

# Challenges associated with portfolio and risk management

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*Several factors make the management of the Government Petroleum Fund a unique task, also in an international context. Each quarter, large amounts of capital are transferred to the Fund and invested in capital markets. Moreover, performance is reported quarterly, and there are substantial requirements concerning risk management and transparency in terms of performance and costs. Over time, transaction costs incurred in connection with the investment of new capital will constitute a considerable management cost. Norges Bank therefore places emphasis on orienting activities in such a way that transaction costs are kept to a minimum. Furthermore, precise risk monitoring and an extensive evaluation of management performance are considered very important. This article describes the most important administrative and management functions of the operational management of the Petroleum Fund.*

## Investment of new capital

An amount of NOK 314 billion has been allocated for investment in international capital markets since the Fund was established. An important aspect of management is to minimise the costs of these initial investments. Particularly in the past year, it has been very important to focus on this management function.

The allocation of new capital to the Petroleum Fund's international currency portfolio over one year depends on the central government accounts for the year. Inasmuch as the precise size of the surplus is not known until a later time, the transfers are determined on the basis of the Ministry of Finance's estimate for the surplus. The current arrangement is that this transfer amount is distributed on four allocation days during the year, while the difference between the expected and actual surplus on the central government accounts is settled in connection with the first transfer in the following year.

Technically, the Ministry of Finance transfers capital to the Fund by transferring capital from the central government's sight deposit account to the Petroleum Fund's NOK account in Norges Bank. At the same time, Norges Bank Investment Management transfers capital for an equivalent amount in foreign currency from the foreign exchange reserves to the Petroleum Fund's international portfolio.

**Table 1: Cost of investing new capital in stock markets in 2000. In thousands of NOK and basis points**

Date of capital transfer	31 March	30 June	29 Sept.	30 Nov.	Total 2000	Basis pts
Amount invested	6 495 276	18 063 224	19 205 304	20 687 790	64 451 594	
<b>Purchase costs, equity futures</b>						
- direct	109	1 091	1 332	1 409	3 941	0.6
- indirect	6 411	5 506	19 489	10 482	41 888	6.5
<b>Purchase costs, individual equities</b>						
- direct	8 021	23 822	40 124	14 288	86 254	13.4
- indirect	2 793	2 350	7 964	15 504	28 612	4.4
Total transaction costs	17 335	32 769	68 909	41 682	160 695	24.9

Foreign currency that is to be channelled to the Petroleum Fund is today taken from a separate sub-portfolio in the foreign exchange reserves. This petroleum buffer portfolio receives foreign currency from two sources. First, it receives current foreign exchange earnings from the state's direct financial interest in petroleum activities (SDFI). Second, the Market Operations Department in Norges Bank buys foreign currency in the market on a daily basis, for transfer to the petroleum buffer portfolio.

The management of the petroleum buffer portfolio thus ensures that purchases of international securities take place over time and not just on the days the Ministry of Finance transfers capital to the Petroleum Fund. This is a responsibility Norges Bank has undertaken in order to reduce the magnitude and costs of purchases and sales of securities and foreign currency for the foreign exchange reserves and the Petroleum Fund as a whole. Both portfolios are ultimately central government wealth and it is sound to view the management of them in an overall context.

The petroleum buffer portfolio primarily consists of government bonds issued by countries in which the Petroleum Fund can invest and futures contracts on equity indices in the same countries. The value of a futures contract shadows that of the underlying equity index and the contract thereby basically provides the same return as if all the individual equities included in the index had been bought. The equivalent value of futures contracts is held as cash deposits with large, highly rated banks. The markets for these futures contracts are very liquid and have low transaction costs. This is therefore an inexpensive way to achieve exposure to equity markets.

It is not appropriate, however, to keep futures contracts over a long period inasmuch as costs will be incurred for rotating the contracts at regular intervals. When the capital is transferred to the Petroleum Fund, futures contracts will therefore be sold in the course of a short period and individual equities will be bought instead. To some extent the timing of these trades is chosen with a view to achieving low transaction costs. For example, another large investor may want to sell an equity portfolio that is suitable for the Petroleum Fund, so that crossing between the Petroleum Fund and this investor can take place. This means that the trade is agreed without using the ordinary broker system. However, the largest volumes that are traded are program trades in the ordinary market, i.e. purchase orders are placed for a large number of equities at the same time.

