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Norwegian Government Petroleum Fund **Annual Performance Evaluation** Report

Prepared for:

Royal Norwegian Ministry of Finance

Prepared by:

Hanne Hother Mark Fereday Christy Jesudasan

MERCER

Investment Consulting

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The Role of Mercer Investment Consulting and Russell/Mellon

1.1 **Background**

• This report was commissioned by the Royal Norwegian Ministry of Finance ("the Ministry") and has been prepared by Mercer Investment Consulting ("Mercer") in accordance with the terms of the contract awarded by the Ministry in relation to the Norwegian Government Petroleum Fund ("the Petroleum Fund"). The Petroleum Fund consists of the "Ordinary Portfolio" and the "Environmental Fund". The terms of reference for this work are set out in the Invitation to Tender issued by the Ministry to Mercer on 13th May 2002.

1.2 Role of Mercer

The purpose as set out in the Public Procurement document is for Mercer to verify Norges Bank's internal performance measurements and to strengthen the Ministry's basis for evaluating the competence and actions of Norges Bank. Mercer outsource the role of performance verification to Russell/Mellon, an independent performance measurer appointed by Mercer.

1.3 Role of Russell/Mellon

- The function of calculating and verifying Norges Bank's internal performance measurement is carried out by Russell/Mellon under the guidance of Mercer who retains overall responsibility for the process. Russell/Mellon calculate performance for the Petroleum Fund based on portfolio data and market values supplied by the custodian JP Morgan Chase. Data for fixed income securities managed internally is supplied directly by Norges Bank.
- Russell/Mellon employ the "time weighted" rate of return as the base performance statistic. This return measure is consistent with the one employed by Norges Bank and takes into account investment income, as well as realised and unrealised capital profits or losses. The use of this statistic minimises distortions due to cash flows into and out of a portfolio which are, in general, outside the control of the investment manager. Further details about Russell/Mellon's calculation methodology are contained within Appendix A.

Summary of Control Function

2.1 **Scope of Control Function**

- Mercer has, in conjunction with Russell/Mellon, performed control and verification functions throughout 2003, in accordance with the terms of the contract awarded by the Ministry.
- The objective of this process has been to check Norges Bank's internal performance measurements and to perform wider verification checks, both at portfolio and benchmark level according to instructions received from the Ministry of Finance.

2.2 Controls conducted in 2003

- During the course of 2003 Mercer has, in conjunction with Russell/Mellon, measured and verified the monthly returns of the Petroleum Fund, the Ordinary Portfolio, and the Environmental Fund, along with the respective benchmark returns.
- Although Russell/Mellon calculates the monthly return at asset class level for Equity and Fixed Income separately, these returns are not directly comparable to those calculated by Norges Bank. The difference arises as a result of a difference in the treatment of cash between Norges Bank and Russell/Mellon. Norges Bank allocates individual cash positions against specific equity or fixed income regions which they correspond to, whereas Russell/Mellon treat cash as a single and separate asset class.
- Throughout the report, performance for 2003 in respect of the Equity and Fixed Income segments of the Ordinary Portfolio and longer term performance has been sourced from Norge's Bank whereas all other returns have been sourced from Russell/Mellon.
- The monthly performance of the Petroleum Fund at the Total, Equity and Fixed Income level has been reported to the Ministry by means of a report issued directly by Russell/Mellon.
- In the event of discrepancies in performance calculation between Norges Bank's internal performance measurement and Russell/Mellon's calculations, when measured to two decimal places, further checks are made. The results of which are reported to the Ministry by means of a letter accompanying the monthly report. This occurred on one occasion during 2003, and was attributed to the late revision of month-end market values of securities by the custodian JP Morgan Chase. This was reported to the Ministry in conjunction with monthly performance report for June

- 2003. Letters from Russell/Mellon and Norges Bank elaborating further on this discrepancy are contained within Appendix B.
- A comprehensive summary of Russell/Mellon's data processing and reporting process that Russell/Mellon carries out as a result of its role in the Control Function is also contained within Appendix B.

Petroleum Fund Details

3.1 **Performance objective**

- The Ministry has delegated the operational management of the Petroleum Fund to Norges Bank who manage the Petroleum Fund in accordance with a mandate stipulated by the Ministry in public regulations. The performance objective is to maximise returns given the restrictions imposed by the regulations and the desired risk profile. The risk tolerances for the Petroleum Fund's Ordinary Portfolio is ex-ante tracking error of 1.5% p.a. whilst for the Environmental Fund it stands at 1.0% p.a.
- The Ministry specifies the benchmark portfolio comprised of equity and fixed income instruments reflective of the Petroleum Fund's investment strategy.
- The Environmental Fund was established 31 January 2001 and is managed by Norges Bank. It forms part of the Petroleum Fund invested in companies assumed to have low negative impact on the environment. The Environmental Fund will have exposure to approximately 80 per cent of the market value of the companies in the relevant FTSE All-World indices.

3.2 **Petroleum Fund Benchmark**

- The current strategic benchmark consists of 60% fixed income and 40% equities. A new fixed income benchmark was introduced in 2002, which is constructed from the Lehman Global Aggregate family of indices.
- The equity benchmark uses FTSE All-World indices and market capitalisation weights. The strategic weights within the customised equity benchmark are Europe 50% and Americas/Asia/Oceania 50%.
- The reader should note that extraordinary transaction costs are incurred when new transfers are made into the Petroleum Fund or changes are made to the Petroleum Fund's benchmark. In addition to the transaction costs outlined above, the Petroleum Fund pays tax on share dividends in a number of countries. Such costs are not deducted when the index supplier calculates the return on the benchmark. For the purpose of this report the benchmark has not been adjusted for such costs, despite the presence of such extraordinary transaction costs and taxes detracting from the Petroleum Fund's returns.
- Further detailed information on benchmark is contained within Appendix B.



Fund Performance

This section of the report analyses the Petroleum Fund's monthly performance and corresponding benchmark performance over the twelve month period to 31 December 2003, along with longer term analysis. Numerical performance shown in the charts is given to one decimal place. Performance commentary considers performance to two decimal places.

For the purpose of this report all fund and benchmark returns shown for 2003, and contained within sections 4.1, 4.2 and 4.3 of this report, are expressed in Norwegian Kroner. Longer terms performance reported in section 4.4 shows performance in terms of the basket of currencies contained within the benchmark. The currency basket measure is relevant when assessing the Petroleum Fund's performance against the stated objective of maximising the Petroleum Fund's international purchasing power.

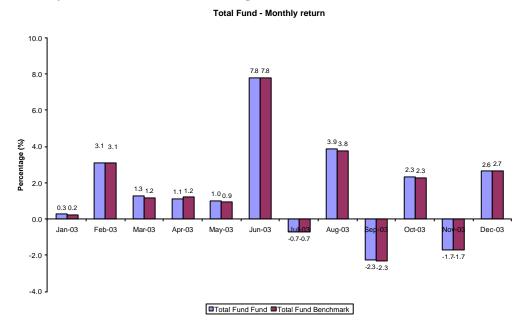
Section 4.1 considers the Ordinary Portfolio's performance along with the monthly performance for the equity and fixed income segments of the Ordinary Portfolio.

Section 4.2 considers the monthly performance of the Environmental Fund on a standalone basis.

Section 4.3 looks at the Ordinary Portfolio's performance on a regional basis.

