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Date: 21.12.2020

Management of the Government Pension Fund Global (GPFG) in the light of the coronavirus pandemic

In its letter of 4 November 2020, the Ministry asked Norges Bank to report on its experience of the operational management of the fund since the outbreak of the coronavirus. The Bank was also asked to assess the need for analysis and research related to the fund's investment strategy and to present any plans for this. The Bank's response follows.

Market developments

2020 has been a year of large fluctuations in financial markets. Following the outbreak of the virus, equity prices fell more quickly, but no further, than we have seen in previous situations with considerable uncertainty about the economic outlook. After dropping 30 percent from the beginning of the year until hitting bottom on 23 March, equity prices rapidly recovered again.[1] At the end of the third quarter, the fund's equity index was only 1 percent down from the start of the year.

There have been substantial variations between returns in different markets, sectors and segments. While European stock markets were down 8.2 percent at the end of the third quarter, the US and Chinese stock markets were up 5.7 and 16.7 percent respectively. These substantial differences can be explained partly by differences in sector

[1] All return data are based on the fund's benchmark index and measured in the fund's currency basket unless otherwise stated. See Enclosure 1 for a more detailed overview of developments during the year.

composition. The technology sector, which has a relatively high weight in the US and China, has produced the highest return. The oil and gas sector, which has a relatively high weight in Europe, has been by far the weakest performer and is still trading close to its March lows. Prices for small companies have also fallen further than those for large companies, and the largest companies now account for a higher share of the fund's benchmark index than at the start of the year. This tendency towards greater concentration has been strongest in the US. This too needs to be seen in the light of the surge in prices for technology stocks.

The fund's benchmark index for bonds gained 0.2 percent from 1 January to 23 March. Again, there have been substantial variations between markets and segments. While prices for US Treasuries climbed more than 12 percent from 1 January until the equity market bottomed out in March, prices for corporate bonds and government bonds from commodity-producing countries fell more than 6 percent.[2] Since then, substantial monetary stimulus measures and expectations of persistently low interest rates have contributed to positive returns in all markets and segments in the fixed-income index.[3] The fund's fixed-income index was 5.8 percent higher in the third quarter than at the beginning of the year.

The turbulence in equity and bond markets affected liquidity. Trading costs rose sharply, even in markets that are normally highly liquid, such as those for US Treasuries and German Bunds.[4] The period of weak liquidity coincided with a period of relatively large withdrawals from the fund. We were able to release the necessary funds, but the actual cost of carrying out the trades was higher than in normal markets.

The sharp slide in equity prices led to a decrease in the equity share of the fund's benchmark index to 65.8 percent at the end of March. This triggered a rebalancing, and the equity share was subsequently adjusted gradually back to 70 percent. The rapid and strong rebound in equity prices later in the spring reduced the need to purchase equities. Withdrawals from the fund during the same period pulled in the same direction. The equity share in the benchmark index was back at 70 percent as early as the end of the second quarter. The rebalancing in the second quarter was the first to have been carried out under the new rebalancing regime introduced in 2019. Our assessment is that the regime functioned well and as intended. The strength of the current rebalancing rule is that it is simple and verifiable, and that it reflects the division of duties between the Bank and the Ministry well.[5]

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[2] Based on a simple average for Canada, Australia and New Zealand.
[3] See Enclosure 2 for developments in central bank balance sheets in the euro area, US, UK and Japan.
[4] See Enclosure 3 for an analysis of liquidity in the government bond market.
[5] For a discussion of the current rebalancing rule and possible alternatives to it, see the Bank's letter of 28 August 2018.

Investment results
The fund is invested in equities, bonds and real estate. However, the benchmark index against which the fund's performance is measured consists solely of equities and bonds. The return on the portfolio at the end of the third quarter was 14 basis points lower than the return on the benchmark index.

Equity management and fixed-income management made positive contributions to the relative return at the end of the third quarter of 27 and 15 basis points respectively. The positive contribution from equity management can be attributed largely to the strategies for internal and external security selection. The fund's exposure to systematic risk factors in the equity market contributed negatively because of a sharp fall in prices for value stocks. The positive contribution from fixed-income management was due primarily to internal security selection in the department responsible for the fund's investments in corporate bonds.

The fund's real estate portfolio consists of both listed and unlisted investments. Listed real estate investments returned a negative 27.8 percent at the end of the third quarter.[6] Unlisted real estate investments fell 5 percent. The negative contribution from real estate investments to the fund's relative return during the period was 56 basis points.

