.

Between June 2007 and early 2009, the fund's asset allocation was transitioned from 40 to 60 percent equities. This period coincided with the global financial crisis. This meant that we bought significant amounts of equities during a very volatile period. During this time, we purchased an average of 0.7 percent of shares outstanding in global equity markets, increasing the fund's average ownership from 0.3 percent at the end of 2006 to 1 percent at the end of 2009. Our net buying during this period amounted to 1,010 billion kroner. As with other transitions, we were concerned about the market impact of our trading and about other market participants speculating about our activity. Hence, we set an implementation plan but deviated from it opportunistically.

During the same period, 23 additional emerging markets were included in the fund's equity index, in September 2008. This resulted in the addition of 900 new companies to the equity index.

From 2009 to 2011, we managed multiple large transitions related to the internal restructuring of our investment strategies. From November 2009 to January 2010, the internal active equity mandates were restructured from long-short portfolios to long-only portfolios with research lists. The portfolio managers communicated wish lists for their initial long-only portfolios that were traded into by the trading desk. In November and December 2010, the benchmarks of the internal active mandates were adapted further. In April 2011, most external sector mandates were terminated, with a value of approximately

Chart 47 Transitions. Number of active manager transitions.

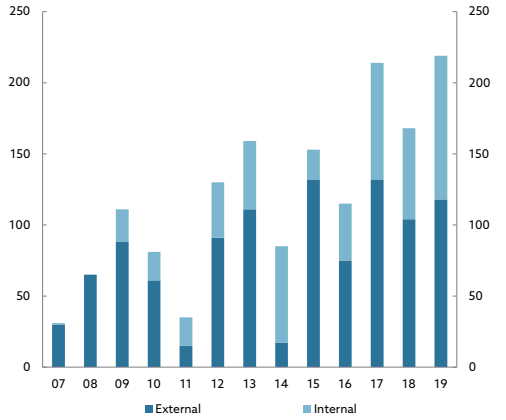


Chart 48 Transitions. Volume of active manager transitions. Billion dollars.

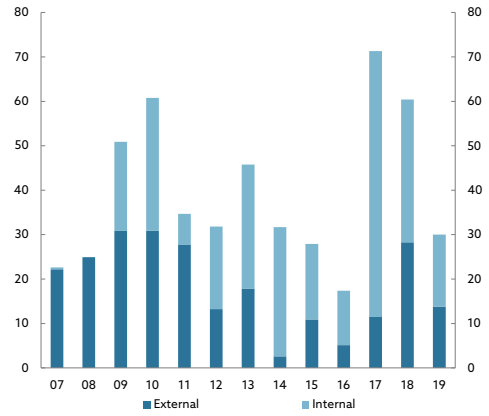


Chart 49 Transitions. Number of exclusions, risk-based divestments and related re-inclusions.

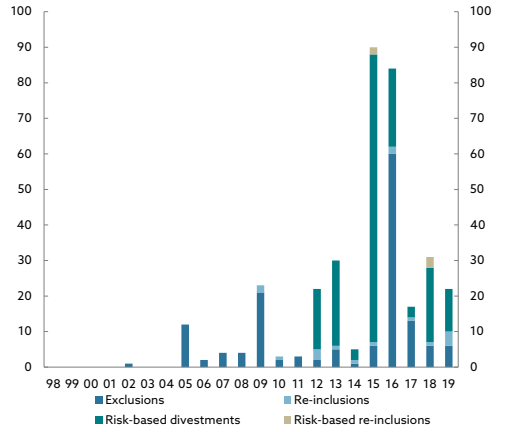
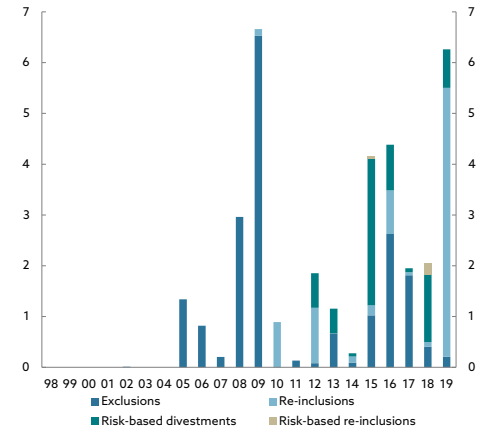


Chart 50 Transitions. Volume of exclusions, risk-based divestments and related re-inclusions, including re-investment. Billion dollars.




成交量 涨跌
4744 -0.08
24920 -0.02
9869 0.34
10527 -0.02
11110 -0.10
4785 -0.06
806 -0.01
36800 -0.08
8809 -0.03
5128 -0.10
11411 0.50
9871 0.07
32029 -0.20
345 0.42
18012 -0.04
0 -8.56
4565 0.07
19962 -0.05
9834 0.06
23018 0.08
上证指数
B股指数
深证成指
深证综指
深证B指
万中城市房价数据显示,

25 billion dollars. In addition, internal benchmark structures were unwound. To ensure an appropriate trade-off between risk and transaction costs, we have utilised different structures to manage the fund's transitions. Some transitions were commingled into the index portfolios, while others were managed separately.

After 2011, transition activity became less prominent as part of our trading volume. We also saw that, with the external management strategic focus on emerging markets, and the fund being larger, we would need to manage transitions differently. Transitions would be less liquid, reducing the importance of implementation in favour of long-term risk management. As the index portfolios were already managing long-term risks efficiently, we chose to integrate transition management into index portfolio management from 2011. The index portfolios contributed cash to fund new external mandates and received the portfolios of any terminated mandates. While this has led to increased turnover for the index portfolios, we believe it has enhanced the risk management of the transitions and saved transaction costs overall. In 2018, we chose to isolate the effect of transitions in separate portfolios that were still managed by the index portfolio managers.

Our decision to manage transitions internally has proven to be very beneficial given the large volume. External transition management would have proven to be costly in terms of both fees and implementation costs. In addition, our ability to manage large, strategic transitions has proven invaluable in increasing the organisation's agility. We have been successful because we have been willing to take risks to achieve better outcomes, while measuring the outcomes to ensure continuous improvement.

Trading portfolio (2001)

While we have been active in equity markets continuously from our first trade in 1999, we realised that it was important to maintain a level of trading activity to ensure we were always shown relevant flow.

We established a portfolio in 2001 that allowed traders to take active positions in single stocks and futures without having received a portfolio manager order. The traders traded actively in the top positions of our internal active mandates to maintain a minimum level of activity between the larger portfolio manager orders. This also allowed us to avoid becoming too predictable to our counterparties, by being active in both buying and selling even if we were increasing our positions over time.

In addition, traders implemented a selection of single-stock ideas from brokers, measuring their outcomes, and participated in liquidity-provisioning strategies, including equity capital market transactions. The positions were small compared to other portfolios. We understood that we could not have a significant competitive advantage in trading based on market flows, compared to the broker-dealers who received constant intelligence about buyers and sellers in the market.

However, the trading portfolio allowed us to improve our overall trading performance. Traders remained up to date on single-stock situations and followed the market more closely. In addition, we were more likely to be shown relevant blocks because of our activity. We closed this portfolio in 2008, as the aftermath of the financial crisis required us to focus our attention on transition activity.

Internal pricing (2011)

As we established a separate trading function, we gave the traders full responsibility for implementing portfolio manager orders. This separation of responsibilities was an important first step in ensuring that portfolio managers focused on the analysis of the companies in their portfolios, rather than the implementation of their trades in the market. However, we found that portfolio managers still tried to influence the trading of their orders by specifying a trading horizon or by splitting larger orders into multiple smaller ones in an attempt to time the market. We did not see this as an optimal use of a portfolio manager's time.

In 2011, we set up a system – internal trade pricing (ITP) – that allowed all active portfolio manager orders to be priced instantly and automatically by the trading desk. The active portfolio managers received a price based on the prevailing market price, plus a spread depending on the estimated implementation cost of the order. The portfolio manager's order is executed instantaneously, and the trading team takes over the entire implementation risk of the order. The resulting risk exposure is then managed by the trading team in an internal risk book, managing the implementation in the market using the different trading strategies at their disposal.

We found that, over time, changes to the calculation of the expected implementation shortfall had a large impact on the decision-making process for the portfolio managers. We have periodically revisited the calculation methodology to reflect the interests of the fund, in line with changing market conditions. In this way, the ITP setup can be used as a management tool, promoting certain portfolio manager behaviours while discouraging others. In addition, the ITP setup provides significant benefits in distressed market situations.

By centralising trading, we have identified overall investment views and risks that we have been able to hedge out in the market.

This separation of responsibility for security selection and order implementation is a unique feature. Most asset management firms' structures do not allow for such a separation. In our case, it has contributed to improving both our trading performance and our active portfolio management, by allowing each team to focus on its core activities.

Liquidity provisioning (2015)

As our ownership of the listed equity market increased fourfold from 2006 to 2013, and we invested in more illiquid securities such as small-cap stocks, we also saw a need to develop our trading activity in a direction where we provided liquidity to the market.

This was supported by developments in the equity market. We saw that capital requirements for investment banks had triggered a decrease in their capacity to hold risk over multiple days. High-frequency traders, which provided liquidity to smaller investors, also closed their positions at the end of the trading day. Hence, there was a need for investors with higher risk capacity to provide longer-term liquidity to the market, at an appropriate price.

We worked with the index portfolio managers to create lists of securities where we would be willing to trade if a block was presented to us. The index portfolio managers separated the universe into three segments. In one segment, they would be willing to trade at current market prices, as it would reduce their relative risk. In the second (larger) segment, they could be willing to trade if offered an attractive price, even if this increased the relative risk of the portfolio. In the last segment, they would not be willing to trade.

Chart 51 Internal pricing. Number of active portfolio manager orders.

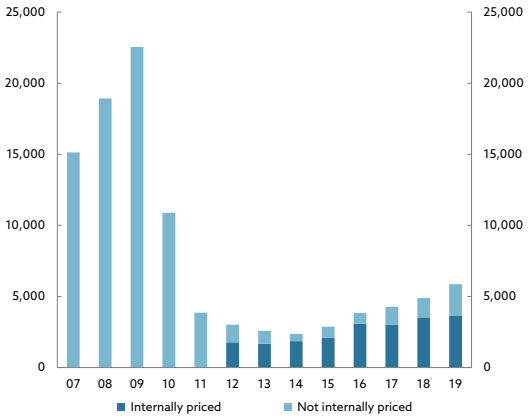


Chart 52 Internal pricing. Number of stocks traded, by region.

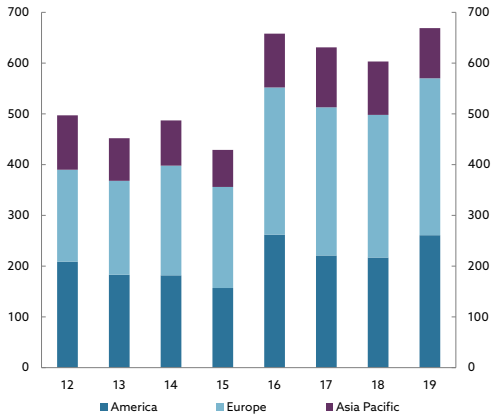


Chart 53 Internal pricing. Average size of active portfolio manager orders. Million dollars.

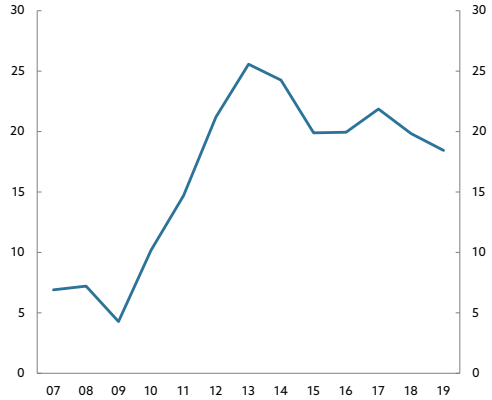
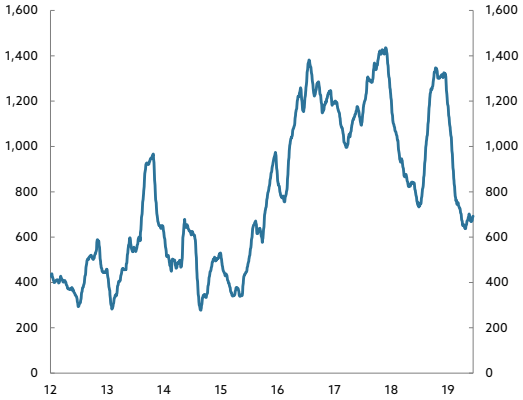


Chart 54 Internal pricing. Gross exposure of internal pricing portfolio. Million dollars.



On the trading desk, we then matched these lists with block opportunities. We traded orders for the portfolio managers when the opportunity presented an attractive risk-adjusted return to the fund. We partnered with some of our broker-dealers to increase this liquidity-provisioning activity from 2015. Our main challenge was to ensure that we provided liquidity to investors who were trading because of liquidity needs, and not investors who were better informed than us. As with other trading strategies, we measured the outcomes and presented them to our counterparties.

Our liquidity-provisioning activity has increased our block-trading presence in the market, benefiting the rest of our trading activity. After a very active year in 2017, with 350 transactions, we reduced our activity in 2018 and 2019, to focus on higher-conviction opportunities.

Chart 55 Liquidity provisioning. Volume. Billion dollars.

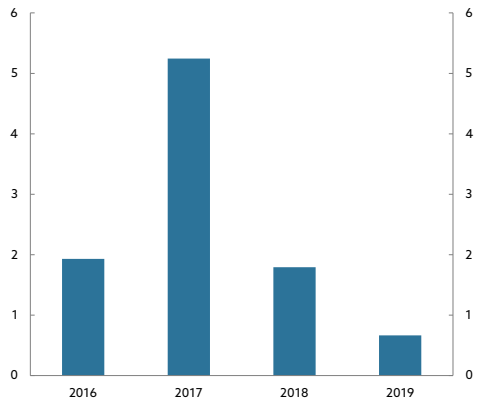
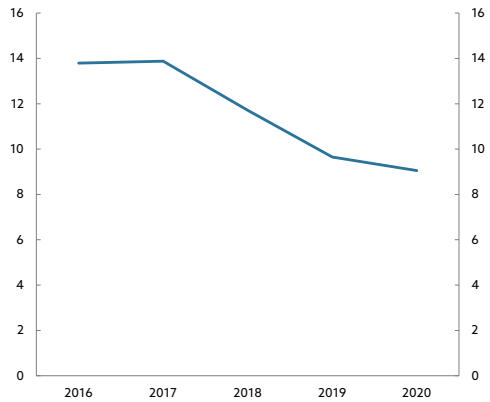


Chart 56 Liquidity provisioning. Average trade size. Million dollars.



The trading systems

Traders require several systems to implement portfolio management decisions successfully. Given the volume of portfolio manager orders and executions in the market, system performance has been paramount for the trading team. Being a global organisation from the outset meant that we developed our systems with global markets in mind. This has allowed us to retain the ability to deploy innovations to all regions simultaneously and hand over trading activity seamlessly between offices.

Order management

Portfolio manager orders need to be tracked by a system and transmitted to the traders. This has historically been done in the order management system (OMS).

The OMS is the ledger of all ongoing activity and gives traders and the organisation an overview of what orders are active in the market. It allows us to manage the orders, as well as the internal complexity that may arise when multiple portfolio managers send orders in the same stock. It also allows us to host compliance functions ensuring that we follow external and internal restrictions on both traders and portfolio managers. The system is then used to communicate with downstream settlement and accounting systems. It ensures a consistent electronic flow from order initiation to transaction bookkeeping.

Our choice of OMS was guided by our need for an efficient system capable of dealing with an increasing number of orders and executions. We realised early on that we would need to adapt our OMS to the differentiating traits of the fund. In particular, we integrated the crossing of portfolio manager orders into the system at an early stage, expanding later to internal pricing of orders. We have emphasised our OMS's capacity to integrate easily with other systems we use. We have also valued our ability to further develop our OMS internally, rather than being dependent on a software provider to develop enhancements. As our requirements have been different from those of other asset managers, this has been core to our trading strategy.

Connectivity management

Once the portfolio manager orders have arrived at the trading desk, they must be routed to the broker-dealers and venues. This requires systems to manage the routing of the orders, and network connectivity to transmit them efficiently. While the OMS could perform this task, a specialised system allows for faster execution processing and real-time handling of orders – allowing us to start or stop execution instantly when needed.

While the transmission of orders between asset managers and their brokers traditionally took place by phone, the FIX protocol was introduced in 1992 in an effort to enable electronic transmission. As we saw that our orders would span baskets of multiple securities, we became early adopters of the FIX protocol.

The electronic transmission of orders requires high-quality connectivity with the broker-dealers to ensure that orders reach the broker's systems in a secure manner. This has required us to set up direct network links to our broker-dealers, transmitting our orders and the information about their execution.

To manage the transmission of our orders to our broker-dealers, we use an execution management system (EMS). When we were adopting electronic trading, we needed an EMS that could offer us the necessary parameterisation of the different algorithms. This led us to our initial selection of a broker-provided EMS. This was a fruitful

partnership – as a large client, we could give input on algorithm and system design, helping to improve the product. The advantage was close integration with broker offerings and relatively rich functionality. The disadvantage was that a broker-provided EMS only offered connections to one or a few brokers. Broker-neutral systems provided by third parties were at that time generally not competitive from a cost, functionality or system maturity standpoint.

At the same time, the exclusivity of our electronic flow that the broker enjoyed due to our use of its EMS was not viable in the long term as our usage of electronic trading increased. It was also not in line with our development strategy. As a third-party, broker-neutral EMS became feasible in terms of functionality and system maturity, we initially supplemented and later replaced the broker-provided EMS with a broker-neutral trading system.

By 2006, we had implemented a fully broker-neutral trading system. This was provided by a small, independent company, which allowed us to give input into their strategy. Broker neutrality ensured that we could select brokers based on their performance and ability to handle our order flow alone. We rejected the common industry model of brokers sponsoring their clients' EMS costs because of the agency problems this introduces to the relationship between asset manager and EMS provider. We have insisted on paying all licence costs for the EMS we use and require our brokers not to sponsor any of the systems we use. We believe that this is effective in minimising agency problems.

Over time, the EMS we had selected no longer sufficiently covered our requirements, leading us to adopt a different product. As the EMS functioned independently, through a connection to the OMS, it was relatively easy to change providers.

The EMS has served a crucial role for the equity trading function in enabling us to connect to multiple liquidity sources. In addition to broker algorithms, it has given us easier access to peer-to-peer trading networks and custom broker offerings. This has allowed us to try innovative liquidity sources without disruption of our process.

Performance management

While the OMS manages our ledger and interaction with internal systems, and the EMS manages our external connectivity with broker-dealers, we have seen the need to enhance the tracking of our orders and positions. While most trading desks manage orders over a single day, our orders span days to months, which requires us to track our execution risk.

As our willingness to take execution risk has been a differentiating factor of our trading strategy, we have not found systems covering our needs. On the one hand, portfolio management systems are generally designed for management of positions that change slowly. On the other hand, order management systems do not provide enough information about the portfolio of live orders. In addition, our tracking systems needed to connect to internal data sources, such as interfacing with the portfolio management systems.

We have therefore developed our performance management systems internally. We have benefited from the open architectures of our other systems, connecting to them through application programming interfaces or database connections. These tools have generally been developed by the trading desk, driven by the requirements of the traders. This was a natural

consequence of our hiring analysts and traders with programming experience. The development of these tools improved our process and enabled more strategies, but most importantly gave us confidence to try new things. Over time, our development efforts have become more structured, with shared responsibility between the trading desk and the IT groups.

Data management

The prime focus of our data management strategy has been on processing data emanating from our own executions in the market. This has allowed us to analyse our results and guide our strategy further. To enable this analysis, we have not only stored raw execution data, but also focused on collecting further information about our orders. These data have encompassed stock-specific information such as price, bid-ask spreads, and volatility at the time of the order, but also order-specific information such as investment strategy and urgency.

To further develop our benchmarking efforts, we decided to build an internal tick database in 2007. This database stores all trades and quotes for our universe of stocks and allows us to compare the execution of our trades to the prevailing market conditions. In addition to this database of historical trades and quotes, our traders also require real-time data. While se data are not stored, they enable the traders to plan and adapt their execution strategy.

The cost of these data, particularly real-time data, has increased tremendously over the years, reflecting the evolving business models of exchanges as well as the increasing value of the data to market participants. Costs include both direct license fees for the data, as well as the administrative burden around the management of the data. This includes frequent audit requests by data providers to ensure we are within the limits of our data licenses.

The benefits of having these data available for traders outweighs the costs for the fund. However, we have encouraged exchanges and data providers to promote the standardisation of data consumption models and of the pricing of data, to mitigate the administrative burden to us and other asset managers. Given the benefits of these data for asset managers, and the interest of exchanges and data providers in further developing their relationships with asset managers, we believe that the market will develop a robust data delivery model. This will allow exchanges and data providers to operate high-quality delivery systems with a reasonable profit margin but allow a broad set of asset managers to access the data at an acceptable cost. In this way, the benefits of access to tick and real-time data would be available to a much broader set of market participants.

We have built our internal trading analytics systems based on our order execution data and market information. The trading analytics systems have enabled us to measure our internal performance as well as the performance of our counterparties.

In addition, we have created internal datasets where they were not available commercially and allowed us to further develop our strategy. For example, we have developed a tracking system for our ECM activity to challenge our broker-dealers on allocation outcomes.

Trading for performance

Trading is costly, as transactions in the market entail costs such as commissions, taxes, fees and, most significantly, market impact. Our trading strategy aims to minimise these costs while achieving the desired exposure. However, avoiding trading could also be costly, because of the opportunity cost of not being optimally invested.

The trading cost
The cost of trading can be broken down into three components. The first is commission, which is paid to the broker-dealer executing the trade. The second consists of taxes and other fees. The third is implementation shortfall, which reflects the difference between the price at the time of the order and the price achieved in the market.

The first two components, commissions and taxes, are direct costs. They are generally proportional to the size of the trade. However, they do not depend on the characteristics of the trade other than size. As such, the amount of commission and taxes paid over the course of a year is dependent on our total trading volume in different markets. The implementation shortfall, however, is an indirect cost. It represents the cost of liquidity in the market, and varies with the trade size, but also with trade characteristics, such as the liquidity of the stocks or their volatility. Hence, it varies more than the direct costs, depending on market liquidity and the composition of our turnover.

The trading costs are reflected directly in the fund's return, and in the returns of the investment strategies sending the orders.

When we started trading in 1999, we expected our total trading cost to be approximately 25 basis points, of which 15 basis points would be commissions and taxes, and 10 basis points would be implementation shortfall. As the fund has grown, and the market has evolved, our costs have also changed. In particular, the implementation shortfall has become the dominant component of our total trading costs.

Commission
Broker-dealers receive trading commissions as compensation for the execution services they provide. Commissions generally differ by execution strategy, depending on the service level required. In electronic execution, the commission compensates the broker-dealers for the development of high-performance trading algorithms and efficient connectivity, but the possibilities for automation mean that the commission is low. On the other hand, block execution requires more involvement from the broker to find a relevant investor on the other side, leading to higher commission rates.

For the fund, trading commissions are just one part of the total cost of trading. Generally, implementation shortfall will account for a larger share of that total cost. Therefore, while

controlling commissions is part of the management of trading costs, we are more interested in minimising overall trading cost. This means that we have selected trading strategies with higher commission costs where we believe it reduces our total cost.

Trading commissions have declined over time, driven by competitive pressures and by advances in technology, lowering the costs for broker-dealers. The commission rates we have paid reflect the general trend of declining commissions, but also the changing mix in our execution strategies over time. From 2004 to 2007, we were able to reduce our commission rates significantly through a greater use of electronic trading. From 2010 to 2016, our commission rates were flat, reflecting an increasing share of block trading in an environment where average commission levels in the industry were decreasing. Since 2016, we have reduced our commission rates by lowering our commissions paid on block trades.

Our policy has been to pay commission rates that are the market average for larger investors. We have also implemented separate rates for different products, such as agency, electronic and block executions, and have declined the offer of lower commission rates in exchange for guaranteed trading flow. These decisions have helped us retain our flexibility to select broker-dealers and execution channels that are in the best interests of the fund.

Some broker-dealers have offered zero or even negative commission rates. These are commonly offered to large index managers, particularly around index rebalancing events. Such an offer may be profitable for broker-dealers if they can use this trading flow to attract other, commission-paying clients. However, it may also lead to diverging interests, where the implementation cost increases because of information leakage. This is a risk we have sought to avoid.

Chart 57 Commission rate. Basis points.

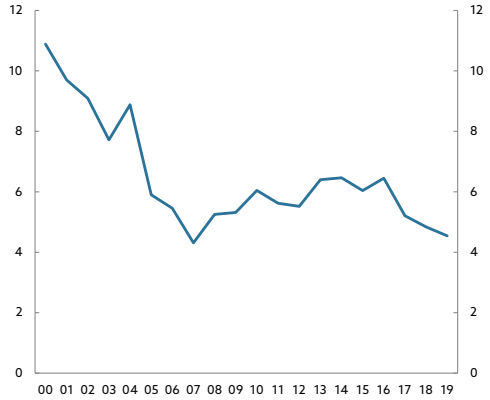


Chart 58 Commission cost. Million kroner.

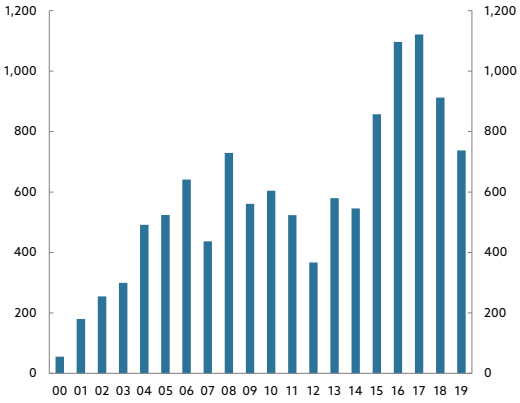


Chart 59 Commission rate, by region. Basis points.

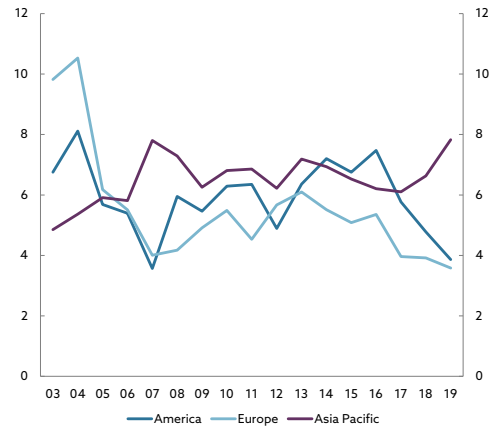
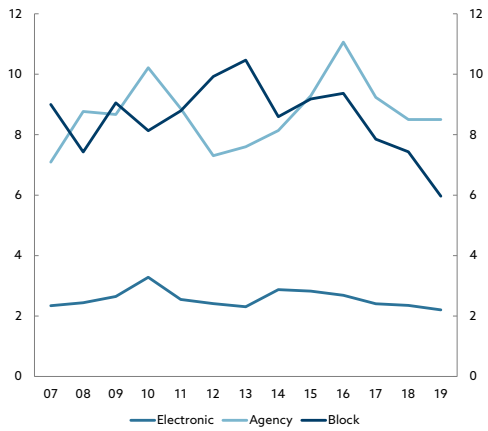


Chart 60 Commission rate, by execution strategy. Basis points.



Transaction taxes and fees

The fund pays transaction taxes and other market fees in 24 countries. Some countries charge taxes on buys, others on sales, and some on both. Transaction taxes do not include taxes paid on dividends or capital gains taxes in certain countries.

The transaction taxes and fees are paid on behalf of the fund by the brokers executing the transactions. It has been a priority for us that such transactions and fees are reported separately from our broker commissions, to allow us to evaluate our commission rates independently of any tax considerations.

While transaction tax rates are generally stable over time, we have observed an increase in the number of countries introducing such transaction taxes over time, for example with the introduction of financial transaction taxes in Europe after the financial crisis in 2008. The total transaction taxes and fees paid will depend on our trading volume in these markets. In practice, this can not be influenced by the trading desk, but portfolio managers take into account the cost of trading in these markets when they consider their portfolio construction.

Chart 61 Transaction taxes and other charges. Basis points.

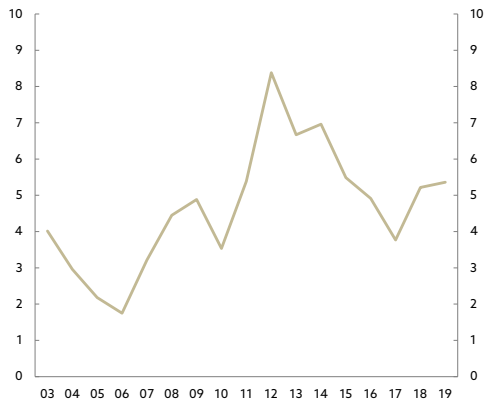
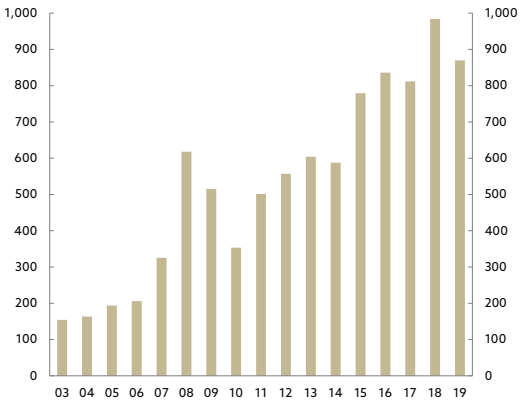


Chart 62 Transaction taxes and other charges. Million kroner.



The trading shortfall

The implementation shortfall measures the difference between the price at the time a portfolio manager sends an order, and the price achieved in the market. For an individual trade, this difference can be positive or negative, as prices can move in either direction. However, on average, prices tend to worsen during the execution of our orders, compared to the initial price at the beginning of the order.

The implementation shortfall can be seen as the cost of liquidity. For a single share order, the shortfall of executing a buy order instantly would be the difference between the ask-price in the market and the mid-price. However, for larger orders the implementation shortfall represents the costs of finding the necessary liquidity to execute the full order.

Implementation shortfall has become an increasingly important part of our total trading cost. In 2003, it represented half our trading cost, while since 2008, implementation shortfall has represented between 70 and 80 percent of our total trading cost.

Measurement

The measure of implementation shortfall depends on how portfolio manager orders are received by the trading desk. If the portfolio manager sends a multitude of small orders in the same stock, the measured implementation shortfall will be significantly smaller than if the trading desk receives the full position that the portfolio manager wants to implement as one order. However, the actual cost to the portfolio would be the same, or even higher, when trading a multitude of small orders.

Trading cost can also be measured by comparing the execution price to the volume-weighted average price, the close price, or the price at some point in the future. While these are also relevant comparison points, we have focused our measurement on a simple measure, reflecting the cost of each order.

Our strategy has been to ensure that the trading desk receives the full portfolio manager order, to manage the implementation of the fund's position in the market. This has also prompted us to measure the full implementation shortfall of these orders, from start to finish. Our methodology leads to higher cost measures than those used by other market participants, but we believe these to better reflect the actual costs to the fund. The measured implementation shortfall could have been lower if we had chosen to slice up the orders, but the actual cost to the fund would probably have been higher.

Evolution

Our implementation shortfall was stable, averaging approximately 13 basis points, between 2003 and 2006. Electronic trading provided a significant improvement in our implementation shortfall, particularly compared to our earlier execution strategies. The execution algorithms provided by the broker-dealers allowed us to access liquidity in an efficient manner, adapted to our trading objectives – allowing us to be passive when possible, and seeking out liquidity more actively when our orders were more urgent. During this period, we mostly traded developed-market large- and mid-cap stocks, which are generally more liquid.

In 2007, small-cap stocks were included in the equity index, followed by several new emerging markets in 2008. The addition of these segments, which are more difficult to trade, meant that we could expect our implementation shortfall to increase. As volatility increased in 2008, our implementation shortfall rose dramatically, reaching 45 basis points that year.

Chart 63 Shortfall. Basis points.

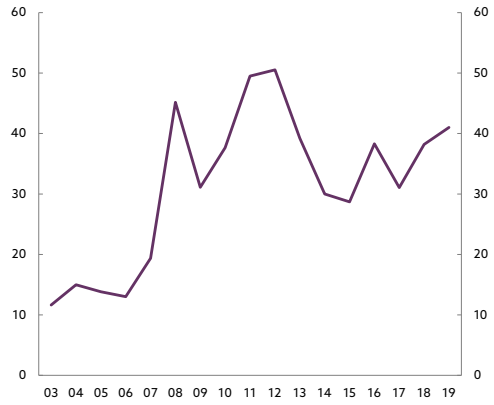


Chart 64 Equity trading volume, by execution strategy. Percent.

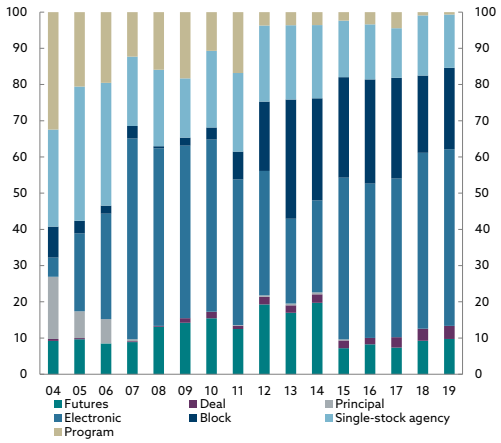


Chart 65 Shortfall, by region. 12-month moving average. Basis points.

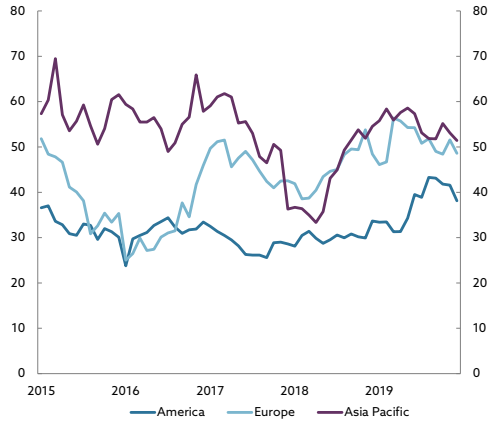


Chart 66 Equity trading volume, by region. Percent.

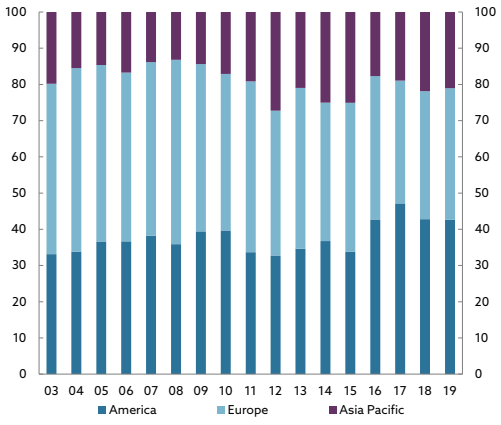


Chart 67 Shortfall, by market classification. 12-month moving average. Basis points.

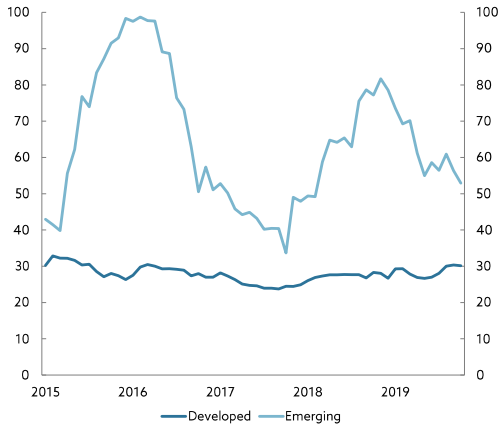


Chart 68 Equity trading volume, by market classification. Percent.

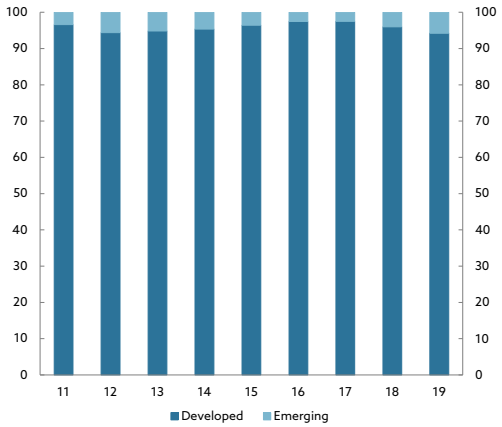


Chart 69 Shortfall, by investment strategy. 12-month moving average. Basis points.

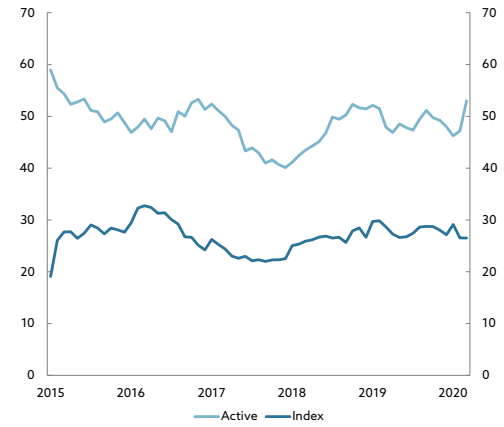
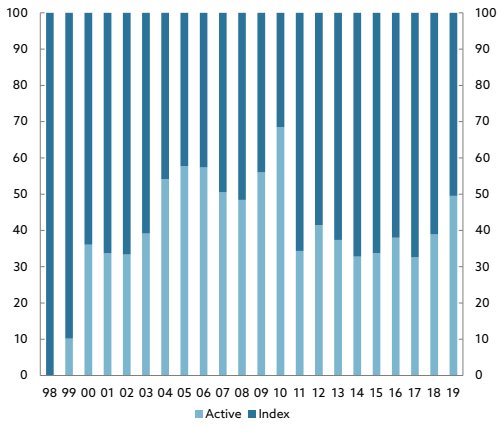


Chart 70 Equity trading volume, by investment strategy. Percent.