Finally, section 4.4 considers longer term performance for the Ordinary Portfolio.

4.1 Ordinary Portfolio Returns (Norwegian Kroner)



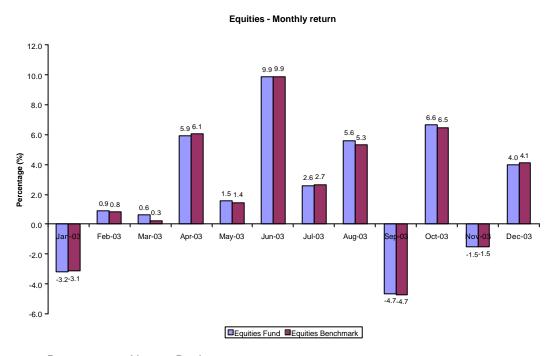
Data source: © Russell/Mellon Ltd 2004. All Rights Reserved.

Mercer Investment Consulting

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- Over the twelve month period to 31 December 2003, the Ordinary Portfolio produced a cumulative return of 19.94%, outperforming the benchmark return of 19.47% by 0.47%.
- The Ordinary Portfolio's performance was broadly in-line with benchmark throughout the period on a month-by-month basis with the largest deviation being only circa 0.1%.

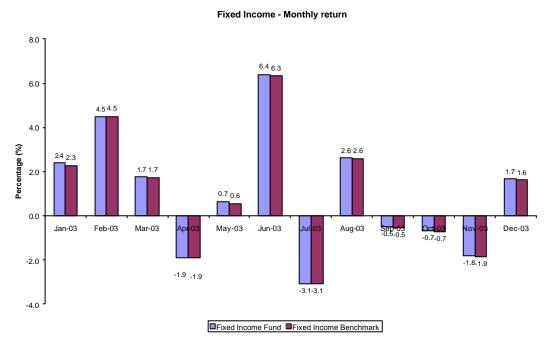
4.1.1 **Ordinary Portfolio - Equity Returns (Norwegian Kroner)**



Data source: Norges Bank

- Over the twelve month period to 31 December 2003, the Equity segment of the Ordinary Portfolio returned 30.87%, outperforming the benchmark return of 30.33% by 0.54%.
- On a month-by-month basis, the performance of the Ordinary Portfolio's Equity segment was broadly in-line with the benchmark.
- The largest deviations from benchmark performance occurred during the months of March and August when the Ordinary Portfolio's Equity segment exceeded the benchmark by circa 0.3%.
- The Ordinary Portfolio's Equity segment outperformed the benchmark in six of the twelve months reviewed and underperformed the benchmark in the remaining six months reviewed.

4.1.2 Ordinary Portfolio - Fixed Income Returns (Norwegian Kroner)

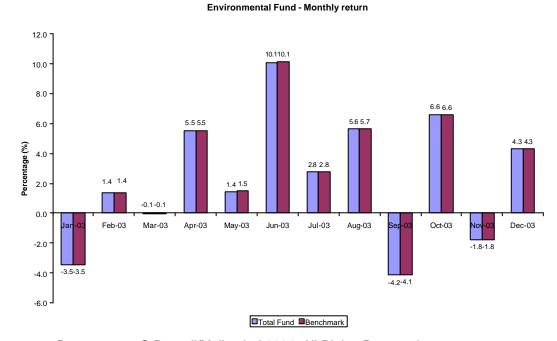


Data source: Norges Bank

- The monthly performance of the Ordinary Portfolio's Fixed Income segment performed broadly in-line with benchmark; outperformance was achieved in nine of the periods reviewed, and underperformance was achieved in two periods. In April, performance was in-line with benchmark.
- Over the twelve month period to 31 December 2003, the Fixed Income segment of the Ordinary Portfolio returned 12.14%, outperforming the benchmark return of 11.73% by 0.41%.

4.2 Environmental Fund Returns (Norwegian Kroner)

• The Environmental Fund has a low risk profile and is managed to a 1.0% p.a. exante tracking error limit.



Data source: © Russell/Mellon Ltd 2004. All Rights Reserved.

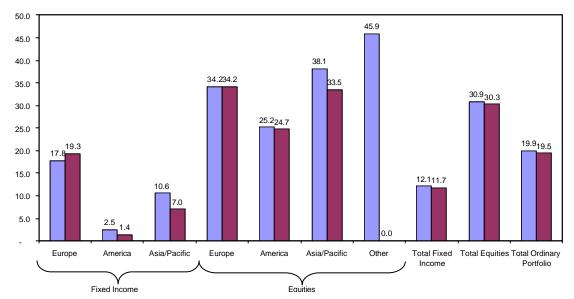
- Over the twelve-month period to 31 December 2003, the Environmental Fund returned 30.92%, marginally behind the benchmark return of 31.09%.
- The monthly returns for the Environmental Fund were broadly in-line with benchmark for all months during the twelve months to 31 December 2003.

4.3 Ordinary Portfolio - Regional Performance (Norwegian Kroner)

- The regional Fixed Income and Equity returns have been sourced from Russell/Mellon as Norges Bank's internal performance measurement systems do not calculate returns on a regional basis.
- Performance for the Ordinary Portfolio has been sourced from Russell/Mellon, whereas returns for Total Equity and Total Fixed Income have been sourced from Norges Bank. Please refer to Section 2.2 of this report for a further explanation.







Data source: © Russell/Mellon Ltd 2004. All Rights Reserved / Norges Bank.

- From the chart above it can be observed that the Ordinary Portfolio's fixed income portfolio outperformed its benchmark; outperformance in both America and Asia/Pacific regions contributed to outperformance. Similarly, the Ordinary Portfolio's equity portfolio outperformed its benchmark; outperformance in both America and Asia/Pacific contributed to outperformance.
- Holdings in 'Other' regions, which consist of equities domiciled in Israel and Bermuda but listed on stock exchanges where the Petroleum Fund is permitted to invest in, performed well over the period. However, the overall contribution to returns is minimal as this extends only to a limited number of stocks and accounted for only 0.3% of the Petroleum Fund's market value as at 31 December 2003.
- The regional performance is shown in Norwegian Kroner terms which mean that regional performances for both the portfolio and benchmark will be influenced by the foreign exchange movements of the Norwegian Kroner relative to currencies within those regions.

• The table below provides a snapshot of the Ordinary Portfolio's performance in selected equity and fixed income markets. The markets are listed and ranked according to the market capitalisation of the respective markets as measured by the Index suppliers FTSE and Lehman Brothers and according to the customised benchmark.

Equity Performance - 12 months to 31 December 2003					
Country	Fund %	Benchmark %	Relative %		
US	24.24	23.27	+0.97		
UK	28.40	26.71	+1.69		
Japan	36.63	31.32	+5.31		
France	37.34	36.63	+0.71		
Switzerland	29.88	28.76	+1.12		
Germany	58.59	57.79	+0.80		
Netherlands	24.05	23.53	+0.52		
Spain	49.90	52.31	-2.41		

Data source: © Russell/Mellon Ltd 2004. All Rights Reserved.