Listed real estate investments are traded on stock exchanges and priced daily. Unlisted real estate investments are valued quarterly.[7] In some cases, therefore, the listed real estate portfolio can provide an early indication of developments in the unlisted portfolio, especially if the fall does not reverse quickly. However, there are also some differences between the fund's unlisted and listed real estate investments. Part of the difference in the returns on the two portfolios can be explained by factors such as debt levels and capital structure. It may also have to do with differences in vacancy rates, sector composition and the quality and location of properties.

A positive excess return thus far in the fourth quarter means that the return on the portfolio could end up being higher than the return on the benchmark index over the year as a whole. Internal security selection in equity management has continued to contribute positively this quarter. In addition, rising prices for both value stocks and listed real estate so far in the fourth quarter have meant that the contribution from these investments as at mid-December is somewhat less negative than at the end of the third quarter.

All of the fund's investments are managed within a limit for expected relative volatility (tracking error) of 1.25 percentage points. As daily pricing is not available for the fund's unlisted real estate investments, we use a model from MSCI to calculate the relative risk for these investments. The model is based partly on price movements for listed real

[6] Measured in the fund's currency basket relative to the assets the Bank sold to fund them.
[7] Valuing unlisted real estate has been a challenge during this period. The long-term consequences are still uncertain, and different real estate sectors may be affected differently.

estate stocks. Listed real estate stocks had one of their worst weeks ever in March, and the fund's expected relative volatility climbed from 0.33 percentage point at the beginning of the year to 0.49 percentage point on 19 March as a direct result of this.[8] Other things being equal, this extreme event in March will affect the calculation of relative volatility for a long time to come, and expected relative volatility at the end of the third quarter was 0.53 percentage point. The increase was not a result of changes in the underlying relative positioning of the fund.

The fund receives an income stream in the form of dividends from equity investments, coupons from bond investments and rent from real estate investments.[9] The outbreak of the virus has particularly affected dividends. Some companies announced early on that dividends would be postponed or reduced, especially in Europe. In the US, more companies opted to maintain dividend payments but scale down buybacks. However, the depreciation of the Norwegian krone meant that dividend payments to the fund in the first three quarters of the year were only 10 billion kroner lower than in the same period last year when measured in kroner.

Experience of the operational management of the fund – investments

We have been able to carry out our management assignment and manage the fund in line with the strategies set by the Executive Board at all times since the outbreak of the virus. The following presents some of the experience we have had in managing the various parts of the fund.

Fixed-income management

A large amount of new government debt was issued during the spring. During the same period, the Federal Reserve made substantial bond purchases. Events of this type affect the benchmark index and the portfolio differently, and they resulted in substantial unintended deviations between the index and the portfolio in terms of the country and currency composition. In the operational management of the fund, the Bank will normally want to minimise deviations of this kind through transactions in the market. To minimise the volume of such transactions, the Executive Board proposed some adjustments to the mandate in a letter to the Ministry on 28 August. In its letter of 4 November, the Ministry replied that the management mandate would be amended in line with the Bank's proposals with effect from 30 November.

It has been decided that government bonds issued by governments in emerging markets should be removed from the benchmark index. These bonds are currently being phased out of the index under a plan set by the Ministry in its letter of 29 November 2019. Liquidity in emerging bond markets deteriorated after the outbreak of the virus, but not to the extent that we considered it inappropriate to continue phasing out these bonds

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[8] We calculate expected relative volatility every Tuesday and Thursday and at each month-end.
[9] Income from dividend and coupon payments is used in the management of the fund as it affects the composition of the benchmark index.

according to plan. One consequence, however, is that actual transaction costs in the portfolio for the phase-out have been somewhat higher than they would normally have been. At the same time, emerging bond markets had a weaker return than developed bond markets during the period when liquidity was at its most challenging.

The fund's benchmark index for bonds is based on sub-indices from Bloomberg Barclays. The composition of the index is updated at each month-end in line with set rules. One of these is that bonds with less than a year to maturity are removed from the index. As a direct result of this, the index's duration increases at the start of each month. Five days before the March update, Bloomberg Barclays announced that bonds with less than a year to maturity would not be removed from the index. Unforeseen changes to the rules can lead to unnecessary transactions to reverse adjustments already made to the portfolio. Such changes should therefore be avoided as far as possible.

Real estate management

The fund's unlisted real estate investments are concentrated in a limited number of major cities in Europe, the US and Asia. Most of these cities were hit hard by the outbreak of the virus and by the steps taken by the authorities to reduce its spread.