As volatility abated after the crisis, we expected our costs to come down. However, the larger size of the equity portfolio, and the increasing fragmentation of the market, meant that our trading costs did not decrease as expected after the financial crisis. This led us to expand our usage of block trading in 2011 to source liquidity for larger trades. These efforts, combined with our improvements in algorithm selection and local presence, have helped us stabilise our implementation shortfall, even as the fund and our order sizes have grown.

Differences

Our implementation shortfall has been higher in Europe and Asia Pacific than in America. In Europe, our ownership of equities has been higher than in the other regions, and our share of active management has also been higher. In addition, European and Asian stocks are generally less liquid than American stocks.

While emerging markets have represented around 5 percent of our trading volumes, the costs associated with trading in these markets are on average twice that in developed markets. Emerging markets are some of the most expensive markets we trade in, but they do not represent a large part of our trading volume. However, some developed markets, such as Japan, have also been expensive to trade in.

Over the last five years, the markets we have been most active in are the US, the UK and Japan. The US has also been one of the markets with the lowest implementation shortfall, given the high liquidity.

Lastly, orders from our active portfolio managers have proven to be more costly than orders from our index portfolio managers. This is natural, as the active portfolio manager orders are generally more urgent, because we expect a change in the companies' fundamentals. The active orders are also generally larger than the index orders, which makes them more expensive to execute. Over the last five years, index orders, which also include orders related to transitions and rebalancing, have represented approximately 60 percent of our total trading volume.

Chart 71 Shortfall, top markets. 12-month moving average. Basis points.

Chart 72 Shortfall, by country. 3-year average shortfall (basis points) versus average annual volume (billion dollars).

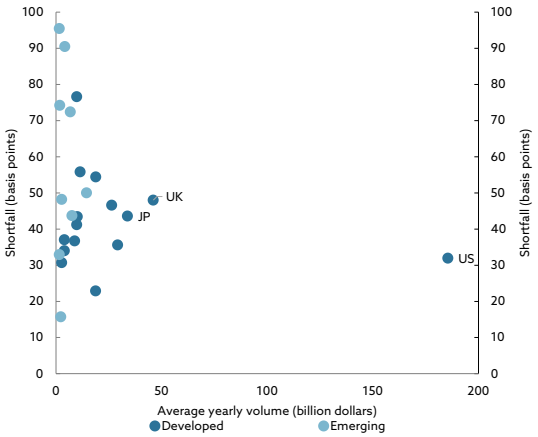


Chart 73 Shortfall, by order size. Basis points.

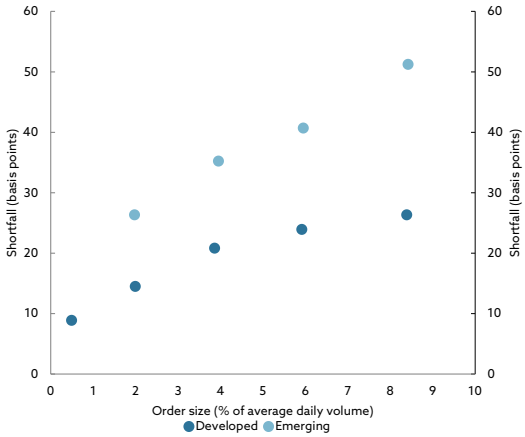
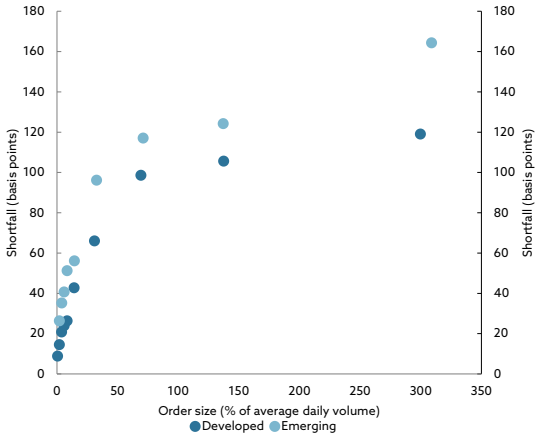


Chart 74 Shortfall, by order size. Basis points.



The trading performance
The total costs of trading have varied through time, with varying contributions from commission, transaction taxes and implementation shortfall. In 2003, commissions and taxes represented half of our trading costs, and shortfall the other half. Since 2008, implementation shortfall has made up between 70 and 80 percent of our total trading costs.

Trading costs can also be seen in relation to the equity portfolio's size. Our realised trading costs have, on average, been 27 basis points per year since 2003. Trading costs were higher in relation to the equity portfolio in the period 2003 to 2008, averaging 42 basis points. Over the last five years, they have averaged 16 basis points, of which 12 basis points is the shortfall cost, as the fund has become larger and inflows, as a share of the equity portfolio, have slowed down. This means that if we had been able to trade at the prices in the market at the time we sent the orders, the fund's performance would have been 12 basis points higher over the last five years.

However, it is necessary to trade in the market to fulfil the fund's investment strategy. Trading has been necessary to achieve a large and diversified equity portfolio, and to implement our active investment decisions. The cost of trading should be seen in relation to the returns received on the fund's investment strategy over time.

Chart 75 Trading cost, by origin. Basis points.

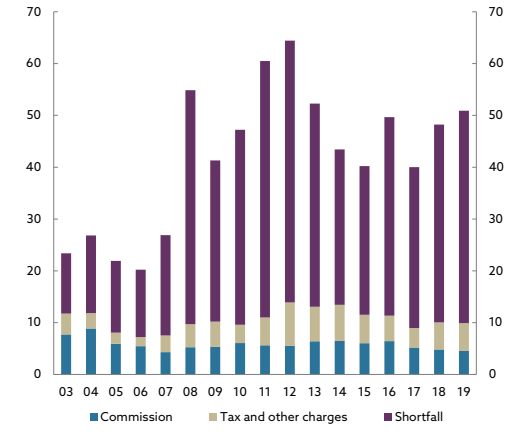


Chart 76 Trading cost, by origin. Percent of total.

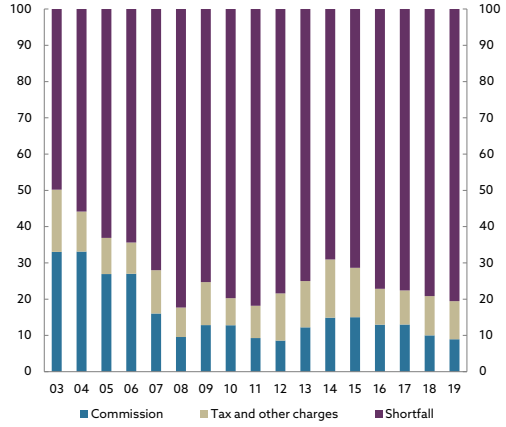


Chart 77 Trading cost, by origin. Million kroner.

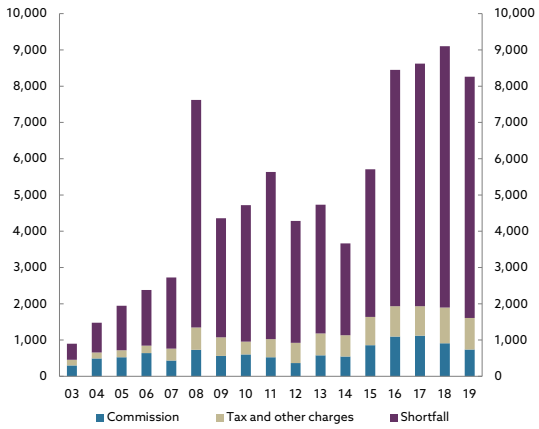
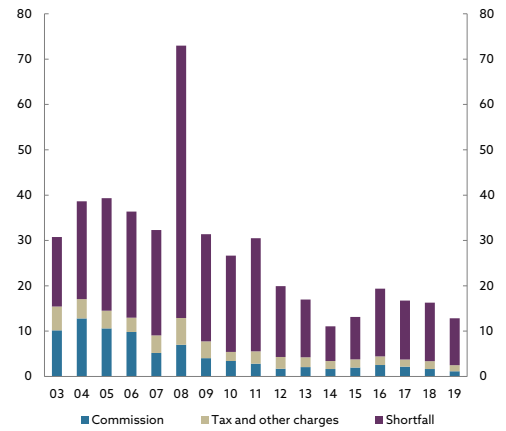
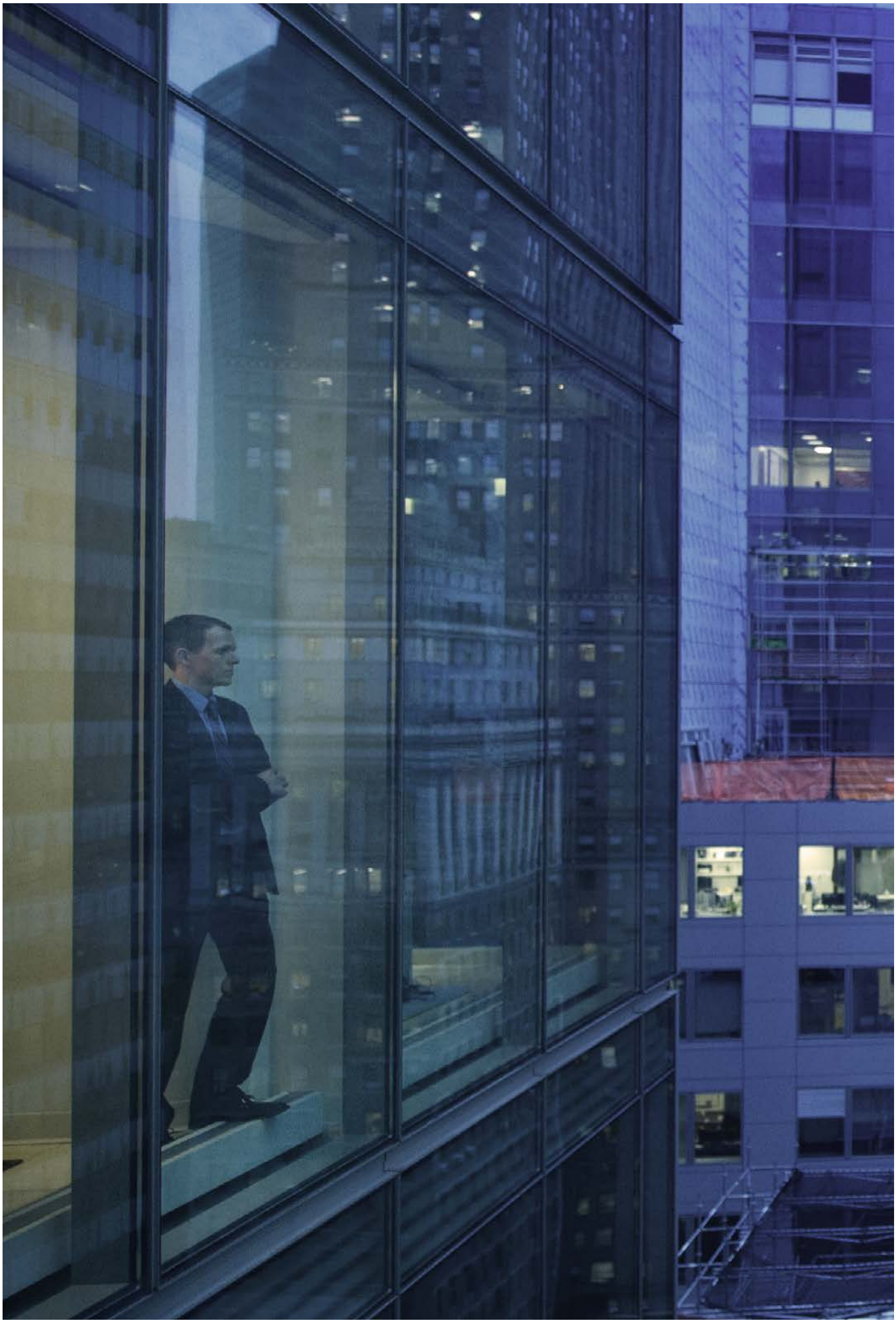


Chart 78 Trading cost, by origin. Basis points of the equity portfolio.



2 | Indexing



Investing with an index

In 1997, the Ministry of Finance issued a mandate for the fund with an index that would play a key role in our fund management. The mandate defined the management strategy through constraints on deviations from this index.

The Ministry of Finance and Norges Bank laid the foundations for the fund's investments in equities back in 1997. Between April and December that year, a mandate was set up, as well as an implementation plan that would bring the equity share of the fund to 40 percent by the end of May 1998. The Ministry of Finance selected an equity index to serve as the benchmark for the equity portfolio, and formulated a mandate for our investments, setting constraints on the risk relative to this benchmark. As we sought to acquire equity exposure quickly in 1998, the equity index was a good starting point for constructing the portfolio.

Indices play an important role in modern portfolio management. They are designed to represent markets and can serve two different purposes. First, they can serve as a benchmark for the actual portfolio management, in order to evaluate its performance. Second, they can serve as the basis for portfolio construction, by providing a representation of the market. Both assume a high degree of market efficiency, meaning that the market price corresponds to the best estimate of long-term value.

In order to serve their purpose, indices must be rules-based, investable and transparent. Satisfying these three criteria allows an index portfolio manager to construct a portfolio that is sufficiently close to the index that, over long time periods, the return of the portfolio will match the return of the index.

There are multiple advantages to investing with an index. The fund's equity index is a broad,

global equity index. It represents a diversified portfolio of stocks that serves as a good starting point for investments. Such a portfolio has the advantage of adapting well to a growing fund, by avoiding excessive concentration in stocks that are difficult to buy in large volumes.

Furthermore, index management is less costly than active management, in terms of both management costs and transaction costs. The management costs are low, as a global index portfolio can be managed with a small team of portfolio managers. The transaction costs are low, as indices using the market capitalisation of a company as the starting point to form weights have lower turnover than most actively managed portfolios. This has been an advantage in limiting transaction costs as the fund has grown.

An equity index will also include new companies that are coming to the market, once they reach a certain size. This can be at the time of the initial public offering, or at a later stage when the company has grown and become more liquid. When investing with an index, this means that the portfolio will include new companies as they grow, ensuring that the fund evolves with the market. The result is that today's equity index is very different from the index 20 years ago.

Chart 79 Number of companies in the equity index, by period they were first added to the index.

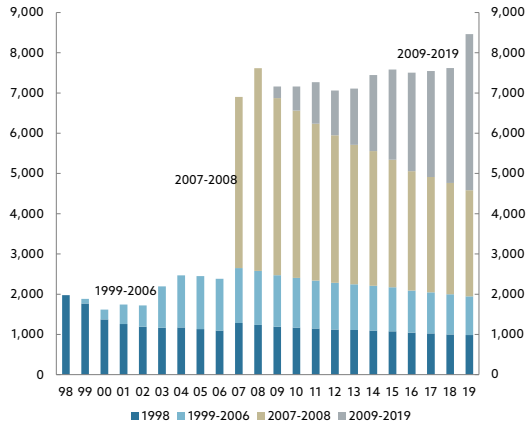


Chart 80 Composition of the equity index, by period the companies were added. Percent.

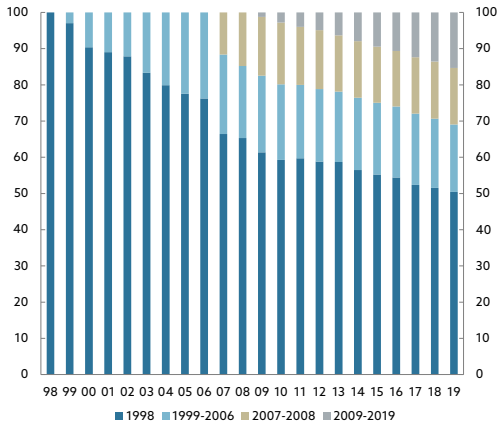


Chart 81 Composition of the equity index, by industry. Percent.

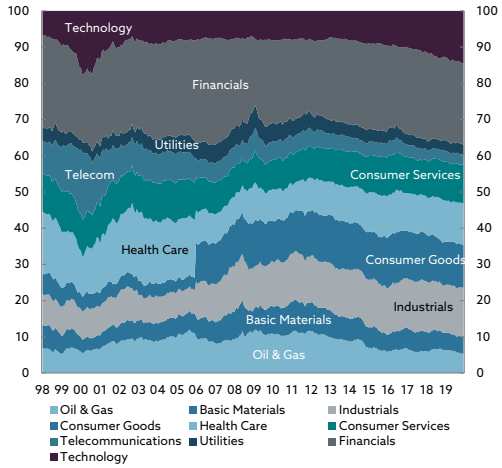


Chart 82 Composition of the equity index, by country. Percent.

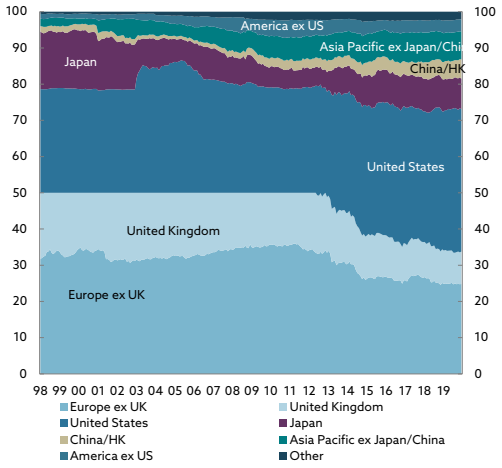


Chart 83 Composition of the equity index, by market cap segment. Percent.

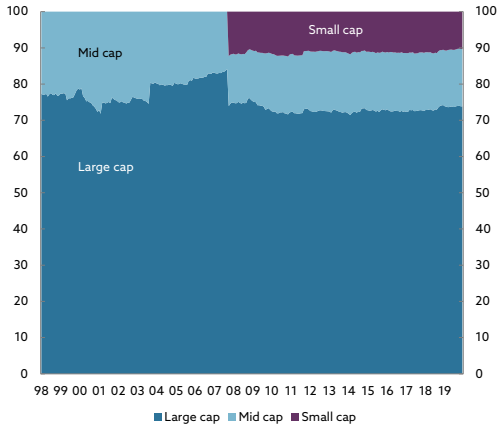
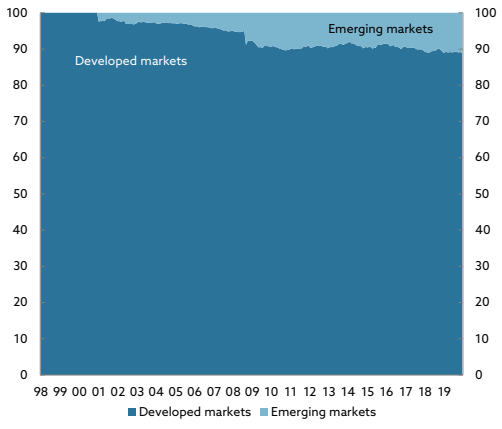


Chart 84 Composition of the equity index, by market classification. Percent.



The index selection

The Ministry of Finance, as the asset owner of the fund, decides the composition of the fund's equity index. In 1997, the Ministry selected FTSE Russell – then known as FT/S&P Actuaries – as the index provider for the equity index of the fund. The equity index has since then been based on the standard global index series produced by FTSE Russell. The Ministry of Finance further adapts the composition of the equity index to the fund strategy through two levers: selecting the markets and segments that make up the equity index, and setting the regional composition of the equity index. Companies are then excluded from the equity index based on the fund's guidelines for observation and exclusion of companies.

There are multiple providers of global equity index products, MSCI and FTSE Russell being the most prominent. In 1998, MSCI's World Index, most popular with American investors, sought to represent 60 percent of the global equity market, while the FT/S&P indices, used mostly by European investors, sought to represent 80 percent of the market. Both indices were weighted by market capitalisation, i.e. the weight of each security was proportional to the market value of the company. The advantage of such a weighting scheme is that, as stock prices change, the index weights follow, such that a portfolio constructed on the basis of an index weighted by market capitalisation does not need to be rebalanced based on price moves. This is not the case for other weighting schemes.

At the time, equity indices were mostly used as benchmarks for active portfolio management. The requirements for accuracy are more stringent when an index is used as the starting point for index portfolio management. In 1998, the FTSE index, then called the FT/S&P Actuaries World Index, did not account for dividends on the "ex" date – which is the date when investors will actually account for the dividend – but distributed the dividend yield of the index over the year. This meant that the actual return of a portfolio invested according to the index would differ from the index return.

Furthermore, both MSCI and FTSE formed indices using companies' full market capitalisation, i.e. the full market value of their equity. However, many companies have strategic

Chart 85 FTSE and MSCI global indices. Cumulative returns since January 1998. Percent.

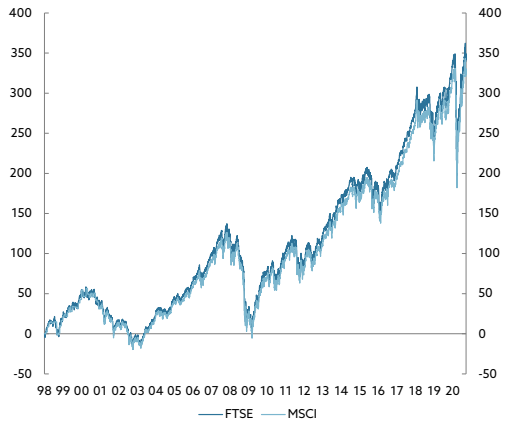
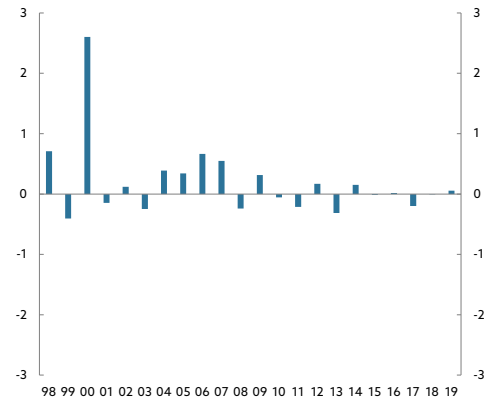


Chart 86 FTSE and MSCI global indices. Annual return differential. Percent.



or government owners, or shareholders whose own equity is also listed, meaning that their full market capitalisation is not accessible to a regular investor. In 2001, both MSCI and FTSE changed their methodologies to include only a stock's free float, meaning that they removed strategic or otherwise unavailable parts of companies' market capitalisation. This was a significant change for index-based investors, but it allowed all financial investors in aggregate to hold the index portfolios constructed by FTSE and MSCI.

However, it is challenging to determine what share of a company's equity is freely accessible, and there have been significant discrepancies between the free float numbers used by the different index providers. This, as well as other differences in index construction, resulted in significant performance dispersion between the FTSE and MSCI indices. Between 1998 and 2008, the FTSE index outperformed the MSCI index by 0.4 percentage points annually. In a single year, the performance dispersion was as high as 2.6 percentage points. Over time, data quality has improved, and methodologies have converged. As a result, the differences in returns between the two indices have diminished significantly: from 2009 to 2019, the FTSE index underperformed the MSCI index by 0.1 percentage point annually.

In September 2003, FTSE made significant changes to the way its global equity index series was constructed and extended the coverage by adding small-cap companies. As there were concerns about the potential ownership challenges with owning significantly more companies, the Ministry of Finance decided that the fund's equity index would continue to include only large- and mid-cap companies, which was closer to the index used since 1998. The new equity index consisted of 2,200 companies, compared to 1,800 previously.

As the challenges were addressed, small-cap companies were added to the fund's equity index in October 2007, diversifying it further. This changed the number of companies in the equity index from 2,400 to 6,900, with small caps representing a 10 percent weight in the new index.

As there are many listed companies that are too small or too illiquid to be investable for most investors, index providers do not attempt to include all listed equities in their index. MSCI and FTSE Russell's flagship indices have evolved from seeking to cover 60 and 80 percent respectively of developed markets in 1998, to 99 and 98 percent of developed and emerging markets today. The resulting cut-off for what is an investable company depends on the index providers' index methodologies. In practice, we have seen that the market capitalisation of the smallest firms varies by region and index provider, influencing the make-up of our equity index.

The Ministry of Finance has also decided which markets to include in the equity index. The initial 1998 equity index consisted of markets in 21 developed OECD countries. In January 2001, the Ministry included five emerging markets: Brazil, Mexico, South Korea, Taiwan and Turkey. Turkey was subsequently replaced by South Africa in 2004. As the fund grew larger, and we sought a more diversified portfolio, 23 more emerging markets were added to the equity index in September 2008. These represented an additional 900 companies. From that year, the equity index included all the markets classified as developed, advanced emerging and secondary emerging by FTSE. In June 2019, FTSE Russell added China onshore equities to the fund's equity index, representing an additional 1,000 companies. At the end of 2019, there were 8,740 stocks from 47 different countries in the fund's equity index.

Chart 87 Equity index and FTSE and MSCI global all-cap indices. Number of stocks.

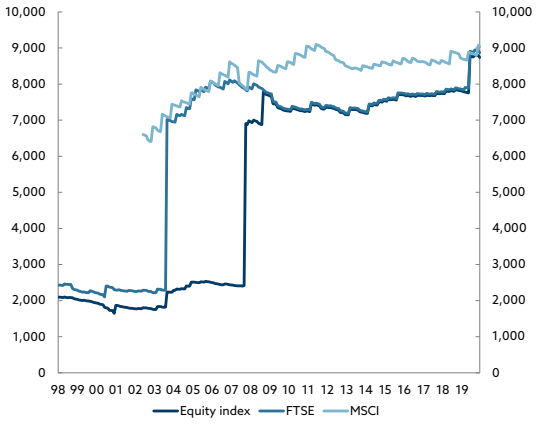


Chart 88 Equity index and FTSE and MSCI global indices. Number of countries.

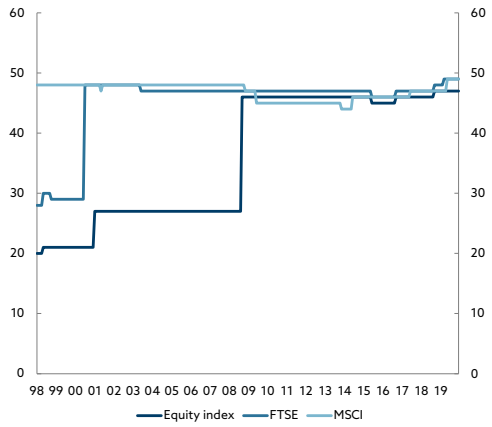


Chart 89 Market capitalisation inclusion levels for US companies in FTSE and MSCI indices. Million dollars.

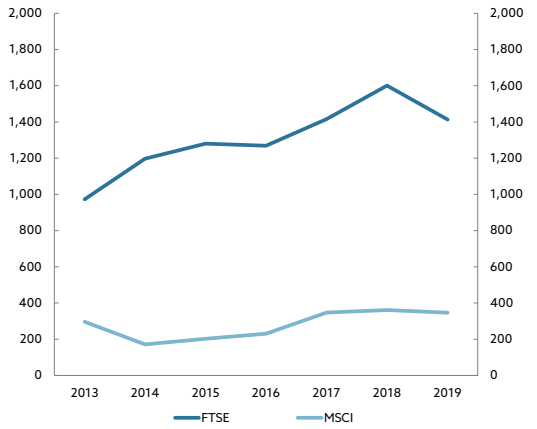
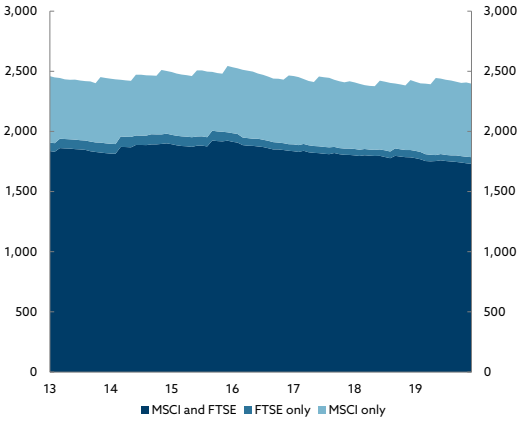


Chart 90 Number of US companies in FTSE, MSCI indices.



The index dynamics

While an equity index provides a diversified and liquid starting point for constructing an equity portfolio, there are several drawbacks to following an index passively. As the equity market evolves, because of new companies being listed, companies being acquired, or other corporate events, the index providers need to update their indices. Hence an equity index evolves continuously, and a passive index manager will need to trade in the market to adapt to these changes.

The main driver

The main driver of the changes in the equity index have been the changes made by the fund's index provider, FTSE. The index provider updates the list of eligible stocks, as well as each stock's free float, every quarter. The eligible stocks are determined based on criteria relating to company size and liquidity. Because equity indices are rules-based, the decision on which companies to include in the index is effectively made by the index provider's rules. On average, 406 companies have been added each year, and 324 removed, in the period since small caps were added to the equity index in 2007. In addition, companies are added and removed outside the quarterly rebalances because of corporate events such as spin-offs and takeovers.

Some of the changes to the index are positive in the long term, for example the inclusion of newly listed companies, some of which have grown to become market leaders. Inclusion in major equity indices is sought after by companies as a stamp of approval. It brings with it an increasing number of passive and semi-passive investors. Because indices are rules-based, there is no due diligence performed on the companies by the index providers. They rely on the stock exchanges and regulators to create a well-functioning marketplace. There have been several examples of companies included in major indices that have turned out to be fraudulent.

Chart 91 Equity index, number of additions and deletions on main rebalancing days.

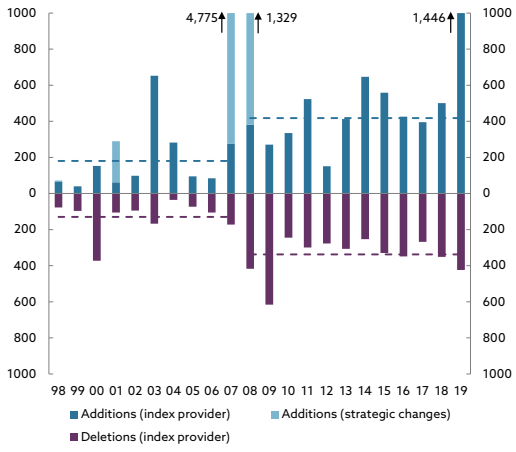
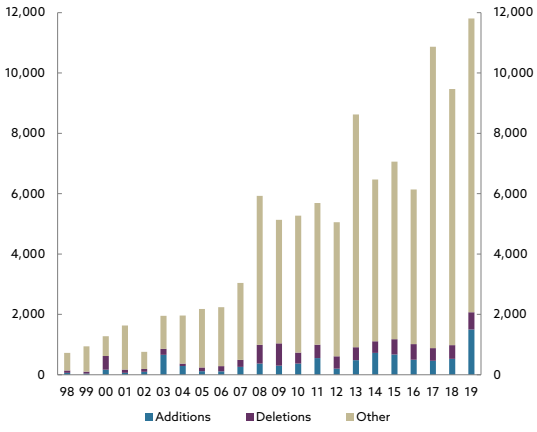


Chart 92 FTSE, number of changes per year.



An investor tracking an index effectively outsources to the index provider the choice of which companies to invest in and will be exposed to losses associated with such fraud.

FTSE Russell, like other index providers, classifies countries as developed, emerging or frontier markets, based on criteria including regulatory environment, market accessibility and operational efficiency. Developed and emerging markets are included in the equity index, while frontier markets are not. However, as the market environment evolves, emerging markets are at risk of demotion from the index if they fail to meet the inclusion criteria, usually because of decreasing liquidity or regulatory changes such as capital controls. On the other hand, frontier markets that improve their market structure and accessibility will be upgraded to emerging markets and hence included in the equity index.

As countries are reclassified, the equity index also changes, as the index construction rules and regional factors assigned to the equity index by the Ministry of Finance are different. For example, Greece became a developed market in 2001 and was subsequently downgraded to an emerging market in 2016. When this downgrade happened, four new companies were added to the equity index in Greece, but the country's total weight in the equity index was reduced by 30 percent. When Poland was upgraded to a developed market in 2018, five companies were removed from the index, but the weight of Poland increased by 60 percent.

In addition, a large part of the changes in an equity index are minor updates, such as small changes in the number of shares outstanding in a company, or free float. As the level of precision in index methodology has increased, the number of such updates has risen. In 1998, there were only 700 changes affecting our equity index; in 2019, there were close to 12,000. These changes are necessary to maintain a high-quality index but have a low impact on the return of the index over time.

These index dynamics do, however, come at a cost for an index-based investor. Implementing changes to an equity portfolio is costly because of the associated trading costs, creating a drag on index managers' performance. Furthermore, these drawbacks have been exacerbated by the growing share of passive investments in the last 20 years. Passive index managers are, through tight risk limits, forced to implement all the changes to the index at the time when they occur, creating competition for the available liquidity, and speculation by other market participants about the impact of the rebalancing from passive investors. Because of this cost, the turnover of the equity index has an important effect on the cost drag on index-based investors.

Rebalancing and strategic transitions

The Ministry of Finance sets the strategic weights for the fund's asset allocation. These are fixed between each change in strategy. However, as prices may cause the asset allocation to drift, a rebalancing regime is necessary to maintain the proper allocation over time.

From 1998 to 2001, the asset class weights and regional weights in the equity index were rebalanced back to the strategic weights quarterly in conjunction with inflows into the fund. In 2001, it was decided to introduce a new rebalancing regime, where inflows were used to bring the actual benchmark index closer to the strategic weights, with specific steps to be taken if the asset class weights drifted more than 3 percentage points from their targets. This regime lasted until 2012, when a public rebalancing rule between equity and fixed income was adopted.

In the period from 1998 to 2012, the regional weights of the equity index were fixed at 50 percent for European equities and 50 percent for the America and Asia Pacific. The weight of the America region varied between 30 and 40 percent during the period. The rebalancing necessary to bring the equity index weights back to the strategic weights was substantial at times. In 2012, the fixed regional weights were abandoned in favour of floating regional weights.

As the fund's equity strategy has evolved, we have chosen to implement strategic changes to the equity index over longer time periods to save transaction costs and smooth out the timing of the changes. When the fund was smaller, most strategic changes could be implemented with only a few months' inflows. As the fund has grown, we have extended the period taken to implement strategic changes. The transition period to floating regional weights lasted from September 2012 to September 2014. As inflows of new capital into the fund were considerably reduced from 2013, we had to sell significant amounts of European equities to buy American equities during this period.

The internal dynamics

The fund's equity index applies as a benchmark to the entire equity portfolio. However, only a portion of the equity portfolio is managed according to an indexing strategy, the rest of the portfolio being managed by active portfolio managers, internally and externally. The share of indexed assets declined gradually as our internal and external active mandates were built up in the early 2000s. Following the financial crisis and the rapid growth of the fund, the share of indexed assets increased again, and it has remained relatively stable at around 80 percent during the last ten years.

Combining multiple strategies within the same portfolio management framework was a novel concept when it was implemented, and to some extent still is. Using a single portfolio management framework has been important in the fund's overall investment strategy. It has allowed us to select specific segments of the market where we wanted to engage in active management, without impacting the fund's regional or sector allocation. It has also enabled us to scale the extent of active management in the equity portfolio depending on the opportunity for excess return. Lastly, it has enabled us to manage the equity portfolio's total risk efficiently.

As a result of our portfolio management framework, we have not been able to rely on off-the-shelf products, but have instead developed our internal systems and processes to ensure the necessary support and controls. In certain cases, we have also worked actively with our service providers to develop the necessary infrastructure.

Chart 93 Equity index. Origin of turnover. Billion kroner.

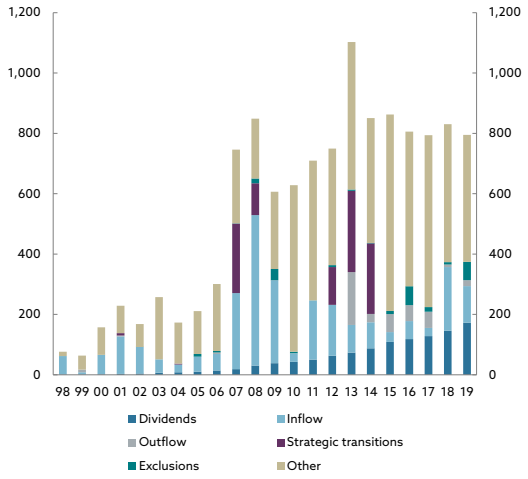


Chart 94 Equity index. Origin of turnover. Percent.

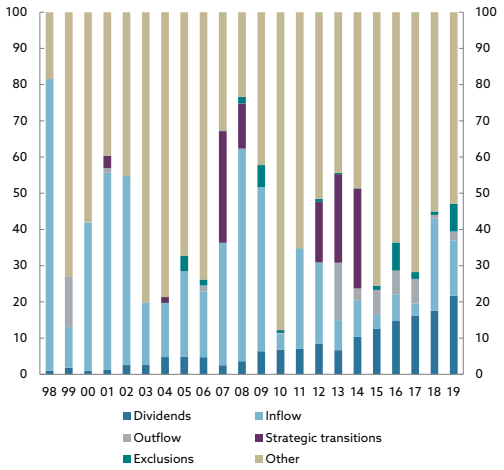


Chart 95 Equity portfolio, share by investment strategy. Percent of net asset value.