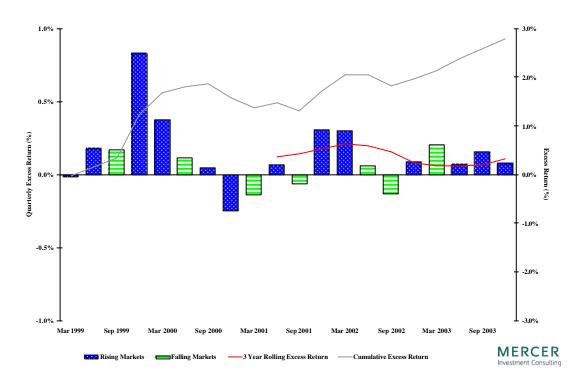
Fixed Income Performance - 12 months to 31 December 2003					
Country	Fund %	Benchmark %	Relative %		
Eurozone	19.40	20.56	-1.16		
US	-1.37	-0.11	-1.26		
UK	7.24	10.25	-3.01		
Denmark	16.00	20.11	-4.11		

Data source: © Russell/Mellon Ltd 2004. All Rights Reserved.

4.4 Ordinary Portfolio – Longer term performance

- The following charts show quarterly performance relative to benchmark for the five-year period ending 31 December 2003 for the Ordinary Portfolio, the Equity segment and the Fixed Income segment. In addition, the charts illustrate the three-year rolling and cumulative excess returns over the five-year period ending 31 December 2003. As the charts evaluate relative performance, they can be used as a measure to assess the manager's ability to add value in excess of benchmark over a period of time.
- The charts are generated using Mercer Manager Performance Analytics (MPA) and uses local returns from the currency basket measure, as opposed to Norwegian Kroner returns. This is done to ensure that the rising/falling market indicator is not influenced by changes in the value of Norwegian Kroner.

4.4.1 Ordinary Portfolio – Total Returns (Local Currency)

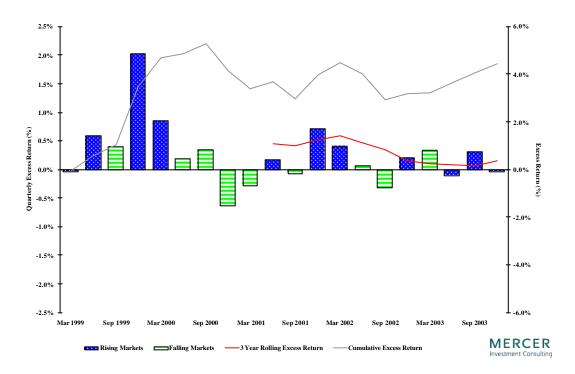


Source: Mercer MPA and Norges Bank

- The Ordinary Portfolio outperformed its benchmark on a quarterly basis during most of 1999 and 2000.
- Relative performance since the end of September 2000 has been more mixed with four quarters of underperformance; underperformance has been mostly delivered during periods of falling markets.

Long term relative performance remains healthy with cumulative excess return over the five years ending 31 December 2003 approaching 3.0%. Rolling three-year excess returns remain positive despite selected periods of underperformance.

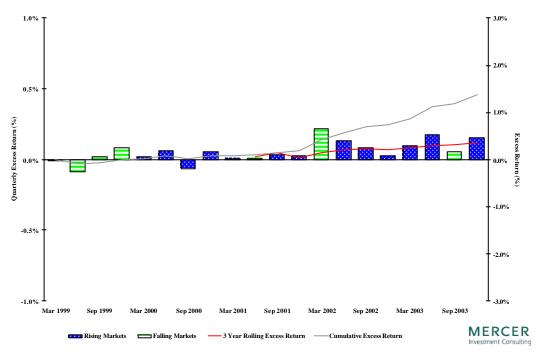
4.4.2 Ordinary Portfolio - Equity Returns (Local Currency)



Source: Mercer MPA and Norges Bank

- The equity segment of the Ordinary Portfolio outperformed its benchmark significantly at the end of 1999 and start of 2000. Performance has been mixed since the start of 2001, resulting in the three-year rolling performance to 31 December 2003 being only slightly above benchmark.
- Cumulative excess returns for the five-year period to 31 December 2003 remain positive and are in excess of 4.0%.

4.4.3 Ordinary Portfolio - Fixed Income Returns (Local Currency)



Source: Mercer MPA and Norges Bank

- With the exception of three quarters, the fixed income segment of the Ordinary Portfolio has consistently outperformed its benchmark over the five-year period to 31 December 2003. The strongest relative performance for Fixed Income segment has occurred from the start of 2002 until the end of 2003.
- Rolling three-year excess returns have been consistently positive in the five year period under review.
- Cumulative excess returns over the five year period to 31 December 2003 are strong, approaching 1.5%.

Style Research Portfolio Analysis (SRPA)

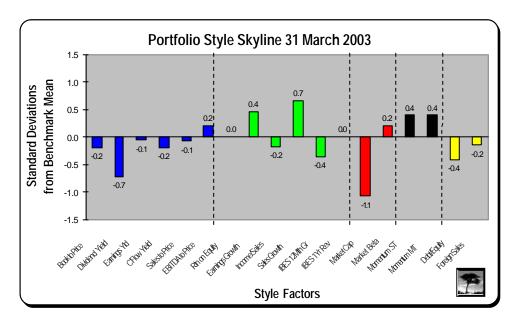
5.1 **Introduction**

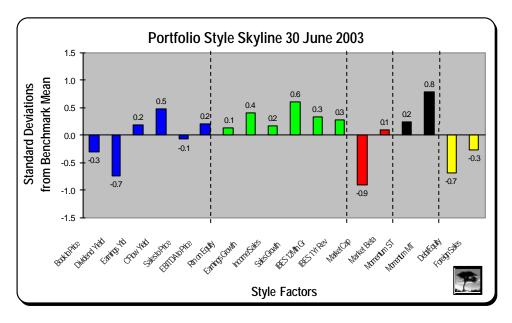
- This section takes a closer look at the style characteristics of the Ordinary Portfolio's <u>equity</u> segment only.
- When analysing the Ordinary Portfolio's style characteristics we have utilised an analytical software package called SRPA provided by Style Research Limited. SRPA looks at the individual securities held within a portfolio at any one point in time (a 'snap-shot') and uses a bottom up approach to analyse the style adopted and risk taken by the investment manager(s). The snap-shot analysis is based on a detailed, multi-dimensional examination of the equity portfolio's composition not historical returns.
- The SRPA risk attribution model is different from the risk model used by Norges Bank. Norges Bank use a RiskManager risk model from Riskmetrics to measure expected tracking error. The RiskManager model makes direct use of security price series to estimate the Covariance matrix, whereas the SRPA model uses quarter-end security prices in determining the Covariance matrix.
- The charts shown in section 5.2 highlight specific style characteristics of the equity component of the Ordinary Portfolio as at 31 March 2003, 30 June 2003, 30 September 2003 and 31 December 2003. The set of charts shown in Section 5.2 emphasise the key style features of the equity component of the Ordinary Portfolio in terms of any "value" tilts (represented by the first group of blue bars) and "growth" (represented by the second group of green bars). The analysis is conducted relative to the customised benchmark of the equity segment of the Ordinary Portfolio. Any figure (represented as Standard Deviations away from the benchmark mean) greater than ± 1 is treated as significant.
- The second set of charts shown in section 5.3 plot the breakdown of the portfolio in terms of industry sector weightings and is again compared with the benchmark.
- The term "coverage" referred to in the charts contained within section 5.3 is a measure of the equity segment of the Ordinary Portfolio's exposure to the indices it is benchmarked against. The output shown in Section 5.3 indicates a coverage level of circa. 80% indicating that the Ordinary Portfolio is similar in constituents to the indices against which the Ordinary Portfolio is benchmarked. Please refer to Appendix C for a more detailed explanation of the term "coverage".