In the initial phase of the pandemic, the focus was on gaining control and an overview of the situation. Key questions were how we should handle cases of infection in the buildings we own, what requirements were being made of us as a landlord, what rights our tenants had, and what procedures our partners had in place. Most of our partners had established procedures for dealing with an influenza outbreak or pandemic. We had a fruitful dialogue with our partners on how best to handle the situation, and we used experience from the different markets to establish procedures for the buildings that we own without a partner. The necessary procedures were in place by the end of February. This timing should be seen in the light of us currently having six properties in Asia and thus having commenced this work well before the outbreak reached Europe and the US.

In the period since the virus struck, there have generally been few people present in our office buildings, especially in the US. We have therefore reduced the number of people working on the operation of these buildings and kept normal operating expenses down. Operating expenses that can be linked directly to the outbreak of the virus have increased somewhat.

Rental receipts have been monitored closely throughout the period. To date, we have received more than 90 percent of contractual rents. This is somewhat higher than for the market as a whole and may be a result of our having a portfolio of attractive buildings and good tenants. The share of tenants paying rent according to contract has been much higher for our office and logistics properties than for our retail properties.

Equity management

The strategies for external and internal security selection have contributed positively to the fund's relative return so far this year. These two departments have nevertheless had to change the way in which they work.

Our principle has previously been to hold physical meetings with our 90 or so external managers at their offices two to four times a year. This has not been possible since February. Our external managers have therefore been followed up using video conferencing, and we have chosen to meet managers more frequently than before. The follow-up of managers we already know has functioned satisfactorily. The use of video conferencing has, however, been more challenging when it comes to first meetings with new managers. All new mandates established since the outbreak of the virus have been awarded to managers we had met face-to-face before the outbreak began.

Staff in the department for internal security selection have also had to change the way they work. One important part of this strategy has been obtaining information through physical meetings with companies. Since the outbreak, all of these meetings have been held as video conferences. This has functioned satisfactorily in the circumstances.

The benchmark index for equities is constructed on the basis of subindices from FTSE Russell. Chinese A-shares have been phased into the index gradually since March 2019. The final part of this process was due to take place on 20 March this year. On Friday 13 March, FTSE Russell confirmed that it would include the final tranche as planned. On Monday 16 March, however, four days before the change was due to be reflected in the index, FTSE Russell decided otherwise.[10] In the same way as with the bond index, we believe that this type of unforeseen change to the index rules should be avoided as far as possible.

Active ownership

Voting is one of the most important tools we have as a shareholder. We hold shares in more than 9,000 companies. A well-functioning and robust voting process is an important reason why voting in 2020 has functioned normally despite a number of shareholder meetings being postponed as a result of the virus outbreak.

We aim to promote good corporate governance and responsible business practices through dialogue with companies. Company meetings are generally held at one of our four offices outside Norway or by visiting selected companies. Neither has been possible this year. Our company dialogue has nevertheless functioned more or less normally. To allow companies to concentrate on their operations in a demanding situation, we held back on raising strategic issues during the most acute phase. Nor did we launch any new strategic dialogues during the period.

[10] The inclusion factor for these equities was reduced from 100 to 25 percent.

Experience of the operational management of the fund – office closures

Norges Bank Investment Management (NBIM) has more than 500 employees, and almost all of them worked from home in the period when the markets were at their most volatile. Flexible employees, good IT solutions and local powers to take the necessary decisions have helped this to function well. The following presents our experience from the closure of our offices.

<u>Experience at our offices outside Norway</u>

The outbreak hit Asia and our offices in Shanghai and Singapore first. We carry out annual emergency response exercises as part of our contingency planning. At our offices in Asia, virus outbreaks have always been the greatest concern. Emergency response exercises were therefore held in October 2019 to simulate an outbreak similar to SARS. Local contingency plans helped ensure we were well prepared when Covid-19 hit Asia.

The office in Shanghai, NBIM's smallest office, was the first to be closed, early in January. Limited bandwidth has meant that it has been somewhat more challenging to get the home-working solution to work well there. The office in Singapore was partially closed in mid-February. Here, equipment was purchased and the home-working solution tested in advance.

Based on experience from the offices in Asia, it was decided early in March to test the home-working solution for all staff at our other offices. The test was carried out only a few days before our offices in Oslo, New York and London closed in mid-March, and confirmed that the technical solutions we had in place worked.

The outbreak has gone through different phases at different times at our five offices. In the most acute phases, local emergency response teams and delegated powers were important for finding good solutions adapted to local conditions and regulations. The fact that the crisis hit Asia first, home to our smallest offices, gave us valuable experience that we could draw on once the outbreak reached the larger overseas offices and headquarters in Oslo.