Table 1 provides an overview of the Petroleum Fund's costs in connection with the investment of new capital in equities in 2000. During the year, the Ministry of Finance transferred NOK 150 billion to the Petroleum Fund. Of this amount, NOK 64.5 billion was invested in equity markets. For purchases of futures contracts, direct costs are incurred for implementing and settling the trade, although these costs are small. Even more important are the indirect costs that can be incurred when prices for futures contracts do not exactly reflect prices for the underlying equities. There is a tendency for this to occur around the turn of each quarter, which is a time when futures contracts in the petroleum buffer portfolio are normally transferred to the Petroleum Fund. In 2000, this pricing differential involved a cost of 0.065 per cent or 6.5 basis points of the total amount invested. (This is not a cost, however, for the petroleum buffer portfolio and the Petroleum Fund as a whole.)

The cost of purchasing individual equities is higher. Direct costs include broker's fees and share turnover taxes. Total broker's fees came to 4 basis points, while taxes came to 9.4 basis points, altogether 13.4 basis points of the total amount invested. The share turnover tax is particularly high in the UK where 17 per cent of the equity portfolio is invested. Indirect costs consist of the difference between the bid price achieved and the average market price on the day the trade is executed. The deviation here cost 4.4 basis points of the total amount invested, which is considered very low.

The total costs of investing NOK 64.5 billion in equity markets amounted to NOK 160.7 million, which is 24.9 basis points of the invested amount (and 11 basis points of the total equity portfolio). This is a cost level that is slightly lower than the market norm for new capital to be invested. Because the transfer of capital in 2000 was so high, investment costs also had a considerable impact on equity management performance. Without these investment costs, the return on the Petroleum Fund's equity portfolio would have been about 11 basis points higher.

An amount of NOK 85.5 billion was transferred to the Petroleum Fund's fixed income portfolio in 2000. The cost of buying fixed income securities is far lower than the cost of purchasing equities. No broker's fees or turnover taxes are paid. Costs are instead incurred as a result of differences between bid and offer prices in the market. The Petroleum Fund must buy at bid prices that are higher than the offer prices used to calculate the return on the benchmark portfolio. A large portion of the fixed income securities that are transferred to the Petroleum Fund are purchased for the petroleum buffer portfolio and transferred at the end of each quarter at the middle price between bid and offer prices.

In the Petroleum Fund, trades of fixed income securities with a market value of about NOK 35 billion were executed in 2000 as part of the phasing in of new capital. This is far less than the amount transferred because most securities, as noted earlier, are purchased for the petroleum buffer portfolio before being transferred to the Petroleum Fund. The trading of NOK 35 billion was distributed on about 200 trades with 30 different counterparties. The result of each of these trades was measured in relation to the prices used in the valuation of the benchmark portfolio, i.e. against the final prices on the day of the trades. Measured against these benchmark prices, the trades on average provided a positive result for the Petroleum Fund despite the expected spread cost.

In 2000, equity futures amounting to more than NOK 60 billion and fixed income securities amounting to more than NOK 90 billion were purchased for the petroleum buffer portfolio. In addition, foreign currency transactions amounting to more than NOK 50 billion were carried out. The costs of these transactions may be estimated at NOK 30-50 million. In the management of fixed income securities, these are largely costs that would also have been incurred even if the sole purpose had been to accumulate foreign exchange reserves. The costs of buying exposure to the equity market through equity futures are slightly higher. Norges Bank is of the view that in the long run the excess return provided by exposure to the equity market more than offsets these additional costs.

## **Rebalancing the Petroleum Fund's portfolio**

The Ministry of Finance has defined a benchmark portfolio for the management of the Petroleum Fund (see annual report). The benchmark portfolio specifies the strategy of the Fund's owner and also serves as a basis for measuring Norges Bank's performance as operational manager.