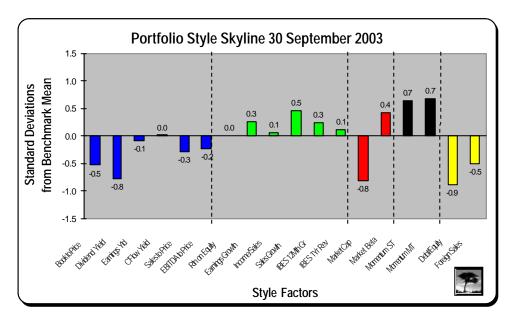
• The final chart shown in section 5.4 analyses the risk profile of the equity segment of the Ordinary Portfolio as at 31 March 2003, 30 June 2003, 30 September 2003 and 31 December 2003 and breaks it down into its key risk components. For further explanation of Style Research Portfolio Analysis definitions please refer to Appendix C.

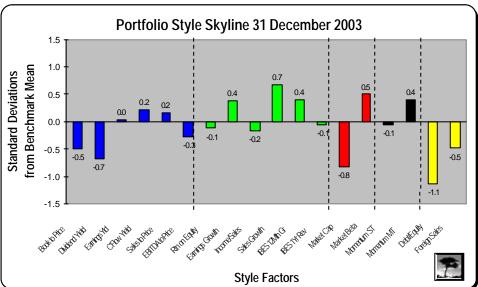
5.2 The Portfolio Style Skyline

• To give a better impression of the development of the Ordinary Portfolio's style and risk characteristics, the portfolio style skylines as at the end of each quarter during 2003 are shown below. Please note that each quarter's analysis is based on a historical 'snap-shot' of the stocks held in the Ordinary Portfolio at an aggregate level as at the end of every quarter.





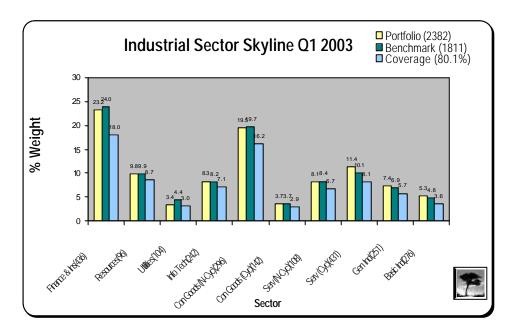


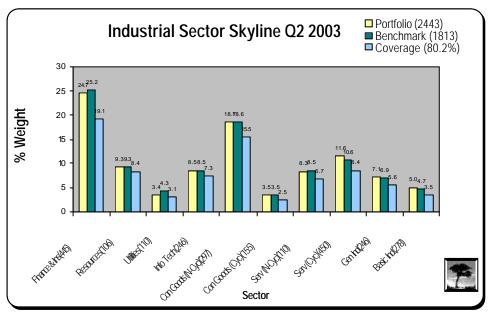


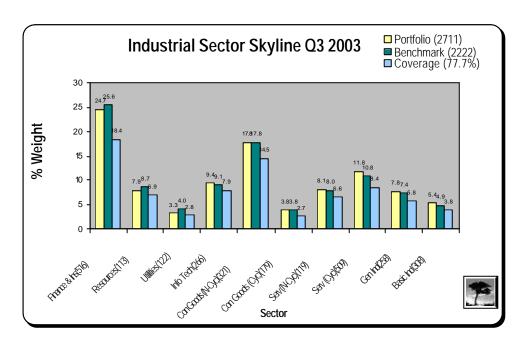
- Throughout 2003, the equity segment of the Ordinary Portfolio has exhibited a consistent marginally positive growth tilt.
- The results of the analysis indicate that on the whole there are very few significant deviations away from the benchmark mean.
- The consistent negative 'Market Cap' indicator of circa -1 standard deviation indicates that the equity portfolio has consistently held a bias towards small cap stocks relative to the benchmark.
- As at 31 December 2003, the 'Debt/Equity' of -1.1 standard deviations indicates that as at 31 December 2003, the Ordinary Portfolio's equity holdings exhibited a lower 'Debt to Equity' ratio than the benchmark.
- More detailed explanations of the terms 'Market Cap' and 'Debt to Equity' can be found in Appendix C.

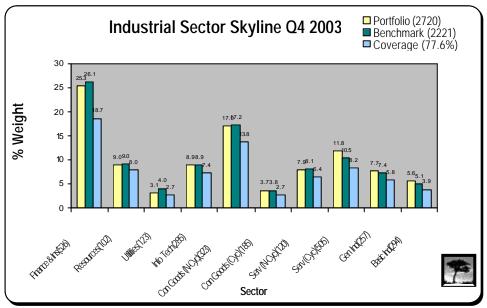
5.3 The Portfolio Sector Skyline

To give a better impression of the development of the sector characteristics of the equity component of the Ordinary Portfolio, industrial sector skylines as at the end of each quarter during 2003 are shown below. Please note that each quarter's analysis is based on a historical 'snap-shot' of the stocks held in the Ordinary Portfolio at an aggregate level as at the end of every quarter.







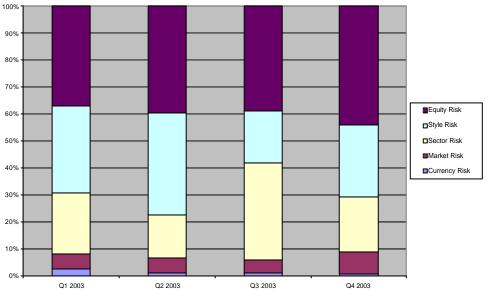


- The number of stocks held with the Equity segment of the Ordinary Portfolio at the end of each quarter exceeds the number of holdings within the benchmark; this is a result of Norges Bank's exposure to Small Cap holdings, which are not contained within the benchmark.
- The charts illustrate that the number of stocks held and the quantity of stocks contained within the benchmark rose sharply as at 30 September 2003 and 31 December 2003, compared with the previous two quarter end periods.
- The increase in benchmark holdings is a direct result of changes in the structure of FTSE All-World indices, against which the Equity component of the Ordinary Portfolio is benchmarked. The benchmark structure changes occurred during September 2003.

- The increase to equity holdings shown as at 30 September 2003 and 31 December 2003 was a direct result of the increase in benchmark holdings.
- Since the restructuring of the FTSE All-World indices, coverage has dropped by circa. 2.5%.
- Throughout 2003, the industrial sector skyline has remained largely unchanged; furthermore, the charts illustrate that Norges Bank are not taking significant sector bets away from the benchmark in the management of the equity component of the Ordinary Portfolio.
- The portfolio has been consistently overweight in Cyclical Services and Basic Industries throughout 2003, with allocations of 11.8% and 5.6%, relative to benchmark allocations of 10.5% and 5.1% respectively as at 31 December 2003.
- The two most persistent underweight positions over the twelve months have been Finance & Insurance and Utilities, with allocations of 25.3% and 3.1% as at 31 December 2003 respectively, relative to the benchmark's allocation of 26.1% and 4.0%.