<u>The home-working solution</u>

All of our offices have been partially or completely closed at times since the outbreak erupted. Staff have adapted well to new ways of working and to working from home. The operational management of the fund has functioned more or less normally. The insourcing of operational functions and a transition to cloud services have been an important part of the fund's IT strategy in recent years. The strategic goals we had set in these areas had been achieved before the virus struck. Local IT support functions ensured that employees quickly received the necessary equipment, and cloud services allowed immediate upscaling of the services that were needed to ensure a stable home-working solution with extensive use of video conferencing.

We have seen an increase in the number of attempted cyberattacks in the wake of the virus. Our IT security procedures are the same whether staff are working at the office or from home. There is nevertheless a risk that employees working from home will be less alert to cyberattacks and fail to follow established information management procedures. We have therefore circulated more information on IT security and information management since the outbreak of the virus.

Before the outbreak, equity and fixed-income traders were only allowed to carry out trades from the office. Systems and guidelines had to be amended to permit trading from home. Working from home increases the risk of human error and fraud. To manage this risk, a number of controls and risk reduction measures were introduced. All trading activity is being monitored by management more closely than before, and frequent video conferences have been held to compensate for the absence of physical controls.

Working from home has also led to other challenges that are not necessarily unique to NBIM. NBIM has employees from 34 nations at offices in five countries. We have conducted two staff surveys since the outbreak of the virus. These have shown that most of NBIM's employees have adapted well to working from home, but also that those who are younger and live alone have faced the greatest challenges in adapting to the current situation. This applies particularly to the offices outside Norway, where a large proportion of staff are of another nationality. In the most acute phase, a number of development projects were put on hold, especially those requiring the involvement of critical functions. The office is a venue for creativity, innovation, teamwork and the informal exchange of information. It is difficult to find good substitutes for this when working from home.

Possible long-term effects on the fund's investment strategy
In its letter of 4 November, the Ministry asks the Bank to assess the need for analysis and research related to the fund's investment strategy and to present any plans for this.

We do not know what long-term consequences the pandemic may have for the real economy and financial markets. Based on the principles underlying the fund's investment strategy, we have identified a number of areas that we plan to work on further in the time ahead.

<u>Diversification</u>
The principle of diversification is an important starting point for the investment strategy for the GPFG.[11] We have seen substantial variations in returns this year as a result of the outbreak. Some markets, sectors and segments have recovered rapidly, while others have not. This underlines the importance of being well diversified. For a long-term investor such as the fund, it is also important to understand the drivers behind these different returns, and especially whether these differences can be expected to persist.

[11] Report to the Storting No. 32 (2019-2020).

The value of an investment can be expressed as the discounted value of expected future cash flows. We know that price movements as a result of changes in expected cash flows are generally more persistent than changes in discount rates and are therefore more important for a long-term investor such as the fund. We will build further on previous work in order to increase our understanding of how expectations of future cash flows have changed during the pandemic.

<u>The role of fixed-income</u>
The fixed-income index has been constructed partly with a view to the fund's bond investments reducing the volatility of the fund's overall return.[12] The extent to which bond investments can fulfil this role depends both on how much bond returns are expected to vary (volatility) and on the degree to which prices for bonds and equities move in the same direction (correlation).

Equity and bond prices have tended to move in different directions in recent decades, and bond investments have therefore helped reduce fluctuations in the overall return. For a brief period in March, bond and equity prices moved in the same direction. It is possible that this event was a result of very specific conditions in the market for US Treasuries, and there do not currently seem to be grounds to conclude that the correlation between bond and equity prices has changed.

What we can say with greater certainty is that persistently very low interest rates will make bond returns less volatile. We have, for example, seen this in Japan for many years. When volatility is low, the diversification gains for the fund from investing in bonds will be smaller than they would otherwise be. Against this background, we plan to look more closely at how equities and bonds will behave if bond yields remain around zero, and the extent to which bond investments will reduce volatility in the overall portfolio in the future.

<u>The fund's real estate strategy</u>
The unlisted real estate portfolio is to make up a maximum of 7 percent of the investment portfolio.[13] The size and type of investments in unlisted real estate are to be decided by Norges Bank within the general constraints set out in the mandate.[14] We have found that different parts of the real estate portfolio have been affected differently since the outbreak of the virus. This may be only temporary but may also be due to more permanent changes.

Even before the outbreak, we had noticed that the retail sector was performing worse than the logistics sector. This trend has intensified during the pandemic. At our office

[12] Report to the Storting No. 20 (2018-2019).
[13] Management Mandate for the GPFG, Section 2-4 (3).
[14] Report to the Storting No. 32 (2019-2020).

properties, the trend in recent years has been towards less space per worker. The virus has led to a rise in working from home, but also to an increase in the space required per worker. We have also seen that the major cities, where many of our properties are located, have been hit harder by the pandemic. In addition, we have seen few new projects starting up this year, which could hit the supply of new properties in two to three years. We will be working on all of these factors in our development of the fund's real estate strategy.