The benchmark portfolio consists of equities that are included in the FTSE index in the countries in which the equity portfolio can invest and government bonds that are included in the Salomon Smith Barney index in those countries in which the fixed income portfolio can invest. These are recognised indices that are used by many international investors. The indices are described further in a feature article concerning "The composition of the Petroleum Fund's portfolio" in the annual report for 1998. The various country indices for equities and bonds are weighted in such a way that the equity proportion is 40 per cent and the fixed income proportion is 60 per cent, and in such a way that the distribution on the regions Europe, the Americas and Asia/Pacific is 50/30/20. Within each region, the market value of the companies included in the FTSE country index is used as weights for the equity portfolio, while countries' gross domestic product is used as weights for the fixed income portfolio. The feature article referred to above provides a more detailed description of this.

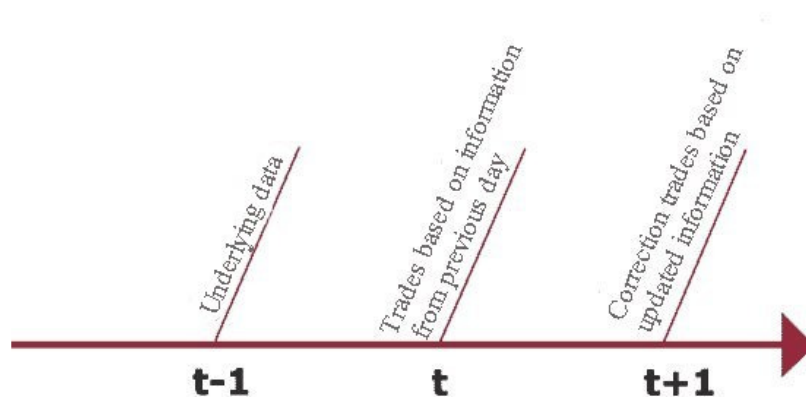
The country weights are set at the turn of each quarter and thereafter remain fixed through the quarter. This means that the proportions of the two asset classes and of the three regions within each asset class will change as a result of changes in market prices. If equity prices through the quarter rise at a faster pace than bond prices, the equity proportion in the benchmark portfolio will be higher than the stipulated 40 per cent. If equity prices in Europe rise at a faster pace than equity prices in the Americas and Japan/Pacific area, the proportion for Europe in the equity portion of the portfolio will be higher

than the stipulated 50 per cent, etc.

The composition of the benchmark portfolio is therefore updated at regular intervals in order to return to the weights stipulated by the Ministry of Finance. This updating is called rebalancing and is usually carried out at the turn of each quarter. When the benchmark portfolio is updated in this way, the actual portfolio of the Petroleum Fund will be adapted to the new benchmark portfolio. As there is active management of the Petroleum Fund, with planned deviations from the benchmark portfolio, the actual portfolio will not be exactly the same as the benchmark portfolio. However, the deviations that are not planned as part of active management will be eliminated.

The rebalancing of the actual portfolio is an extensive process that requires a considerable use of resources in Norges Bank Investment Management on the days this takes place. The magnitude of purchases and sales of securities basically depends on the size of the deviation to be adjusted. Precise information about this is not known until information is received concerning the portfolios of external managers and market prices on the day the rebalancing occurs, i.e. this information comes afterwards. Trades that are executed on the rebalancing day must therefore be based on the portfolio composition and market prices the previous day. A projection is then made on the basis of average market developments, although this is not entirely precise. Some adjustments must therefore be made the following days. If rebalancing were to be carried out in a portfolio that does not receive new capital, the need for purchases and sales of securities could be quite substantial. The Petroleum Fund is in the fortunate position that it receives new capital on a regular basis. In order to limit the number of transactions, rebalancing is always carried out on the day new capital is transferred to the Fund. This means that securities usually do not have to be sold. Purchases of new securities can instead be adapted in such a way that, combined with the old portfolio, they are suitable for the new benchmark portfolio. If, for example, the equity proportion in the Petroleum Fund's actual portfolio is to be reduced, this is achieved primarily by using the new capital to buy fixed income securities. It was not necessary to sell securities in the fixed income or equity portfolio in connection with rebalancing in 2000. The Fund therefore did not incur costs other than those resulting from the investment of new capital (see above).