5.4 The Petroleum Fund – Ordinary Portfolio Equity Risk Profile

- The following chart shows the risk in the Equity segment of the Ordinary Portfolio broken down into different component forms as at the end of each quarter during 2003. Details of the methodology behind the analysis is set out at the end of Appendix C.
- The analysis is prepared according to a SRPA risk model for multi-market risk attribution and provides a snapshot breakdown of the different components of portfolio risk relative to benchmark.



Note: Security holdings sourced Norges Bank; Benchmark data sourced from FTSE; Risk model output sourced from SRPA.

- The Ordinary Portfolio has exhibited a smaller degree of style risk in the latter six months of 2003, compared to the first six month period of 2003.
- Throughout 2003, risk levels relating to the choice of equities (Equity Risk), markets (Market Risk) and currency (Currency Risk) have remained broadly consistent.
- Currency risk levels have been consistently very small in relation to the entire portfolio risk levels.
- Sector risk levels rose significantly at the end of September 2003, compared to the previous two quarter end periods. As at 31 December 2003 the sector risk levels have returned to a similar level indicated as at 31 March 2003.



Petroleum Fund Assets Under Management

The table below shows the market value of the Petroleum Fund (including both the Ordinary Portfolio and the Environmental Fund) as at the end of every month during 2003. The table also shows the net transfer of new capital from the Ministry to the Petroleum Fund during the corresponding months. The transfer in March is less management remuneration to Norges Bank.

Month	Transfer Amount (NOK)	Total Fund (NOK)
January	19,631,311,846	630,208,997
February	14,374,911,904	664,085,028
March	9,330,932,790	681,972,677
April	9,857,079,300	699,477,206
May	7,143,570,040	713,676,530
June	6,088,972,546	775,444,462
July	5,886,623,282	775,671,393
August	7,973,777,182	813,745,003
September	8,039,797,680	803,299,474
October	7,478,827,741	829,588,359
November	8,101,670,386	823,604,424
December	-	845,305,501

Data source: © Russell/Mellon Ltd 2004. All Rights Reserved.

Appendix A

Calculation Methodology

- A.1 Russell/Mellon employs the "time-weighted" rate of return as the base performance statistic. This return takes into account investment income as well as realised and unrealised capital profits or losses. The use of this statistic minimises distortions due to cash flows into and out of a portfolio which are, in general, outside the control of the investment manager.
- A.2 Exact calculation of the time-weighted rate of return requires a full valuation of the portfolio whenever a cash flow occurs. As a practical alternative Russell/Mellon employs an approximation to the time-weighted return, using monthly valuations, monthly/daily transaction details and monthly/daily cash flows. The method used is based on the Regression Method, recommended by the Bank Administration Institute in their definitive report on the topic of performance measurement published in 1968, and which gives an excellent approximation of the time-weighted rate of return.
- A.3 At the total fund level Russell/Mellon calculate a day-weighted, money-weighted return using market values at the start and end of the month and net injection details.

Appendix B

Control and Reporting Process

Petroleum Fund

Russell/Mellon Data Processing and Reporting Process

Overview

From January 2003 onwards, Russell/Mellon have calculated the performance of the Petroleum Fund and produced a monthly report.

Performance calculations are reliant on the quality of data supplied by external data sources, however Russell/Mellon do carry out a number of reconciliation checks on the data prior to reporting.

Current data sources:

- Norges Bank
- JP Morgan Chase

Data reconciliation checks

1. JP Morgan Chase data

Reconciliation by asset class across the period

Data supplied by JP Morgan Chase is already in a suitable format for performance calculations. Russell/Mellon are therefore able to input this data directly into their system and calculate returns.

Within their data, JP Morgan Chase supply 'book value' information.

Book values represent the historical costs of assets that are held within a fund.

When stocks are purchased those stocks assume and retain a book value equal to their purchase cost. Similarly when stocks are sold there is a book cost associated with those stocks. At the end of a particular month the stocks held within the fund will have an associated book value.

While book values are not used to calculate performance they may be used to check the data supplied since book values may be reconciled as follows:

End	=	Start	+	Purchases at	-	Sales at
Book		Book		Book Cost		Book
Value		Value				Cost

As JP Morgan Chase supply this information for all equity, bond and futures asset classes, it is possible for Russell/Mellon to carry out a reconciliation check on these asset classes using the above formula.

Reconciliation errors may indicate that purchases or sales have been omitted from the data or that assets have been omitted from the end of month values.

If any such errors occur, Russell/Mellon will query data with the data supplier.

2. Norges Bank data

Reconciliation by asset class across the period

The data supplied by Norges Bank is in a relatively raw format and so Russell/Mellon need to construct performance data from the information supplied prior to entry into their calculation system.

Norges Bank do not supply book values within their data however they do supply nominal holdings in respect of bonds and futures contracts. These are used by Russell/Mellon in order to reconcile transactions on these asset classes.

Any reconciliation errors found by Russell/Mellon in constructing performance data will be queried with Norges Bank prior to return calculation.

3. Overall data checks

Market value reconciliation check

Having constructed performance data, Russell/Mellon will check that the total values for the various components of the fund agree with those values calculated by Norges Bank. Russell/Mellon also check that the total value for the fund agrees with Norges Bank's calculated value.

Any significant reconciliation errors here may indicate that there are accounts omitted from the data supplied. If the overall difference is more than a few thousand Kroner, we will raise queries with the data providers.

Transfers

When transfers occur at the month end Russell/Mellon ensure that the transfers into the fund shown in the data agree with those detailed in the letter supplied by Norges Bank.

4. Fund return checks

In addition to the data checks above, Russell/Mellon carry out sense checks on individual asset class and total returns.

Asset class return check

Russell/Mellon carry out sense checks on returns for individual asset classes against the relevant index return. This would highlight any problems with Norges Bank's Atlas reporting system (e.g. incorrect exchange rate used). If the asset class return is unexpectedly divergent from the index return then Russell/Mellon will raise a query with the relevant data provider.

Total return check

After constructing data for individual portions of the fund, Russell/Mellon produce a consolidated data set for the fund as a whole. Russell/Mellon check that the total return calculated for each month is no more than one basis point different to the total return quoted by Norges Bank.

Benchmark checks

1. Petroleum Fund Benchmark

Fixed Income benchmark

Norges Bank supplies their weights for this benchmark on a monthly basis.

Following the Ministry's regulations and guidelines and provision by Norges Bank of the methodology for calculation, from first principles, of the Fixed Income benchmark weights, Russell/Mellon have now set up their own independent wrification spreadsheet calculations. On that basis Russell/Mellon have been able to retrospectively match Norges Bank's weights from July 2003 to December 2003 to within one basis point.

Russell/Mellon have independently sourced the Lehman Aggregate indices that constitute the fixed income benchmark from January 2003 to December 2003. These have been sourced directly from the Lehman Live website.

Using monthly weights and Lehman indices, Russell/Mellon have recalculated Fixed Income benchmark returns monthly from January 2003 to December 2003 in NOK terms. These returns were no greater than one basis point different to Norges Bank's returns.

Equity benchmark

Norges Bank supplies their weights for this benchmark on a monthly basis.

Following the Ministry's regulations and guidelines and provision by Norges Bank of the methodology for calculation, from first principles, of the Equity benchmark weights, Russell/Mellon have now set up their own independent verification spreadsheet calculations. On that basis Russell/Mellon have been able to retrospectively match Norges Bank's weights from January 2003 to December 2003 to within one basis point.