Expected returns

Norway's fiscal policy guidelines state that withdrawals from the GPFG over time must correspond to the expected real return on the fund. Provided that the realised return over time is close to the expected return, this level of spending will enable the nation's petroleum wealth to benefit future generations too.[15]

With a fixed-rate bond, investors know what the future cash flows will be. The expected return can be read directly from the effective yield on the bond.[16] Yields on the fund's bond investments have fallen since the outbreak of the virus, and the expected return on bond investments is therefore lower than before the outbreak. The expected equity risk premium cannot be observed directly in financial markets. One common approach is to estimate it on the basis of dividend expectations. We have seen that dividend expectations have fallen somewhat as a result of the virus.

We have been working for some time on establishing a framework for expected returns for different asset classes and over different time horizons, and we may consider publishing this in a discussion paper.

The fund's role in central government revenue and expenditure

The GPFG is a savings vehicle for the Norwegian government's petroleum revenue. These savings are fully integrated into the central government budget.[17] In 2016, we established a framework for analysing the fund's investment strategy and value in the context of government revenue and expenditure.[18] We plan to develop this framework in order to look more closely at how the value of the fund might be affected in both the short and the long term by various assumptions about developments in financial markets and withdrawals from the fund.[19]

[15] Report to the Storting No. 26 (2016-2017).
[16] We ignore here both default risk and uncertainty about the interest rate at which coupons can be reinvested.
[17] Report to the Storting No. 32 (2019-2020).
[18] For more information, see NBIM Discussion Note 4/2016, available at www.nbim.no.
[19] We present some simple calculations based on the original framework in Enclosure 4.

Yours faithfully

Øystein Olsen

Nicolai Tangen

Enclosures

Enclosures

Enclosure 1: Market and fund performance

Table 1: Key figures, return year-to-date, measured in the fund's currency basket unless otherwise stated

	YTD as at 23.03.2020	YTD as at 30.09.2020
Total benchmark index	-21.4%	0.9%
Total benchmark index, measured in Norwegian kroner	-2.8%	8.2%
Equity benchmark total	-30.2%	-1.3%
Fixed-income benchmark total	0.2%	5.8%
Fixed-income benchmark, government bonds	3.4%	6.0%
Fixed-income benchmark, corporate bonds	-6.8%	5.1%
Relative return, equity management	-0.1%	0.4%
Relative return, fixed-income management	0.1%	0.5%
Listed real estate relative to funding	-18.8%	-27.8%
Unlisted real estate relative to funding	7.9%	-5.0%

Table 2: Return on the equity index year-to-date for the ten largest markets in the equity index at the end of the third quarter, measured in the fund's currency basket

Equity benchmark index	YTD as at 23.03.2020	YTD as at 30.09.2020
United States	-28.6%	5.7%
Japan	-24.0%	-1.2%
United Kingdom	-40.7%	-23.9%
China	-14.5%	16.7%
Switzerland	-20.1%	3.9%
Germany	-34.4%	-0.4%
France	-32.2%	-10.7%
Austria	-42.0%	-8.8%
Netherlands	-27.5%	4.2%
Taiwan	-23.7%	12.8%

Table 3: Return on the equity index year-to-date by sector, measured in the fund's currency basket