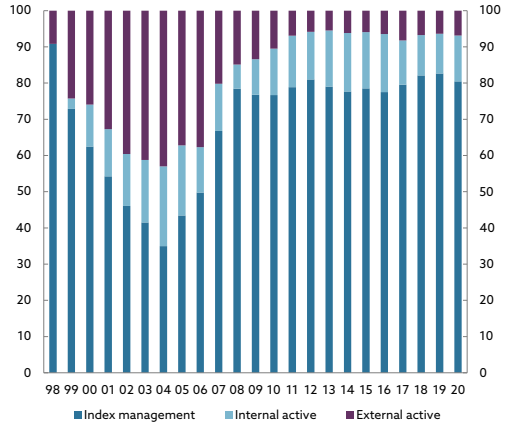
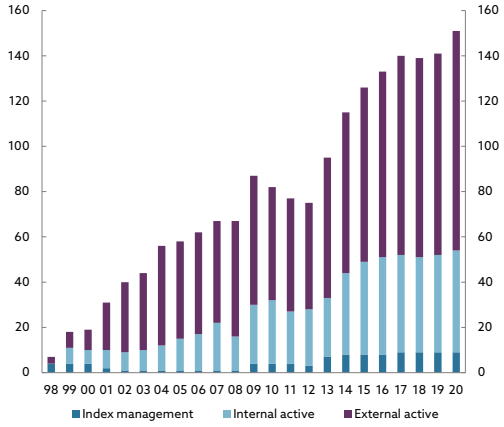


Chart 96 Equity portfolio, number of mandates by investment strategy.



External active mandates

From the beginning, we decided that each active mandate would be measured against an appropriate benchmark. We also made the decision that all the benchmarks in the equity portfolio would sum to the equity index. This would ensure that all relative risk taken versus the equity index was accounted for and managed according to a mandate. In practice, we first select the parts of the portfolio to be managed using a security selection strategy, and then manage the rest of the portfolio, called the completion portfolio, using an indexing strategy.

Tailoring the benchmark of the index portfolios to account for active mandates is a complex task with two main components. The first is a static effect: when a new active mandate is set up, the benchmark of the index portfolio must be adjusted to remove the effect of the active mandate. For example, if a new external mandate is set up with a Japan benchmark, the index portfolio's benchmark in Japan must be decreased accordingly. The second is a dynamic effect: if the mandate in question outperforms its benchmark significantly, the fund would effectively be overallocated to Japan, which could be rectified in two ways: either the external mandate is defunded, or the index portfolio must sell Japanese stocks to compensate for the increase in the external mandate.

We have handled these two aspects differently through time. From 2001 to 2004, we used sets of index portfolios with different benchmarks to manage the overall risk. In addition to a generalist European index portfolio, we managed a separate UK index portfolio to compensate for the high share of external managers with a Europe ex UK benchmark. We found there to be two drawbacks to this model. First, the benchmark for the index portfolios needed to be reset regularly, which was cumbersome. Second, it did not allow flexibility in the benchmarks for the active strategies beyond the sector and country dimensions.

To resolve this, we developed functionality in 2006 for calculating what we refer to as a completion benchmark. A completion benchmark offers the possibility to carve out parts of the benchmark exposure in individual companies. This offered us a high degree of flexibility to create a benchmark for an active mandate. For example, we could select a benchmark consisting of only companies in a particular sector, country or capitalisation segment to accurately reflect the investment mandate of the active portfolio. The completion benchmark for the index portfolio is automatically adjusted to reflect a correspondingly smaller allocation to the companies that are part of the active manager benchmark. With this, we ensure that our selection of an external manager focused on Japanese small caps, for example, does not unintentionally alter the fund's strategic exposure to this segment. Allocation and security selection decisions are disentangled.

Our external managers have been funded with such tailored benchmarks from the beginning, which has dealt with the static effect. Up until 2011, we also tried to shield the index portfolios from the dynamic effect. However, we have found that this is both operationally complex and suboptimal from a risk management perspective. While the dynamic effect increases turnover in the benchmark for the index portfolio, we have the tools to manage this efficiently.

In emerging markets, we have chosen to invest a large share of the assets through external active managers. This has been driven by the opportunity to outperform the benchmark in these markets, as well as the challenges to indexing: the index turnover is higher, and trading is more expensive. As a result, we have evolved to a model where most of the assets are managed externally, while the internal index portfolio has managed the risks associated with the remaining benchmark exposure.

Internal active mandates

In the early years, we funded the internal active mandates the same way. Benchmarks for the internal active portfolio managers were broad sector-specific carveouts of the equity index. To compensate, we managed separate index portfolios in the sectors not being actively managed. A drawback with this structure was the need for internal active portfolio managers to manage some of the complexities of index management, such as corporate actions.

We chose a different mechanism to tackle the drawbacks in our internal active mandates. In collaboration with our custodian, we set up a long-short structure for all internal active mandates in 2005. These primarily borrowed securities from the index portfolio but could also borrow in the market when necessary. The internal borrowing of securities was invisible to the index portfolio managers, limiting the dynamics between the two strategies. It allowed full flexibility within the internal active strategies, which could short all securities in their universe.

Following a strategic review after the global financial crisis, the long-short structure for internal active mandates was discontinued. Instead, we introduced research lists as benchmarks for the active mandates. These research lists are tailored benchmarks specifying individual companies to include as well as their starting weight. In the same way as for the external mandates, the completion benchmark for the index portfolios is automatically adjusted for the composition of the active benchmarks.

Chart 97 Developed markets, share by investment strategy. Percent of net asset value.

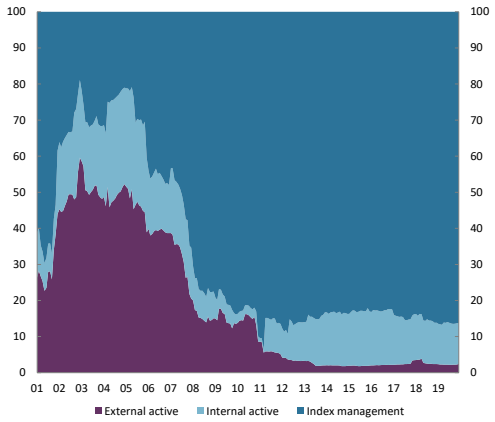


Chart 98 Emerging markets, share by investment strategy. Percent of net asset value.

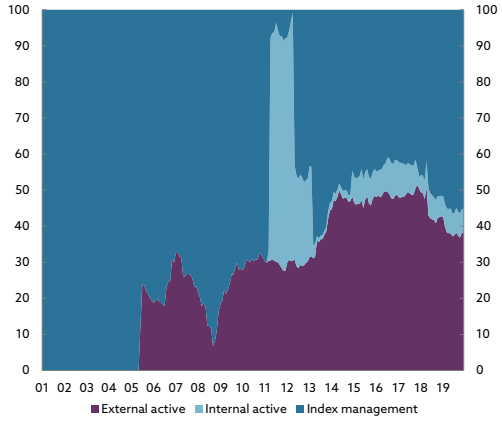


Chart 99 Developed markets, illustration of single-company distribution by investment strategy. Percent.

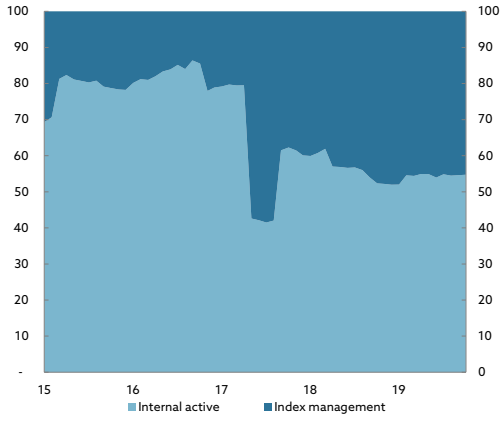


Chart 100 Emerging markets, illustration of single-country distribution by investment strategy. Percent.

Top-down strategic and tactical allocations

In December 2012, a reference portfolio was introduced to serve as a revised starting benchmark for our equity portfolio, adapted to the fund's investment strategy. This replaced the equity index as a starting point for our equity management. The reference portfolio introduced strategic active exposures to systematic risk factors as well as other strategies. In practice, these were implemented as adjustments to the equity index reflecting the desired exposure.

Other strategic and tactical allocation positions were introduced in a similar way, through additional benchmark layers with further adjustments to the equity index. These layers made it possible to have clear investment mandates for each layer of risk in the portfolio, at the expense of increasing operational complexity and effort. These allocation positions have been unwound in recent years.

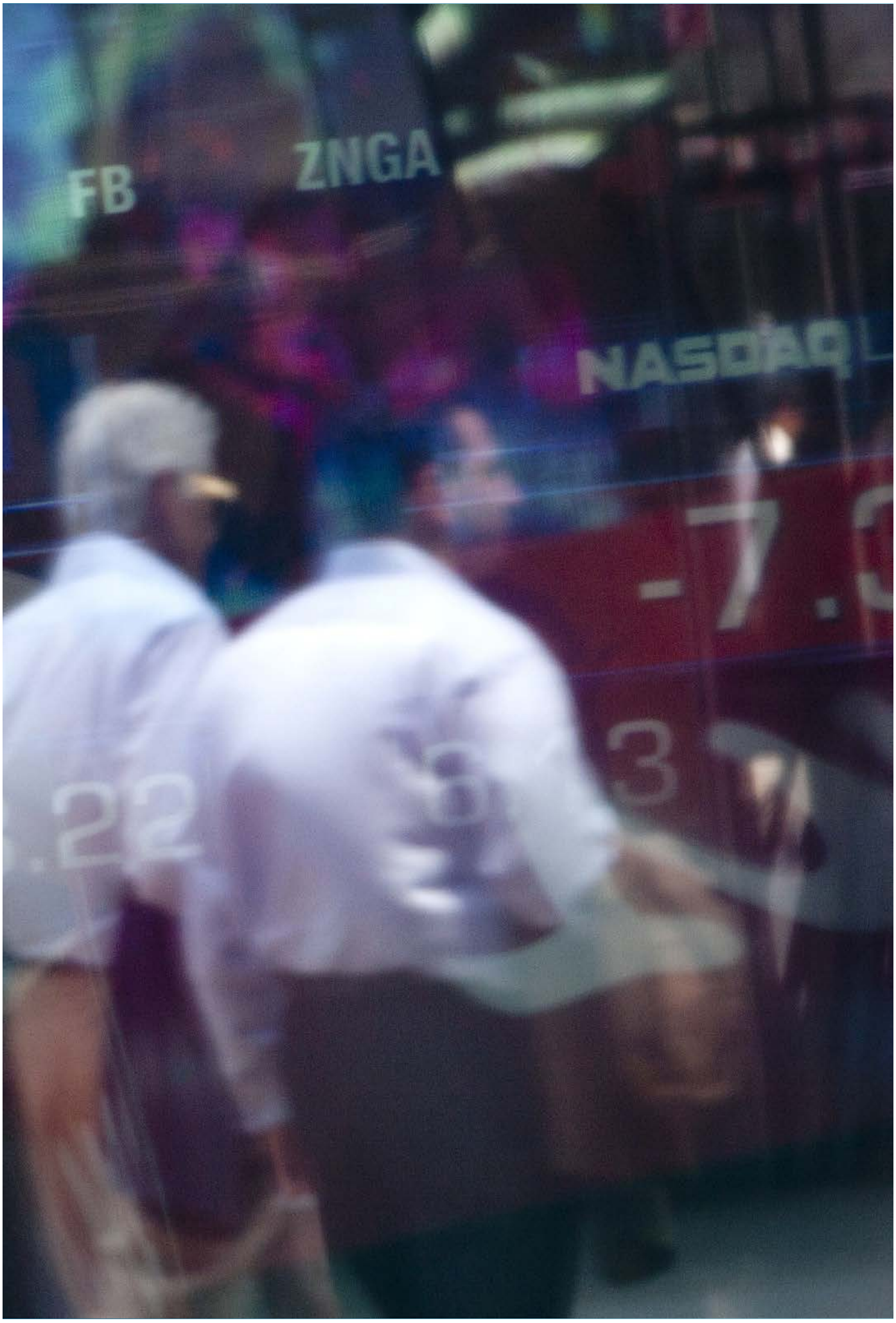
All changes implemented via benchmark adjustments ultimately led to a corresponding change in the index portfolio's completion benchmark. The actual implementation of an exposure will take place in the index portfolio through regular buying and selling of equity securities.

Impact on index turnover

Allocation decisions and the funding of external and internal security selection mandates have a direct impact on the benchmark for index management, both when implemented but also on an ongoing basis due to return differences.

In certain periods, we have tried to isolate this impact from some of the internal dynamics in separate transition portfolios so that we can better manage and measure the effects of different activities. In other periods, we have integrated the impact into the index portfolio, resulting in the risk, return and transaction costs being subsumed there. This has also included the risk, return and cost of the asset side of any transition, such as when we terminate an external manager and take its assets back into the index portfolio.

The ability to efficiently combine multiple strategies without unintentionally impacting the fund's overall asset exposure has served the fund well. First, it has allowed us to focus the security selection strategies where we believe they will provide the best returns. Second, it has enabled efficient management of the fund's overall equity exposure, including various forms of unavoidable portfolio drift. While this has introduced higher risk and turnover to the index portfolios, it has also ensured that we handle the liquidity of these transitions in the most efficient manner, by matching it up with other changes in the equity index as appropriate.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The index management

The fund has grown to become one of the biggest in the world. This has significantly impacted how we can best implement our indexing strategy, and we have increasingly focused on smart risk management to save transaction costs for the fund.

Our strategy has been to invest in the entire breadth of stocks in the equity index. This allows us to access the broadest range of liquidity possible. Given that each company in the index represents a significant investment for a fund of this size, there are only a few occasions when we refrain from holding companies that are part of the index.

As the equity index has evolved, so has our indexing strategy. With the expansion of the equity index to emerging markets and small-cap companies, we have had to adapt to a broader portfolio and more challenging markets. And as our ownership of equities around the world has increased, we have transitioned to a global presence, ensuring we make the best use of market liquidity.

The indexing objective

When we started investing in equities in January 1998, we did not yet have the necessary internal capabilities, such as systems, brokerage relationships and operational processes. We focused on selecting high-quality external index managers and establishing proper monitoring. We selected four external index managers: Bankers Trust, Barclays Global Investors, Gartmore Investment Management and State Street Global Advisors. This ensured a large spread of equity investments could be acquired and managed from the start, as well as an opportunity to gain experience with different approaches to efficient index management. A common feature was a high overlap with the index and low tracking error. However, the objectives they followed were different.

For one of the managers, the objective was to achieve the lowest possible tracking error, i.e. the lowest possible volatility of relative returns – whether these were positive or negative. This meant that the manager focused on having excellent systems and understanding of the index rules. It complemented this with a wide client base, allowing it to reduce transaction costs by netting trades between clients that would rebalance between different asset classes or regions at each month-end. This crossing network allowed us to limit our market trading when we were handling the fund's inflows into equities and our own regional rebalancing.

For another manager, the objective was to achieve the lowest possible management costs. While index management products were cheaper than active management products, a manager could gain a commercial edge by offering the cheapest possible product in terms of fees. Unfortunately, the focus on low costs came at the expense of quality. We quickly realised, through our monitoring and follow-up

meetings, that this manager's index management capabilities were not at the level we initially expected. This had resulted in late implementation of index changes, at higher cost to the fund, as well as breaches of the investment limits set out in the mandate. This external manager was terminated in March 1999.

For the third manager, the objective was to achieve excess returns for its clients by utilising a lower-risk version of its active indexing strategy, in which it employed both index enhancement and quantitative strategies. At the time, index managers offered two different products: passive index management and more active index management, with the latter being priced significantly higher. As we were not willing to pay higher fees than for passive index management, the external index manager did not exploit the enhancement opportunities to the fullest.

The fourth manager was different, in that it was not a large index manager, but rather a group specialised in managing transitions for its active management clients. This meant that it was sensitive to transaction costs and focused on managing the portfolio with the lowest possible transaction costs.

In 2001, we decided to move the management of the index portfolios in-house. The decision required weighing the pros and cons carefully. On the one hand, external index management was low-cost and efficient from an organisational perspective, allowing us to invest in a very broad portfolio with limited internal resources.

However, towards the end of 2000, it had become clear that the fund was set to grow substantially, such that internal index management would quickly benefit from economies of scale. Furthermore, internal management of the index portfolios allowed us to manage the mix between active and index management in a more granular way than would have been possible through external management. We were also hesitant to share information about our significant rebalancing activities with our external managers. Most importantly, we believed that an internally managed enhanced indexing strategy would significantly outperform an externally managed indexing strategy. The results of the external index managers' enhancement activities had not been particularly impressive. We recognized that they would not be in a position to achieve the excess performance we sought, because they needed to cater to a wide range of clients with different objectives.

As we formulated our index management strategy, we had to decide on our objective. Our experience with the external index managers showed that there could be very different objectives for an index management organisation: low tracking error, low turnover, low management costs or outperforming the benchmark. While the first three elements needed to be taken into account, we were convinced that the index management strategy should seek to outperform the benchmark through active management. Not only did we think that the opportunities for enhancement strategies were significant; we knew that an organisation that strives to outperform would be of higher quality than an organisation only seeking to limit risk.

As we moved most of our index management in-house during the course of 2001, we terminated most of the external mandates but chose to convert the mandate of the third external manager to a fully enhanced indexing mandate. We used this as a point of comparison

Chart 101 External index managers. Ex-ante tracking error using the Barra model. Basis points.

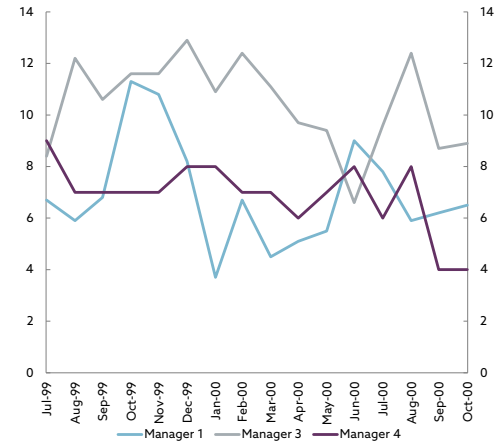


Chart 102 External index managers. Share of index companies held. Percent.

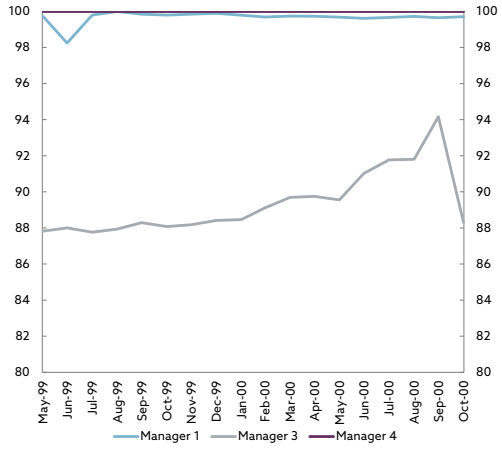


Chart 103 Net asset value of index portfolio. Billion kroner.

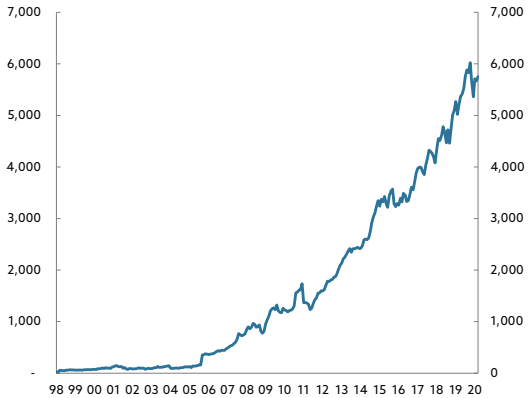
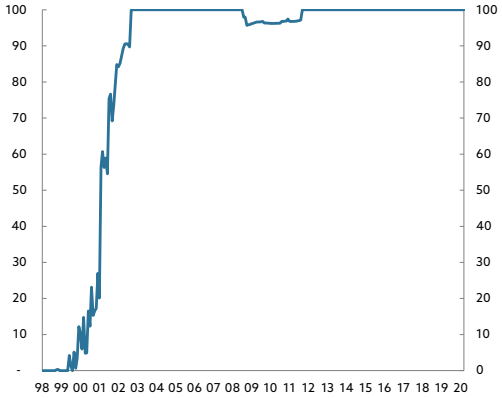
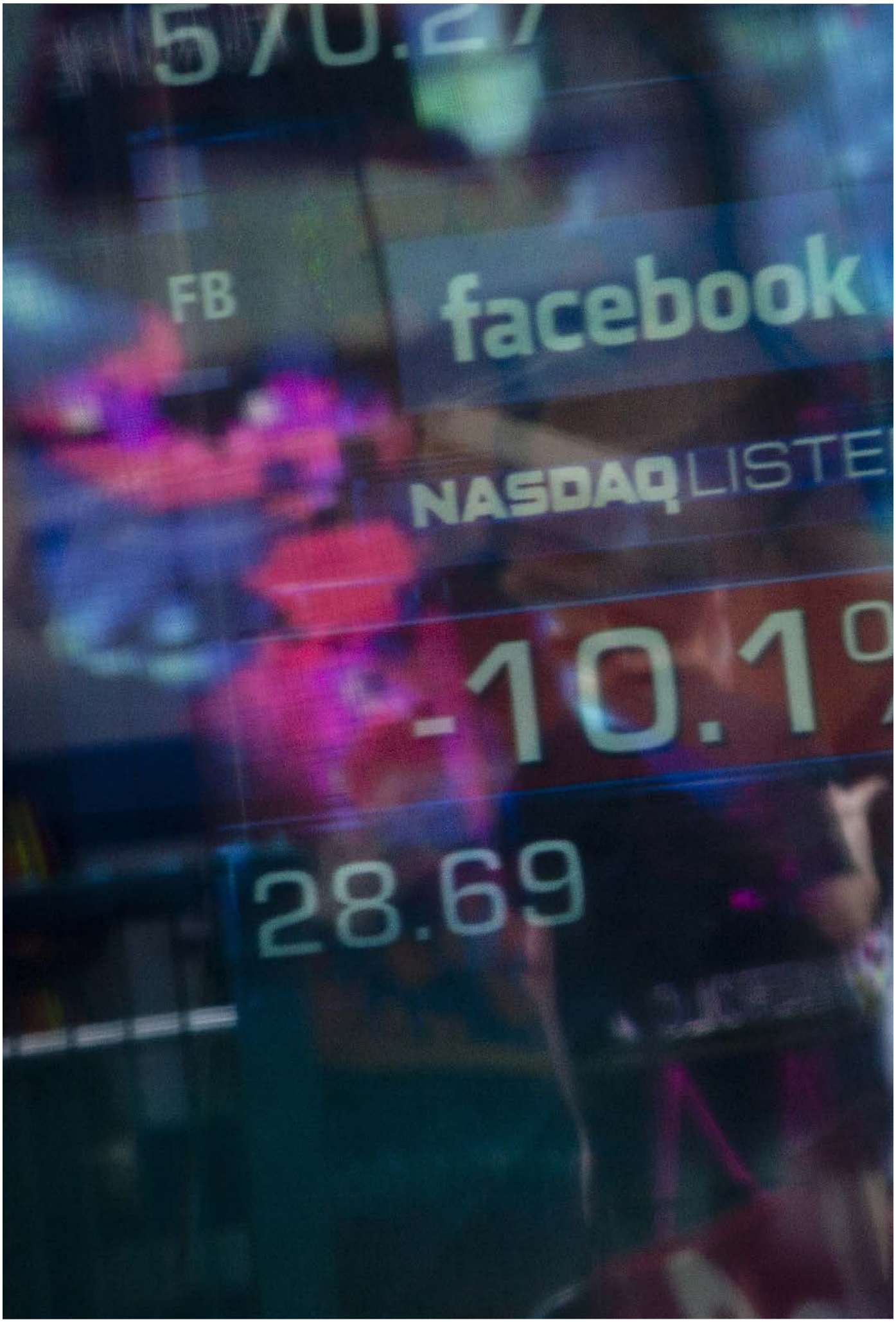


Chart 104 Share of internal index management. Percent.

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for our internal mandates until we terminated it in 2002. We subsequently re-established two external index managers between November 2008 and February 2012, to benchmark our indexing strategy against the market offering at the time. After a review period, we concluded that our internal index portfolio management was more successful, and terminated the external mandates.

The indexing choices

Once we had formulated the objective of our indexing strategy, there were some important choices we needed to make. These indexing choices have structured our approach to portfolio management. Our choices have been influenced by the fund's overall investment strategy and mandate, as well as the opportunities and challenges offered by the market. Most importantly, our approach has been to utilise the possibilities offered by our investment mandate to make the best possible investment decisions for the fund, even though those decisions have at times entailed significant amounts of relative risk.

Investment universe

The first choice we had to make was how we would construct the equity portfolio. We understood that the return of a well-diversified portfolio of equities could be characterised by the returns of a set of factors, such as market, country and sector, with the specific return of single stocks being less important in a well-diversified portfolio. This observation has led to what is known as the stratified sampling approach, where the portfolio manager buys a representative basket of the index instead of the entire index. This can be an efficient approach for a portfolio manager managing a small index portfolio, or for the management of an index portfolio that will be liquidated quickly. Knowing that we would invest inflows to build a long-term equity portfolio, and that we would want to benefit from the liquidity available in the broad market rather than a subset of stocks, we decided that we would invest in most of the constituents in the equity index.

Furthermore, we have not constrained our mandates to invest only in companies that are included in the equity index. We invest in companies that have recently listed and have not yet been reviewed by the index provider, as well as companies that we think will be included in the index at some point in the future. We also keep companies in the portfolio after they have been removed by the index provider, if we expect this to be beneficial for the portfolio over the longer term. As the cut-offs for inclusion in equity indices are based on rules from the index provider, we do not consider that this is a hard constraint on our investments. As such, we have, in certain periods, particularly from 2013 to 2015, chosen to invest broadly outside the index, preferring to hold a more diversified set of companies than the equity index.

Chart 105 Number of companies in the index portfolio and the equity index.

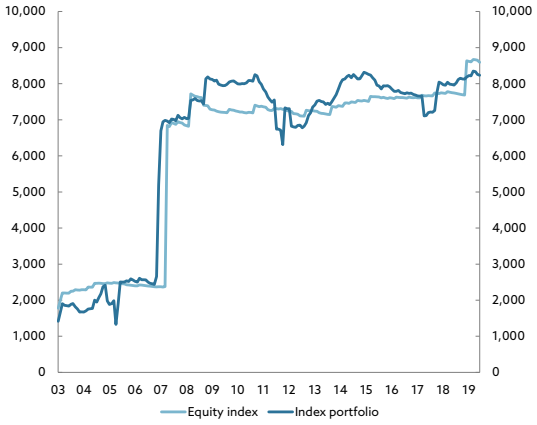


Chart 106 Number of companies in the index portfolio, by region.

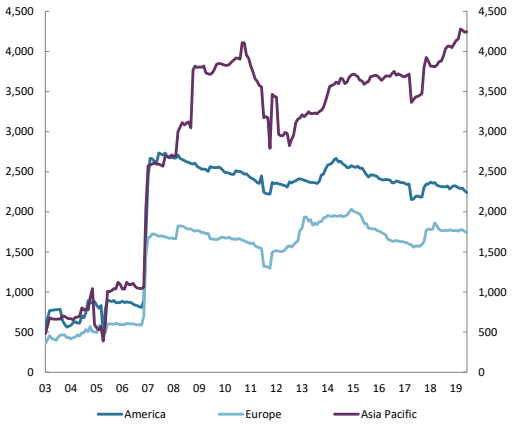


Chart 107 Number of companies in the index portfolio, by segment.

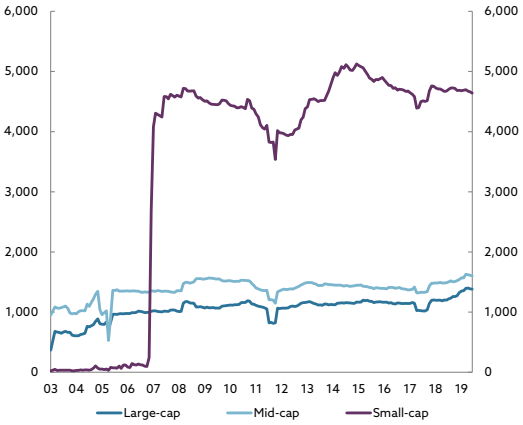


Chart 108 Number of companies in the index portfolio, by market classification.

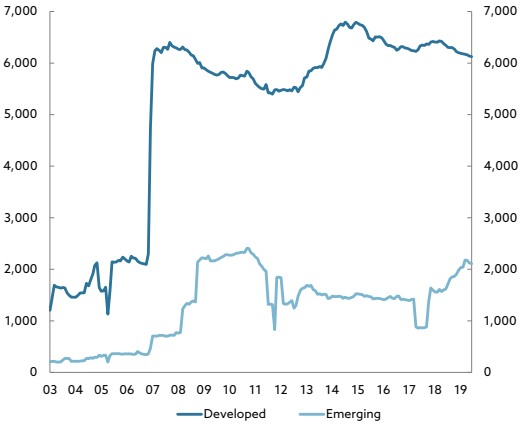


Chart 109 Share of equity index companies invested in by the index portfolio. Percent.

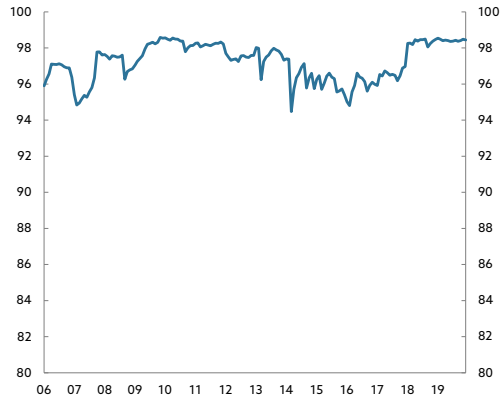


Chart 110 Number of equity index companies not invested in by the index portfolio.

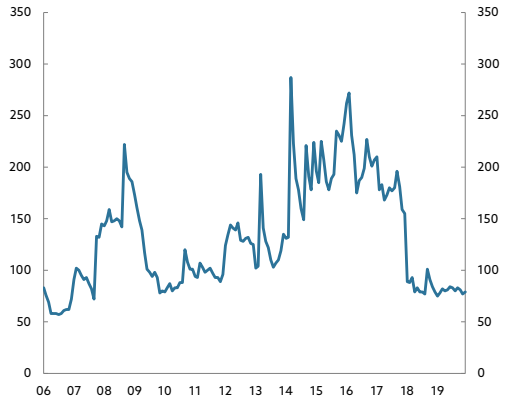


Chart 111 Share of index portfolio invested outside FTSE Global All Cap. Percent.

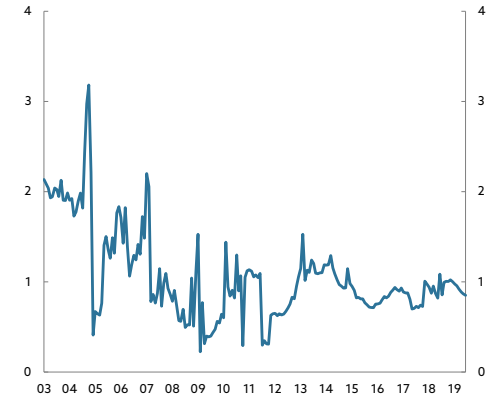
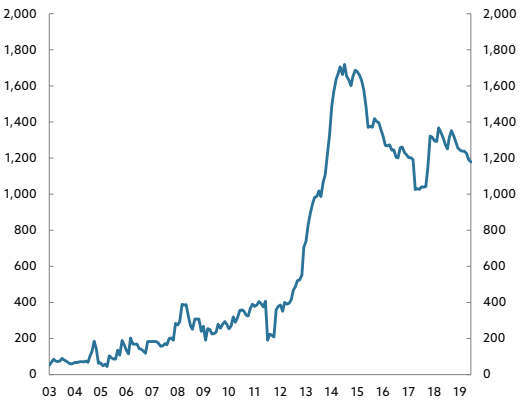


Chart 112 Number of companies in the index portfolio not part of FTSE Global All Cap.



Risk tolerance

The next important choice to be made was the relative risk tolerance of the index portfolio. The mandate for the fund has always had a relatively narrow tracking error limit compared to an actively managed portfolio. This limit has been between 1 and 1.5 percent. However, an index management strategy will usually have a tracking error below 0.5 percent. As such, the fund's tracking error limit has not been a constraint on our index management strategy.

Knowing that tracking error is a volatile measure, we have not relied on a tracking error limit to set our relative risk tolerance. We have instead operated with a more nuanced and granular view of risk management. This has included measuring the overlap between the portfolio and the benchmark, at the company level as well as at the sector and country level, to ensure proper risk monitoring. The overlap at the security level has historically varied between 90 and 98 percent for the index portfolios. We have also operated with constraints on our maximum deviation from the benchmark at the company level to avoid drawdowns associated with security-specific risk. When required, these levels have been waived to achieve low-cost implementation of changes.

Once we had set our relative risk tolerance, we had to form our risk management strategy. Reducing risk in the portfolio through trading in the market can be costly for a large equity portfolio. Even back in 1999, we were measuring the transaction costs of our external index managers. We noticed that there could be substantial savings associated with lowering trading volumes and managing the resulting risk efficiently. Our trading function has focused on achieving the lowest possible transaction cost per trade. But the index portfolio manager can also manage the aggregate amount traded in the market in order to save transaction costs.

Cash flows

The origin of equity transactions can give an indication of the real opportunity to reduce the total trade volume. The equity portfolio has received significant amounts of cash each year. This cash comes from inflows into the fund, changes in the fund's equity share, and dividends or other corporate actions leading to a cash distribution to shareholders. In addition, the equity portfolio has seen periods of outflows, and we have, at times, had to free up cash to fund active strategies. The index portfolio manager is expected to maintain the equity exposure of the fund, so these cash flows need to be traded to achieve the correct exposure: if the fund receives inflows or dividends, those will be reinvested into the equity market.

However, we can choose how to implement the cash flows. Buying or selling physical stocks is cost-efficient in the long term, while equity index futures are a cost-efficient alternative when the time horizon is sufficiently short. In the period from 1998 to 2000, we made significant use of equity index futures to manage the regional exposure of the portfolio while waiting for opportunities to cross equity baskets with other investors through our external index managers. As we moved the index portfolio management in-house in 2001, we prioritised buying equities in the market to build up the long-term equity portfolio. We have continued using index futures to manage equity exposure, particularly in periods where the index portfolio has outflows that will subsequently be matched with new inflows.

Chart 113 Cash flows received by the equity portfolio, by origin. Billion kroner.

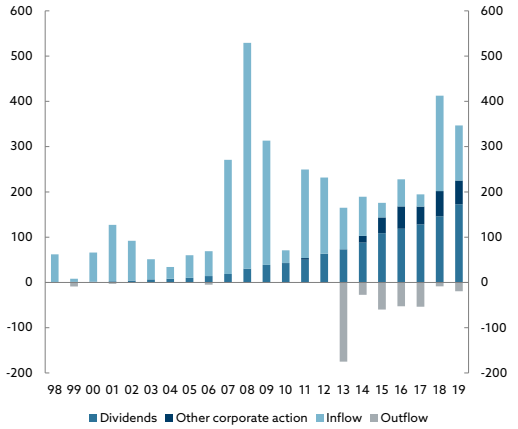


Chart 114 Cash flows received by the equity portfolio, by origin. Percent of equity portfolio.

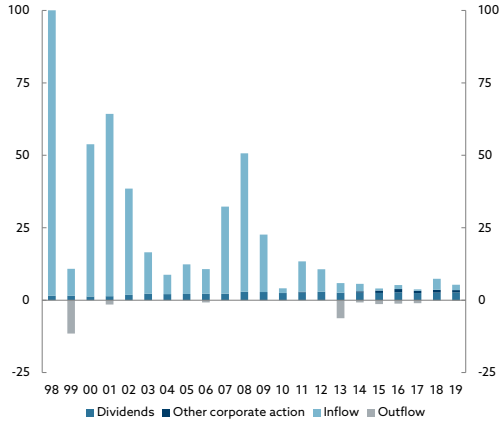


Chart 115 Trading volume for index portfolios, by instrument type. Billion kroner.

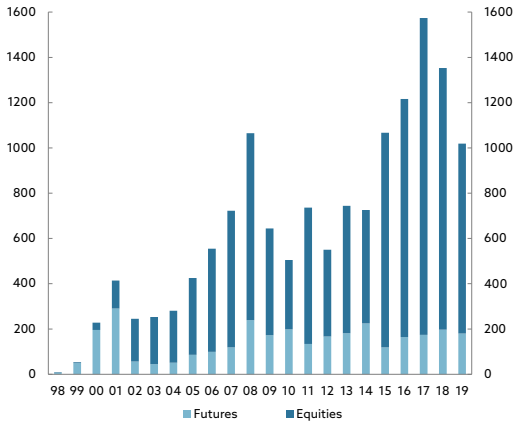
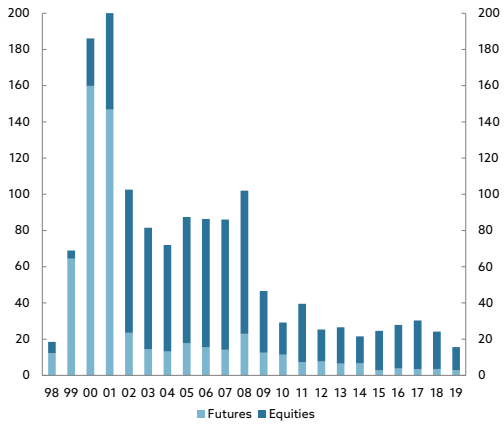


Chart 116 Trading volume for index portfolios, by instrument type. Percent of equity portfolio.