Customised regional benchmark index values in US\$ terms up to November 2003 calculated by FTI have also been forwarded by Norges Bank. FTSE took over provision of customised benchmark indices from December 2003 onwards. From December 2003 onwards Russell/Mellon have received customised benchmark indices directly from FTSE.

Using monthly weights and FTI/FTSE indices, Russell/Mellon have recalculated Equity benchmark returns monthly from January 2003 to December 2003. These returns were no greater than one basis point different to Norges Bank's returns.

Overall Petroleum Fund benchmark

Norges Bank supplies their relative Fixed Income and Equity weights within the overall benchmark on a monthly basis.

Following the Ministry's regulations and guidelines and provision by Norges Bank of the methodology for calculation, from first principles, of the overall benchmark weights, Russell/Mellon have now set up their own independent verification spreadsheet calculations. On that basis Russell/Mellon have been able to retrospectively match Norges Bank's weights from January 2003 to December 2003 to within one basis point.

Using monthly weights and Fixed Income and Equity benchmark returns calculated above, Russell/Mellon have calculated overall benchmark returns monthly from January 2003 to December 2003. These returns were no greater than one basis point different to Norges Bank's returns.

2. Environmental Fund Benchmark

Historically, Norges Bank have forwarded monthly weights and customised index values calculated by FTI. FTSE took over provision of customised benchmark indices from December 2003 onwards. From December 2003 onwards Russell/Mellon have received customised benchmark indices directly from FTSE. Benchmark returns are calculated by dividing out customised total return indices in NOK.

3. Total Fund Benchmark

Russell/Mellon calculate the Petroleum Fund's total return benchmark on a monthly basis by weighting the Ordinary Portfolio's and the Environmental Fund's benchmark returns by their respective start market values.

Reporting

Having calculated performance, Russell/Mellon produce monthly reports for the Petroleum Fund Assets.

These reports incorporate:

- Fund and benchmark performance
- Fund market values and asset distributions

These are issued to the Ministry, Norges Bank and Mercer.



ALBION TOWER

11 ALBION STREET
LEEDS LS1 5ES
TEL +44 (0)113 246 0416
FAX+44 (0)113 242 1041
www.russellmellon.com

Royal Norwegian Ministry of Finance Økonomiavdelingen Postboks 8008 Dep 0030 Oslo Norway

May 2004

The Norwegian Petroleum Fund – Russell/Mellon's role during 2003

Our role in 2003

During 2003, Russell/Mellon have provided independent performance measurement in respect of the Norwegian Petroleum Fund.

To perform this task we collect asset class level performance data on a monthly basis from Norges Bank and JP Morgan Chase. We then carry out a number of reconciliation checks on the data, both at the asset class level, ensuring that data reconciles from the previous month, and at the total level, ensuring that the total market value ties in closely with that quoted by Norges Bank. Different valuations by Norges Bank and JP Morgan Chase for the Equity portfolio generally give rise to slightly different market values. If the differences are more than a few thousand Krone, we will query with the data providers. When reconciling Norges Bank asset class level data, we ensure that changes in nominal holding of fixed income stocks tie in exactly from the start to the end of the month taking into account transactions. When reconciling JP Morgan Chase asset class level data, we ensure that changes in book value of fixed income and equity stocks tie in exactly from the start to the end of the month taking into account transactions.

This data is then run through our internal performance system to calculate returns. At the asset class level Russell/Mellon employs the "time-weighted" rate of return as the base performance statistic. This return takes into account investment income as well as realised and unrealised capital profits or losses. At the total fund level Russell/Mellon calculate a day-weighted, money weighted return using market values at the start and end of the month and net injection details. Monthly total returns calculated by Russell/Mellon were no more than one basis point different from those calculated by Norges Bank during 2003.



Russell/Mellon also carry out a number of independent checks on Norges Bank's benchmark return calculations. We independently source FTSE-AW indices and Lehman customised indices in order to carry out a check on the Equity and Fixed Income benchmark returns. We then apply relative Fixed Income and Equity weights within the Petroleum Fund to calculate the overall benchmark. Following provision by Norges Bank of the methodology for calculation of the Fixed Income, Equity and Overall benchmark weights we have now set up our own independent spreadsheet checks to verify these weights. On that basis, we have been able to retrospectively match Norges Bank's figures for the Equity and Overall benchmarks from January 2003 and for the Fixed Income benchmark from July 2003. Benchmark weights all agreed to within one basis point. Benchmark returns were no more than one basis point different.

Russell/Mellon calculate Environmental Fund benchmark returns using customised total return index values provided by FTSE. Norges Bank initially disagreed Russell/Mellon's calculations for 2003 but upon review of their methodology have since agreed our figures.

Performance discrepancies in 2003

On a month-by-month basis, small differences between JP Morgan Chase's month end valuations and Norges Bank's valuations may give rise to small differences in return between Russell/Mellon and Norges Bank. These are usually no more than 0.01% to two decimal places.

There were revisions to the 30 June 2003 valuations that were incorporated by Norges Bank into their reporting but which were not incorporated into the data supplied to us by JP Morgan Chase. Consequently the return quoted by Russell/Mellon for June 2003 was understated relative to Norges Bank's (by -0.01%) while the return for July was overstated relative to Norges Bank's (by 0.01%). While there were discrepancies in these individual months however, over the two-month period our overall return for the Petroleum Fund matched that of Norges Bank.

Yours sincerely

Daniel Hall

Publications & Statistics Manager

Jamel tola



NORGES BANK

Norges Bank Investment Management

The Minestry of Finance Økonomiavdelingen Boks 8008, Dep 0030 Oslo Date. 3 May 2004 Your ref. Ø EØy

Our ref.

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Explanation of discrepancies between the performance of the Government Petroleum Fund for 2003 as reported by Russell/Mellon CAPS and that reported by Norges Bank Investment Management

In 2003 there were 3 differences between the total market value reported monthly by Russell/Mellon CAPS for the ordinary Government Petroleum Fund, and that reported by Norges Bank Investment Management

The table below shows these differences in millions of NOK

NOK	Market value	Market value	
mill kr	RussellMelonCAPS	Norges Bank	Difference
31.01.2003	630 209	630 209	0
28.02.2003	664 085	664 085	0
31.03.2003	681 973	681 973	0
30.04.2003	699 477	699 493	-16
31.05.2003	713 677	713 677	0
30.06.2003	775 444	775 523	-79
31.07.2003	775 671	775 671	o
31.08.2003	813 745	813 735	10
30.09.2003	803 299	803 299	o
31.10.2003	829 588	829 588	0
30.11.2003	823 604	823 604	0
31.12.2003	845 306	845 306	0

Explanations.

1) April 2003

NBIM's fund accountant, JPMorgan, erroneously made the same dividend error correction entry twice in April. This was discovered after the books had been closed for that month NBIM chose nevertheless to include the correct figures and did a manual re-cut of the monthly performance figures to reflect this.

2) June 2003

JPMorgan passed incorrect entries relating to the late transfer of stock and missing dividend payment in connection with Credit Lyonnais' takeover of Credit Agricole. This was discovered after the books had closed for that month. NBIM chose to include the corrected entries and did a manual re-cut of the performance figures for the month.