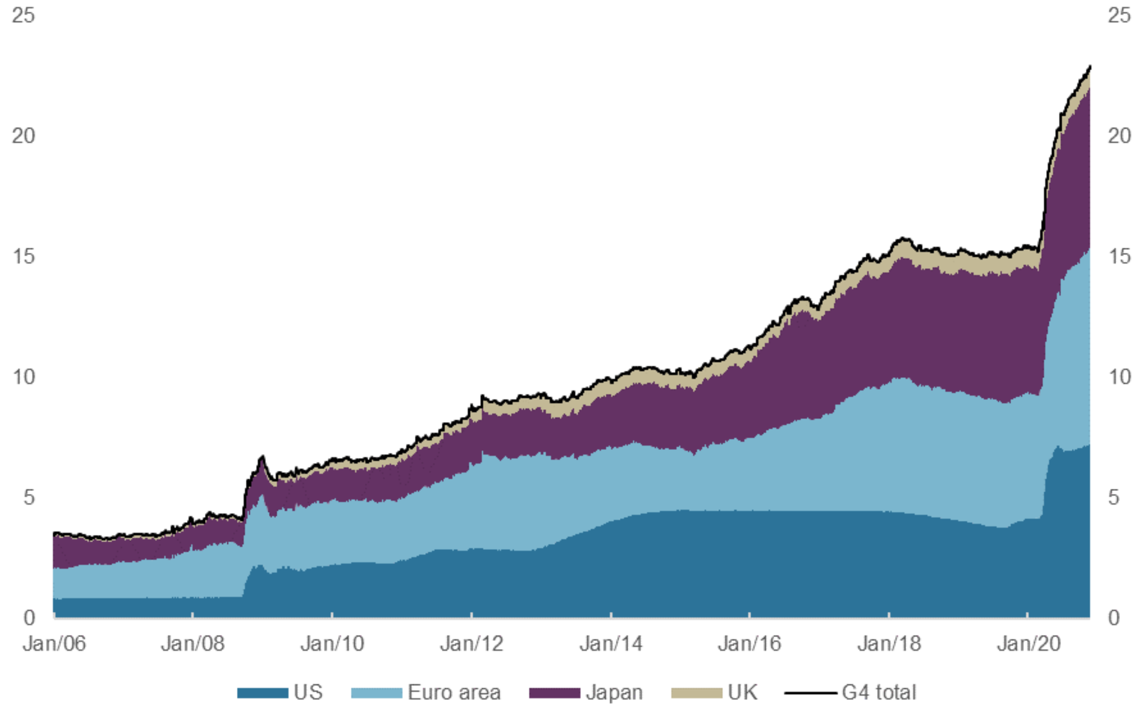
Equity benchmark index	YTD as at 23.03.2020	YTD as at 30.09.2020
Oil & Gas	-52.1%	-39.8%
Basic Materials	-34.2%	2.6%
Industrials	-34.0%	0.7%
Consumer Goods	-27.0%	2.4%
Health Care	-21.0%	7.2%
Consumer Services	-26.8%	8.1%
Telecommunications	-21.4%	-9.8%
Utilities	-24.8%	-3.6%
Financials	-38.1%	-20.8%
Technology	-20.3%	25.0%

Table 4: Return on the government portion of the bond index year-to-date by currency, measured in the fund's currency basket

Government bonds in the fixed-income benchmark index	YTD as at 23.03.2020	YTD as at 30.09.2020
AUD	-12.2%	6.2%
CAD	-2.0%	3.9%
CHF	2.8%	6.5%
DKK	0.4%	5.9%
EUR	0.2%	7.3%
GBP	-2.5%	4.9%
JPY	0.9%	1.4%
NZD	-8.7%	6.1%
SEK	-4.6%	5.2%
SGD	-1.6%	5.3%
USD	12.1%	8.1%

Enclosure 2: Monetary stimulus

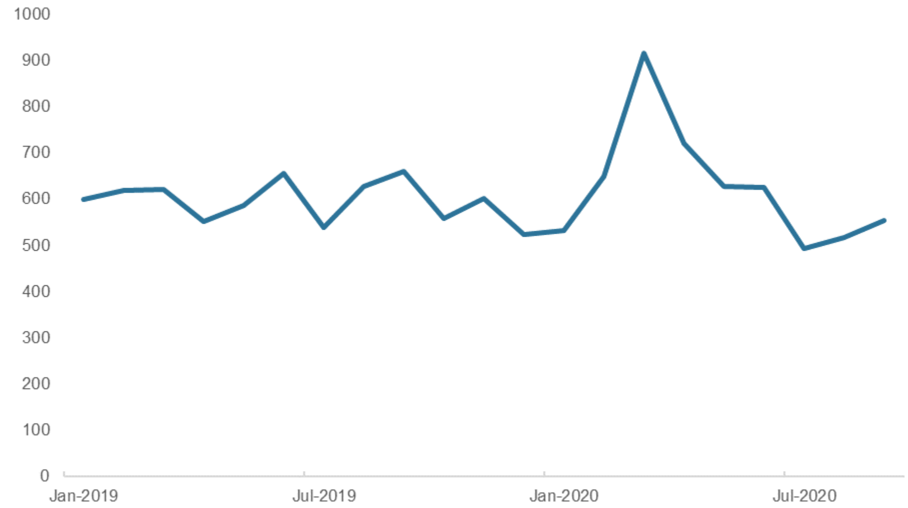
Chart 1: Central bank balance sheets in the euro area, US, UK and Japan, trillion US dollars



Source: Federal Reserve, European Central Bank, Bank of Japan, Bank of England, Macrobond and NBIM calculations.