Starting in 2004, we sought to optimise our transaction costs by trading contracts for difference (CFDs) to achieve the correct single-stock exposure when this was most efficient. By trading CFDs instead of single stocks, we gained the economic exposure to the equities through a derivative contract with an investment bank. These were efficient instruments when we knew in advance that our holding period would be short. We wound down this activity in 2013, as falling interest rates meant that it had become uneconomical to hold CFDs beyond six months.

As the index portfolio started growing substantially in 2008, we increasingly sought to utilise all broad trading flows to mitigate risk. In the absence of cash flows, we have carefully balanced relative risk and transaction costs, and accepted significant risk, to reduce the transaction costs associated with risk management. During periods of inflows into the fund or rebalancing between equity and fixed income, we have used the associated cash flows to bring the portfolio closer to the benchmark, at no additional cost to the fund. For example, if changes in the benchmark meant that the portfolio was underweight American equities, we could invest the subsequent cash flow in more American equities in order to reduce this underweight. In other periods, we have used the dividends we receive from the portfolio. We also seek to achieve as much internal crossing as possible between the different strategies employed in the equity portfolio, to limit the market-facing turnover further.

In addition, we have increasingly managed both the current and future relative risk of the index portfolios. By having a good overview of the portfolio's future relative exposure, we can plan ahead to assess our liquidity needs, and avoid buying a stock that we would then need to sell again within a short time span. Most index managers monitor changes in the benchmark over the next few days. We have developed capabilities to monitor expected changes to both our index and the fund strategy multiple months into the future.

Chart 117 Equity index holding as share of free float, by region. Percent.

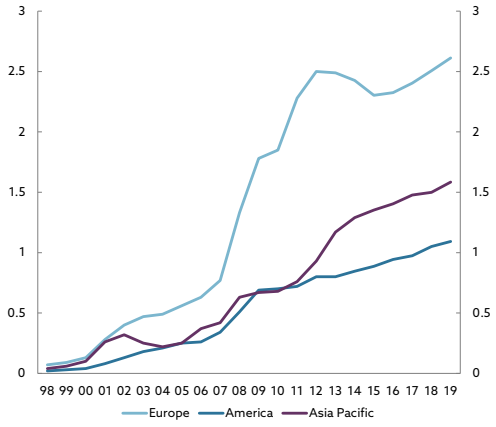
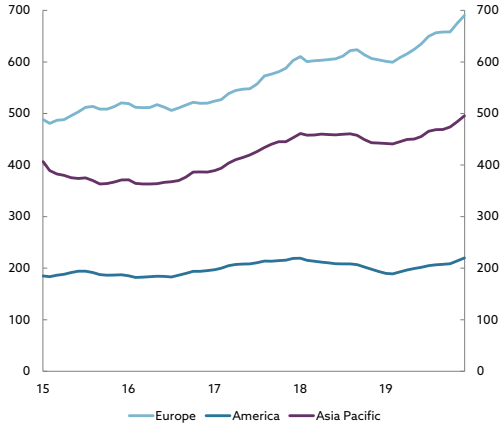


Chart 118 Equity index holding as share of average daily trading volume, by region. Percent.



Risk dimensions

While cash flows need to be traded to achieve the appropriate equity exposure, this is not the case for other changes to the benchmark. For those changes, the index portfolio manager can choose which to implement in the portfolio, while staying within the restrictions of the mandate. The changes that are not implemented will save transaction costs but result in a deviation from the benchmark. Hence, the index portfolio manager must find the correct balance between the amount of transaction costs to incur in order to replicate the index, and the amount of relative risk to assume.

Our approach to risk management has been to focus on aggregate exposures, prioritising the reduction of the exposures we believe to be the most risky for the portfolio. We have sought to achieve risk reduction along multiple dimensions through our trade programs, and where possible take on active positions with positive expected returns by avoiding trading in certain situations.

From 1998 to 2007, most of our single-security risk related to enhancement positions, while we monitored the aggregate risk dimensions of the index portfolio. As the index portfolio grew from 2007, we were forced to increase our tolerance of single-stock deviations. We focused increasingly on the aggregate risk dimensions, where we could achieve significant risk reduction through moderate trading volumes. The aggregate risk dimensions we have focused on are related to market, country, sector and risk factors such as value, momentum, beta and size. As these factors are associated with significant volatility and trending returns over the long term, we have managed the portfolio's relative exposure to them in order to avoid drawdowns.

We manage the aggregate risk very proactively, with daily follow-up. Our experience has been that aggregate risks that are not managed may quickly lead to losses. As a result, the aggregate risk measures we use have also evolved through time. Until 2012, we focused primarily on the region, country and sector dimensions. As we extended our risk factor strategies' data coverage, our risk management dimensions expanded to value, quality, momentum and size, with multiple data inputs for each risk dimension.

One example of why the aggregate risk dimensions are important comes at each quarterly rebalancing of the equity index. As underperforming companies tend to be removed from the index, while outperforming companies are added, the equity index will increase its exposure to high-momentum stocks every quarter, while reducing its exposure to high-value stocks. As momentum and value are important equity risk drivers, the index portfolio managers must be aware of these effects when managing their risks before and after the equity index rebalancing.

We have supplemented the aggregate dimensions with risk management models and in-house quantitative research. We have used the Barra equity risk model, an industry standard, in different periods starting in 1998. The benefit of using such a risk model is to challenge our own risk management dimensions and highlight any risks that have not been measured. However, we have not relied on a risk model as the only input to our risk management process. Covariance matrices are unstable, and there may be hidden risks that are not captured by models.

We have also undertaken research on new risk dimensions that may create unexpected drawdowns. When there are thousands of unintended deviations from the benchmark,

we are concerned about the portfolio being unwittingly exposed to risk dimensions that are not captured by the standard exposure measures. We have used quantitative clustering, monitoring of flows, attribution analysis and thematic research to identify such risks.

To tie these elements together, we have developed an internal optimisation engine, allowing us to design trade programmes that help us invest cash flows into the portfolio while optimally reducing the relative risk. The engine also takes account of constraints such as liquidity and minimum trade sizes. We have used the engine during certain periods, particularly when investing significant cash flows. The index portfolio managers intervene where necessary to ensure that the trade programmes satisfy the risk tolerance of the portfolio and consider the enhancement opportunities that are available.

Portfolio segmentation

We have evolved and adapted our risk management strategy over time, driven by changes in the equity index. From 1998 to 2007, the portfolio was invested in large- and mid-cap stocks, mostly in developed markets. The size of the portfolio, and the liquidity of the stocks in the benchmark, meant that it was possible to implement changes opportunistically around the date of the index rebalance. Relative risk predominantly resulted from our efforts to time our implementation optimally, avoiding trading at the same time as other, more passive funds. However, almost all benchmark changes were implemented fully in the portfolio within a relatively short period of time.

In 2008, the index portfolio started growing substantially, as the fund received record inflows coupled with the transition to 60 percent equities. Small-cap companies were added to the portfolio in 2007, and additional emerging markets in 2008. The index portfolio evolved from being invested in 2,600 companies at the end of 2006 to 7,500 companies at the end of 2008. These segments are more illiquid than the developed-market large- and mid-cap segment and imply a higher index turnover. We have had to adapt our strategy to this evolution by reducing our market-facing turnover as much as possible, and by stretching out the implementation periods. This has led to increased tracking error for the index portfolio.

In emerging markets, the market infrastructure is less developed, and access to liquidity is the most challenging. We have chosen to prioritise external active management in these markets, serving a dual purpose: achieving excess returns in an inefficient market segment and avoiding internal trading activity in these markets. In the larger emerging markets, we have continued to manage internal index portfolios, with higher relative risk tolerance than in our developed-market mandates.

With small-cap companies in developed markets, the index turnover is higher than for larger companies, and trading more challenging. As we developed our small-cap strategy, we decided to split out the developed-market small-cap portfolios into separate regional small-cap mandates in 2013.

Our small-cap strategy has focused on two aspects, the first being a lifecycle approach to smaller companies. We prefer being an early investor, participating in the initial public offering (IPO) of the company even though it is not likely to be included in the index until nine to twelve months later, sometimes longer. We supplement this by screening the investment universe for companies that are likely to meet the index inclusion criteria in the future, by growing into higher market capitalisation and liquidity.

We also seek to identify companies that are failing and at risk of either bankruptcy or being removed from the index, in order to sell them out of the portfolio when there is available liquidity.

The second aspect has been close collaboration between the index portfolio manager and the trader. As small caps are more challenging to trade, we have adapted our approach. The portfolio manager sends large baskets of orders that he or she would be willing to execute if offered a chance in the market. The trader has then been responsible for monitoring available liquidity situations and executing these orders opportunistically, while monitoring the resultant portfolio tilts together with the portfolio manager. This has allowed us to play a liquidity-provisioning role in the small-cap segment, lowering our overall transaction costs.

The indexing team
Norges Bank receives a mandate for the management of the fund from the Ministry of Finance.

Delegation through investment mandates

As we built the equity investment organisation, we made an important decision to delegate mandates further in the organisation, to individual portfolio managers. This was the case even in periods when there was only one account and each portfolio manager managed his or her own positions within that account.

From our experience with the selection of external managers, and evidence from academic research, we have seen several advantages of individual investment mandates over investment committee structures. Portfolios managed by a single portfolio manager lead to more diligent portfolio management decisions. Furthermore, we often need to make decisions quickly, as events have short deadlines. Lastly, delegation creates clear lines of responsibility instead of diluted ownership. This ensures that all the active risk in the portfolio is closely monitored by the portfolio managers involved.

Hence, we have evolved to a model where portfolio managers are given a delegated investment mandate to manage their portfolios. This mandate is usually more restrictive than the overall mandate for the strategy, meaning that the portfolio managers will need to escalate any significant risks occurring, whether through active strategies or because of a large index change. The manager issuing the mandate monitors it and the overall risk and strategy through regular follow-up with the portfolio management team – to ensure investment decisions are sufficiently challenged. As our investment team structures have evolved, lead portfolio managers have further delegated responsibility for parts of their portfolios, while

maintaining an overall responsibility for risk management.

Importantly, the mandates issued to index portfolio managers include a target to outperform the benchmark. As passive index management would result in a cost drag to the portfolio, we have found that striving to achieve a positive result is essential in creating a culture of excellence. Achieving this target has been dependent upon us developing our indexing strategy, but also on portfolio managers who are willing to take risks to achieve the best outcome for the fund.

As the complexity of the portfolio has grown through the addition of small caps, emerging markets and new investment strategies, the number of mandates has also increased. We have chosen to split the universe of companies and strategies into manageable pieces. On average, each index portfolio mandate spans around 1,000 companies in the same geographical region.

Specialisation

When we started investing in equities in 1998, we were still building up the equity investment organisation. Our initial priority was to set up efficient and thorough monitoring and follow-up of our external index managers. The indexing strategy counted a single portfolio manager in both 1998 and 1999, and grew to two in 2000, both based in Oslo.

As we improved capabilities to manage equities internally, we made a strategic decision to insource the management of the index portfolios. Internal index management started in January 2000, and assets under management grew rapidly as external index mandates were phased out and the fund received large inflows of new capital. Based on the experience we had acquired through the external index managers, we formed our own strategy for index management.

We expanded to six team members in 2003, which allowed us to grow our enhancement activity. As small-cap companies and emerging markets were phased into the fund in 2007 and 2008 respectively, with an increasing number of companies and events, we needed to expand our regional indexing capabilities. The management of the fund's Asian and American index portfolios was transferred to personnel at our offices in Shanghai and New York in 2007.

This local presence and increased capacity facilitated the development of more tailored portfolio management. There are many events affecting the portfolio with a tight deadline, such as corporate actions or follow-on offerings, and being within the right time zone is essential. As the index portfolio has grown, the close co-operation between local portfolio managers and traders has also been crucial in achieving the most efficient index replication.

Index portfolio management is both a broad and a specialised task. It is broad because the number of companies in the benchmark means that the portfolio manager cannot have in-depth knowledge of each company. It is specialised because the skillset to manage a broad portfolio and set of enhancement strategies requires specific expertise and experience.

In the period from 1998 to 2007, portfolio managers managed global index portfolios but specialised in managing one or more global enhancement strategies. As we expanded the team, some of the portfolio managers were able to focus primarily on the enhancement strategies. Starting in 2007, we increasingly managed index portfolios regionally. Regional index portfolio managers took greater

Chart 119 Number of internal core index mandates.

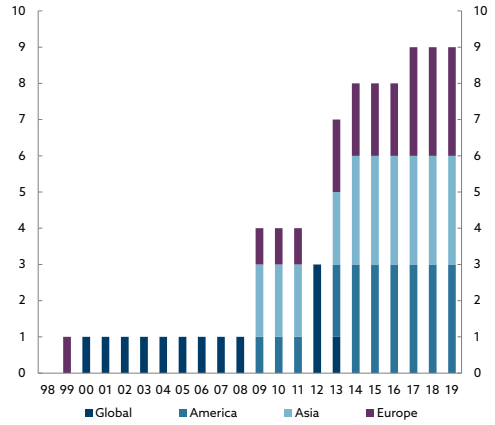


Chart 120 Average number of companies per core index mandate.

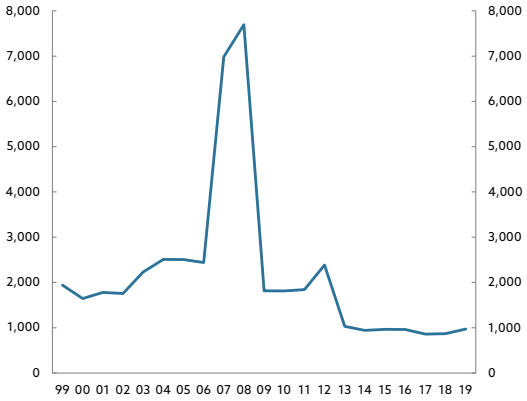


Chart 121 Number of index portfolio managers and analysts.

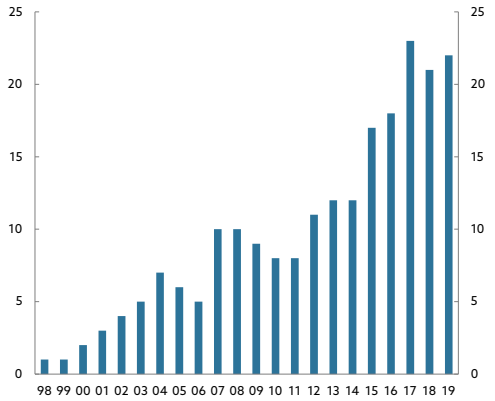
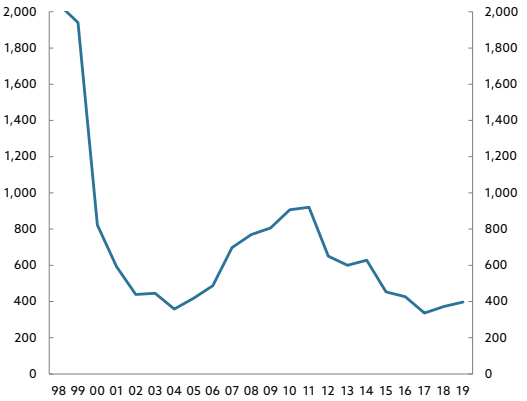


Chart 122 Average number of companies in the equity index per portfolio manager/analyst.



responsibility for managing enhancement strategies targeting their region, but they also implemented strategies based on analyses and systems from the global specialists. Combining regional portfolio managers and global strategy specialists has offered the possibility to increase the scale of risk taking while adapting to local market specificities.

The analysts and portfolio managers we have hired shared a strong quantitative background, but with previous experience in financial markets varying from decades to practically none. The skills necessary to manage index portfolios is not taught in universities, but through learning on the job for several years from peers within the team and from experience in the market.

We have found there to be five essential traits in being a successful index portfolio manager. First, the portfolio manager must be good at building and utilising information management systems, which are an important part of the job and mostly purpose-built within the team. Second, there are many moving parts within the fund, which all affect the benchmark of the index portfolio. Hence, understanding the machinery allows a portfolio manager to intuitively understand the index dynamics, thereby reducing trading and associated costs. Third, the ability to deal efficiently with, and mentally structure, large amounts of information is necessary to manage a portfolio with thousands of companies. Fourth, successful index portfolio managers must be very engaged and proactive in the portfolios they manage. As they do not track their index perfectly, they manage significant risk versus their benchmark. Because this risk evolves constantly, as the index changes and trade programmes are completed, it requires daily monitoring to be managed efficiently. Last, but not least, the successful portfolio managers have an ability to drill into the impact of security-specific situations, in corporate actions or index rebalancing events. This has proven to be more important than being able to formulate broad trading strategies, because of the combination of liquidity challenges and the high impact of single events.

Integration of enhancement strategies

Index management and the enhancement strategies are different in nature. With a flexible portfolio structure, we have the ability to separate these into two separate activities handled by different portfolio managers. Following expansion of the index team and implementation of long-short portfolios, we started to separate the two activities in 2005. Index management was handled by global index managers, while selected enhancement strategies were increasingly managed by specialised portfolio managers in separate long-short portfolios, often referred to in the investment industry as alpha satellites.

Such a separation offered the possibility of further specialisation in both activities. Strategy portfolio managers typically specialised in different global enhancement strategies, but this structure also permitted overlapping mandates and thereby provided a means to compare portfolio managers and their ideas and approaches. Each specialist portfolio manager managed his or her own active positions within specified risk limits, ensuring complete ownership and accountability. In total, the indexing strategy held a diverse set of enhancement positions.

The separation worked well in the years leading up to the global financial crisis. However, the crisis revealed weaknesses in such a structure. The underlying commonality in risk taking and the sensitivity to leveraged positions and liquidity across the enhancement mandates

proved higher than assumed beforehand. As a result, the added diversification benefits sought by risk taking from independent portfolio managers turned out to be smaller than we had thought.

Since then, we have primarily chosen to have the index portfolio managers also manage the enhancement strategies within their segment. There are three benefits to this.

The first is that we are able to limit our market trading as much as possible. As the index portfolio manager will need to trade in the market regularly, he or she will be able to combine that trading volume optimally with the implementation of active strategies, for example by using an enhancement strategy to choose which stocks to buy instead of buying the broad index. This has become increasingly important with the increase in fund size and breadth.

The second benefit is that the index portfolio manager will manage the relative risk of the portfolio, balancing the active strategies and risk management together. For example, if an active strategy brings with it a certain country or sector tilt, the index portfolio manager can compensate for this through overall risk management of the portfolio.

Lastly, the index portfolio manager will be able to adapt the active strategies to the market in which he or she operates. Through experience, we have come to recognise that some equity markets behave differently from others. This is because of differences in regulation and in the market participants. Accordingly, we have chosen to adapt our indexing strategy to the markets in which we operate. The general building blocks remain the same, but the regional portfolio managers have been able to adapt and innovate based on their experience.

An example of this has been in Asian emerging markets. We established local portfolio management for Asia in Shanghai in 2007. Starting that year, we managed an index portfolio of Asian emerging-market companies from Shanghai using the main enhancement strategies employed in other market segments. However, we came to realise that these markets have significantly different dynamics to the developed markets that make up the largest part of the index portfolio. Retail investors are more active in the market, and international investors are still trying to orient themselves. Access to information is more complicated. State-owned enterprises dominated the index in 2007, to be overtaken by internet companies in 2015. Governance issues are more frequent, as in other emerging markets. We have developed our active strategies in Asian emerging markets from these observations and chosen to take more active risk than in other markets.

To ensure deep strategy knowledge and experience also in broader regional index mandates, we have increasingly moved from individual-portfolio-manager mandates to multiple-portfolio-manager mandates. The lead portfolio manager is responsible for all risk taking in the multiple-portfolio-manager mandate, but is supported by other portfolio managers/analysts and global strategy specialists who focus on selected strategies or segments. Such a setup ensures we capture the benefits above while also enabling specialisation and focus.

Precision of supporting processes

Index portfolio management has the advantage of scalability, as most costs do not increase with the market value of the portfolio. However, high-performing index portfolio management requires an organisation that is correctly set up to facilitate it.

The most important requirement for an index portfolio manager is very high data quality. It is impossible to manage complex portfolios without having automated data feeds, from the most basic, such as holdings and benchmarks, to the more complex, such as fundamental data and other inputs into the risk management and enhancement strategies. Moreover, these data feeds need to be quality-assured: a portfolio manager with 30 stocks in his or her portfolio may be able to check all the data for that portfolio and pick up errors, but that is impossible for a portfolio of 1,000 stocks. Because of this, we have worked closely with internal IT and data specialists, as well as third-party vendors, to ensure high-quality data.

While most portfolio management is focused on the current portfolio's holdings and benchmark, our timeline for index portfolio management is different. The index portfolio manager needs to look into the future to assess the need to adjust the portfolio to upcoming changes, such as known dividends, corporate actions, index changes or internal strategy changes. Having the best possible view of both present and future exposures has allowed us to plan our trading programmes efficiently. We have therefore progressively expanded our data points from a limited time horizon initially to multiple months today.

Chart 123 Number of daily data points used to manage global index portfolios. Thousands.

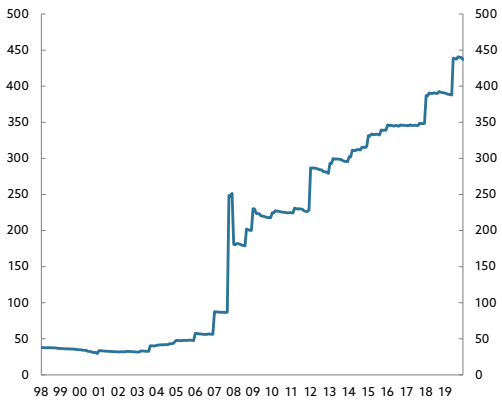
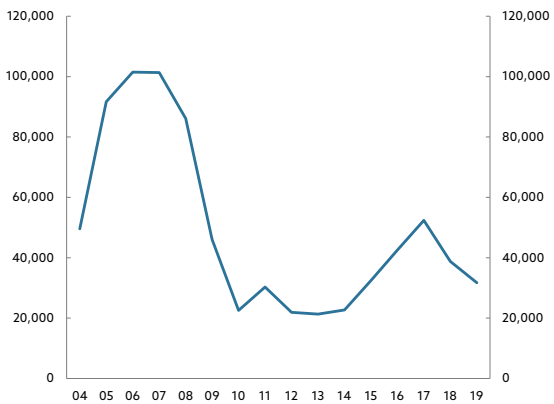


Chart 124 Number of trading orders sent by index portfolio managers.



Once the data are received, portfolio managers need to visualise their portfolio and take action to achieve the desired outcomes, such as investing cash flows. While there are many portfolio management systems available commercially, we have found that none satisfy our requirements. Most are aimed at the management of smaller active portfolios, with few adapted to index portfolio management. Even systems designed for index portfolio managers do not match our specificities, such as a very long forward view compared to others. We have thus developed our own system to manage the index portfolios. This has taken place within the indexing team to ensure proper alignment with the processes involved.

The portfolio manager adjusts the portfolio either through trades in the market or by electing on corporate actions. All equity trading goes through the trading desk, with which the portfolio managers collaborate closely to achieve the best possible implementation. Corporate action instructions are sent to the fund's custodian. Corporate actions involve many complex options and come in a wide variety of formats, and high data quality is important to ensure the best investment decision is made. Making sure that the options are correctly reflected, and correct instructions sent within the right deadlines, has been essential in implementing our strategy.

The index enhancements

The fund's indexing strategy is active fund management. Our enhancement strategies seek to create excess return and avoid the shortcomings of index replication.

Our indexing strategy has forced us to be active, as we choose which risks need to be reduced, and which risks we are comfortable keeping to avoid trading. This means that we are constantly faced with choices about which stocks to trade, and which deviations to keep in the portfolio. This has put us in a unique position to leverage the fund's competitive advantages to enhance the index portfolio returns.

Our enhancement strategy has been simple: we have sought to leverage the differences between the fund and other investors to avoid the shortcomings of index management. As the fund has grown larger and broader, our enhancement strategies have also evolved. We have challenged our existing strategies and sought to develop new ideas – all with the objective of delivering the highest possible returns for the fund.

As we surveyed the market of index management products in the period 1997 to 2001, we gained a good understanding of the different avenues for enhanced index management. The enhancement strategies could roughly be divided into three categories. All the strategies resulted in a portfolio that was close to the index, with a low tracking error.

The first strategy consisted of engaging in active management, but with a low tracking error. The portfolio manager typically utilised in-house research capabilities to create broad portfolios of equities ranked "buy" as well as "hold", with a lower tracking error than the more concentrated active products. We preferred selecting our active external managers directly, rather than paying for a semi-active product.

The second were model-based strategies, which later came to be known as smart beta strategies. These strategies use publicly available price and accounting data to form factors to select equities. These are typically a set of valuation factors and momentum factors. The strategy does not assume an information advantage, but that market frictions and behavioural biases among investors make it possible to outperform. We were reluctant to use these strategies without a better understanding of the mechanisms involved, and the managers we interviewed were not able to give us more comfort. The models required presuppositions that we were not comfortable making.

The last group of strategies assumed inefficiency in pockets of the market in special cases. These effects show up at the

stock-specific level. Distressed assets, equity capital market events, corporate actions, liquidity and seasonal effects are the most common areas. These are, for the most part, processes in the capital market infrastructure which are not fully exploited by market participants, usually because of mandate constraints. Our preference within this group was the subset of strategies which could be seen as refinements of index management by avoiding the main pitfalls of a passive approach. This was not readily available at the time, and we saw no other choice than to develop this enhancement activity ourselves.

The size of the equity portfolio is a challenge in terms of the cost of implementing changes. However, we enjoy several competitive advantages over other asset managers: the size and breadth of the fund's investments, our long investment horizon, and low excess return requirements. Because the fund has a single owner, and is very large, small contributions to percentage returns can still have a significant monetary impact. Our enhancement strategies seek to make the most of these competitive advantages by exploiting technical or structural aspects of equities that usually exist for short periods of time. The strategies aim to avoid the drawbacks of index management by seeking better outcomes for the fund than passive implementation.

Internal enhancement activities started up in June 1999, when we participated in an initial public offering that we immediately transferred to one of our external index managers. We started managing internal enhanced index portfolios in February 2000. The initial enhanced indexing mandates encompassed four core strategies: corporate actions, index rebalancing, equity capital markets, in particular initial public offerings, and relative value situations, in particular share class arbitrage. While we have expanded the scope of each strategy, the core set of enhancement strategies has remained fairly unchanged for the last 20 years. However, the contribution from the different strategies has changed as the size of the fund and the competitive landscape has evolved. We have also innovated to expand to new areas as the fund's investment universe has broadened to include new segments or markets.

Corporate action strategies

A corporate action is an event initiated by a company that brings a change to the securities issued by the company. The simplest corporate action is a cash dividend, where the company pays out cash from its balance sheet to shareholders, while a more complex example is an exchange offer, where a company allows holders of the equity to exchange existing shares for shares in a new company. Other common examples are rights issues and tender offers.

Monitoring corporate action events is an important operational part of any equity portfolio management, and we would need to undertake this however we chose to organise the fund's investment strategy. It is rendered complex by the number of companies and markets in the portfolio, as each company will have its own corporate action events, and each market will have its own specificities. Corporate actions are important in a company's lifecycle and should be regarded as an investment opportunity.

Corporate actions will result in changes to the equity index, which the index provider will implement using a pre-determined set of rules. A subset of corporate actions known as voluntary corporate actions carry different choices for the portfolio manager that can allow him or her to outperform the index provider's treatment. A very simple example of this is optional dividends, where the holder can choose to receive the dividend in stock instead of cash. The optimal choice would then be to select the option with the highest value.

In principle, most corporate action event types should be relatively simple investment decisions, with a clear optimal election and little opportunity to add value beyond choosing the best option. In practice, there are challenges to achieving the optimal result. We typically need to respond to more than 2,000 voluntary events per year, and we need to ensure we have sufficient data to evaluate each of them. While corporate actions can be live for weeks and even months, the election can only be finalised at the last minute before a hard deadline, as the value depends on fluctuating market prices. In the most complex cases, the result will depend on what other holders have elected. In these cases, we will need to estimate what other investors will do in order to make our own optimal election.

Some complex events can also lead to significant losses if they are not executed correctly. In October 2008, our holding in a South Korean bank went through a corporate action where we would be able to tender our holdings at an advantageous price if we voted against a resolution. As equity prices were falling, we tendered our holdings and subsequently bought back the shares in the market in early 2009. However, we later discovered that our vote, and hence our tendered shares, had not been accepted because we were a foreign investor. As such, our buying in early 2009 had made the portfolio overweight in the stock, resulting in a loss of 40 million kroner versus the benchmark.

Many market participants fail to maximise returns by oversimplifying the election process with a set response per event type, or outsourcing the process to middlemen who take a cut without necessarily making the best possible choices. Most asset managers see corporate action elections as an operational activity, while we have always seen them as a core investment activity.

We identified early on that the key to dealing successfully with voluntary corporate actions

was differentiation. We differentiated the elections by event type, choosing to outsource the simplest events, optional dividends, to our operations manager. This left index portfolio managers free to conduct research and elect on more complex and critical event types such as tender offers.

Another aspect of corporate action strategies consists of positioning the portfolio actively in advance of the completion of a voluntary corporate action. Many tender offers appear in the context of mergers and acquisitions (M&A), where one company, the acquirer, seeks to buy another company, the target, for cash or stock, or a mix. Before the transaction is concluded, the target company will usually be priced at a discount to the terms of the transaction, reflecting the risk that the transaction will not be successful. We started positioning ahead of M&A events as early as February 2000, as the British telecommunications company Vodafone was acquiring German conglomerate Mannesmann after a bidding war at the height of the dot-com bubble. The transaction was successful, earning the fund a profit of 8 million kroner as the transaction closed and the index adjusted to remove Mannesmann and increase the weight of Vodafone.

In the following years, we expanded the breadth of our M&A positions as we expanded our overall enhancement activity. Global M&A activity was particularly high in the years leading up to the financial crisis in 2008, leading to a high number of tender offers. Our results in corporate actions and M&A were positive every year until 2008, when we suffered a small loss from the strategy and reduced our risk in the strategy.

As the financial crisis hit, tender offers dried up. In their place, the number of discounted rights issues increased as leveraged entities, particularly banks in peripheral economies, needed capital. Shorting bans and lower available arbitrage capital strengthened the mispricing of tradable rights versus their underlying security. Here, the fund's large inventory proved valuable, allowing us to arbitrage many situations. Such distortions, however, also increased the election risk.

As we considered the different enhancement strategies in 2010, we concluded that it was difficult for us to have a competitive edge in M&A situations. The strategy offers positive returns over the long term but suffers from severe drawdowns when transactions fail. While the risk can be reduced through close monitoring of the conditions and progress of each transaction, we did not at that time have the resources to undertake this. Hence, we chose to avoid intentionally pre-positioning for M&A transactions.

As the fund's size grew, the impact of each corporate action also increased. Information quality remained an issue, and differentiation became even more important. We classified events, including optional dividends, according to the potential impact of the investment decision and insourced the largest ones, delving into the details of those events. The insourcing of all operations related to corporate actions in 2014 allowed us to improve the quality control of data, and close co-operation with the custodian meant that we could achieve optimal deadlines in time-critical elections.

The fund's long investment horizon and tolerance for illiquidity are an advantage in certain corporate actions. In some cases, companies incentivise long-term shareholding by allowing holders to convert their holding to a separate, untradable instrument. Such shares may bestow benefits such as increased

dividends or improved voting rights, but these benefits come at the price of a longer lead time to sell the shares. We performed research on these instruments in 2012 and received internal approval to start utilising them.

With the dual rise of activist and passive investing, corporate actions have become increasingly contested. On the one hand, activist investors challenge management's intentions, trying to achieve better outcomes for investors. On the other hand, passive index managers have become increasingly wary of committing to a transaction before knowing what outcome will be reflected in the index. We have strengthened our research capabilities, and corporate action analysis has become a core skillset for index portfolio managers. Corporate action strategies have the advantage of requiring little to no trading to implement. For many market participants, the small gains associated with optimal corporate action elections are not worth the cost, but the fund's size makes the strategy very worthwhile.

Chart 125 Number of corporate actions.

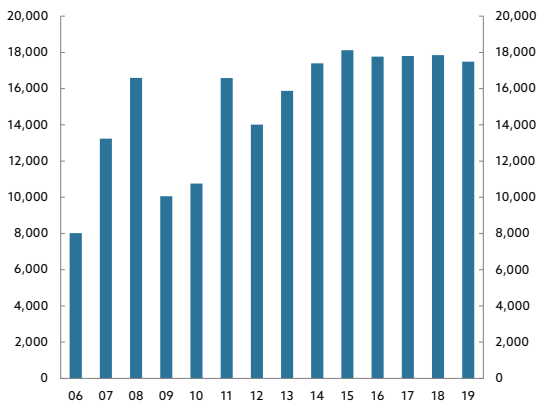
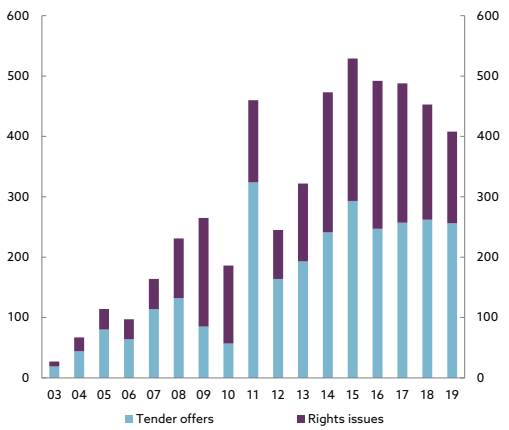


Chart 126 Number of tender offers and rights issues.



Index rebalancing strategies

Index providers update the composition of equity indices regularly. Companies that have become large and liquid enough are added, while companies that have become too small or illiquid are removed. The index providers also update the number of freely floating shares in companies that have undergone corporate actions, equity capital market events or buybacks. Some of these changes to the indices are made as the events happen, while most are bundled together in a quarterly, semi-annual or annual index rebalancing event.

These index rebalancing events do not affect companies' fundamentals. However, passive index managers will implement the index rebalancing on the effective date in order to track the index, generating pressure on the stock prices on that date that can be exploited by active managers.

There are three separate periods for any index rebalancing event. In the period leading up to the announcement by the index provider, we may forecast what the changes will be, based on an understanding of the index methodology. For example, a company that has bought back its shares during the quarter will see its shares outstanding reduced at the next index rebalancing event. Second, when the index provider announces the changes, one month to two weeks before the effective date, we have a much clearer picture of what the passive flows will be. On the effective date, the passive index managers will trade at or close to the market close, because they are benchmarked against the closing price. The last period is after the effective date, when prices may come back to a new equilibrium. In addition to passive flows, speculators pre-position to benefit from price movements linked to the index rebalancing and will trade in the other direction on the rebalancing date.

We started implementing index enhancement positions based on these effects in February 2000 at the same time as we started managing index portfolios internally. We were initially active in events affecting our own index from FTSE. Based on our own research, we pre-positioned for expected adjustments before the announcement from the index provider, buying the stocks that we expected to be up-weighted, and selling the stocks that would be down-weighted. We quickly expanded the activity to nine other indices, such as the STOXX 50, CAC 40 and MSCI World, by pre-positioning after the announcement and providing liquidity to the passive trackers on the effective date. However, these positions were usually smaller and more short-term, as they required us to turn around the position on the effective date in order to capture the effect.

In 2001, the two largest index providers, MSCI and FTSE, made changes to their methodology to align the weight of the securities in their indices with the number of shares readily available for investors, or free float. This was a major event for all passive index managers. Having insourced index portfolio management, it became easier for us to implement large portfolio changes over time and well ahead of the effective date of the index changes, thereby trading at better and less distorted market prices. Our implementation of these events contributed 35 basis points to our excess performance in 2001.

We maintained the same strategy in subsequent years. The contribution to the relative return was less spectacular than in 2001, but still positive in almost all years, with 2006 being slightly

negative. On average, index rebalancing strategies contributed positively to our excess return in the period 2000 to 2011 – even if we exclude the exceptional performance in 2001. We found that the performance was particularly good in periods of crisis or higher volatility, when risk capital was withdrawn from the market: 2007 and 2008 were some of the best years for the index rebalancing strategies.

As the market share of passive management grew after 2008, we focused increasing efforts on two aspects of the strategy. The first was developing the liquidity-provisioning aspect of the strategy, i.e. using our broad portfolio to sell to passive trackers the stocks that were the most affected by the index changes. The second was pre-positioning increasingly early, far ahead of the announcement dates. This allowed us to source the liquidity for our own index management over longer time periods. It also pre-empted opportunistic market participants, such as hedge funds or proprietary trading desks, increasingly implementing index-rebalancing strategies in the light of their attractive performance.

Index rebalancing strategies will remain core to our index portfolio management strategy, because of our need to source liquidity at the best possible prices. However, the performance contribution will vary according to the arbitrage capital seeking to take advantage of the effect, compared to the amount of passively managed capital. The potential performance contribution is lower today than it was 20 years ago, because the size of the portfolio makes us less nimble in the market.

Chart 127 Index rebalancing strategies. Number of index rebalancing events, by month.