PB 117

Postadresse PB 179 Sentrum 0107 OSLO

Bankplassen : 0151 Oslo

Revierstrede

Telefon 22 31 60 00 Telefaks 22 41 31 05 E-post central bank@norges-bank no Foretaksregisteret NO 937 884 117 NO **%NB%** 2

3) August 2003

JPMorgan overstated the market price for 3 securities held by an external fixed income mandates at the end of August This was discovered after the books had closed for that month NBIM chose to include the correct prices for those securities and did a manual re-cut of the performance figures.

Only the difference in the June figures are significant enough to show up in the monthly performance figures when reported to 2 decimal places. The return reported by NBIM for June was overstated relative to Russell/Mellon CAPS (by 0 01%) while the return for July was understated relative to Russell/Mellon CAPS (by 0 01%). The monthly differences are only caused by re-cuts and the overall figures for the total year agree with Russell/Mellon CAPS.

The Environmental Fund 2003 - revised table 11 in the Annual Report

rotalt.	Currency ba	sket)		NOK	i i
	Fund B	enchmark	Fund B	enchmark: (%	Relative :
1 Quarter 2 quarter	-8 20 % 15 32 %	-8 16 % 15 37 %	-2 22 % 17 87 %	-2 18 % 17 92 %	-0 04 % -0 05 %
3 quarter	4 99 %	5 07 %	4 04 %	4 12 %	-0 03 %
4 quarter	10 57 %	10 53 %		9 15 %	0 04 %
2003	22 89 %	23 04 %	30 92 %	31 09 %	-0 17 %
Tax adjusted benchmark 1				30 95 %	-0 03 %
Memo Ordinary benchmark with country weights as in					
The Environmental Fund		22 74 %		30 77 %	0 32 %

The relative performance of the Environmental Fund for 2003 has been restated in the above table to correct an operational error made in NBIM's calculation of the index delivered by the vendor (FTI/FTSE) The relative performance is 13 basis points less than that reported in the Annual Report for 2003 NBIM's absolute performance was reported correctly as 22 89% measured against the relevant currency basket, and 30 92 % measured in Norwegian kroner

Ingerhise Sendberg
Inger Lise Sandberg

Yours sincerely,

ohn Fahs

Appendix C

Style Research Portfolio Analysis Definitions

The Factors The Returns to (see below) analysis is conducted using the

following investment criteria or Factors:

Value Criteria

Book to Price The ratio of the company's Book Value (the sum of

Shareholders' Equity plus accumulated Retained Earnings

from the P & L Account) to its Share Price.

This Factor has been one of the most successful measures of

the intrinsic Value of company shares.

Dividend Yield The annual Dividend Paid per Share divided by the Share

Price.

This Factor measures the Value of company shares

according to the stream of dividend income resulting from

share ownership.

Earnings Yield Annual Earnings per Share divided by the Share Price.

This Factor measures the worth of a company's shares according to the company's ability to support each share

with after tax earnings.

Cash Flow Yield Annual Cash Flow per Share divided by the Share Price.

This Factor is related to the earnings yield but also includes other items, specifically: depreciation, amortisations, and provisions for deferred liabilities. It is intended to capture the cash availability of the company as a multiple of the share price, and offers a Value criteria based on the stream

of accessible cash earnings.

Sales to Price

Net Sales per Share divided by the Share Price.

This Factor measures the worth of a company's shares according to the annual sales volume supporting the company business. The item is considered by many analysts to be less susceptible to manipulation than other valuation criteria; it is, however, a less comprehensive measure of a company's range of activities.

GROWTH CRITERIA

Return on Equity

Net Income before Preferred Dividends divided by the Book Value of Shareholders' Common Equity.

RoE measures the profitability of the operations of the company as a proportion of the total amount of equity in the company. Since RoE multiplied by the reinvestment rate (the proportion of earnings not paid as dividends but reinvested in the company) gives the warranted growth rate of a company, RoE is a very usual measure of a company's growth potential.

Earnings Growth

The average annual growth rate of Earnings over a trailing three years.

Earnings Growth is, perhaps, the clearest of the Growth criteria. However, it is subject to the distortions of reporting conventions and manipulation and, particularly in some markets, only known after a considerable lag.

Income to Sales

The "net margin", annual Net Income divided by annual Net Sales.

This measure attempts to assess the company's potential for profitable, sustained expansion or growth.

Sales Growth

The average annual growth rate of Net Sales per Share over a trailing three years.

Although growth in sales per share might be only a narrow measure of a company's business growth, and may be subject to a number of distortions, it is less subject to differences in reporting conventions or manipulation than many other Balance Sheet or Profit and Loss items.

Earnings Growth

IBES 12Mth Growth – The IBES consensus forecast growth over the next 12 months. This is calculated on a pro-rata basis from the forecasts for each company's next 2 annual reporting periods.

IBES 1 Yr Revisions – The IBES balance of earnings forecast revisions for the next annual reporting period. This

is calculated as the difference between the last 3 months upwards revisions minus the last 3 months downward revisions expressed as a percentage of the total number of estimates over the last 3 months.

Size & Risk Criteria

Market Cap

The market capitalisation of a stock.

The Market Cap statistic of the portfolio is the weighted (by holding value) average size of the securities held. The Market Cap statistic of the benchmark (or total market) is the weighted (by holding value) average size of the securities within the benchmark (or total market).

Market Beta

The "slope coefficient", (b), from the simple regression:

Security Monthly Return = $\alpha + \beta$ * Market Monthly Return + Random Error

The regression is carried out over rolling 36 month periods; where sufficient information is not available, β =1 is assumed.

Performance Record Criteria

Historic Relative

The Historic Relative Return is calculated using a 6 month **Return** "memory" of monthly relative returns. The past period returns are weighted using to a "decay ratio" of 2/3, per month.

This weighted historic relative return factor measures the degree of simple price performance trend following. It is useful in recognising the trading character of specific markets and in noticing occasional changing patterns through the market cycle.

The international equity analysis shows short-term and medium term momentum factors.

Other Criteria

Debt to Equity

Total Debt as a percentage of total Common Equity.

The Debt to Equity ratio measures leverage, or gearing, a particular feature of share price risk - the higher the ratio the more changes in a company's fortune might be reflected in changes in the payment of dividends. The influence of this criterion is, however, especially subject to a number of particular specific considerations (e.g. sector differences, interest rate sensitivity). Consequently it is considered separately from the other "risk" criteria.

Foreign Sales /

International Sales as a percentage of Net Sales

Total Sales

Although information is occasionally rather sparse, where the data are available, and reliable, this is frequently an important investment criterion. It is undoubtedly linked to movements in the exchange rate and company size, and has different interpretations in different industrial sectors.

Risk Terms

Currency risk (the extent to which currency exposure differs from the benchmark)

Market risk (the extent to which the portfolio's exposure to different equity markets differs from the benchmark)
Sector risk (the extent to which the portfolio's exposure to different industries differs from the benchmark)
Style risk (the extent to which the portfolio's style biases (see graph on previous page) introduce risk relative to the benchmark)

Equity risk (risk arising from stock-specific factors)

However, the different components of risk are not independent. For example, sector risk can itself introduce currency risk if the sector has a bias to companies with non-domestic currency exposure. As a result, we also calculate what we call "X terms", which measure the element of risk attributable to a given factor that is correlated to other factors. Where correlations are less than 100%, the combined risk is less than the simple sum of the component risks. For this reason, the risk components summed above do not equal the total (which will always be less than the sum). However, we can calculate the percentage contribution of each risk component to the total to see where risk is concentrated.