**Chart 1: Rebalancing**



The current regime is thus rebalancing at the change of each quarter and, in general, fixed benchmark portfolio within the quarter. This functions well as long as transfers of new capital to the Fund are large in relation to the size of the Fund. However, if the transfers become considerably smaller, it may be necessary both to sell and purchase securities as part of the rebalancing process. The transaction volumes may conceivably be very large if markets in different asset classes and regions have moved in different directions.

Because the Fund's capital is increasing, the transfer amounts over time will be lower, measured as a share of the Fund. Expected transaction costs due to rebalancing will then increase. It is possible to counter this by reducing the rebalancing frequency. In such an event, this will involve larger and more prolonged deviations from the defined basis for weights in the benchmark index.

### **Establishment of portfolios for external management**

At end-2000, 79 per cent of the Petroleum Fund's equity portfolio and 10 per cent of the fixed income portfolio were managed by external managers. About half of the equity portfolio had been allocated to external index managers, while almost a fourth was placed with external active managers. Active mandates were assigned to all external managers of the fixed income portfolio, and the percentage of this type of external management will probably increase somewhat in the period ahead. The Petroleum Fund also uses external managers in tactical asset allocation. These managers have only smaller portfolios, but nevertheless have considerable scope for taking active decisions.

The external managers are given portfolios that have already been invested by Norges Bank, both when they receive capital for the first time and when they receive increased capital for management. The most important reason that Norges Bank itself carries out these transactions is Norges Bank's responsibility for ensuring that the Petroleum Fund's capital is invested at low transaction costs. Norges Bank is in a unique position as a result of the large amounts that are to be invested in markets each year and has therefore developed special expertise for this type of activity. A higher level of expertise in these areas in Norges Bank compared with external managers is an important reason for the Bank's decision to construct the portfolios of external managers.

When evaluating the management carried out by external managers, it is important to have reliable figures for the return achieved. Most active managers have agreements with provisions stipulating that management remuneration depends on the excess return achieved. Norges Bank places emphasis on being able to measure the return from the day capital is transferred

to managers. However, if cash were transferred to managers, they would have to buy securities before management could start. To keep transaction costs low, this would have to take place over time, and Norges Bank would then be unable to measure managers' return in the establishment period.

The portfolios that are transferred to external managers primarily consist of physical securities. The portfolios are constructed on the basis of the responsible managers' preferences. Index managers are given portfolios that correspond to the composition of the index the manager is to replicate. Active managers may choose a composition that differs from the index they are to be measured against in order to have the positions they want from the takeover day. The same procedures that apply to the first time capital is transferred to an external manager also apply to later transfers. Norges Bank also has routines for terminating mandates.

The agreements with external managers give the Bank the right to terminate a mandate without notice. When a manager is notified that the mandate is to be terminated, Norges Bank takes over the portfolios either for internal management or transfer to another external manager.

### **Portfolio risk management**

The Ministry of Finance has established limits for the deviation between the actual portfolio and the benchmark portfolio (see, for example, the annual report section and the article on tracking error in the annual report for 1999). Norges Bank must regularly ensure that the total portfolio is within the established limits and, if necessary, adjust the composition if there is a risk that the limits will be exceeded. So far, the deviations have never been so great that it has been necessary to make adjustments for this reason.

However, continuous adjustments are made for minor but nevertheless undesired deviations from the benchmark portfolio. In order to be able to identify these deviations and the type of deviation involved, Norges Bank must have a continuous overview of the composition of both the benchmark and the total portfolio. Information about the sub-portfolios of each manager and the portfolios that are managed internally are updated on a daily basis in a database in Norges Bank. A more detailed description of the information flows that are required to achieve this may be found in an article on risk management in the annual report for 1998. On the basis of the information in the database, Norges Bank analyses the deviations between the actual portfolio and the benchmark portfolio and decides whether adjustments should be made to the composition of the actual portfolio. Deviations in the equity portfolio are usually adjusted by buying or selling equity futures contracts. These are contracts that are linked to broad market indices in each country. If Norges Bank wants to reduce equity investments in a market, the Bank sells futures contracts in this market. If Norges Bank wants to increase equity investments in a market, the Bank buys futures contracts. In some cases individual equities are also traded, particularly if the purpose is to adjust exposure to special sectors.