Enclosure 3: Estimated liquidity

Chart 1: Average daily trading volume for US Treasuries, billion dollars

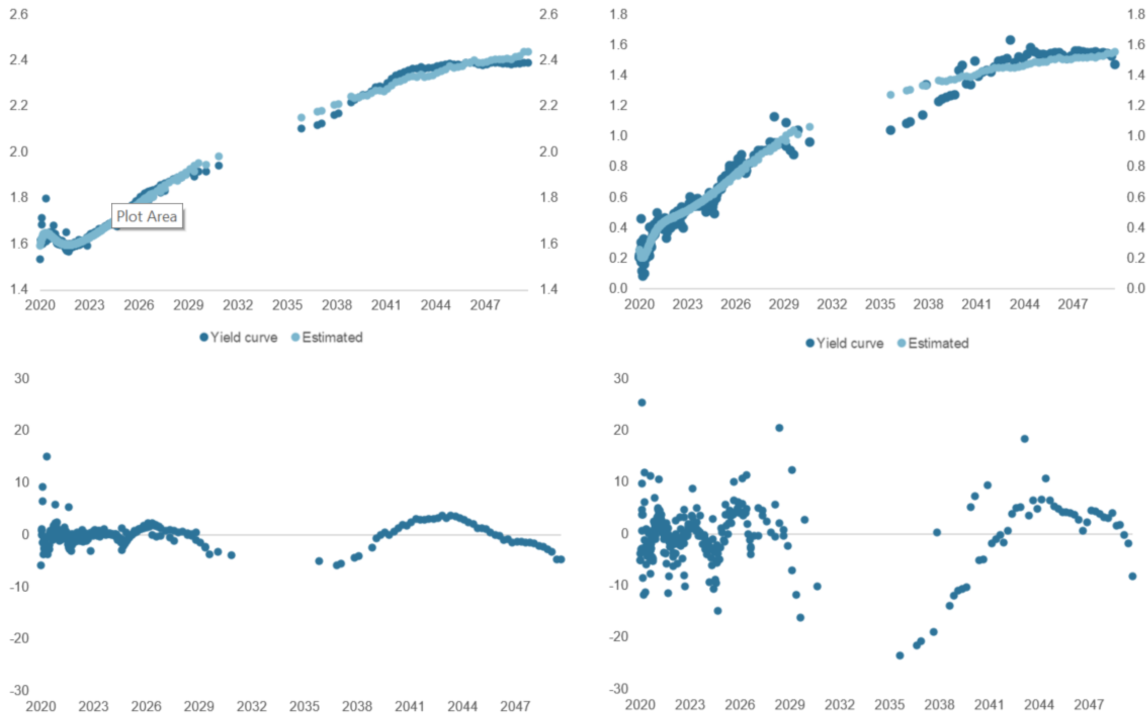


Source: SIFMA. The chart shows daily volumes at a monthly frequency from January 2019 to September 2020.

Chart 2: Actual and estimated yield curves for US Treasuries on two given days (percent) and estimated noise in the pricing (basis points)