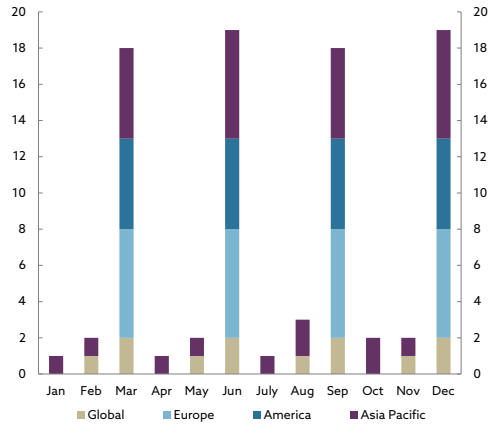
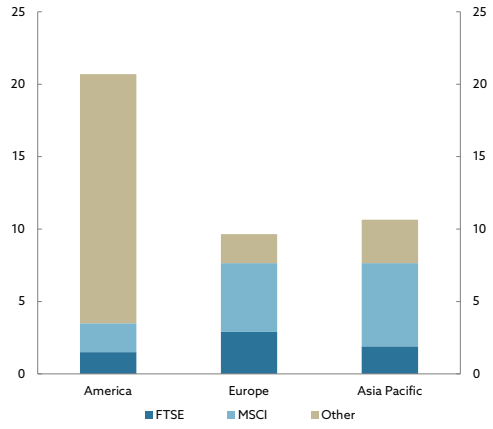


Chart 128 Estimated share of passively managed assets tracking different indices. Percent of market capitalisation.



Capital market strategies

An equity capital market (ECM) event occurs when a company or an investor sells a large block of shares on the primary market. The best-known type of ECM event is the initial public offering (IPO), when a company first lists on the stock market. However, ECM events also involve follow-on capital raises, where listed companies raise additional capital, or placings where large shareholders sell down their stakes.

We seek to invest broadly in listed companies, so a natural place to start is at the time of the IPO. Furthermore, there is ample empirical evidence of IPOs being sold at a discount. When a company first goes public, it is typically willing to offer shares at attractive prices to ensure the success of its listing. It is natural that investors in IPOs are compensated, as they are taking the risk of valuing and investing in a company that is not well-known and well-analysed by other investors. Index providers will add the new listings with a delay, ranging from a few days for the largest IPOs, to a year for the smaller ones, and potentially more if the stock does not attract enough liquidity in the first months.

We observed that the external index managers would buy shares in the market, at higher prices, instead of participating in the IPO. We therefore decided to participate in the IPOs ourselves and transfer the shares to the external index managers on the inclusion date. The first IPO we participated in was Banca Monte dei Paschi di Siena in June 1999, followed by Telecom Eireann in July 1999. The first IPOs were very successful, with Telecom Eireann returning 20 percent on the first day of trading. We continued along the same model until we could manage internal index portfolios in 2000.

The key challenge for an IPO strategy is adverse selection. In the most attractive IPOs, allocations to each investor will be lower. For less informed market participants, such as index managers, there is a risk of being allocated more in the IPOs that perform poorly, and little in the IPOs that perform well, hence reducing the total performance of the strategy. By moving IPO participation to our internal trading desk, we were able to communicate Norges Bank's role as a consistent liquidity provider. Our expectation from the start was to receive full allocation in all deals: we have always indicated our real demand to the investment banks and have expected to be treated fairly. This is different from most IPO investors, who significantly inflate their demand, expecting to receive less than they ask for. In addition, we have consistently acted as long-term investors, by staying invested in the newly listed companies for the long term, instead of selling them on in the market after the listing event. This has distinguished us from other, shorter-term investors.

From 1999 to 2004, we focused our capital market strategies on IPOs that were large enough to enter the equity index on a fast-track basis. These enter the equity index a few days after the event, while smaller IPOs only enter the index after a period of nine to twelve months. However, there were few such events, and from 1999 to 2004 we participated in an average of six IPOs per year. The performance contribution was positive, but small.

In 2005, we improved our tracking of the ECM event pipeline together with the trading desk, allowing us to expand our participation in both IPOs and follow-on offerings. The latter are offerings of shares in already listed companies which tend to be executed on a shorter timeline, usually in the evening after the equity market closes. They are generally less risky than IPOs and less volatile in the aftermarket. Furthermore, a follow-on offering in an index constituent will

result in an update to the free float or shares outstanding of a company, such that its weight will increase in the index. Given the size of our index portfolio, we were well placed to participate in such offerings. As small-cap companies were added to the equity index in 2007, we expanded the breadth of ECM events we participated in, and we invested in 59 IPOs that year.

As the financial crisis hit in 2008, the IPO market dried up and our activity dropped accordingly. Having conducted more research on the topic, we participated broadly in equity capital market events across the size spectrum from 2014. In the period 2014-2019, we participated in 135 IPOs per year on average. In 2016, an active ECM strategy was set up within our security selection strategy, focused on deal selection. This allowed us to increase our visibility with the investment banks and the companies coming to the market, while being perceived as a more active and reliable ECM investor with an effective set-up for engaging in transactions. As a result of this, we increased our market share in ECM and improved our allocation outcomes. During the same period, we have developed our relationship with brokers, providing liquidity to sellers intraday in smaller block trades at a discount to market prices.

Our capital market strategies have contributed positively to the enhanced index portfolios since we started implementing them in 1999. Most years have been positive. However, ECM events can also do poorly in negative market environments. The IPO of the Japanese telecom operator Softbank Corp in December 2018 illustrated this. As it was a fast-track IPO, we asked for our full demand in the book-building process. As it was a large IPO and the risk appetite of active managers was very low towards the end of 2018, we received a full allocation. Unfortunately, the company suffered a severe outage to its services between the pricing of the IPO and the first trade date, sending the shares down 15 percent and contributing to a 250 million kroner loss.

Our capital market strategies have developed over time and are a key component of our enhanced indexing. They play to one of our strengths, i.e. having a large and diversified portfolio, which means we will have an interest in most ECM events. Furthermore, not having to trade in the secondary market means that these strategies scale very well with the size of the fund. ECM transactions are often a very attractive source of liquidity. Lastly, ECM events serve a critical role for well-functioning capital markets by allowing companies to raise capital, and large shareholders to access liquidity, thereby increasing the companies' free float over time.

Chart 129 Number of IPOs participated in by internal equity portfolios, by region.

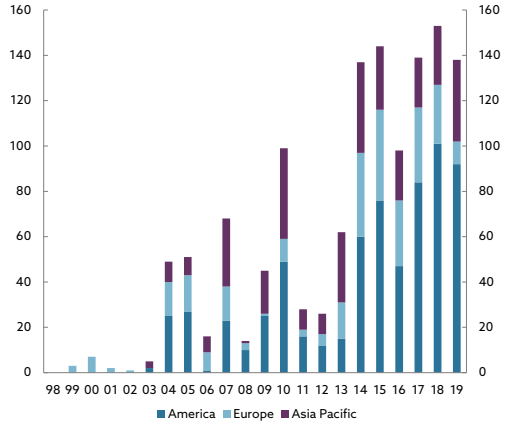


Chart 130 Number of equity capital market events participated in by internal equity portfolios, by event type.

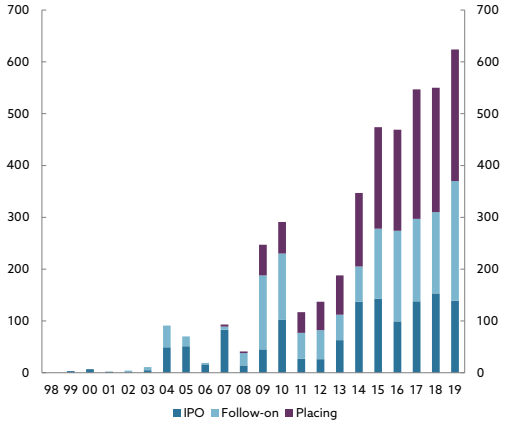


Chart 131 Equity capital market allocations to internal equity portfolios, by region. Million dollars.

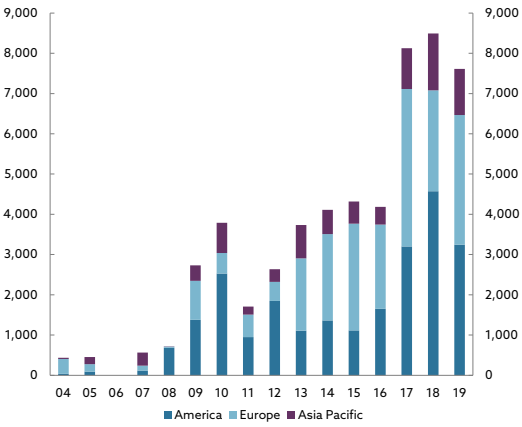


Chart 132 Equity capital market allocations to internal equity portfolios, by event type. Million dollars.

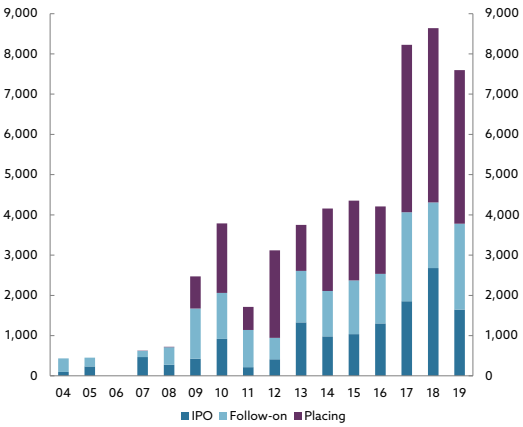


Chart 133 Market share in IPO allocations and average ownership of free float. Percent.

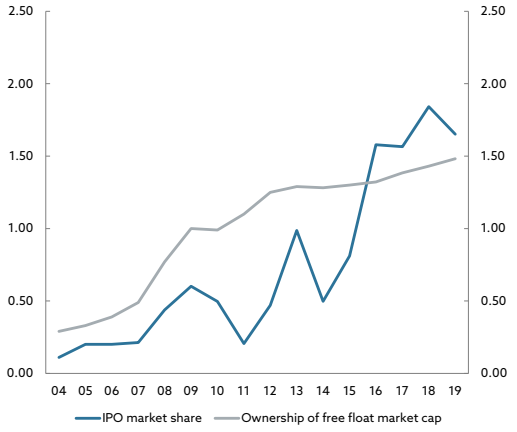
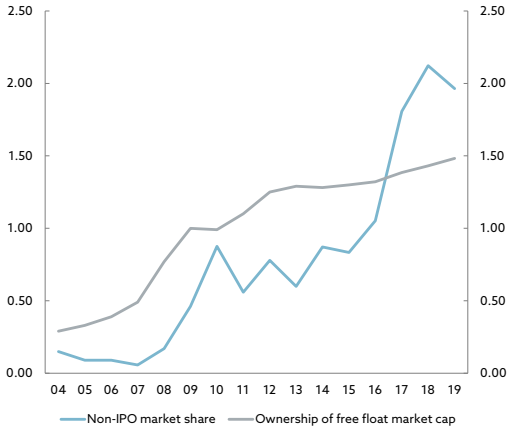


Chart 134 Market share in non-IPO allocations and average ownership of free float. Percent.



Relative value strategies

Relative value strategies seek to take advantage of situations where the market, for various reasons, prices claims on the same or similar underlying cash flows differently. The strategies differ from security selection strategies, as we do not make attempts to analyse the individual companies' fundamentals. The relative positioning is typically within a small set of closely related securities, such as different share classes or different geographical listings of the same company, and up-weights the cheaper securities to take advantage of better yields and potential spread compression. On the somewhat more complex end of the scale is positioning between a holding company and its holdings, where the basket of company holdings can be diverse and include non-investable entities/ securities.

For example, Unilever PLC and Unilever NV, two corporate entities of the same company, are listed in the UK and the Netherlands respectively in a structure called a dual listing, where the two listings give the same economic benefit to the holders. However, the share prices of these two entities have deviated over time: since 2000, we have seen Unilever NV 5 percent more expensive than Unilever PLC at times, and 5 percent cheaper at others, allowing us to switch our holding between the two listings.

In certain cases, the difference in pricing can be explained by differences in liquidity or voting rights. But in others, there is a seeming violation of the efficient market hypothesis. This can be explained with investor segmentation and limits to arbitrage. Many investors face mandate constraints forcing them to hold only certain

Chart 135 Unilever PLC and Unilever NV. Spread between share prices. Percent.

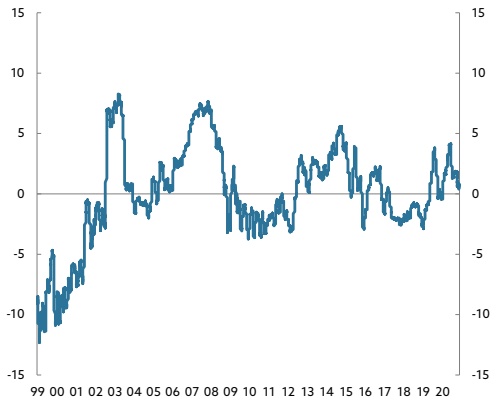
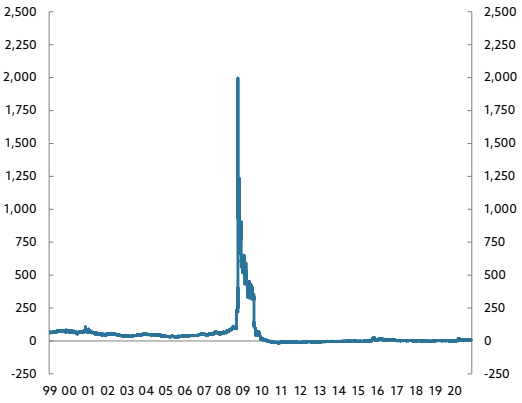


Chart 136 Volkswagen AG. Spread between ordinary shares and preference shares. Percent.



securities. For example, many UK-based managers can only hold UK-listed shares, and a passive index manager can only buy the share class that is in the index, even if that is more expensive. With small price differences, which may mean-revert over long time horizons, holding the relative value opportunity is not attractive enough for many hedge funds. Our size, long time horizon and low excess return requirements are competitive advantages. Opportunities that seem small can become significant return drivers scaled to the fund's size.

In the period from 2000 to 2007, a smaller and more liquid index portfolio meant that we could pursue a very dynamic approach to relative value. The first relative value position taken on actively was a share class position in February 2000. We went long the cheap but illiquid Telecom Italia savings shares, and underweighted its ordinary shares, in anticipation of a buyback in the former. This position was closed out at a profit in less than two months. In some cases, we would meet company management to discuss the relative valuation of their different share classes.

This active approach to relative value paid off handsomely in the early years. After starting slowly in 2000 and 2001, we scaled up the activity from 2002 after insourcing the index portfolios. It quickly became the most important driver of relative risk and return of the indexing strategy, producing positive excess returns every year from 2000 to 2005.

Our relative value strategies started to underperform in 2007, in the early stages of the global financial crisis. However, the drawdown the following year was much more severe than we had thought possible. As borrowing costs and volatility surged, all types of active positions suffered, but particularly those that were most widely held by levered investors forced to sell.

While we had deliberately set up overlapping relative value mandates, the underlying commonality in risk taking and the sensitivity to leveraged positions and liquidity premiums were larger than assumed beforehand. Most relative value mandates were discontinued during 2008 due to their severe underperformance. Several positions were liquidated, and the rest were transferred into the index portfolios with the aim to reduce the positions over time. The index portfolios had existing exposure to some of the same positions, and these continued to detract from relative return throughout the year.

One situation in particular illustrated many of the potential challenges of enhancement strategies. The outperformance of ordinary shares in Volkswagen AG versus its preference shares, caused by a takeover attempt by Porsche SE, created havoc in the market and our relative value strategies. The position to overweight the preference shares and underweight the ordinary shares, based on what was believed to be a temporarily elevated spread, was initiated in the second quarter of 2006 and further increased towards the autumn of 2008. In this period, the preference shares traded at a 35-40 percent discount to the ordinary shares, even though the financial entitlements were slightly better for the preference shares.

The spread between Volkswagen AG's ordinary and preference shares increased substantially in the autumn of 2008. First, during the collapse of Lehman Brothers, the ordinary shares went from trading at 200 to 300 euros, likely a consequence of hedge fund redemptions and other effects causing forced buying. Second, when Porsche SE announced in October that it had increased its stake from about 35 percent to 75 percent, using in large part cash-settled options, the ordinary shares briefly traded above 1,000 euros per share. At this point, the

preference shares traded at a discount of more than 90 percent. This dramatic increase and widening in the spread are in hindsight considered by many as one of the largest short squeezes ever experienced in global equity markets. The negative return contribution to the index portfolio from the Volkswagen share class position alone was 60 basis points in 2008.

The Volkswagen situation in 2008 was extraordinary, driven by a feud for control of the company where the situation was concealed from other investors by using cash-settled option structures to avoid regulatory disclosure. This situation made it impossible for minority investors, and index providers, to ascertain the freely floating shares of the company. We subsequently openly criticised Volkswagen AG's board of directors for the lack of disclosure about the transactions between Volkswagen AG and the troubled parent company Porsche SE.

As the global financial crisis came to an end, the liquidity and relative value spreads recovered sharply. The ownership situation in Volkswagen was also gradually clarified during 2009, reducing the discount on the preference shares to about 15 percent. As trading liquidity continued to shift towards the preference shares, these outperformed further and traded at a premium two years after the short squeeze. While we retained part of the position and were able to participate in the return to equilibrium, our position had been reduced at an inopportune time. On the one hand, the index provider drastically reduced the free float of Volkswagen AG ordinary shares after Porsche SE's higher ownership stake was disclosed. This removed 60 percent of the index's exposure, reducing our capacity to be underweight in these shares at the worst possible time. On the other hand, we also reduced our risk in the relative value strategies after an unexpectedly severe drawdown. Taken together, these two effects locked in losses of 44 basis points over the 2008 to 2009 period.

The large drawdown experienced during the financial crisis warranted a re-evaluation of our relative value strategies. We took a more careful approach to relative value strategies in general, and liquidity risk in particular. While most relative value strategies were continued as part of index management, the nature of risk taking changed from a relatively dynamic and short-term trading strategy to a more static buy-and-hold strategy. As a share of the indexing strategy's relative risk, the contribution from relative value strategies was significantly reduced compared to the years leading up to the global financial crisis.

Our approach to relative value situations has remained broadly similar over the last decade. We seek to take advantage of the fund's long-term horizon by positioning the fund towards increased yields and long-term spread compression in attractive situations. We have managed our exposure to relative value situations to be able to increase our positions at times when other investors need to decrease theirs, thereby providing liquidity to the market. Due to the limited scope and scale offered by such strategies compared to the fund's size, the expected return contribution is less than 1 basis point. However, we have found that identifying and monitoring these situations continuously contributes positively by enhancing our understanding of the market we are active in, and making sure we implement benchmark changes by finding the most attractive source of liquidity.

Risk factor strategies

Model-based strategies seek to generate excess return through systematic exposure to identified return signals, usually in the cross-section of the equity investment universe. Quantitative techniques are typically used to identify and assess investment opportunities. The data used as inputs to the strategies typically include databases of fundamental data on companies, such as their historical accounting data, and alternative data sources, such as option prices and environmental, social and governance (ESG) indicators. As research has evolved in recent decades, strategies targeting the most well-known investment signals such as value, size, momentum and quality have become known as risk factor strategies.

In the fund's early years, we approached quantitative strategies in multiple ways. In 2004, we implemented a mean-reversion strategy within identified pairs or clusters of companies, which was followed by a momentum strategy in 2005. In 2007, we expanded to a multi-factor strategy and a strategy based on short interest.

These strategies proved short-lived: the "quant crisis" in August 2007 initiated a sharp drawdown for most quantitative strategies. This continued into 2008, and as a result we closed these strategies that year. There were no further initiatives on this front in the years immediately following, but some of the quantitative frameworks and ideas were utilised and further refined within our index management.

In their report to the Ministry of Finance in December 2009, Ang, Goetzmann and Schaefer recommended that the fund should establish systematic risk factors as a strategic exposure rather than a by-product of other active strategies. In 2012, the Ministry of Finance added a requirement that the equity portfolio should be composed in such a way that the expected excess return is exposed to several systematic risk factors. The operational implementation of this mandate requirement was delegated to Norges Bank.

The requirement from the Ministry of Finance was operationalised through a top-down strategic allocation in the reference portfolio from December 2012. In 2013, we also reintroduced risk factor strategies as an enhancement strategy within our index portfolio management. The core risk factor exposures were to value and quality, but these were complemented with factor exposures such as momentum, low volatility and size to provide diversification.

Maintaining exposure to a set of risk factors requires significantly higher portfolio turnover and transaction costs than an index weighted by market capitalisation. Coupled with the fund's size, implementation of risk factors requires a tailored approach to avoid excessive transaction costs. The index portfolio managers were responsible for implementing the fund's risk factor exposure, which introduced significantly higher turnover in their benchmarks. As we were already used to managing the trade-off between risk and trading costs, we were well positioned to implement the risk factor exposures efficiently. However, it required even closer monitoring of the portfolio's relative risk factor exposure. We have focused on reducing turnover in the risk factor strategies and being more opportunistic in our trade execution, moving away from periodic rebalancing and increasingly taking advantage of liquidity when it is available.

As the operationalisation matured, there was a need to consolidate the different approaches to risk factor strategies. Although focused on different segments of the market, the underlying risk drivers in the reference portfolio allocation

and the enhancement strategy were the same, and proper risk management required a consolidated approach.

In our first to attempt to consolidate in 2017, the reference portfolio allocation was maintained but our implementation altered the definition and composition of the reference portfolio's strategy. As such, there were two aspects to the enhancement strategy: enhancing selected parts of the reference portfolio, and exposing the portfolio to additional risk factor exposure. The link to the reference portfolio allocation was maintained through a mandate requirement on the combined risk factor exposures' betas versus the reference portfolio allocation. This provided for more dynamic and diversified risk factor exposures overall and a more opportunistic implementation. However, the link with risk factor betas proved operationally complex, and the additional risk factor exposures meant that the fund's total risk factor exposure was still not fully consolidated.

In 2018, the strategic reference portfolio allocation was discontinued in favour of an explicit requirement to expose the index portfolio towards selected risk factors within a set range. With this, the allocation to the risk factors was largely decided top-down, similarly to the previous reference portfolio allocation, but the factor construction remained delegated to index management. During this period, the fund's entire strategic allocation to risk factors was reported as part of our indexing strategy. This solved some of the operational challenges of earlier models, but the continued underperformance of risk factor strategies exposed weaknesses in the decision-making structure, as the ownership of decisions and investment risk was diluted.

Towards the end of 2018, we decided to discontinue the risk factor strategy within the indexing strategy, in favour of a re-inclusion of the top-down strategic risk factor allocation in the reference portfolio. The size and

Chart 137 Exposure to risk factor strategies. Percent of equity portfolio.

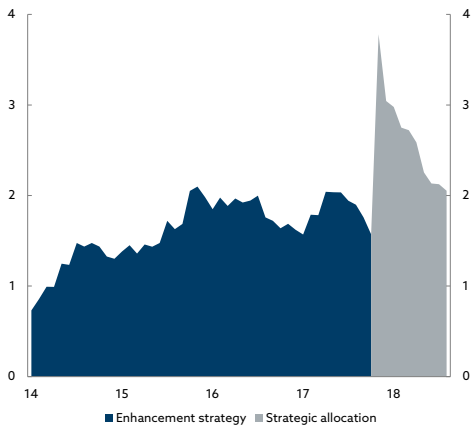
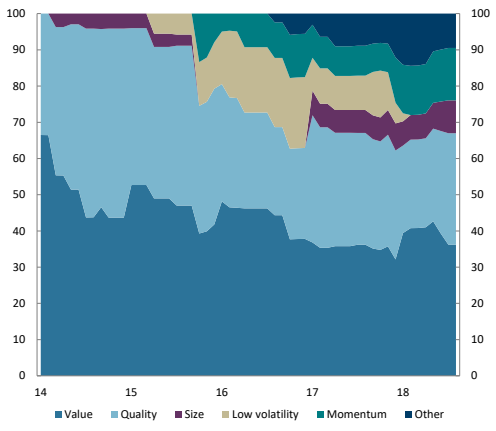


Chart 138 Exposure to risk factor strategies, by strategy. Percent.



characteristics of these exposures had made them less suited as an enhancement strategy within delegated index management. After realigning the portfolio with the risk factor exposures in the reference portfolio, our index management has focused on implementing the risk factor exposures, with their inherent high turnover, in a cost-efficient manner. We have continued utilising risk factors as tools to facilitate our indexing activity in emerging markets, and as inputs to our overall risk management in developed markets.

Instrument strategies

As an active market participant for the last 20 years, we have had the opportunity to consider the use of alternative instruments to gain the appropriate market exposure for the fund, beyond investing directly in companies' shares.

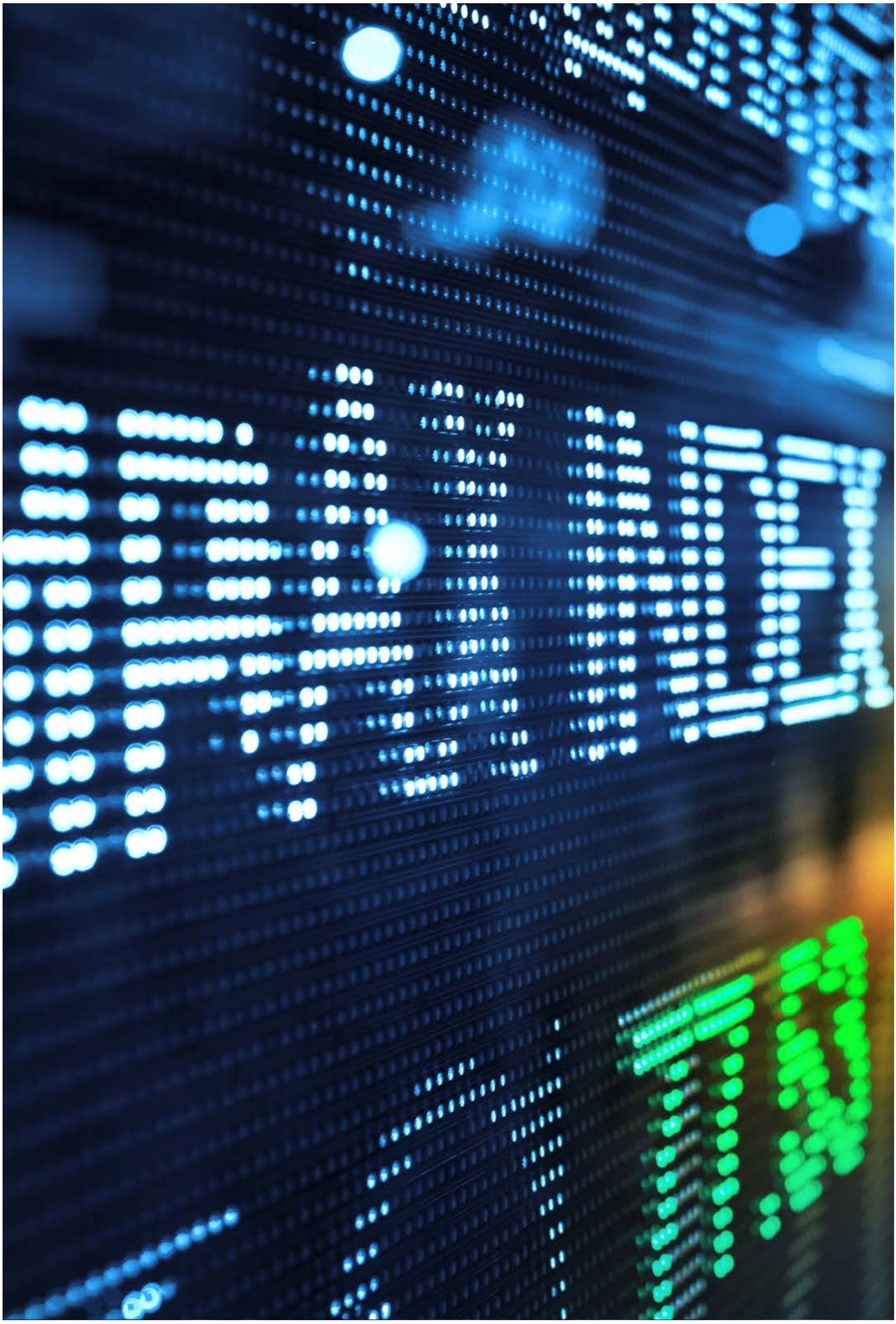
New instruments are subject to an internal approval process, including due diligence on the legal, regulatory, operational and risk considerations before approving an instrument for use. We have been particularly mindful of the risks introduced by complex derivative instruments.

Equity index futures are one of the simplest derivative instruments, and we have employed them since we began investing in equities in 1998. They provide a liquid and operationally simple instrument to hedge regional equity exposure, and have the benefit of being centrally cleared, implying low counterparty risk. Before we started managing equities internally, we used equity index futures to adjust the regional composition of the equity portfolio as the fund received inflows. As we were active in the futures markets, we considered the relative valuation between the index futures contract and the underlying index we would eventually want to buy, opportunistically trading futures when this was more advantageous. In 2004 and 2005, we also engaged in a short-term reversion strategy using equity index futures.

In 2006, we initiated a new active strategy, buying and writing call or put options to exploit differences in the pricing of volatility in different securities in our investment universe. While this strategy was small in scale compared to our other enhancement activities, we saw it as a diversified return stream, complementing our relative value positions. We eventually wound down this strategy in March 2008, after positive returns from 2006 to 2008.

Since the financial crisis in 2008, we have taken a cautious view of derivative instruments, which were at the core of the crisis. We utilised contracts for difference (CFDs) for transaction cost management until 2013. However, we have not engaged in replacing parts of the equity holdings of the index portfolio with synthetic exposure, such as total return swaps. While such instruments can, at times, offer an attractive spread to physical equity holdings, we can also capture this spread through our securities lending strategy.

As exchange-traded funds (ETFs) have grown in size and liquidity, and their fees have decreased, we have considered their use. While they could be relevant liquidity instruments for the fund, there are few ETFs that are large and liquid enough in the markets we have investigated. As they are arbitraged very actively, we have not seen any significant occasions when the price of the ETF has become sufficiently out of sync with the value of the underlying assets to offer us an opportunity to provide liquidity to the market. As most ETFs, particularly in emerging markets, have not attained sufficient size, they have not been relevant instruments for us. Finally, for both ETFs and synthetic exposure, we would be hesitant to let an external provider manage a significant part of our index portfolio.



Governance strategies

As we deployed our risk factor strategies within the Asian emerging markets portfolio, we saw that there was a higher dispersion among the companies. In particular, the value scores, which rank companies based on their market value relative to their underlying earnings, cash flows or book value, exhibited more extreme pricing than in other parts of the world. Furthermore, we observed that there was a relationship between this extreme pricing and widely publicised reports of accounting fraud.

Governance in challenging markets

Our observations were consistent with reports from other investors, who have published a series of findings related to accounting fraud in the region. Some unscrupulous companies have taken advantage of the different regulatory regimes, manipulating their accounts to appear more profitable than their real operations are. They have subsequently become popular with investors – in particular retail traders on the lookout for a quick profit – and have increased in price very quickly. As an index-based investor, this represents a challenge. As these companies reach a significant size, they are included in the major equity indices. A passive index investor will then have to purchase the shares to avoid tracking error. When a fraud is eventually uncovered and the stock price drops precipitously, the passive investor loses his investment.

Having made these observations, we took an increasingly active approach to this segment from 2017. Through screening of the universe and subsequent accounting analysis, we uncovered multiple companies that were likely to be manipulating their accounts, and sold them out of the portfolio. We further developed the strategy, screening new additions to the equity index for accounting irregularities or other suspicious signs. This strategy has proven to be very successful in Asian emerging markets, as many of our suspicions were subsequently highlighted by other investors or investigated by the authorities. However, the stocks in question are significantly more volatile than others. This has forced us to manage our underweight positions actively, and sometimes limited our capacity to sell out the fund's entire holdings, as we sought to diversify the contribution of single situations to our relative risk.

As we developed our strategies aimed at uncovering accounting fraud in Asian emerging markets, we sought to expand them geographically. We have employed various tools and data sources to screen for companies that may be engaging in accounting fraud, or simply have a rapidly deteriorating business model. We have scored the companies' accounting data internally, used external research providers specialising in forensic accounting, and sourced ideas from the set of stocks that are in high demand from hedge funds wanting to short them. We have implemented such positions mostly within our emerging markets and small-cap portfolios, segments that receive less scrutiny from the market. While the contribution has been positive, we have found there to be a lower incidence of fraudulent cases in developed markets, where the regulatory framework is more stringent.

In 2019, our work led us to uncover a significant fraud in Europe: Wirecard AG, a German digital payments company. We first invested in the company as it was included in the equity index in September 2007. In 2019, the Financial Times published a series of investigative pieces about the company, accusing it of fraudulent activity. Meanwhile, one of our corporate credit portfolio managers uncovered what were signs of significant accounting fraud, where the company

had falsified its profits to give an impression of strong growth, when in reality the company's business was underperforming. In December 2019, we established a significant underweight position in our indexing mandate, which we reinforced in April and May 2020 as a forensic audit report by KPMG was made public, further strengthening our conviction. As the case progressed, we collaborated closely with fundamental equity and credit portfolio managers to gain clarity, and several active portfolio managers also sold their holdings in the company. On 18 June 2020, the company announced that its auditor had not signed off on the annual accounts, as a significant amount of the cash on the balance sheet was missing. As we received this news, we were able to sell the fund's remaining holding before the market value collapsed completely. In total, our actions contributed 3 basis points to our indexing strategy in 2020.

We have found that engaging in a strategy focused on finding companies with a high risk of underperformance plays to one of our competitive advantages, i.e. our wide portfolio. As we do not sell short, we can only be underweight stocks that are in the equity index. However, while hedge funds need to borrow a stock to sell it short, we can achieve the same relative positioning by selling what we have in the portfolio – without needing to borrow the stock from other investors.

Chart 139 Share of companies losing more than 80 percent of their market value, by year

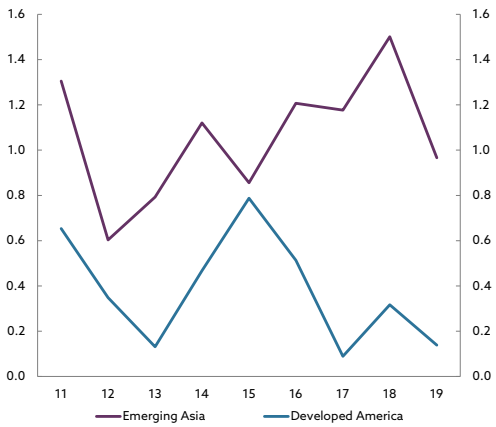
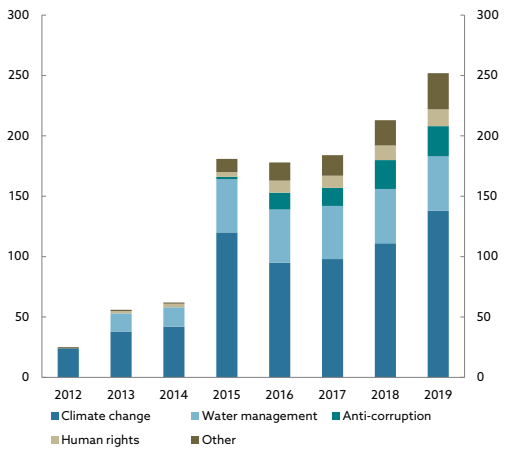


Chart 140 Risk-based divestments. Number of companies divested from the portfolio.



Environmental and social risks

Starting in 2010, we developed a strategy for risk-based divestments, identifying small companies in the portfolio whose business models were not sustainable given their high environmental or social risks. Because the objective of this strategy was the risk management of the portfolio, rather than an active investment strategy, we decided that the decisions on these exclusions would be made by an internal committee rather than individual portfolio managers. Accordingly, this strategy has been managed and reported as part of the reference portfolio, rather than the indexing strategy.

This activity has led us to source a wide range of ESG-related datasets, which help the index portfolio managers monitor ESG risks in the portfolio. The index portfolio managers maintain a close dialogue with the relevant teams responsible for ESG risks and divestments. Being close to the market means that index portfolio managers will often be the first to become aware of developments at certain companies, especially those that are involved in equity capital market events or corporate actions. They will therefore be able to flag ESG concerns to be analysed further within the organisation.

Combining strategies

In the first ten years of index portfolio management, most of the relative risk in the indexing strategy was active. Given the smaller size of the portfolio, and the relative liquidity of the holdings, we were able to take relative risk where we had an active strategy, and reduce the relative risk in the rest of the portfolio. When there was a change in our benchmark, we would analyse to what extent this change could be associated with an active strategy. If there was a share class that was more attractive to buy, we would buy that; if there was an index rebalancing event, we would seek to time the implementation optimally. We would also trade actively to implement active positions in line with our enhancement strategies.

There were few constraints on our active strategies apart from the opportunity set. Having a very diversified universe meant that we could implement active positions in a large number of companies, but the size of each position was constrained by the benchmark available in single securities. We therefore sought to widen the scope of active strategies. We broadened the relative value strategies, including pairs of securities sharing common traits. The relative value strategies offered the most diverse opportunities, and we increased the risk taken in these strategies between 2002 and 2008. The other strategies were narrower and offered less potential for expansion. As such, they remained a smaller part of the relative risk.