Similarly, deviations in the fixed income portfolio are adjusted by trading in either interest rate futures contracts or individual fixed income securities. Since liquidity is generally high and the costs associated with trading in individual fixed income securities low, purchases and sales of individual securities are used to a considerably greater extent than for the equity portfolio. Deviations from the benchmark portfolio arise for a number of reasons. For example, a high return in some active mandates over a relatively short period may produce sizeable distortions in the distribution on asset classes and countries in the portfolio. To the extent these distortions are not due to active position-taking, they will be adjusted. Another example is that the supply of new capital to the Fund does not always have the desired composition, so that adjustments must be made at a later time. Active management is carried out by a number of different managers and all of these managers have their special benchmark portfolios adapted to the management conducted. It is not necessarily the case that the sum of the managers' benchmark portfolios is the same as the benchmark portfolio that applies to the entire Petroleum Fund. As a result, deviations may arise that must be adjusted in centralised risk management.

Active managers take positions independently of each other. The investment mandates contain limits that shall ensure that they in total do not depart from the guidelines that apply to the Fund. The sum of the various managers' positions may nevertheless constitute a larger position for the Fund than Norges Bank considers sound. For example, situations may arise where the return on the Fund's capital is very dependent on a single underlying explanatory factor or even a single company. In some situations Norges Bank will make adjustments for this undesirable risk exposure.

### **Securities lending**

Securities lending is a source of income for both equity and fixed income management. In 2000, the Petroleum Fund's income from securities lending amounted to about NOK 138 million, with a little more than half from the lending of fixed income securities and a little less than half from the lending of equities. As a rule, the securities are lent for a few days at a time. Borrowers may, for example, include managers that have sold securities they do not have and must therefore borrow in order to deliver the securities to the buyer. The Fund's securities are placed in a small number of custodian institutions, independently of the manager that has bought the securities. Lending activities are based on the holdings in these custodian institutions. It is common that investors allow custodian institutions to handle the lending operations.

These institutions charge part of the lending income as payment for the service. This is the arrangement Norges Bank currently has for the equity portfolio, with J.P. Morgan Chase as operator for lending activities. For the fixed income portfolio, Norges Bank itself engages in extensive lending activities and only uses custodian institutions as a supplement.

Norges Bank has an overriding responsibility for ensuring that the lending activities based on the Petroleum Fund's portfolio are as remunerative as possible. Continuous assessments are made of the various solutions for organising lending activities and changes in the current arrangement will be made when deemed profitable for the Fund.

### **Summary**

An amount of NOK 150 billion was transferred to the Petroleum Fund's portfolio of international securities in 2000. The investment of this capital in securities markets resulted in direct and indirect costs of NOK 160 million in the equity

portfolio, equivalent to 0.25 per cent of the invested capital. Transaction costs will necessarily be incurred when new capital is to be invested. Considerable transfers will probably continue to be made for several years. The costs associated with investing capital in markets will therefore be of considerable importance to the Petroleum Fund's net return. Norges Bank clearly understands the importance of executing these investments in an efficient and sound manner, and the Bank has therefore developed expertise and routines for investing large portfolios over time at minimum transaction costs. This system is also used when capital is transferred to external managers.

The Ministry of Finance measures Norges Bank's performance as manager in relation to a stipulated benchmark portfolio. The benchmark is updated quarterly, and this also has consequences in the form of adjustments to the portfolio managed by Norges Bank. Such rebalancing may be considerable, but the transfer of new capital is used systematically to reduce the scale of transactions. As Norges Bank is measured in relation to the benchmark, considerable emphasis is placed on managing the various sub-portfolios in such a way that only intended active positions are taken. This risk management takes place on a continuous basis.

Norges Bank focuses on achieving maximum efficiency in the supply of new capital, in the ongoing administration of portfolios and in the management of risk. These are tasks ensuing from Norges Bank's overriding responsibility for the management of the Petroleum Fund, and are independent of the management proportion that Norges Bank chooses to allocate to external managers.



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