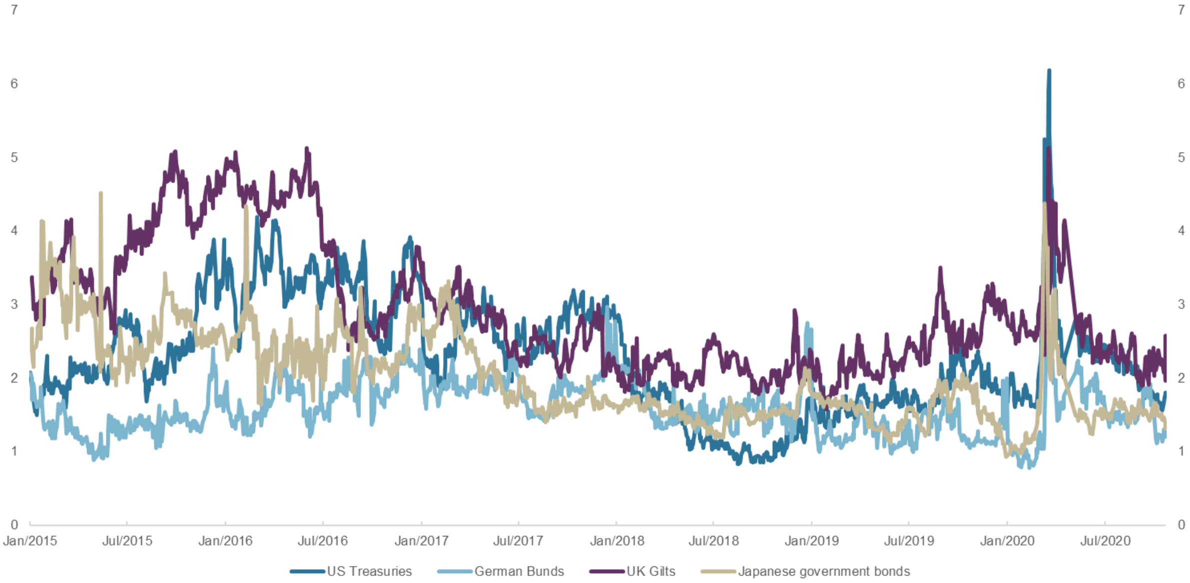
US Treasury yield curve 31/01/2020

US Treasury yield curve 20/03/2020



Source: Bloomberg and NBIM calculations. To calculate pricing error in the US Treasury yield curve, we sourced data for all Treasuries traded on a given day and used these data points to estimate the yield curve with a Nelson-Siegel-Svensson model. The actual and estimated yield curves for two given days are shown in the top two charts. The measure of pricing error (bottom two charts) was calculated as the difference between actual and estimated price. We calculated pricing error for two dates: 31 January 2020 (the charts on the left) and 20 March 2020 (the charts on the right).

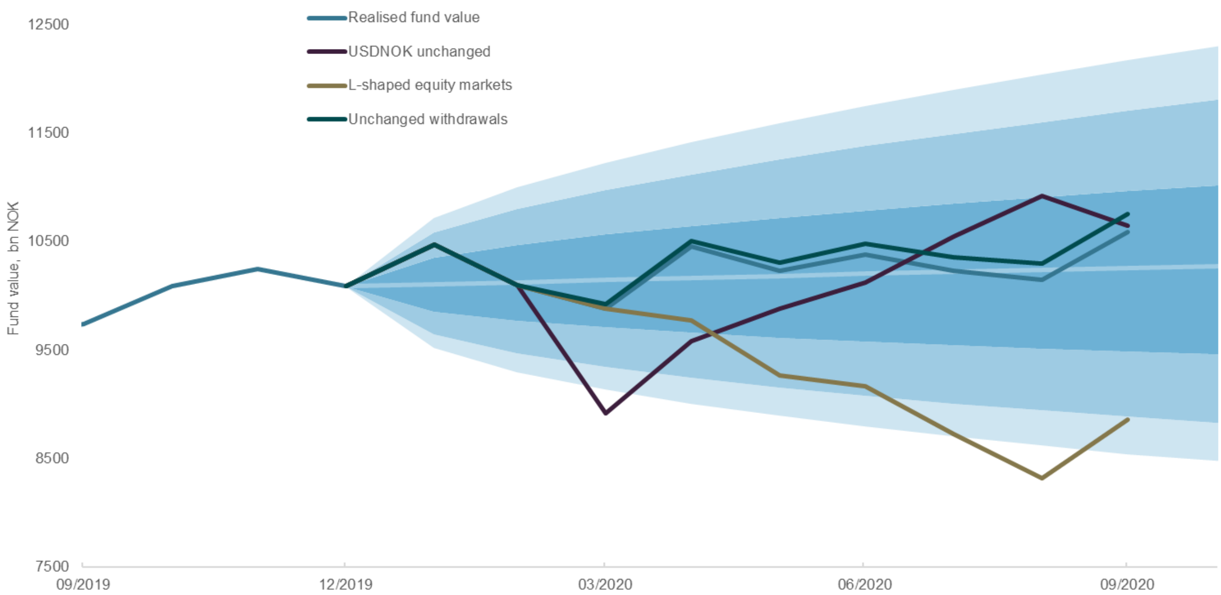
Chart 3: Average estimated noise in government bond pricing in the US, Germany, UK and Japan, basis points



Source: Bloomberg and NBIM calculations. To calculate average pricing error in the yield curve over time for government bonds issued in the US, Germany, UK and Japan, we sourced data for all government bonds traded on a given day and used these data points to estimate the yield curve using a Nelson-Siegel-Svensson model. The pricing error measure was calculated as the square root of the average squared pricing error (difference between actual and estimated price). In this case, we calculated movements in pricing error over time.

Enclosure 4: Fund value under different assumptions

Chart 1: Fund value in 2020 under different assumptions, billion kroner



Source: NBIM Discussion Note 4/2016.

The calculations are based on the original framework from Discussion Note 4/2016. Realised fund value has been calculated using the same framework and therefore differs somewhat from actual fund value. Assumptions underlying the different calculations (all else equal): (i) unchanged USDNOK: fund value had the USDNOK exchange rate been constant from the end of February 2020; (ii) L-shaped equity market: fund value had the equity market been unchanged from the end of March 2020; (iii) unchanged withdrawals: fund value had withdrawals from the fund followed the model's expected path.