As the index portfolio grew and expanded to more segments, it was no longer possible to focus all relative risk on active strategies. Our approach to relative risk changed drastically from 2009 onwards. We scaled back the active risk taken in the relative value strategies, and our main mission was to invest large inflows into equities cost-efficiently. The index portfolio grew quickly and was much broader than in the first ten years. Our focus was on strategies that could help us invest broad flows in the best possible way. Our risk factor strategies contributed significantly in this regard, allowing us to guide parts of the flows towards certain segments of the market. This was particularly helpful in the small-cap segments and emerging markets. We also expanded our strategies aiming to provide liquidity to the market, such as index rebalancing and capital market strategies.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As we adapted to managing one of the largest single-owner equity portfolios in the world, we consolidated our active strategies around strategies that benefited from our size. Most active strategies that require active trading will suffer from diseconomies of scale. We continue to pursue these as long as we expect them to contribute excess returns, but we do not attempt to scale them up. On the other hand, some strategies, such as corporate action and capital market strategies, benefit from our size and have become a larger component of our active risk over time. However, the largest contributor to relative risk in the enhanced indexing strategy will remain transaction cost management, seeking to implement the changes in the benchmark and the fund strategy optimally.

While the relative contribution of our strategies to the relative risk has varied over time, two traits have remained important. The first is that we seek to use the changes in our benchmark as an opportunity to increase relative returns for the fund, by seeking to implement them in the best possible way. The second is that we do not always seek an optimal combination of strategies in terms of their relative risk contribution. Rather, we seek to achieve the highest possible excess return for the fund, by making the most of the opportunities that are presented to us. We then seek to manage the total risk in our indexing strategy at a level that is acceptable.


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The investment returns

As the index portfolio is managed with limited deviation from the benchmark, the portfolio returns will largely reflect the benchmark returns. While the index portfolio incurs transaction costs to implement the desired equity exposure for the fund, we have managed to outperform the benchmark significantly.

There are certain differences between the portfolio and benchmark returns. The portfolio returns are the actual return of the portfolio, including dividends received, and transaction costs, taxes and commissions paid. As such, it reflects the actual returns received by the asset owners.

The benchmark returns, on the other hand, are what a theoretical equity portfolio would return. The index providers make their best efforts to reflect dividends, corporate actions and dividend withholding taxes as accurately as possible. The quality of the benchmark returns was lower 20 years ago, as the index provider did not accurately reflect the dividends on the date they occurred, but an average dividend yield throughout the year. In addition, the results of corporate actions were often not included in a manner that was possible to reproduce through holding the shares. Hence, it was impossible to exactly replicate the benchmark returns in practice. Over time, the benchmark returns have become more accurate. However, transaction costs, associated taxes and capital gains taxes have not been included in the benchmark returns, as these depend on the investor's size and execution capabilities and are largely impossible to estimate for the index providers.

As an indexing strategy provides a market exposure similar to the index, it is the relative returns against the index that are of interest to assess the value added by the indexing strategy. As a starting point, a passive indexing strategy would lead to negative relative returns, as the costs of implementing the index exposure affect the portfolio, but not the benchmark. However, through active enhancement strategies and smart risk management, we have managed to outperform the index over time, leading to significantly positive results.

The cost of indexing

The main cost of the indexing strategy comes in the form of transaction costs. As trading is costly, the trading required to invest cash flows and replicate the equity index translates into a performance drag on the index portfolio. This performance drag would be higher if we managed the portfolio according to a passive indexing strategy.

The estimated cost of a passive indexing strategy can be decomposed into two elements: transaction costs related to inflows and extraordinary benchmark changes, and transaction costs related to replication of the index.

The transaction costs for inflows and extraordinary benchmark changes relate to the phasing-in of new capital into the portfolio, the set rules for rebalancing of the asset allocation, and strategic changes in the index, such as changes to the investment universe or regional weights. These costs are largely borne by the portfolio regardless of whether a passive or enhanced indexing strategy is pursued, as they need to be implemented to achieve the desired exposure. They are estimated based on standard market assumptions about trading costs and not actual realised costs and are therefore uncertain in nature.

The transaction costs for replication of the index relate to regular changes in the index composition, through additions, removals and updates to free float or shares outstanding. These costs are borne by a passive index portfolio, but a more active indexing strategy can avoid trading some of these changes. These costs are estimated based on models and not on realised costs and are therefore also uncertain in nature.

We have estimated the costs of indexing for the entire fund, including equity and fixed income, to be 8 basis points historically, of which 4 basis points come from the transaction costs for inflows and extraordinary benchmark changes, and 4 basis points from other index turnover. As the cost of trading equities is higher than the cost of trading fixed-income securities, the estimate for indexing the equity portion of the fund would be higher. Between 2005 and 2009, inflows into the fund, combined with strategic changes to the asset allocation and investment universe, led to a high cost of indexing, estimated at around 14 basis points of the fund's value per year. In the last five years, the cash flows and strategic changes to the fund have been smaller as a share of the fund's size, leading to a lower cost of indexing during that period.

Chart 141 Annual cost of a passive indexing strategy (equity and fixed income), by period. Basis points of fund net asset value.

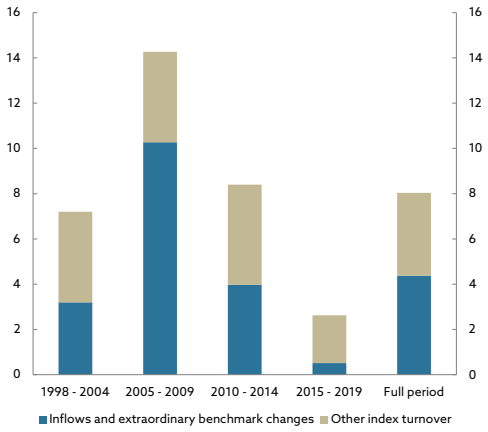
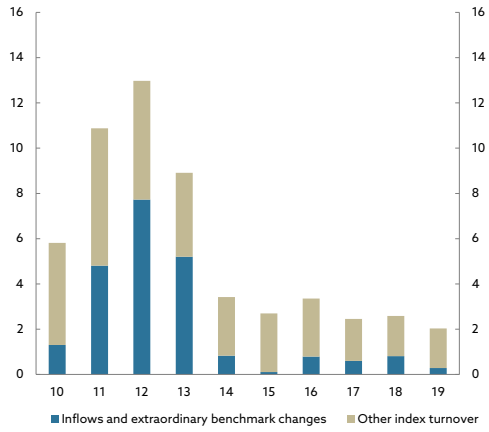


Chart 142 Annual cost of a passive indexing strategy (equity and fixed income), by year. Basis points of fund net asset value.



The enhancement returns

We made our first inroads into most of our enhancement strategies between 1999 and 2004, when the equity portfolio was significantly smaller than it is today. However, we have continued pursuing these strategies over the last 20 years. Some of the strategies have proven to be very scalable, as the size of the fund became a competitive advantage. For others, we have continued them at a more moderate risk level, as they require frequent trading.

The measurement of the contribution of our enhancement strategies is complex, as index portfolio management includes a very high volume of trading and decisions which cannot all be attributed to a specific enhancement or risk management strategy. The enhancement returns have been estimated based on the transactions related to these strategies, and include the related transaction costs and hedging activity insofar as this has been possible. However, the historical data we have on some enhancement strategies in certain periods are of low quality and in some cases not available at all. As such, the enhancement returns are an approximation. Any enhancement returns that are not captured precisely would still, however, be reflected in the broader index management returns.

Our enhancement strategies have contributed 8 basis points annually on average since 2000. The corporate action strategies and index rebalancing strategies have contributed the highest average returns, at 3 and 4 basis points respectively. These enhancement strategies have contributed positively in 19 of the last 21 years, with 2008 and 2017 being the only years of losses, which were dominated by relative value strategies in 2008, and risk factor strategies in 2017.

Chart 143 Annual contribution of enhancement strategies. Basis points.

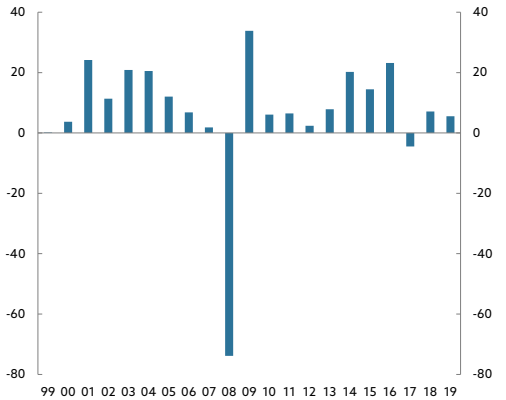
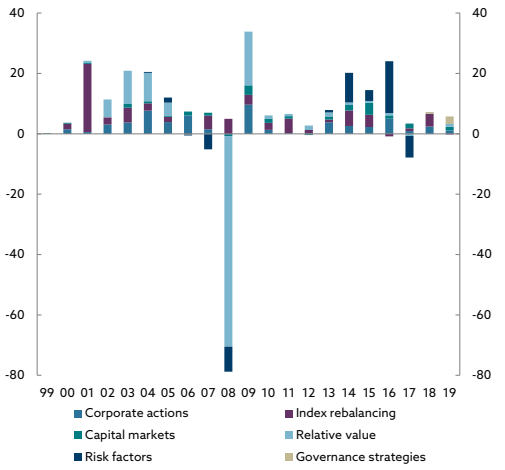


Chart 144 Annual contribution of enhancement strategies, by type. Basis points.



Corporate action strategies

We have engaged in corporate action enhancement strategies since we started managing index portfolios internally in 2000. The strategy has contributed positively to the index portfolio, with an average annual contribution of 3 basis points. In addition, the strategy has only suffered a single negative year, 2008, when the strategy detracted 0.3 basis points. Since 2000, the corporate action strategies have contributed 8 billion kroner to the fund.

The general strategy has remained the same since 2000, namely seeking to achieve the optimal results for the fund in corporate action situations. However, the origin of the enhancement returns has varied through time. In the period from 2000 to 2008, we dynamically positioned the portfolio for M&A situations, utilising our relative risk budget to capture the associated discounts. The M&A strategy contributed 3 basis points annually during that period, which represented the vast majority of the corporate action strategy returns.

Since 2009, we have reduced our pre-positioning in M&A situations. However, the larger size of the index portfolio has meant that the returns achieved from optimal corporate action elections have made significant contributions. Since 2014, optional dividend elections have contributed 0.6 basis points annually, while tender offers, which are sometimes associated with M&A activity, have contributed 1.5 basis points annually.

While the corporate action strategies have contributed positively to the portfolio in 19 of the last 20 years, the enhancement returns depend on the opportunity set. The contribution from optional dividends is fairly steady, but the enhancement returns from tender offers and rights issues depend on the volume of events initiated by companies. For rights issues, the enhancement returns also depend on liquidity and the capacity of other market participants to arbitrage the price between the rights and the stock.

Chart 145 Corporate action strategies. Annual contribution. Basis points.

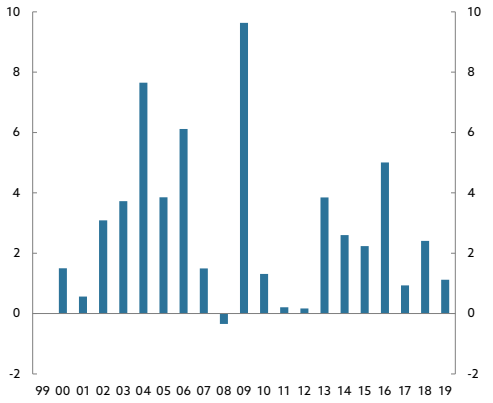
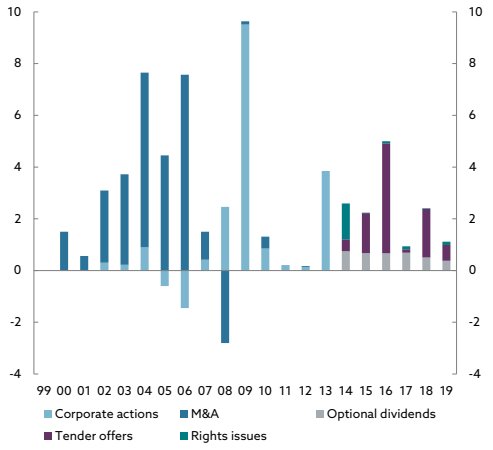


Chart 146 Corporate action strategies. Annual contribution, by corporate action type. Basis points.



Index rebalancing strategies

Index rebalancing strategies have been an essential enhancement strategy during the last 20 years. The potential for enhancement of the index rebalances in 2001 was an important driver in our decision to insource index portfolio management that year.

The contribution in 2001 far exceeded our expectations. The strategy contributed 23 basis points to the index portfolio that year. This was driven by the significant rebalancing flows in the market as both FTSE and MSCI transitioned their weighting schemes from full market capitalisation to free-float-adjusted market capitalisation during that year. Our relative positioning resulted in a gain of 261 million kroner for the fund in 2001.

Since 2001, the index rebalancing strategies have contributed positively in most years, but not to the same degree. The average annual contribution was 3 basis points between 2000 and 2019, and 2 basis points if we exclude the exceptional results in 2001. The strategy has contributed positively in 17 of the last 20 years.

Our experience has been that the performance of index rebalancing strategies depends on the risk capacity of other market participants. In 2007 and 2008, as most market participants lowered their risk capacity because of the high volatility, the strategy contributed close to 5 basis points per year to the index portfolio. In the last five years, however, the enhancement returns have been lower, averaging 1 basis point per year, as we have seen an increase in the number of funds that are active in index rebalancing strategies.

Chart 147 Index rebalancing strategies. Annual contribution. Basis points.

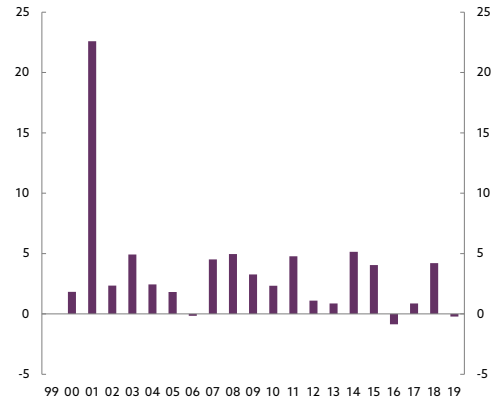
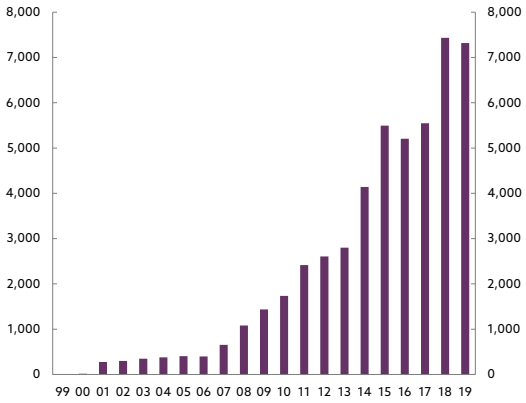


Chart 148 Index rebalancing strategies. Cumulative performance. Million kroner.



Capital market strategies

Our first internal enhancement came about when we participated in three initial public offerings (IPOs) in 1999, subsequently transferring the stocks to the external index portfolio. Over the years, our participation in equity capital market events has grown. We have expanded our reach to follow-on offerings and secondary block placings, and our activity level as well.

The strategy has contributed 1 basis point annually to the index portfolio since 1999. As our activity levels have grown, the contribution of the strategy has increased, averaging 1.6 basis points per year since 2014 – even as the size of the index portfolio has grown. This has translated into a relative return contribution of 4 billion kroner since 1999.

In the last nine years, the excess return contribution has been fairly evenly split between IPOs, follow-on capital raises and secondary block placings. However, the results are more volatile for IPOs, as we hold the relative risk in those for a longer time before they are included in the index. On average, index providers include IPOs in the index after nine to twelve months. Conversely, shares outstanding and free float are adjusted a few days to a few months after a follow-on or a placing. Since mid-2017, FTSE Russell has updated the free float of stocks two days after significant block placings, which has lowered the contribution of these events to our relative risk and returns.

The capital market strategies have contributed positively in 18 of the last 21 years, but single events have sometimes entailed significant losses, such as the IPO of Softbank Corp in 2018, which detracted 250 million kroner.

Chart 149 Capital market strategies. Annual contribution. Basis points.

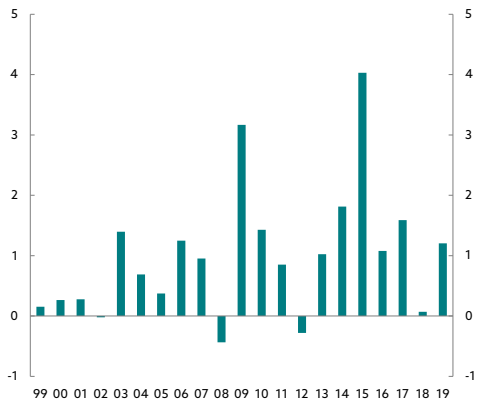
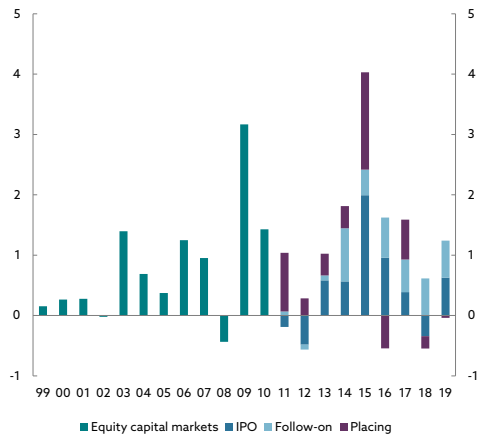


Chart 150 Capital market strategies. Annual contribution, by event type. Basis points.



Relative value strategies

We started our relative value enhancement strategy in 2000, through positions in different share classes of the same companies. We subsequently expanded the strategy to include dual listings, holding companies and eventually pairs of related securities. The strategy was dynamic, as we traded these groups of securities actively and used inflows into the fund as an opportunity to increase or decrease the positions while saving transaction costs.

The strategy proved very successful, as it contributed 4 basis points per year on average between 2000 and 2007. In 2003, the strategy contributed 11 basis points to the index portfolio. The most significant excess returns came from the holding company strategy, which contributed 3 basis points per year during this period. The strategies contributed positively each year from 2000 to 2005. However, in 2006 and 2007, the strategies produced small losses.

In 2008, the strategy underperformed more severely than we had thought was possible. The underperformance was driven by the liquidity situation during the financial crisis. The Volkswagen situation detracted in particular, driving losses in share classes and holding company positions. This led to an underperformance of 70 basis points in 2008, of which 60 basis points came from the Volkswagen position. As we kept parts of the position in 2009, it made a positive contribution of 16 basis points to the index portfolio that year.

Since 2010, the relative value strategies have contributed on average 1 basis point annually to the index portfolio. The scale of the relative value positions has been smaller as a share of the index portfolio. Since 2000, the relative value positions have detracted 1 basis point annually from the index portfolio, including the significant loss in 2008.

Chart 151 Relative value strategies. Annual contribution. Basis points.

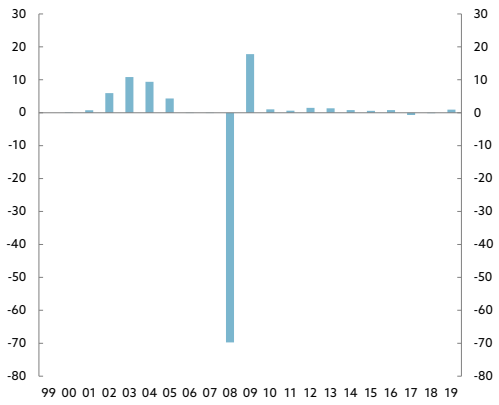
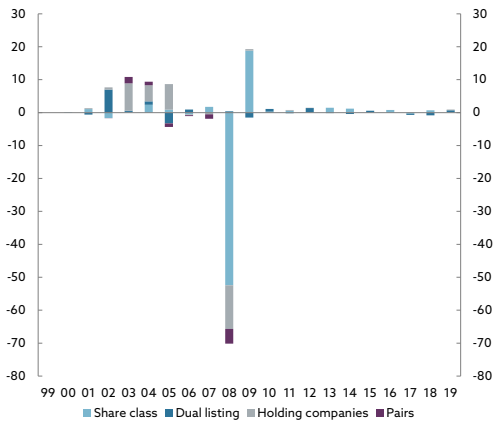


Chart 152 Relative value strategies. Annual contribution, by strategy. Basis points.



Risk factor strategies

Our risk factor strategies can be separated into three periods. Between 2004 and 2008, we developed and implemented risk factor strategies as additional enhancement strategies within the indexing strategies. These strategies encompassed reversal-, momentum- and fundamentals-based strategies, as well as a strategy based on short interest. As the financial crisis hit in 2008, these strategies were unwound. They detracted 2 basis points on average from the index portfolio from 2004 to 2008.

The second period spans from 2013 to 2016. During this period, we developed and implemented a broad set of risk factor strategies within the index portfolios. The main strategies were value and quality, but these were complemented by momentum, low volatility and size, among others. These risk factor strategies were implemented globally and across all company sizes. During this period, the risk factor strategies contributed an average positive return of 8 basis points to the index portfolio, with the value and quality strategies contributing equally.

In 2017 and 2018, we tried two different models for organising our consolidated management of risk factor strategies. In these years, the active risk factor exposure in the reference portfolio and in the index portfolio should be viewed and evaluated in conjunction. In 2017, the risk factor strategies contributed positively to the reference portfolio, but detracted 7 basis points from the index portfolio, as our enhancements underperformed. In 2018, the combined risk factor strategies, which represented the fund's strategic allocation to systematic factors, detracted 17 basis points, in particular due to the value strategy. Since then, we have not targeted exposure to risk factors within the developed-market index portfolios.

Chart 153 Risk factor strategies. Annual contribution. Basis points.

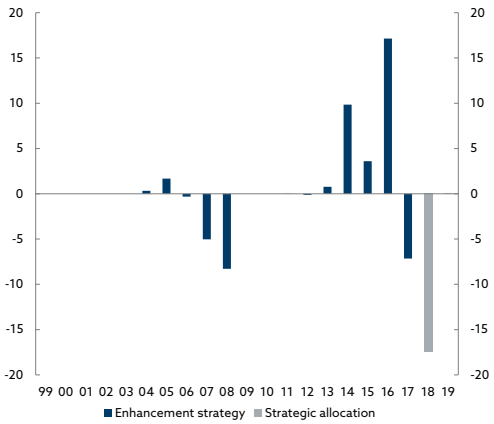
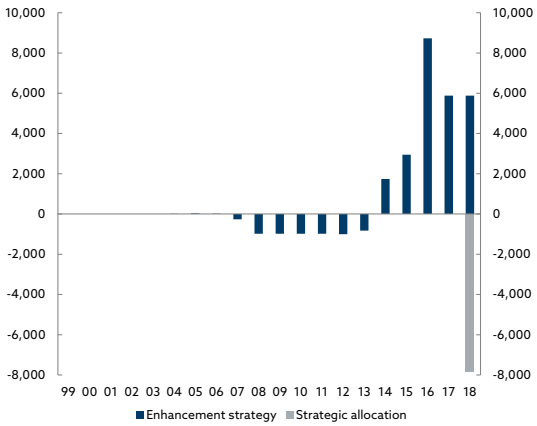


Chart 154 Risk factor strategies. Cumulative performance. Million kroner.



The relative returns

The enhancement strategies have contributed positively to the portfolio, contributing 8 basis points annually since 2000. This has resulted in a 25 billion kroner gain for the fund, including most of the transaction costs necessary to implement the enhancement strategies. The enhancement strategies have contributed positively in 19 out of the last 21 years, with a significant negative contribution in 2008.

In addition to the enhancement returns, there are multiple factors affecting the index portfolio's relative return versus its benchmark, including transaction costs, taxes, transition activity, strategic allocations and other portfolio management activity. As the index portfolios have been the hub for the equity portfolio's overall activity, all strategic changes at the fund level have affected the index portfolio.

Inflows and transitions have been managed in different ways over the last 20 years. From 1999 to 2010, they were mostly managed in separate portfolios. From 2011 to 2014, transitions were managed within the index portfolios, while inflows and rebalancing were handled in separate portfolios. From 2015 to 2019, inflows, rebalancing and transitions were partly managed as separate portfolios, and partly within the index portfolios. In the periods where it has been possible to separate the effects of transition and inflow management on the index portfolios, this has been done to differentiate the results of indexing and transition activity. This activity has resulted in a negative contribution of 3 basis points per year since 1999. The largest detraction occurred during years with very high transition activity: 2000, 2008, 2011 and 2018. However, this detraction should also be seen against the substantial transaction costs necessary to

Chart 155 Annual contribution of indexing. Basis points.

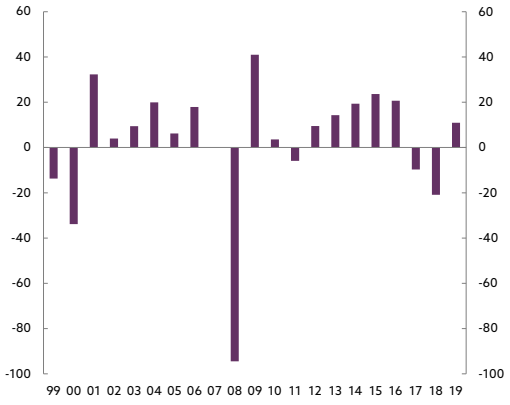
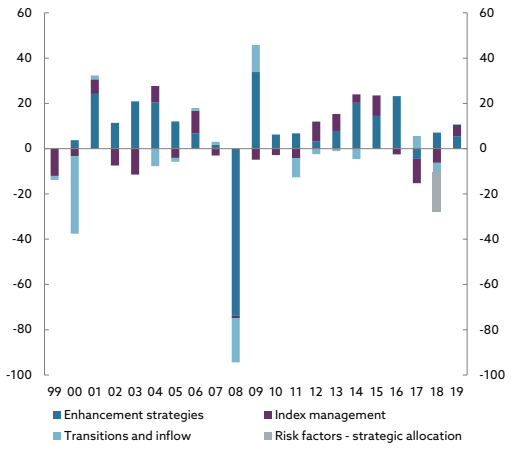


Chart 156 Annual contribution of indexing strategy, by category. Basis points.



successfully implement the necessary transitions, inflows and rebalancing for the fund.

As the index portfolios have been the hub for the fund's overall activity, their performance also reflects the strategic decisions that are not allocated to other strategies. To facilitate cost-efficient implementation, the strategic allocations to certain risk factors were integrated into index management in 2018. Our index management was required by the fund's mandate to be actively exposed, within a set range, to the specified risk factors. This strategic allocation detracted 17 basis points from the portfolio in 2018.

After attributing enhancement strategies, transitions and strategic allocations, the residual relative return of the index portfolios can be attributed to our index management, which consists of managing the residual risk of the portfolio in an optimal manner. Index management entails significant transaction costs and taxes related to our risk management. In addition, the results of index management include costs that are not accounted for elsewhere, such as capital gains taxes in certain markets, and dividend withholding taxes before 2003. The results of our index management also include enhancement strategies and the results of transitions that have not been attributed

Chart 157 Cumulative contribution of indexing strategy, by category. Million kroner.

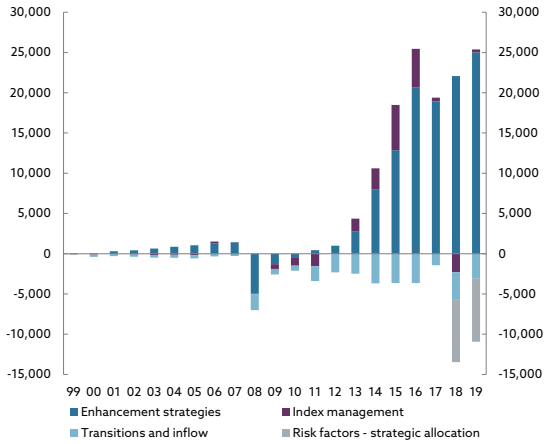
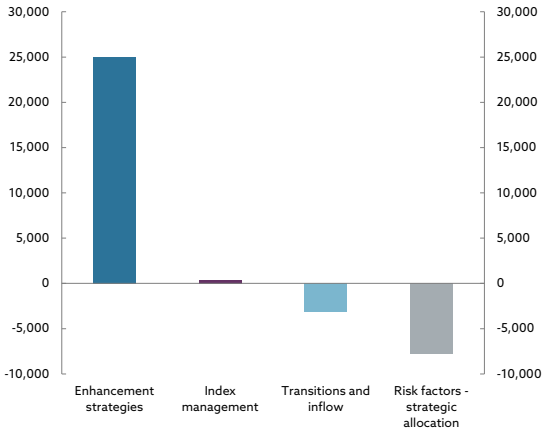


Chart 158 Cumulative contribution of indexing strategy, by category. Million kroner.



precisely. On average, index management detracted 1 basis point per year from the index portfolio from 1999 to 2019. Excluding 1999, when the entire index portfolio was managed externally, index management has contributed zero basis points per year. It has resulted in a gain of 300 million kroner over the period and has contributed positively in eight of the last 21 years.

The enhancement strategies and index management, seen together, have contributed 7 basis points to the index portfolio per year since 2000. They have resulted in a gain of 25 billion kroner for the fund. The average tracking error has been 19 basis points over the entire period, leading to an information ratio of 0.4. The results have been positive in three out of four five-year periods, with an information ratio between 0.75 and 1.4 in each of these periods. The strategies underperformed in the period from 2005 to 2009, as the financial crisis hit, and the index portfolio underperformed significantly in 2008. This was also the period of highest tracking error, averaging 29 basis points during the five-year period and hitting a peak of 57 basis points in 2008.

Since 2013, most of our index management has been separated into regional portfolios. Our

Chart 159 Contribution to enhancement strategies and index management, by region, 2013-2019. Basis points.

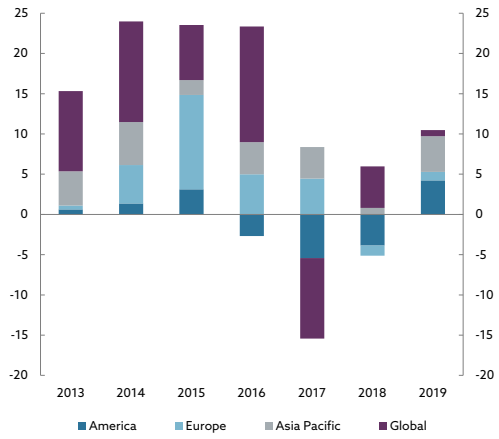
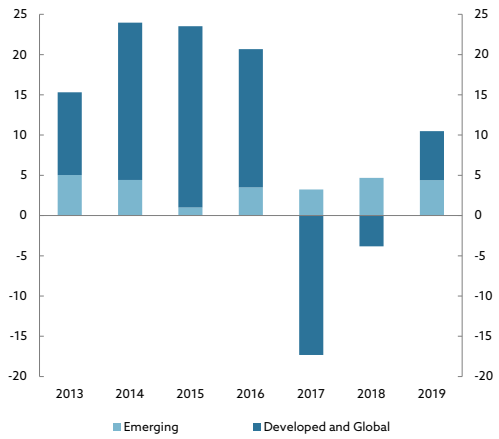


Chart 160 Contribution to enhancement strategies and index management, by market classification, 2013-2019. Basis points.



Europe and Asia Pacific index portfolios have each contributed 4 basis points per year during this period, while our global portfolios and strategies have contributed 5 basis points per year. Our emerging markets portfolios, which we manage more actively than our developed-market portfolios, have contributed 4 basis points per year, or 33 percent of the total result, while their share of the assets has been only 10 percent.

The results of our indexing strategy have been stronger than our initial expectations. By leveraging the fund's competitive advantages and focusing on segments of the markets where we thought we could be successful, we have outperformed the benchmark significantly over the last 21 years. While we have at times faced challenges to some of our strategies, we have continued to manage the portfolio with the aim to achieve the best possible returns for the owner, resulting in significant gains over time.

Chart 161 Tracking error of indexing and enhancement strategies. Basis points. 12-month rolling.

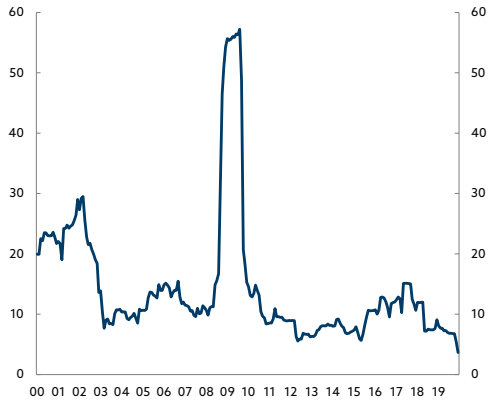
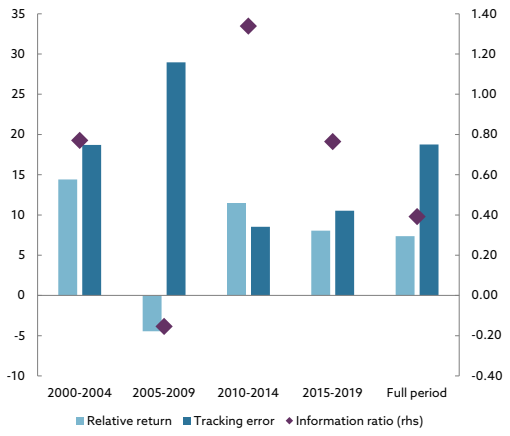


Chart 162 Relative return, tracking error (left-hand axis), and information ratio (right-hand axis) of indexing and enhancement strategies, by period. Basis points.



Relative return of index portfolios, per year.

Year	Relative return (bps)	Strategy/ market colour
1999	-14	External index management. Internal futures rebalancing. First internal IPOs.
2000	-34	First internal index management, including enhancement, with limited scale. Losses from futures rebalancing.
2001	+32	Insourcing index management. Significant outperformance from index rebalancing.
2002	+4	Termination of external index mandates.
2003	+9	Expansion of enhancement strategies.
2004	+20	Strong contribution from enhancement strategies, in particular M&A. First risk factor strategies.
2005	+6	Continued expansion of enhancement strategies.
2006	+20	Strong contribution from all indexing activity.
2007	+3	Start of financial crisis. Quant crisis in August. Transition into small caps (added to equity index in October). Local portfolio management in Asia Pacific.
2008	-91	Financial crisis. Detraction from Volkswagen and other relative value strategies, and from transitions. Local portfolio management in America.
2009	+39	Recouped parts of losses from Volkswagen. All strategies contributing positively.
2010	+2	Consolidation period.
2011	-6	Significant transition of internal and external mandates resulting in losses.
2012	+10	Re-start of risk factor enhancement strategies. Creation of dedicated small-cap portfolio.
2013	+14	Creation of regional large-cap and small-cap portfolios.
2014	+19	Significant excess performance from expanded risk factor strategies and index rebalancing.
2015	+24	High contribution from all enhancement strategies, in particular expanded capital market strategies.
2016	+21	Significant excess performance from risk factor strategies and corporate action strategies.
2017	-14	Detraction from risk factor strategy enhancements. Moderate contribution from most enhancement strategies. Initiation of governance strategies in Asian emerging markets.
2018	-21	Detraction from strategic allocation to risk factor strategies and transition activity related to external mandates.
2019	+11	Positive contributions from most strategies and portfolios, in particular governance strategies.

3 | Lending

Lending our holdings

Securities lending is an integrated part of our asset management strategies and plays an important role in well-functioning markets by increasing liquidity and contributing to more efficient price discovery.

Our approach to securities lending is no different to our approach to any other investment strategy. We seek to identify our competitive advantages in specific areas and then develop relevant skills through research, practical experience and experimentation. Early on in our history, we did not have the capacity to purchase specific expertise in the market. Instead, we focused on recruiting capable but inexperienced individuals without preconceived notions of how to manage investment risk. We gave them the freedom and mandate to develop their products in their own way, but firmly anchored in academic research. We sought scalable strategies, but typically started small as we did not always get it right the first time. We then gradually built up risk and competence in tandem over time.

Securities lending is a market practice in which, for a fee, securities are transferred temporarily from one party to another. The borrower is obligated to return the securities either on demand or at the end of an agreed term. To protect the lender against the failure of these obligations, the borrower provides collateral in the form of cash or securities of at least the same value as the lent securities. The lender is still exposed to the lent security's economic benefits, such as dividends, and price movements. However, absolute title over both the lent security and the collateral passes between the parties, and the new owner of the securities has the right to sell them or lend them on.

The primary source of demand for securities lending is the settlement and financing of hedge funds' short sales. As hedge funds conduct research into companies, they may find some that they consider to be overpriced. To capitalise on this, they use a technique known as short selling: they borrow shares in these companies and sell them at this high price, and then buy them back again once the price has fallen, before returning them to the lender, thus making a profit. In addition, some hedge funds or market makers need to borrow shares for hedging or arbitrage strategies. The hedge funds borrow these shares through investment banks, which act as credit intermediaries between the beneficial owners and the hedge funds.

The lending decision
We decided early on to lend securities to increase the fund's return. We saw that securities lending would provide the fund with additional revenue by actively monetising our large, diversified portfolio of securities.

When we started lending our equities in 1998, the equity portfolio was entirely managed by external index managers. The fund's custodian, JP Morgan Chase, was appointed to manage securities lending across all our equity portfolios, as our agent lender. At the time, it was common for asset managers to lend their securities as a way of covering the cost of custody services. The management of securities lending was mostly seen as an operational and low-margin activity, largely outsourced to the agent lender. The asset manager would provide basic guidelines to the agent on the assets available for lending, approved counterparties, acceptable collateral and the reinvestment of cash collateral. Most transactions would be covered by counterparty default indemnification, a type of insurance provided by the agent lender. The agent lender would be paid through a share of the revenue generated by the lending programme.

Seeing securities lending as one of our core investment strategies, with a significant return potential, we assigned responsibility for the activity to the investment team. This decision created a strong starting point for us to begin developing our own expertise and eventually take an active role in determining a lending strategy.

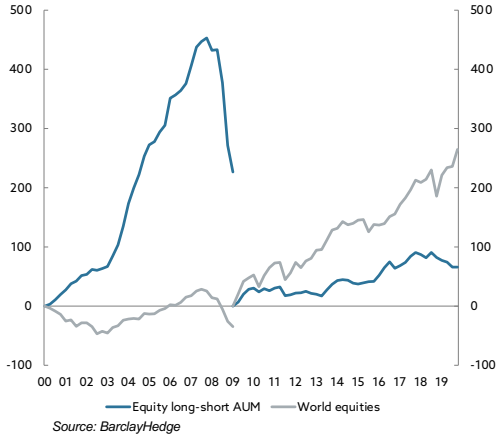
We have lent securities from the entire equity portfolio, independent of which strategy manages the assets and whether the assets are managed internally or externally. As a lender, we can request the return of the securities at any time to sell them in the market, but the borrower will then need to find a new lender. We therefore expect an index portfolio, which is broad and has low turnover, to generate more lending revenue than an active portfolio. Our securities lending activity has benefited from the large share of index management in the equity portfolio.

In addition to the revenue it generates for the fund, securities lending plays an important role in well-functioning markets by increasing liquidity and contributing to more efficient price discovery. It allows a broader cross-section of market participants to express views about the pricing of a stock. As the investor base of companies has become more institutionalised and concentrated, price discovery is significantly improved when the inventory of long-term, large institutional shareholders is made available to actively trading market participants through securities lending.

The agent lender
Rather than building our own systems, we have utilised our custodians for external agency lending of equity securities. JP Morgan Chase was our custodian and agent lender from 1998 until replaced by Citibank in 2014.

While we have outsourced the vast majority of our equity securities lending transactions to our agent lender, we have always been very involved in the process. Norges Bank Investment Management is a lean organisation when it comes to systems and personnel, while securities lending is a transaction-intensive product. It is an over-the-counter market that has been slow to standardise and automate. In short, we have needed the services of an established agent network to deploy the strategies we have developed.

Chart 163 Equity long-short hedge funds. Growth of assets under management, compared to performance of global equities. Percent.



Source: BarclayHedge

Chart 164 Market value of equity loans, by region. Billion dollars.

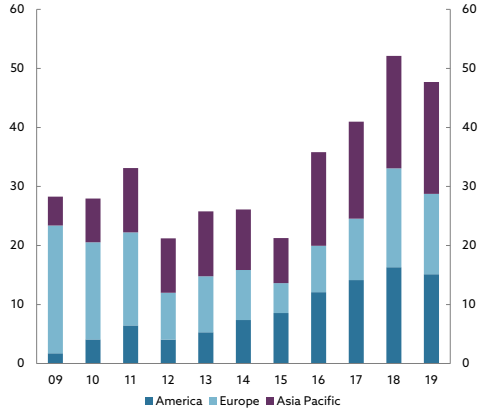


Chart 165 Market value of equity loans, by region. Percent of equity portfolio.

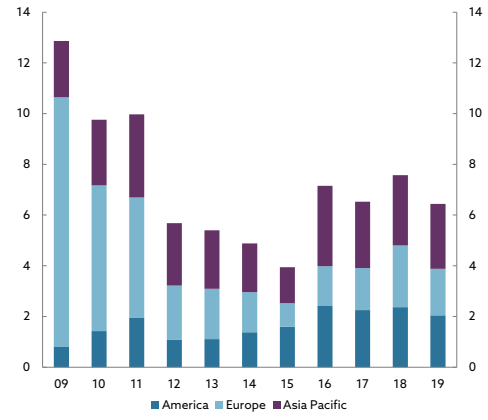
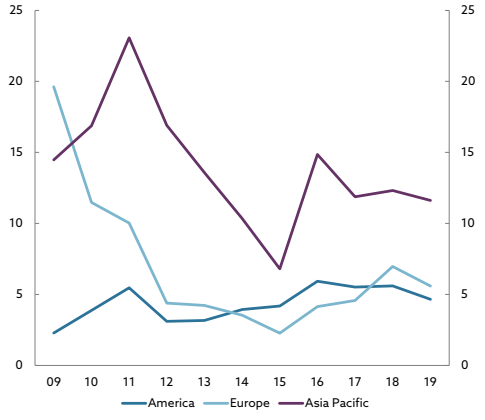


Chart 166 Market value of equity loans. Percent of regional equity portfolio.



We view the agent lender as an outsourced infrastructure provider. The agent lender can focus on operational efficiencies and achieving the best price for individual transactions. We focus on building and improving operational risk controls, risk management, borrower relationships and the integration of securities lending decisions into the portfolio management process. This division of responsibility between the agent and Norges Bank is complementary and will remain in place at least until the industry has reached a critical mass of automation. We have chosen not to be operational early adopters in this respect.

A custodial agent is not the only solution to outsourcing a lending programme. There are also many third-party lending specialists. When we reviewed the options for our custodian setup in 2014, we made the decision not to consider third-party agents. A third-party agent depends on communication and co-operation with the custodian for trade notifications and corporate action elections to manage the recall and asset-servicing processes. In addition to adding another step into each of these processes, these two providers are typically direct competitors and are not necessarily incentivised to work together. For the size and breadth of our investment activities, we felt there were better controls achieved by keeping agency lending within the custodial service relationship.

We have paid our agent lender through a revenue-sharing agreement, but we have adjusted both the amount and methodology over the years. The agent's share serves as both payment for its operational work and compensation for the risk it takes by providing indemnification.

As we became more active in securities lending, we quickly realised that the initial level was too high and negotiated it down in 2003. We recognised a similar revenue model between our equity brokers and agent lenders. Their primary target was gross revenue rather than maintaining margins. As gross revenue grew with assets under management, we were able to negotiate down the percentage paid to our agent. When we launched enhancements to our lending programme from 2003, we negotiated a separate fee split for these activities. As we gradually abandoned indemnification, we reduced the risks to our agent and accordingly negotiated even lower fees. Finally, as with other services, a periodic formal review has kept us updated about the market level.

As our securities lending programme is outsourced to an agent, we have had to deal with the risk of differential treatment. As the fund has grown, we have become an important partner to our agent. The risk to us has been that other clients, paying higher fees, might be allocated a higher share of lending demand. To alleviate this risk, we have sought to develop our direct counterparty relationships and push for more transparency in the market.

Another downside of outsourcing is that we give up some control of the strategic development of the product. Investors are primarily interested in solutions that work best for them individually, whereas the agent needs to consider strategies that benefit its entire client base. We have partnered with our agent in this development, but typically find that shorter-term industry-sponsored development is more achievable than our own longer-term goals. In some cases, such as synthetic lending, we have insourced the operational build to achieve our goals, while in others, such as peer-to-peer lending, we have taken the lead with potential partners in building a business case and scalable model that can be adopted by other lenders.

Competitive advantages

The fund is an attractive counterparty in securities finance markets due to its unique characteristics, primarily the creditworthiness of transacting with a central bank, and the size and breadth of our securities inventory. These characteristics translate into slightly higher returns on our securities lending.

While the creditworthiness of borrowers, which are major investment banks, is often discussed, these borrowers face the equal and opposite risk when transacting with lenders. The creditworthiness of transacting with a central bank reduces this risk significantly for borrowers. With the implementation of bank capital requirements after the global financial crisis in 2008, we have become a preferred counterparty for our borrowers.

The size and breadth of our securities inventory allows counterparties a single point of access to a significant portion of their equity financing needs. The primary borrowers in our equity lending programme are global prime brokers. These service hedge funds covering a range of strategies and markets. We lend actively in 35 equity markets covering the full range of market capitalisation segments in each market. The size of our holdings in individual companies means that borrowers can typically source a large part of their demand in a single transaction, saving on trading, operational and administrative costs. However, we expect this advantage to be eroded over time as the securities lending industry gradually adopts more standardised and automated processes.

In addition to competitive advantages related to the fund structure, we have innovated to remain a preferred counterparty. Our early adoption of equity collateral, ability to manage risk exposure outside an agent indemnification, broad collateral universe and development of regulatory reporting on collateral have all contributed significantly. However, the market is quickly catching up, as our peers have adopted equity collateral and implemented regulatory reporting controls to facilitate it. Continuing to innovate will be key to ensuring the highest possible lending revenue from our assets.

Compensation for risk

In any financial transaction, there must be compensation for the risk taken, and securities lending is no exception. Our starting point is that securities lending is a very low-risk activity. For us to suffer an investment loss, the counterparty must first default, and then the collateral proceeds must be insufficient to cover the repurchase of the lent securities. However, there is a material tail risk. Lending transactions have low margins and make up a significant gross exposure for the fund. This is especially relevant when we consider that a large enough crisis could lead to the failure of multiple lending counterparties.

In 2012, we introduced a 0.25 percent minimum fee for equity lending transactions. By doing this, we reduced our gross counterparty exposure by around 50 percent at an opportunity cost of less than 10 percent of total revenue, by eliminating high-value transactions with low fees. Our priority has been to develop differentiated products or markets where we can harvest high fees, rather than lending a large share of our portfolio for low fees. This has enabled us to recapture some of the revenue at a greater spread by offering term funding trades or synthetic lending on similar assets.

The lending market

The supply of shares available for loan and the demand for equity borrowing have created a global market with dynamic pricing, where asset owners, hedge funds and their intermediaries seek to optimise their securities lending costs and revenue.

Market actors

While our agent lender covers the trading and operational aspects of our securities lending programme, the actual lending transactions occur between the fund, as the beneficial owner of the securities, and our counterparties, typically banks. The banks act as prime brokers for their hedge fund clients. They borrow shares to settle and finance the short sales of the hedge funds, and act as a credit intermediary between the beneficial owner and the hedge fund. As the lender, we relate to our bank counterparties and are not privy to the identity of the ultimate client of the prime broker.

The primary source of demand for securities lending is the settlement and financing of hedge funds' short sales. These funds' short-selling strategy is typically driven by a view on a company's equity being overvalued. It can also include hedging or arbitrage strategies. For example, funds may research and select long positions, and then wish to hedge out certain risks, such as country or sector exposures, with offsetting short positions. Some hedge funds also engage in arbitrage strategies, such as convertible bond and merger arbitrage. With convertible bond arbitrage, the hedge fund is long the bond and short the underlying equity, and will close out the short when the bond is converted to a long equity position. In merger arbitrage, the hedge fund is long the target and short the acquirer, and closes the short when the target shares are converted into new acquirer shares. The universe of equity lending activities also includes facilitating the settlement of market-making activities and hedging derivative underwriting, but the common denominator is providing short exposure to individual securities or portfolios of securities.

Hedge funds were very successful when the dot-com bubble burst in 2000, having taken on the correct short positions for their investors in companies that subsequently declined because of a lack of a sustainable business model. This accelerated the growth of hedge fund assets under management, and the leverage employed, until the financial crisis in 2008. With lacklustre performance after the financial crisis, and lower leverage employed, the demand for equity lending from hedge funds has been on a declining trend in the last decade.

Securities lending transactions are, for the most part, intermediated by prime brokers. There are two primary reasons for this, and both relate to the limited resources of the beneficial owners and the borrowers. First, in the same way that many lenders outsource their securities lending trading and operations to an agent lender, most hedge funds will rely on a prime broker to manage the operational aspects of these activities. Second, most prime brokers will service hundreds of hedge funds. Most pension funds are bound by mandate to deal only with rated entities as counterparties and do not have the resources to conduct thorough credit analysis in any scalable way. Prime brokers offer them an intermediated route to connect to the aggregated demand of their hedge fund clients. For their part, the prime brokers specialise in creating both operational and relationship networks. Along with the agent lenders, they provide the infrastructure for the ultimate lenders and borrowers to access the market.

Market development

In co-ordination with our agent lender, we have been among the first investors to develop securities lending infrastructure in several equity markets. When a traditional securities lending infrastructure has not been available, we have developed a synthetic lending programme to utilise our inventory. Many of these emerging markets have bespoke processes and strict regulatory penalties around trade fails. This has introduced additional operational risk, and we have developed internal controls around trade execution and recalls to ensure timely settlement.

In 2001, five emerging markets were added to the index portfolio: Brazil, Mexico, South Korea, Taiwan and Turkey. We sought to include these markets in our agency lending programme. We started lending in South Korea in 2002. Taiwan, Greece and Brazil did not have a traditional securities lending infrastructure, so we introduced synthetic lending in these markets in 2005, 2006 and 2007 respectively.

As active securities lending and derivatives markets have been important criteria when index providers determine whether a market is classified as developed or emerging, local exchanges and regulators have been incentivised to develop the securities lending infrastructure. This, combined with the addition of further emerging markets to the equity index in 2008, allowed us to expand our agency lending to Thailand, the Czech Republic, Poland, Turkey, Hungary and Ireland in 2007 and 2008. As the securities lending infrastructure developed, we were able to transition from synthetic lending to agency lending in Greece in 2008, Taiwan in 2009 and Brazil in 2011. We introduced agency

Chart 167 Number of active equity lending markets.

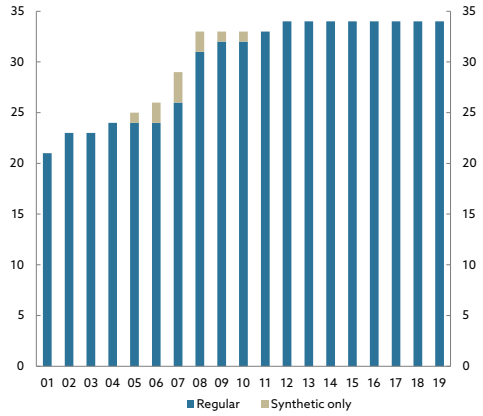
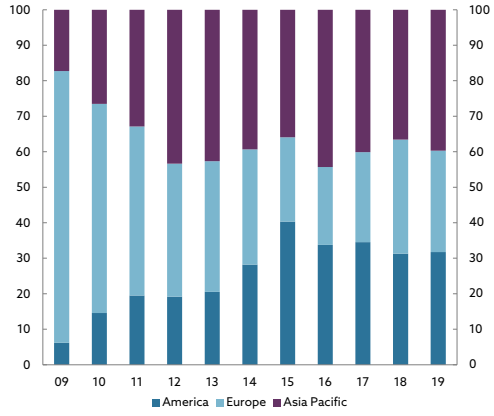
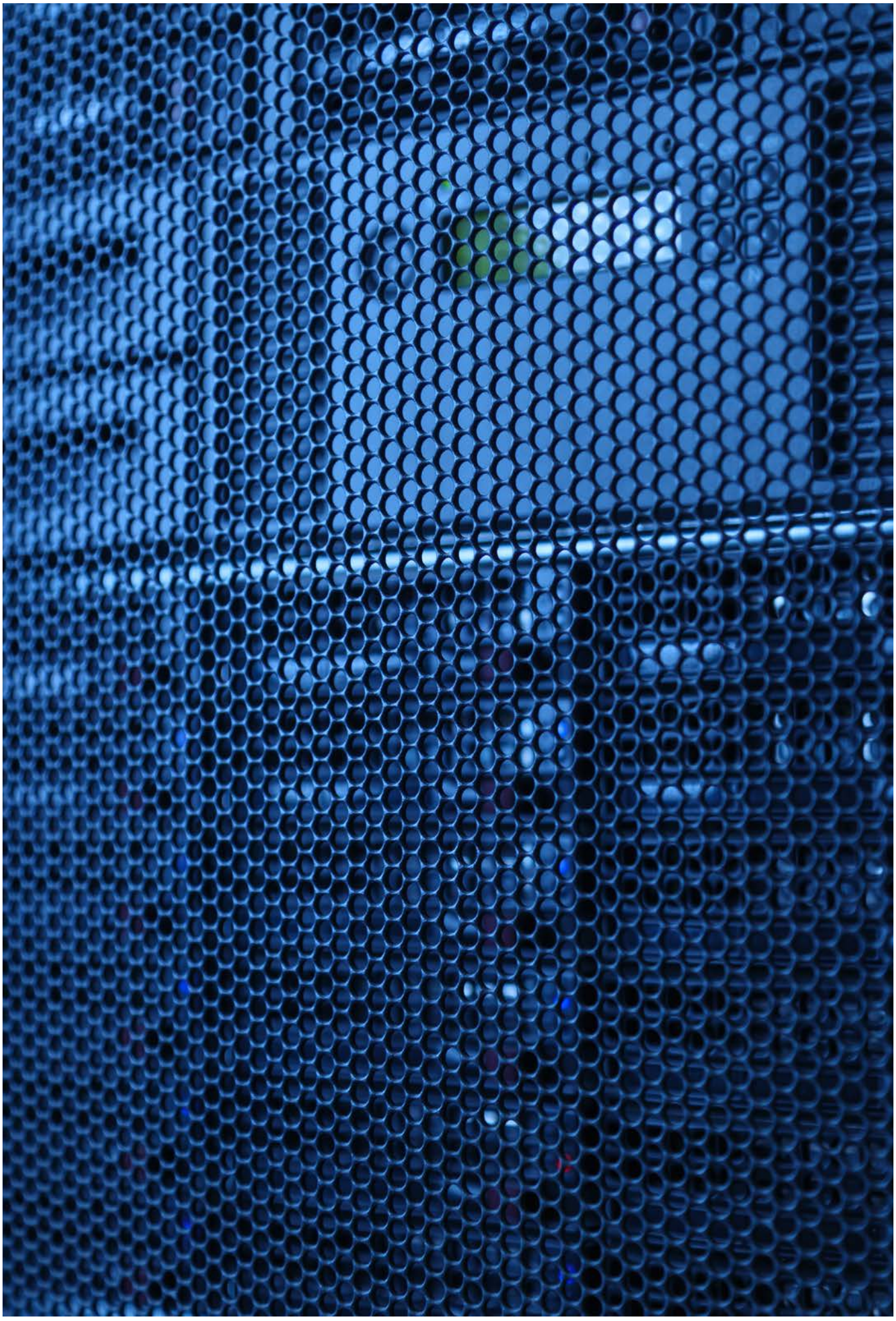


Chart 168 Market value of equity loans. Regional share. Percent.





lending in Malaysia in 2012 and in Russia in 2013, although the latter was then suspended due to international sanctions.

The early adoption of new markets has required greater interaction between the securities lending, portfolio management and trading teams, as some markets have introduced requirements with high operational complexity. However, being able to start lending in these markets early has enabled us to capture a large share of demand and produce outsized returns on our inventory.

In November 2011, during the European debt crisis, we decided to recall all euro-denominated securities from lending and remove them from the collateral sets given the seriousness of the situation. Our equity lending balances were reduced by more than 35 percent within three weeks. We reincluded euro-denominated assets in the lending programme in February 2012.

In certain markets, the local regulator will classify equity loan transactions as portfolio sales, and collateral transactions as portfolio purchases, for reporting on ownership thresholds. A separate regulatory compliance team has developed monitoring tools to report on the combined investment, collateral and loan positions in individual securities according to local regulatory rules.

This reporting is both time-consuming and costly, as there are fees attached to reporting submissions. In addition, the public nature of this information can be a source of confusion for both the relevant company management and the market, as automated news feeds may flag that we have increased or decreased our holding in a company when, in reality, our economic exposure has not changed. To manage this, we work with our compliance department to avoid triggering relevant reporting thresholds through collateral and lending transactions. This can, in extreme cases, lead to the exclusion of entire markets. For example, we have decided not to accept the shares of companies incorporated in China as collateral, as certain ownership thresholds could subject us to a six-month lock-up.

The lending team

We tend to recruit based on potential rather than experience. Securities lending is a microcosm of investment management and rarely receives a mention in any financial curriculum. The pool of experienced talent from agent lenders and prime brokers is reasonably deep in some financial hubs, but absent elsewhere. In addition, being a lean department within a lean organisation, we favour candidates with a technical and quantitative skillset. Combining these skills with relevant experience results in a limited list of candidates. Instead, we focus on recently educated applicants and train them to be securities lending experts through practical experience over time.

As we started investing in equities, the responsibility for securities lending was a task assigned to the trading and portfolio management departments, without a formal allocation of resources. In 2002, we initiated a project, organised by the trading team, to provide input on the strategic alternatives for our securities lending. We considered the risk, return, infrastructure and organisational impacts of our options. This resulted in the launch of our exclusives strategy in 2003 but did not result in a full-time position until 2006, when securities lending was combined with index portfolio management. We added a second position in 2007, extending coverage to Asia. Over the following years, we combined other, related

Chart 169 Number of securities lending team members.

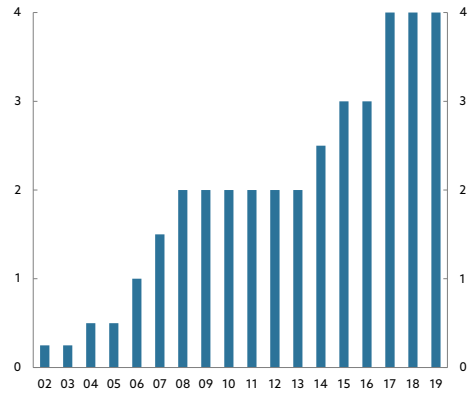
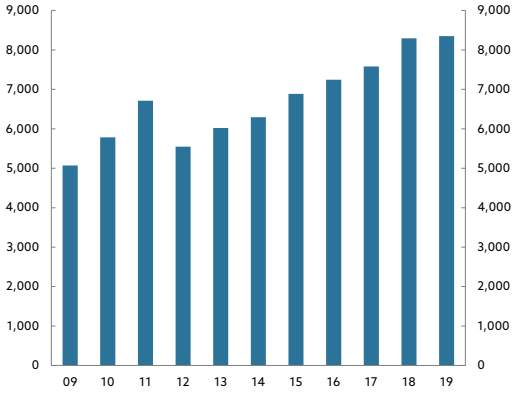


Chart 170 Number of securities lent out.



activities into the group: cash management and fixed-income lending, including repos. This has created an investment department, Financing, covering all aspects of lending and treasury for the fund's equity and fixed-income portfolios. The department totals nine full-time employees globally.

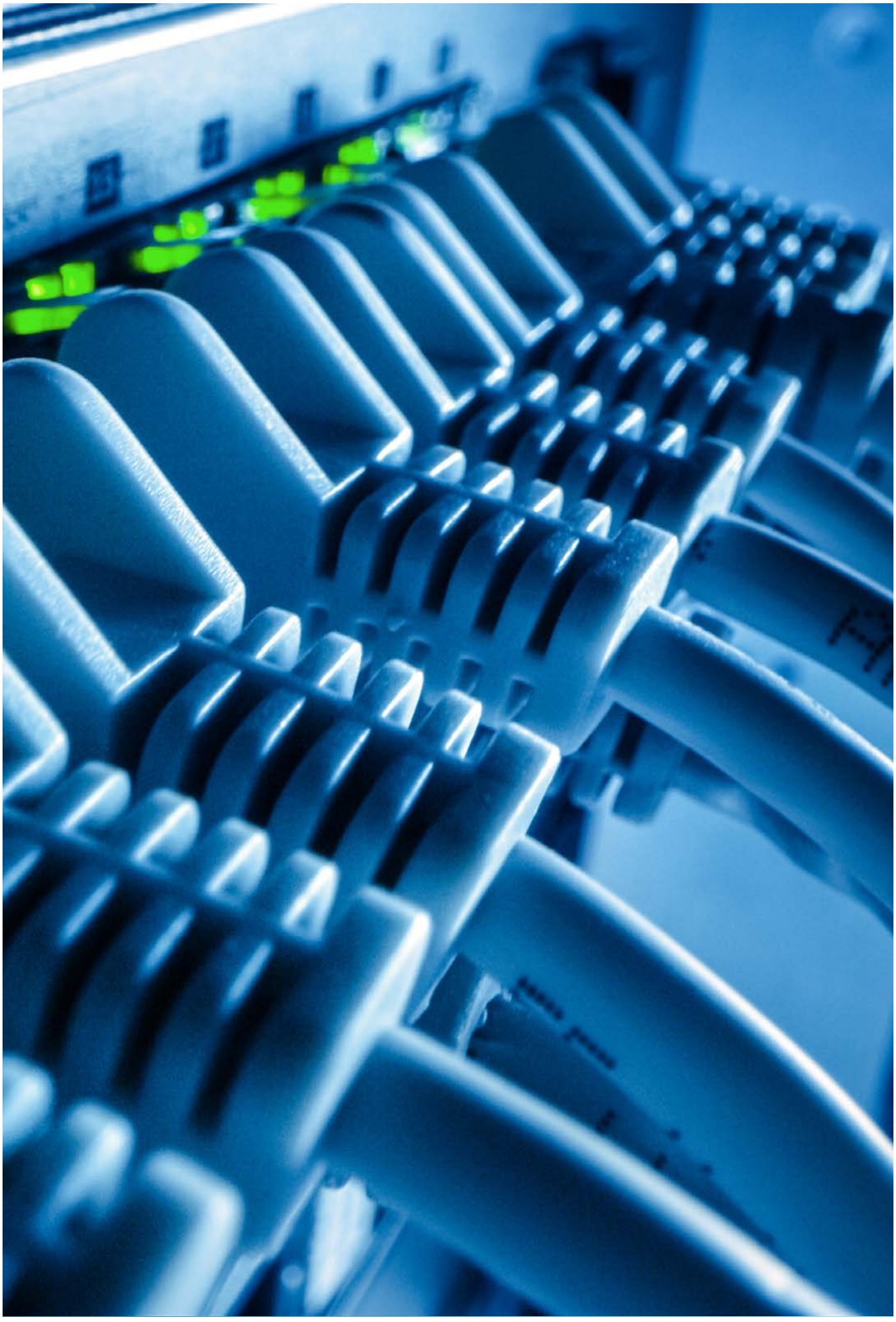
Our securities lending team ensures global coverage. From an initial model where the entire securities lending team was based in Oslo, we have evolved to have regionally based team members interacting with our agent lenders' local trading desks. This evolution has been consistent with the model for trading and index portfolio management, which is also regionally based.

We have managed our securities inventory in close co-ordination with the index portfolio managers. This allows us to lend a greater percentage of our securities inventory, as we can control trading to avoid failed settlement. This has been especially important in emerging markets, where the cost of failing a trade is high and subject to regulatory scrutiny, but the margins on securities lending are higher. By working with the relevant index portfolio managers, we define parts of our lending inventory that are stable and thus conducive to term lending transactions, thereby locking up some of our holdings in exchange for higher securities lending revenue. We also work with the index portfolio managers on corporate action elections. This allows us to ensure that these decisions are reflected in the lent position. We also ensure that, in cases where we are not active for parts of our inventory, we capture the appropriate upside through lending.

Our team members are the liaison between our internal portfolio management and trading functions and the securities lending market. They monitor operational risks (settlement, corporate events) and agree term lending transactions with local portfolio managers. Our local team members are responsible for counterparty relationships and researching new strategies. Counterparty risk is managed at the global level, but regional team members are responsible for understanding and communicating how their own trading decisions contribute to the overall portfolio of risk.

The lending team performs these activities in close collaboration with our internal operations, legal, compliance and risk teams, and in close dialogue with our agent lender. As we have developed new securities lending enhancements, our ability to adapt to changes faster than other large organisations has been a key success factor.

Finally, lending team members are responsible for product development. As we build and maintain our own trading and risk management tools, this is often technical in nature. Lending team members work closely with our technology and operational experts to develop and implement these changes. Our experience with this model has been very good. We find that when we combine the developer and trading roles, individuals are motivated and find practical solutions to make them more efficient traders.



The lending management

We seek to maximise our return on security lending subject to acceptable risk. Ownership and regulatory matters will impact our management strategy.

The risk management
While the securities lending strategy brings steady excess returns to the equity portfolio without any day-to-day market risk, we are exposed to counterparty default risk, and we manage this risk actively. There are two orders of risk in a securities lending transaction. The first is counterparty credit; the second is collateral. In order to sustain losses in a securities lending transaction, the borrower must first default on his obligations, and then the proceeds from the sale of the collateral must be insufficient to repurchase the lent securities.

As we took a more active role in our securities lending programme from 2003, we were early to focus on the importance of risk management. As securities lending was largely covered by counterparty default indemnification, it was considered a zero-risk activity. We requested regular data on securities lending revenue and the associated counterparty exposures, eventually collecting automated data feeds to monitor our exposures.

Indemnification
Indemnification is a type of insurance offered by agent lenders to their clients to protect against a collateral shortfall in the event of a counterparty default. In the past, this typically only covered securities lending transactions collateralised with cash or government securities.

When we received approval for equity collateral in 2005, this was not covered by agent indemnification, a risk that we chose to accept. By offering indemnification, the agent lender is underwriting the risk of the securities lending programme. As we continued to expand our lending strategy into different areas, this often delayed the implementation of new trades. The agent understandably needed to assess this risk versus its own expected return from agency fees.

To ensure we remained in control of the development of our securities lending programme, and to marginally reduce costs, we decided to discontinue all indemnification from our lending agent in October 2016. The balance sheet constraints of our securities lending agent, also affected by more stringent regulatory requirements, would otherwise have hampered the development of new products and trade structures. This transition to insourcing all securities lending counterparty default risk was the result of several years of work to build a data structure and portfolio monitoring tools for securities lending exposure. We took these steps incrementally, and only once we had developed the expertise and tools to manage these risks ourselves.

Counterparty

Many lenders employ counterparty selection as the bedrock of their securities lending risk management. They leverage the credit analysis of their fixed-income investment department to determine and maintain their lending counterparties. Norges Bank has an independent team that sets guidelines, conducts due diligence and approves and monitors our counterparties. However, our securities lending strategy does not rely on the ability to quantify or rank the financial stability of banks any better than public markets. On the contrary, once counterparties are approved, the securities lending team first treats their credit as equal, and then quantifies the risk of the relationship based on the characteristics of the assets in the respective loan and collateral portfolios. We are, however, very aware that most of our counterparties have highly positively correlated risk characteristics. Like the hedge funds on the other end of the lending spectrum, we have diversified our securities lending counterparties since the financial crisis, but they are still mostly banks.

The Lehman Brothers default on Monday 15 September 2008 was a critical moment for the securities lending market. At the time, we had 1.1 billion dollars in outstanding equity loan transactions open with Lehman Brothers via our agency lending programme. When Bear Stearns failed in March 2008, Lehman Brothers was also seen to be vulnerable due to its similar financing model. As a result, we removed Lehman Brothers from our counterparty list. We followed this up with onsite due diligence meetings at the bank's London offices. Impressed with the

Chart 171 Number of equity lending counterparties.

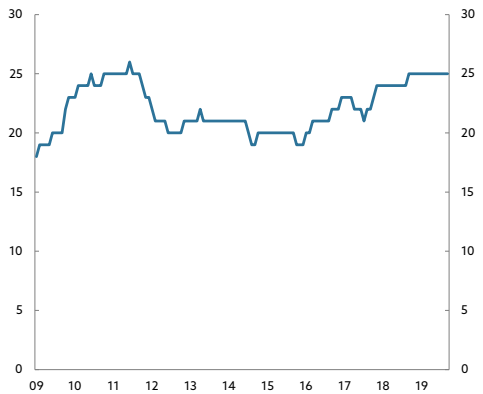
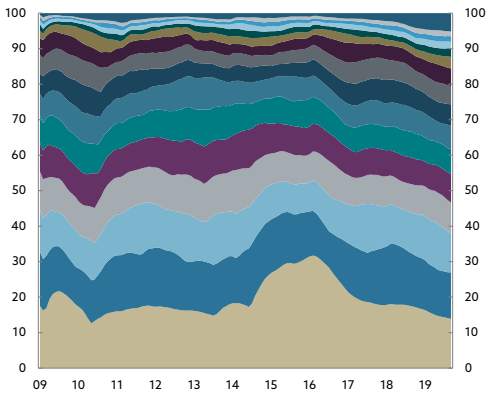


Chart 172 Equity loan exposure by rank of counterparty. 12-month moving average. Percent.



quality of its prime brokerage technology, risk management professionals, margining processes and controls, we added it back to our counterparty list a month later – five months prior to its eventual failure.

With hindsight, we had assessed only the equity business and not the culture, controls and risk management practices of the entire entity to which we were exposed. This was admittedly naïve, and our internal capabilities in counterparty due diligence have evolved significantly since then. However, our opinion is that bank entities are too complicated for outsiders to conduct any meaningful credit analysis. We therefore focus our efforts on the asset risk of a relationship.

Collateral

The focus of the securities lending department – the ultimate owner of the counterparty default risk – is on the underlying asset risk if a counterparty defaults. Our considerations for managing this risk include the hedging quality of the collateral portfolio and the market impact of unwinding it in the event of a counterparty default. In effect, we actively manage a portfolio of equity exposures, knowing that we would need to liquidate it quickly if one of our counterparties defaults.

From 1998 to 2005, we received mostly cash and government securities as collateral for our equity loans. This corresponded to the best practice in the market, as it exposed lenders to "right-way" risk. The market assumption was that lenders would prefer to be long government collateral and short equity loans in the event of a counterparty default. This would leave them well protected if the equity market sold off during the counterparty default.

In a departure from market practice, we approved equity as collateral in 2005. Our reasoning was that this would not only provide additional returns but also be a better hedge than government securities for an equity loan portfolio. We did not know if a counterparty default scenario would be accompanied by an equity market sell-off, or an inflation shock sending equity prices up. As such, we preferred to take the risk-neutral approach of finding the best hedge for the equity loan portfolio rather than predicting the direction of asset prices in the next crisis – exposing us to "like-for-like" risk.

Considering the risk of an equity market sell-off during a counterparty default, we also recognised that we would be significant buyers of equities in such a scenario, as we would rebalance the fund towards its strategic equity weights. Hence, we would not necessarily need to sell the equity collateral received in the market.

In addition, we took the view that the breadth of our loan and collateral book provides risk advantages as it creates a well-diversified portfolio of asset risk in the event of a counterparty default. A significant portion of our lending book is allocated to international prime brokers who service hedge fund clients across the globe. The majority of these borrowers have active loan and collateral positions in every market we have approved in our programme. This often means that an incremental trade can reduce the total counterparty portfolio of risk by further diversifying the portfolio or even offsetting existing risk exposures.

This is the primary reason why we have rejected industry initiatives to route securities lending transactions via central counterparties (CCPs). Their fragmented structure detracts from a diversified, nettable risk portfolio by creating

silos of segregated risk exposures for the lender. In addition, we have not been comfortable outsourcing our investment risk management as a matter of principle.

In the event of a counterparty default, we would have to sell our collateral portfolio in the market and buy back our loan portfolio. Because of this, we have only accepted collateral that is within our investment universe, knowing that we can execute an unwind efficiently.

The expected cost of such a transition is not just determined by the volatility of the assets and their correlation, but also by their liquidity. We must consider two important aspects of our lending programme to assess this. The first is size. Our loan and collateral portfolios are measured in the tens of billions of dollars, and single positions often comprise several percent of the outstanding shares of individual companies. We expect there to be significant market impact, especially in a time of crisis, when unwinding these positions. The second is that we have observed in past crises that certain asset classes become very illiquid. This has kept us from accepting corporate debt as collateral in any meaningful way.

When Lehman Brothers defaulted in September 2008, 20 percent of our outstanding equity loans were collateralised with equity securities and therefore not covered by our lending agent's default indemnity. Our unindemnified loan portfolio with Lehman Brothers amounted to 223 million dollars, for which we had received sufficient equity collateral.

We started trading out of our Lehman exposure early, during European market hours on 15 September, as global equity markets fell by more than 3 percent. By the close of US trading the following day, more than 90 percent of our exposure to Lehman Brothers had been unwound. We traded more than 400 million dollars during those two days to buy back our loan positions and sell our collateral, with one priority: recouping our exposure without incurring losses larger than our excess collateral.

In the midst of high market volatility, the stocks we were trading to unwind our positions were even more volatile than others. In addition, our collateral and loan portfolios were not matched regionally, as most of our loans were in Japan, while the majority of our collateral was in Europe and America.

When the default transition was complete, the collateral proceeds exceeded the value of the equity loan transactions by 16 million dollars, with the surplus being paid back to the Lehman administrator in 2014.

This event proved the robustness of the secured lending model as well as our model for equity collateral, which, although volatile, remained tradeable in a market where other asset classes were not, and ultimately a good hedge for our equity loan exposure. The collateral positions we received, corresponding to the long side of hedge fund portfolios, proved to be easier to liquidate than we had feared, probably as some funds were looking to buy back these holdings.

Chart 173 Equity loan balance. Effect of euro recall and minimum fee. Billion dollars.

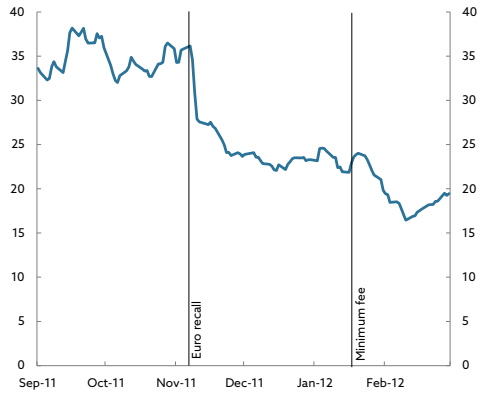


Chart 174 Average fee and minimum fee threshold. Percent.

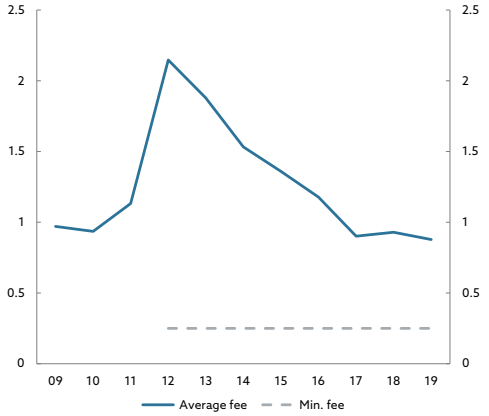


Chart 175 Lehman Brothers default. Unindemnified gross exposure (loans and collateral). Million dollars.

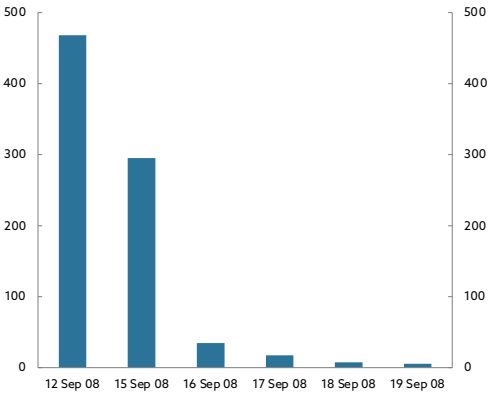
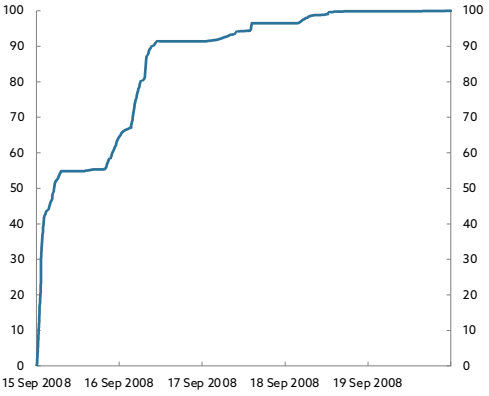


Chart 176 Lehman Brothers default. Share of collateral proceeds liquidated, by minute. Percent.



The cash management
When we receive cash as collateral, we reinvest it in the money markets to earn a yield that covers the interest due back to the borrower. A significant volume of securities lending transactions utilise cash as collateral, particularly in the US. How this cash is invested can significantly change the risk-return dynamics of a programme over time and is therefore an important part of a lending strategy. The reinvestment of cash collateral is typically not covered by agent indemnification. We have chosen to reinvest cash collateral from equity loans conservatively in money markets to avoid increasing the fund's exposure to risky assets.

In the period leading up to the financial crisis in 2008, the reinvestment of cash collateral became an increasingly popular vehicle for lenders to increase their returns. Securities lending desks became significant investors in commercial paper, corporate debt and asset-backed securities. We assessed, but never implemented, a strategy to increase returns from the reinvestment of cash in equity lending transactions. In 2005, approval was given for a short-term bond fund, but this was never executed as part of the agent lender's mandate. We acknowledged that our equity lending department did not have the expertise to manage what was, in reality, a leveraged fixed-income portfolio. This decision was significant and set us strategically apart from many of our industry peers at the time.

Our reinvestments have been conservative and primarily limited to short-term reverse repos, a low-yielding but fully collateralised money-market instrument. Historically, we have had some small direct investments in certificates of deposit (CDs) and bank deposits, but these were removed completely from the agent lender mandate in 2008. The contribution from our reinvestment of cash collateral has been positive, but immaterial, in each period since inception.

Although we have not implemented a cash reinvestment strategy to enhance returns from our equity lending activity, we have implemented changes to how we utilise cash collateral at the fund level. In 2016, we began to insource the management of cash collateral derived from the agency securities lending business. The bulk of cash collateral is transferred from our lending agent to a custody account where it can be combined with the overall treasury/cash management function of the fund as a whole. This creates operational efficiencies by minimising market transactions as well as risk and cost savings where we have offsetting funding needs.

The ownership management
Our participation in the equity lending market requires us to balance the returns generated with the need to act as a responsible investor by exercising our voting rights. Since a beneficial owner cannot vote for shares that are on loan, we must recall them if we want to vote at a shareholder meeting. We also need to maintain our relationship and dialogue with the companies we are invested in.

It is not straightforward to balance the costs of lending restrictions with the value of voting. As the fund owns small minority stakes in companies, it is difficult to predict the impact of our vote. In addition, the benefit to shareholders of individual votes is likely to be realised over a very long horizon versus the daily revenue accruals of a securities lending programme.

As most of our votes are in favour of company management and likely to pass, our communication with the company becomes

very important. Most public companies have become familiar with securities lending and are aware that this revenue is critical to the business models of some of their largest shareholders, the large index managers. We believe that lending and voting can co-exist in this environment if we are transparent with management that we will lend our shares, but that we will recall and vote them when we deem it necessary and impactful to do so.

Our first step to reconcile voting and lending has been never to lend our entire holding. This has ensured that we receive corporate action notifications and are always able to cast a vote at a shareholder meeting, which we have done, in a systematic and principles-based manner, for all the companies in our portfolio since 2005.

One solution to apply our voting policy would have been to recall all securities prior to their individual record dates. For small funds this would be operationally intensive but may be achievable unless all other funds in the agent lender's programme follow the same process. In practice, the agent would substitute loans from the smaller lender with unutilised inventory from larger lenders in the programme. Even if this practice led to recalls of loans, the market could absorb these to some extent.

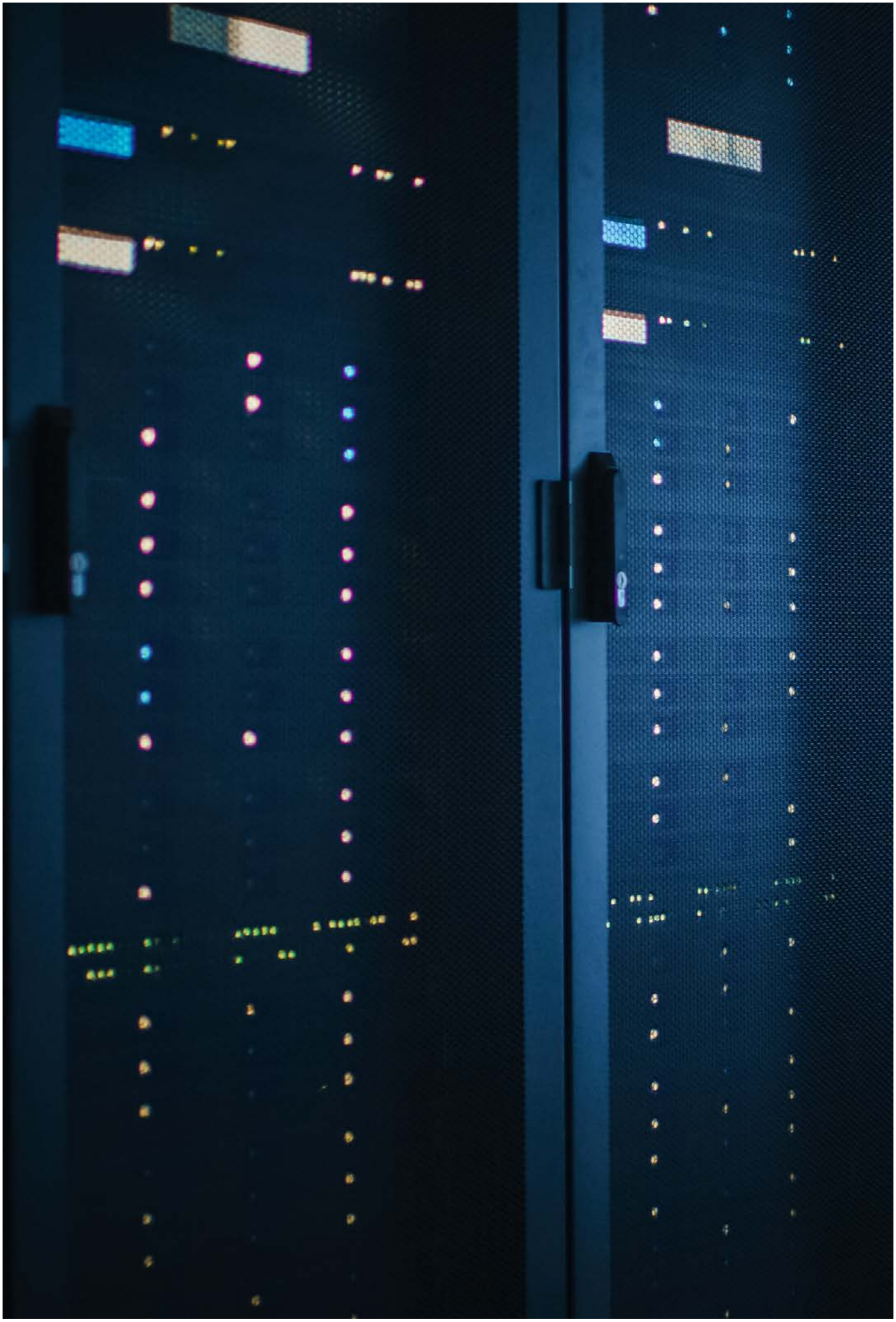
This same process would prove very disruptive to the market in the case of our lending programme. While the fund owns 1.5 percent of listed equities globally, we estimate that on average we manage 5 percent of the available inventory for equity lending transactions in certain regions. As a result, we cannot employ a corporate governance strategy that involves moving our large supply in and out of the securities lending market.

To solve this, we maintain a list of companies where our portfolio managers and corporate governance analysts are engaged in a potentially impactful vote. We keep these companies completely out of the lending programme. This avoids a recall with potential market impact at a critical time for the company. The list of such restrictions is reviewed twice a year, and on average there are 100-200 securities that we restrict from lending at any given time.

Additional governance issues will arise throughout the year, prompting ad-hoc voting requests from portfolio managers and analysts. We will review the on-loan position with our agent and determine the market impact of the recall, relevant record date and appropriate timeframe before reverting to the corporate governance team with feedback and a recall plan.

When we decide to recall shares that are out on loan to ensure we can vote our shares, the fund bears an opportunity cost. The monetary cost is merely the annualised fee spread over the recall and voting period until the shares can be lent out again. However, this also inflicts an unwanted cost on the borrower. In addition to the operational cost of substituting positions, the size of our positions in the market makes it reasonable to believe that the borrower will have to refinance the position at a higher fee. This has a tangible impact on our relationship with the borrower and ultimately affects our attractiveness as a lender over the longer term.

As the evolution of our enhancement and risk management strategies reduced our lending volumes between 2010 and 2012, a positive side-effect was that a larger portion of our inventory became available for voting.



The lending enhancements

We developed a more active securities lending strategy after we insourced index portfolio management in 2001. This entailed a more efficient use of our equity holdings.

In the fund's early years, we adopted a passive approach to securities lending. We appointed JP Morgan, the fund's equity custodian at the time, as our agent to administer the securities lending programme. It was given a mandate to lend the fund's equity portfolio on a best-efforts discretionary basis subject to various risk management constraints, including a set counterparty list, cash reinvestment guidelines, collateral requirements and indemnification of all loans against counterparty default.

After insourcing index portfolio management in 2001, we could take a more active role in our securities lending. When the portfolio was managed externally, there were limits to the operational collaboration between the index portfolio manager and the agent lender. The agent lender needs to be kept abreast of trades in the portfolio in order to manage recalls of loans. The common practice is to send all instructions once per day after the market closes. Having insourced the management, we were able to update our agent lender with our positions multiple times per day. This has allowed a more efficient use of our inventory, particularly in the case of high-value securities.

Exclusives (2003)
Starting in 2003, we took a more active role in our lending of securities. We established direct relationships with our counterparties to understand what their needs were. With this understanding, we could offer them a differentiated product, earning more revenue for the fund. We have continued to have an active dialogue with our counterparties in order to spot market opportunities.

In collaboration with our agent, we developed a model to auction exclusive access to our equity lending portfolio. Exclusive access offered borrowers the right to borrow securities from a defined part of the fund within a specified period, typically one year. The value from the borrower's perspective came from access to large positions across a broad portfolio, which allowed prime brokers to market a captive supply to their hedge fund clients. Initially, the auctions were executed on a regional basis. In Europe, the region of strongest borrower demand, the auctions were further refined to individual countries.

Securities lending is an over-the-counter market which, at the time, offered lenders little transparency into pricing. This made the auction model an attractive proposition for price discovery. With limited insight into how prime brokers priced transactions for their underlying hedge fund clients, we could use a competitive

auction to achieve the fair market rate for designated exclusive portfolios. We initiated research into auction theory with the aim of constructing the appropriate strategy. The academic literature predominantly pointed to equivalent outcomes regardless of the auction strategy.

While we did not expect the choice of auction strategy to influence outcomes, we saw that we could achieve better results by adapting the auction process to the demand in the market. The more ways we could segregate the assets being auctioned, and the greater the number and variety of bidders we could invite, the better the general outcome. Finally, the auction must be seen to be fair by the bidders. Regarding the first point, there were practical limitations on how we could offer exclusive portfolios, but when we started offering country exclusive portfolios in Europe in 2004 and in Asia in 2006, we saw significantly better results. As for inviting bidders, we maintained a modest list of approved counterparties, but these included most entities offering international prime brokerage.

As a result, we put a lot of effort into the final point, namely good communication with borrowers around the structure and process of the auction. Some of the feedback we received before initiating the auctions was from borrowers frustrated that exclusive portfolios offered by other investors were not always awarded to the best bid but overridden by institutional relationships between lenders and preferred borrowers. To address this, we assured borrowers that, within our approved counterparty list, exclusives would be awarded to the best bid. In addition, we followed up each auction by providing quartile bid feedback to all borrowers who presented a non-zero bid.

The auction strategy earned a premium over fees earned under the discretionary lending model, but also resulted in an increase in the utilisation of the portfolio and the associated counterparty exposure. Due to our agent's use of an algorithm to decide how to allocate incoming lending demand, we did not get a clear view of whether our portfolio was sufficiently utilised. By circumventing the agent's allocation algorithm, we were able to achieve higher utilisation through the exclusives process.

However, we continued to rely upon our securities lending agent for operational processes, systems infrastructure and programme administration. We considered it to be inefficient, from both a cost and an organisational perspective, to develop the necessary operational capabilities internally.

After the financial crisis in 2008, prime brokers were generally reluctant to commit to prefunding products and transactions that are subject to regulatory capital requirements and decreasing hedge fund leverage. As a result, we allowed the last exclusive portfolio transaction to roll off in 2010.

Equity collateral (2005)
In 2005, we expanded the securities lending programme to accept equity collateral on an unindemnified basis. Since lending was integrated into our equity investment activities, we had the internal capabilities to manage these risks. Databases, systems and trading personnel were well equipped to monitor these exposures and, in the event of a counterparty default, to trade the positions directly in the market. We felt that equity collateral was a better risk-neutral hedge for an equity loan portfolio and offered additional revenue by differentiating our lending product. In addition, we could demand a higher haircut for equity collateral than for cash or government bonds.

The business case to develop an equity collateral product followed naturally from how prime brokers offer leverage to their hedge fund clients. Prime brokers hold client-leveraged long positions on their balance sheet as security against the cash loans they have provided to purchase those securities. As a prime broker is just a credit intermediary, it then needs to finance these positions in the market.
By offering securities lending combined with equity collateral, we could cover the entire financing and leverage needs of prime brokers' long-short equity clients. However, by taking on this additional exposure, we were positioning ourselves in the same direction as leveraged hedge funds in the event of a counterparty default, where the hedge fund longs would become our longs, and their shorts would become our shorts. We recognised this risk in principle at the time, but it became abundantly clear during our management of the Lehman Brothers default. We saw that demand for these shares was unusually high in this default situation, making the liquidation easier. This strengthened our case for receiving equity collateral.

Being an early adopter of equity collateral, we ensured that we received higher fees from our borrowers. By accepting a broad range of equity indices as collateral, we became a source of liquidity where prime brokers could finance a large cross-section of their client long and short positions. We were also able to differentiate ourselves as a lender, thereby avoiding some of the agency risk we saw in the agent lender model. Adding equity collateral as a component to our exclusive auctions contributed further.

In hindsight, and without transparency into the prime brokerage client fee model, we believe we priced this offer too cheaply in the first few years. In addition, we could probably have demanded a higher haircut. However, we achieved our main objective of "like-for-like" risk exposure accompanied by higher fees. Over time, the securities lending market evolved in our direction. Generalising the use of equity collateral eventually allowed us to abandon the agent indemnification programme in 2016, increasing our share of securities lending revenue.

Synthetic lending (2005)
In 2005, we also expanded the securities lending programme with the development of synthetic lending through the use of derivatives known as contracts for difference (CFDs) for the Taiwanese market. As the Taiwanese equity market did not have a developed local securities lending market, we became the largest supplier of Taiwanese equity inventory. In the first year, we earned outsized returns on our Taiwan portfolio. This is an example of the economic benefit of being early with respect to market developments.

A CFD is a contract between two parties, typically described as buyer and seller, stipulating that the seller will pay to the buyer the difference between the current value of an equity security and its value at contract time (if the difference is negative, then the buyer pays instead to the seller). In effect, CFDs are financial derivatives that allow traders to take advantage of prices for the underlying financial instruments moving up (long positions) or down (short positions) without the need for ownership of the underlying shares.

We have transacted CFDs to synthetically replicate an equity securities lending transaction without the use of an agent. These instruments have been used either where it is more profitable for us to transact directly with borrowers, or in markets where traditional securities lending infrastructure has not been developed.

Following a successful launch in Taiwan, we expanded our synthetic lending activity to Greece in 2006 and Brazil in 2007. We continued to work with our agent during this time on market development, and eventually converted these positions to traditional securities lending transactions in the agency programme: Greece in 2008, Taiwan in 2009 and Brazil in 2011.

We ultimately terminated the synthetic lending product in its entirety due to complications in the operating model. The lack of standardisation by CFD providers required a manual approach to critical processes across the trade lifecycle, such as asset servicing, margining, financing resets and position reconciliation. The synthetic lending strategy via CFDs was revived in 2016, but with different demand drivers and a focus on creating a robust operating model.

After the financial crisis in 2008, securities lending margins continued their downward trend. Both utilisation and fees declined, as a result of reduced demand from an underperforming hedge fund industry and more lending supply from an increasingly consolidated asset management industry. Prime brokers focused on reducing their balance sheet costs from regulatory requirements, and large hedge funds aggressively negotiated down their financing and securities lending fees.

To maintain revenue from securities lending in this challenging market environment, we focused on developing a balance-sheet-efficient offer for our existing counterparties. We reintroduced synthetic lending via CFDs in 2016. After implementing minimum fees in 2012, we had made little use of our large-cap holdings in securities lending transactions. Reintroducing synthetic lending allowed us to redeploy this inventory at an enhanced yield to traditional overnight lending transactions.

To achieve this, we re-engineered our operating model for managing CFD positions. During the period from 2005 to 2011, we had targeted emerging markets lacking appropriate securities lending infrastructure. In 2016, we shifted our focus to low-fee holdings in developed markets. Under Basel-type bank regulation, derivatives

Chart 177 Synthetic lending. Share of equity loans. three-month moving average. Percent.

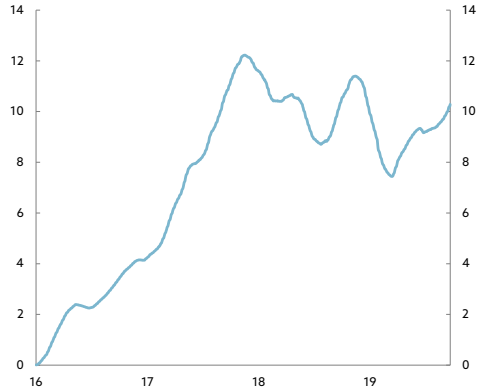


Chart 178 Synthetic lending. Share of equity lending revenue. Percent.

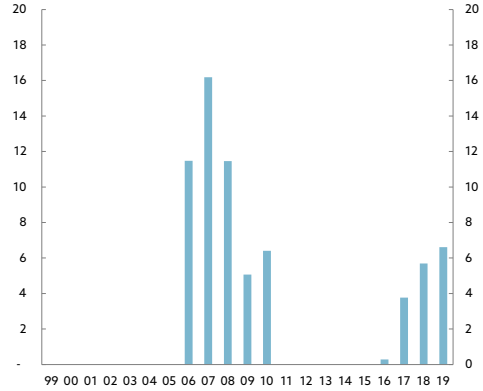


Chart 179 Synthetic lending. Number of markets.

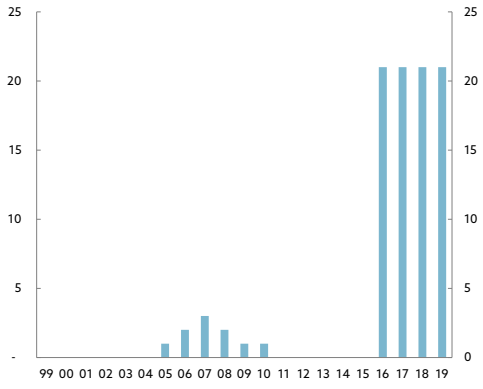
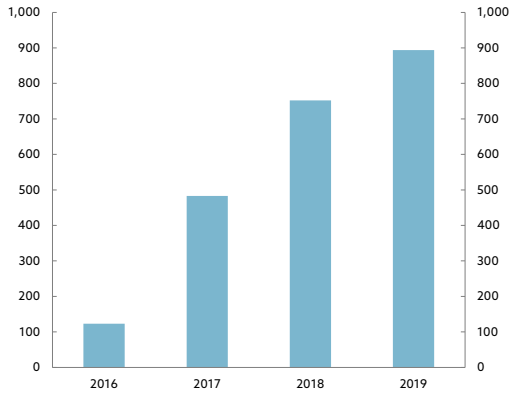


Chart 180 Synthetic lending. Number of unique securities.



contracts attract no regulatory capital requirement if the exposure is offset. The prime broker essentially intermediates a transaction between two clients, for example Norges Bank as the long on the one side, and a hedge fund short on the other side. Through synthetic lending, the associated asset and liability do not impact the regulatory capital treatment on the bank's balance sheet.

Term lending (2014)
In an effort to increase the utilisation of, and revenue from, our inventory, we started offering equity term loans in 2014. In exchange for a premium to the overnight lending fee, we could lend agreed security holdings on the basis that they would not be recalled or rerated over the course of the agreed term. The additional value was based on providing position stability and price certainty to the borrower. This was implemented in practice by agreeing a methodology with the index portfolio managers to identify their long-term core index holdings, and then encumbering an agreed proportion of those in our internal portfolio management system to prevent portfolio managers from entering sell orders until the expiry of the stated term.

Term loans are generally agreed with one-, three- or six-month tenors, and on portions of our inventory that would not have been lent otherwise because of our minimum fee. For the index portfolios, this is generally seamless, as we have identified and lent holdings that we expect to hold for a very long time. These term loans achieve higher lending fees than regular overnight lending. For parts of our inventory where our minimum fee requirement has kept us from lending, term loans have allowed us to achieve acceptable lending fees. Accordingly, the use of term loans has increased the size of our equity loan book, and thereby our total lending revenue.

In the case of some corporate actions, term loans also allow us to capture a significant share of the corporate action upside through lending. Such term loans achieve significant lending fees for a period of time ranging from a few weeks to a few months. They are used by hedge funds seeking to earn excess returns on certain types of corporate actions, such as tender offers or rights issues. Given our active corporate action strategy within the indexing strategy, we can choose to participate in the corporate action strategy internally, or lend out our holdings – or a mix of the two. In this context, we have worked closely with the index portfolio managers and our counterparties to achieve the most efficient strategy and pricing of our term loans.

To facilitate increased use of both term loans and synthetic lending, we integrated our securities lending activity more closely with the portfolio management process. These developments also required more direct involvement in the operational implementation than the agency lending model. The securities lending team was strengthened and expanded regionally to allow for timely interaction with the securities lending agent, borrowers and internal portfolio managers, as well as execution of synthetic lending transactions.

Chart 181 Term lending. Share of equity loans. Three-month moving average. Percent.

Chart 182 Term lending. Share of equity lending revenue. Percent.

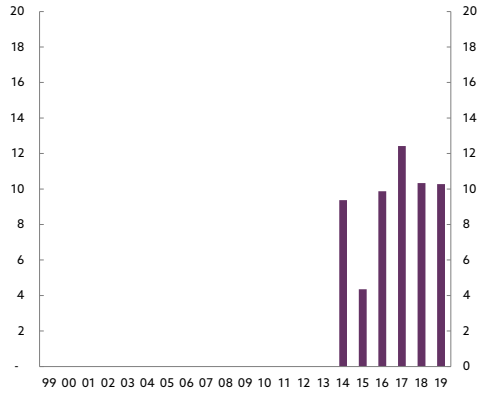


Chart 183 Term lending. Distribution of tenors. Percent.

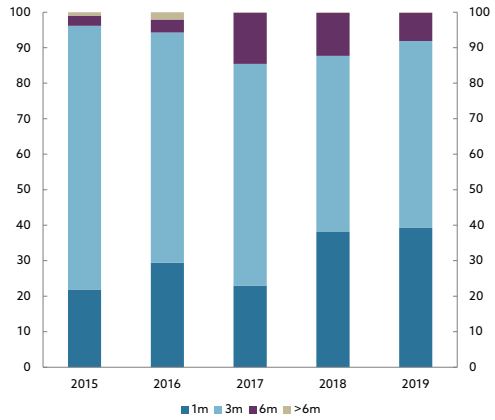
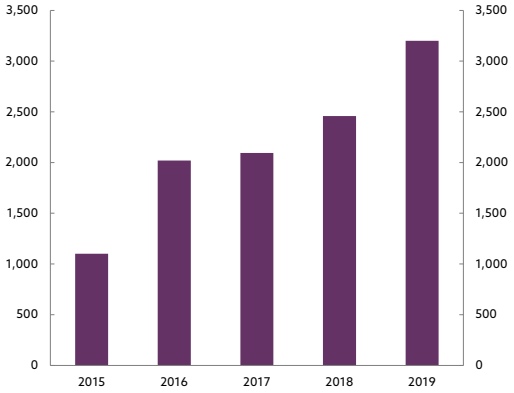


Chart 184 Term lending. Number of unique securities.



Peer-to-peer lending (2020)
In 2018, we took the first steps to expand our lending programme to counterparties beyond prime brokers and lend directly to selected asset managers. As the intermediaries in the securities lending market earn a share of the revenue, the borrowing costs to the hedge funds are higher than the fee passed on to the lenders. By lending directly to the hedge funds, we can earn higher fees, on parts of our inventory that were not utilised because the intermediated fees would have been too low. Disintermediating capital-constrained prime brokers in specific transactions remains a promising avenue to maintain the fund's revenue from securities lending.

Peer-to-peer lending comes with two significant differences from traditional, intermediated lending. First, our counterparty exposure changes, from prime brokers to hedge funds directly. Second, the operational requirements change, as the hedge fund manager needs to internalise its borrowing operations.

With the help of colleagues in our Risk, Compliance and Legal teams, the securities lending department has established a due diligence process for onboarding, documenting and monitoring hedge-fund-type entities. As these counterparties are not rated, our mandate was adapted by the Executive Board in 2019 to allow limited exposure to unrated counterparties. The risk management of our peer-to-peer lending programme is similar to our other securities lending, as we receive equity collateral in exchange for our loans, with a haircut.

Some hedge funds have developed their infrastructure to allow them to handle their securities borrowing operations internally. However, most hedge funds do not have the desire or capacity to internalise these operations, such that we would need to utilise existing prime broker infrastructure to facilitate transactions with a broader base of borrowers.

In 2020, we executed our first equity peer-to-peer transactions with a hedge fund counterparty that can manage its own lending operations and borrow directly from our agent lender. This allowed us to lend out unutilised parts of our portfolio, for a higher fee than our minimum fees.

The lending returns

Equity lending has made a significant contribution to the fund's return. Lending returns have varied over time and have been dependent on continuous innovation in the way we have executed the strategy.

The equity securities lending revenue received by the fund has multiple components. It includes the lending fee paid by the borrower through the agency lending programme, less the agent fee and operational costs. In addition, it includes the yield on invested cash collateral, less the rebate paid to the borrower on that cash. Lastly, it includes the spread earned on synthetic lending transactions using CFDs.

Securities lending revenue has been a significant contributor to the fund's excess return over time, having contributed 8.4 basis points per annum to the equity portfolio since 1999. This translates into a value of 34 billion kroner.

The returns over time
Lending returns have varied over time due to changes in our strategy and fluctuations in demand from hedge funds.

In the initial years, 1999 to 2003, we largely delegated the securities lending programme to our agent, and our returns reflect the average market return. The period of high returns from 2004 to 2008 is indicative not only of our strategic expansion of exclusive portfolio auctions, but also of growth in hedge funds' assets under management and use of leverage.

Since 2008, the annual contribution has been on a declining trend, as the demand for loans from hedge funds has declined, and the securities lending industry has become more competitive.

Starting in 2010, we can compare our returns with the average industry return calculated by the data vendor Markit. We believe the figures below accurately portray the value added by our competitive advantages and chosen lending strategy. It shows that our securities lending revenue has outperformed the market return by 2 to 3 basis points. The decline in this gap from 3 basis points in 2010 to 2 basis points today is indicative of both a partial erosion of our competitive advantages and our active decision to avoid transactions that do not provide an adequate risk-return trade-off.

Chart 185 Equity lending revenue, annual contribution to equity portfolio. Basis points.

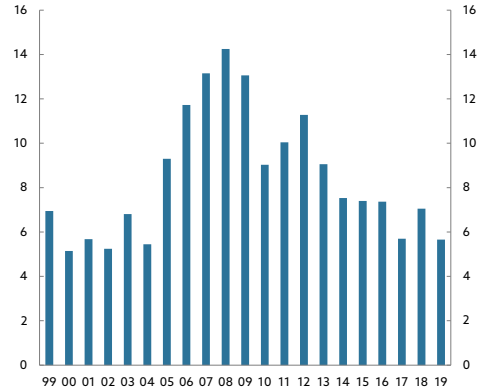
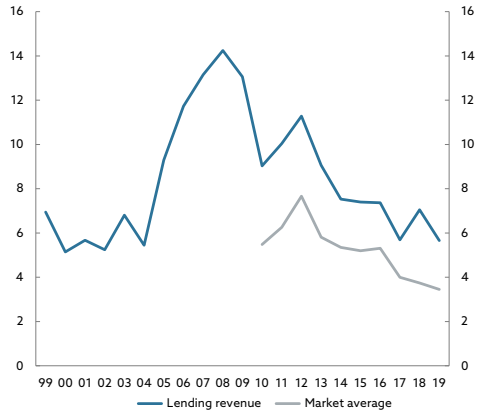


Chart 186 Equity lending revenue and market average. Basis points.



Source: Lending revenue: Norges Bank, Market average: Markit

Chart 187 Equity lending revenue. Million kroner.

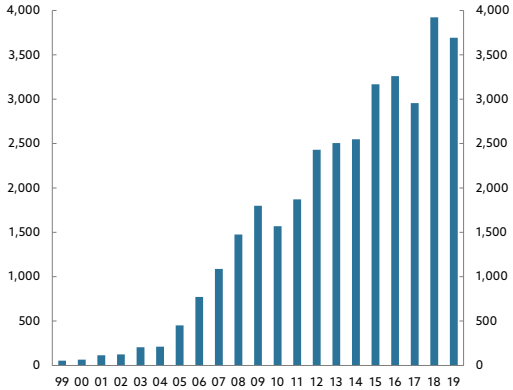


Chart 188 Equity lending revenue. Cumulative. Million kroner.

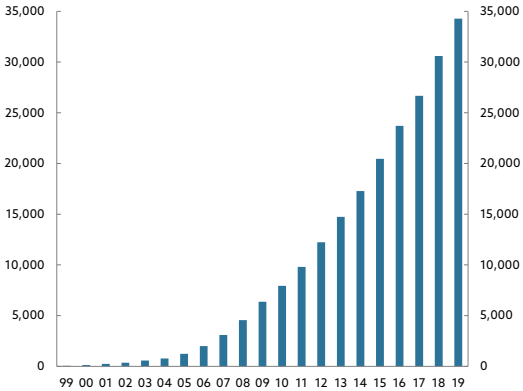


Chart 189 Equity lending revenue, by region.
Basis points.

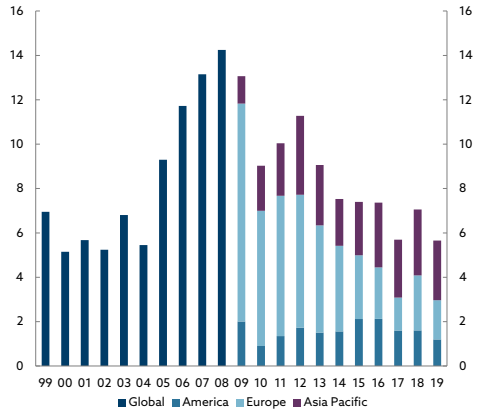


Chart 190 Equity lending revenue, by region.
Percent of total.

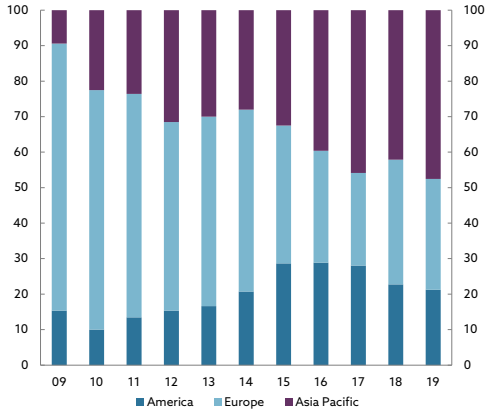


Chart 191 Equity lending revenue, by type.
Basis points.

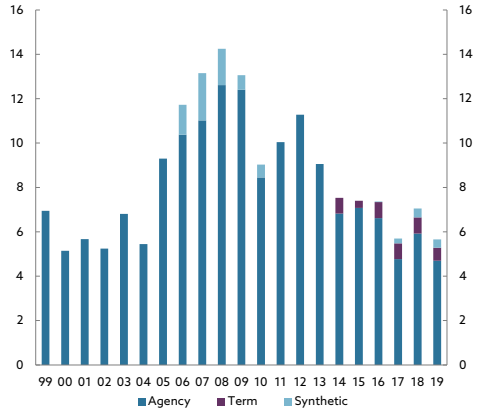
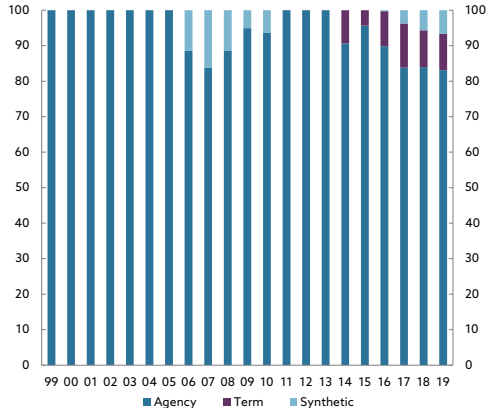


Chart 192 Equity lending revenue, by type.
Percent of total.



The returns by market
While Europe has historically been the largest contributor to our securities lending revenue, Asia has become increasingly important.

Europe accounted for 75 percent of our total securities lending revenue in 2009, but that share has declined to 31 percent today. The demand for securities lending in Europe has fallen throughout this period. However, Asia Pacific has grown from 9 percent of our securities lending revenue in 2009 to nearly half today – while making up only 15 percent of the equity portfolio.

Finally, our lending enhancements have allowed us to maintain the contribution of America to our total revenue. We have achieved this in spite of a declining trend in fees in the US due to higher competition from other asset managers, in particular index managers. By introducing innovations such as term lending, we have been successful in increasing the utilisation of our America portfolio.

The returns by type of lending
The majority of our securities lending revenue has come from agency lending. In the periods from 2006 to 2010 and 2014 to 2019, we also derived significant securities lending revenue from our synthetic and term lending activities.

Equity securities lending revenue and contribution to the equity portfolio

Year	Million kroner	Basis points	Strategy/ market colour
1999	54	7.0	Passive / agent's discretion
2000	65	5.1	Passive / agent's discretion
2001	115	5.7	Passive / agent's discretion
2002	125	5.2	Implemented South Korean market in agency lending
2003	205	6.8	Regional exclusives
2004	212	5.4	European country exclusives achieved a significant premium over discretionary agency lending, but total revenue decreased
2005	452	9.3	Synthetic lending in Taiwan, equity collateral
2006	771	11.7	Synthetic lending in Greece, Asian country exclusives
2007	1,087	13.2	Synthetic lending in Brazil. Implemented Thailand and Czech Republic in agency lending. Equity portfolio expanded to include small-cap companies
2008	1,475	14.2	Implemented Poland, Turkey, Greece, Hungary and Ireland in agency lending
2009	1,799	13.1	Implemented Taiwan in agency lending
2010	1,569	9.0	Last exclusive rolled off
2011	1,871	10.0	Implemented Brazil in agency lending
2012	2,429	11.3	Implemented 25 basis point minimum fee/spread and Malaysia in agency lending
2013	2,506	9.1	Implemented Russia in agency lending (but suspended due to sanctions)
2014	2,549	7.5	Implemented term lending. Custody and agency lending transition from JP Morgan to Citibank
2015	3,168	7.4	
2016	3,261	7.4	Re-engineered CFD/synthetic lending infrastructure and strategy to target developed-market general collateral trades
2017	2,955	5.7	
2018	3,922	7.1	
2019	3,692	5.7	Exposure to unrated counterparties approved in CEO mandate
Total	**34,282**	**8.4**	


招商永隆

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