Coverage

The term "coverage" is a measure of the portfolio's exposure to the indices it is benchmarked against i.e. if a benchmark index had only 2 stocks, both of equal weighting, each stock would have a market capitalisation of 50%. If a portfolio worth 100 NOK held 50 NOK in each stock its coverage would be 100%. If the portfolio invested all the 100 NOK in just one stock its coverage would be 50% as it is only exposed to the movements of the 50% of the benchmark index. Further, if the portfolio was invested 60 NOK in one stock and 40 NOK in the other the coverage would still be 50% in the first stock, but 40% in the other making a total of 90% coverage.

Multi-Market Risk Attribution

The return of stock *j* may be written in terms of its currency, market, industry, style and specific returns (dropping subscript *t* for convenience)

$$r_j = R_{C(j)}^{\phi} + R_{M(j)} + R'_{I(j)} + R'_{S(j)} + r'_j$$

Where company j belongs to market M(j), industry I(j) and style S(j). The Portfolio base currency is ϕ and the currency of market M(j) is C(j). Industries are according to the 10 economic sectors as defined by FTSE International. Styles are defined within each economic sector according to Large Value, Large Growth, Small Value, Small Growth. Size is the primary sort, where Large is the top 80% by capitalization and Small the bottom 20%. Value is taken to be the top half, by capitalization, of each size category, sorted by a measure which is 60% normalized Book Value per Share to Share Price and 40% normalized Dividend Yield, and rebalanced every 6 months; Growth is simplified as the other half within each size category.

The month t currency return is defined as:

$$R_{C(j)}^{\phi} = \frac{er_{C(j),t}^{\phi} - er_{C(j),t-1}^{\phi}}{er_{C(j),t-1}^{\phi}}$$

Where the exchange rate of currency ϕ to currency C(j), at the end of month t, is $er_{C(i),t}^{\phi}$

In matrix notation the Equity returns are:

$$r = R_C^{\varphi} + R_M + R_I' + R_S' + r'$$

The covariance matrix is then:

$$\begin{split} Cov(\mathbf{r}) &= Cov \Big(\mathbf{R}_{\mathbf{C}}^{\Phi} + \mathbf{R}_{\mathbf{M}} + \mathbf{R}_{\mathbf{I}}' + \mathbf{R}_{\mathbf{S}}' + \mathbf{r}' \Big) \\ &= Cov \Big(\mathbf{R}_{\mathbf{C}}^{\Phi} \Big) + Cov \Big(\mathbf{R}_{\mathbf{C}}^{\Phi} , \mathbf{R}_{\mathbf{M}} \Big) + Cov \Big(\mathbf{R}_{\mathbf{C}}^{\Phi} , \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{R}_{\mathbf{C}}^{\Phi} , \mathbf{R}_{\mathbf{S}}' \Big) + Cov \Big(\mathbf{R}_{\mathbf{C}}^{\Phi} , \mathbf{r}' \Big) \\ &+ Cov \Big(\mathbf{R}_{\mathbf{M}}, \mathbf{R}_{\mathbf{C}}^{\Phi} \Big) + Cov \Big(\mathbf{R}_{\mathbf{M}} \Big) + Cov \Big(\mathbf{R}_{\mathbf{M}}, \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{R}_{\mathbf{M}}, \mathbf{R}_{\mathbf{S}}' \Big) + Cov \Big(\mathbf{R}_{\mathbf{M}}, \mathbf{R}_{\mathbf{I}}' \Big) \\ &+ Cov \Big(\mathbf{R}_{\mathbf{I}}', \mathbf{R}_{\mathbf{C}}^{\Phi} \Big) + Cov \Big(\mathbf{R}_{\mathbf{I}}', \mathbf{R}_{\mathbf{M}} \Big) + Cov \Big(\mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{R}_{\mathbf{I}}', \mathbf{R}_{\mathbf{S}}' \Big) + Cov \Big(\mathbf{R}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) \\ &+ Cov \Big(\mathbf{R}_{\mathbf{S}}', \mathbf{R}_{\mathbf{C}}^{\Phi} \Big) + Cov \Big(\mathbf{R}_{\mathbf{S}}', \mathbf{R}_{\mathbf{M}} \Big) + Cov \Big(\mathbf{R}_{\mathbf{S}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{R}_{\mathbf{S}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{R}_{\mathbf{S}}', \mathbf{R}_{\mathbf{I}}' \Big) \\ &+ Cov \Big(\mathbf{R}_{\mathbf{C}}', \mathbf{R}_{\mathbf{C}}^{\Phi} \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{M}} \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{S}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) \\ &+ Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{C}}^{\Phi} \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{M}} \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) \\ &+ Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{C}}^{\Phi} \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{M}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) \\ &+ Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{C}}^{\Phi} \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{M}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) \\ &+ Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) \\ &+ Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) \\ &+ Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R}_{\mathbf{I}}' \Big) + Cov \Big(\mathbf{r}_{\mathbf{I}}', \mathbf{R$$

The covariance between r_i and r_j is:

$$\begin{split} Cov(r_i, r_j) &= Cov(R_{C(i)}^{\phi}, R_{C(j)}^{\phi}) + Cov(R_{C(i)}^{\phi}, R_{M(j)}) + Cov(R_{C(i)}^{\phi}, R_{I(j)}') + Cov(R_{C(i)}^{\phi}, R_{S(j)}') + Cov(R_{C(i)}^{\phi}, r_j') \\ &+ Cov(R_{M(i)}, R_{C(j)}^{\phi}) + Cov(R_{M(i)}, R_{M(j)}) + Cov(R_{M(i)}, R_{I(j)}') + Cov(R_{M(i)}, R_{S(j)}') + Cov(R_{M(i)}, r_j') \\ &+ Cov(R_{I(i)}', R_{C(j)}^{\phi}) + Cov(R_{I(i)}', R_{M(j)}) + Cov(R_{I(i)}', R_{I(j)}') + Cov(R_{I(i)}', R_{S(j)}') + Cov(R_{I(i)}', r_j') \\ &+ Cov(R_{S(i)}', R_{C(j)}^{\phi}) + Cov(R_{S(i)}', R_{M(j)}') + Cov(R_{S(i)}', R_{I(j)}') + Cov(R_{S(i)}', R_{S(j)}') + Cov(R_{S(i)}', r_j') \\ &+ Cov(r_i', R_{C(i)}^{\phi}) + Cov(r_i', R_{I(i)}') + Cov(r_i', R_{I(i)}') + Cov(r_i', R_{S(i)}') + Cov(r_i', r_j') \end{split}$$

The component parts of the covariance matrix are:

Pure Currency term: $Cov(R_{C(i)}^{\phi}, R_{C(i)}^{\phi})$

Market cross terms: $Cov(R_{C(i)}^{\phi}, R_{M(i)}) + Cov(R_{M(i)}, R_{C(i)}^{\phi})$

Pure Market term: $Cov(R_{M(i)}, R_{M(j)})$

Industry cross terms:

$$Cov(R_{C(i)}^{\phi}, R_{I(i)}^{\prime}) + Cov(R_{M(i)}, R_{I(i)}^{\prime}) + Cov(R_{I(i)}^{\prime}, R_{C(i)}^{\phi}) + Cov(R_{I(i)}^{\prime}, R_{M(i)}^{\prime})$$

Pure Industry term: $Cov(R'_{I(i)}, R'_{I(i)})$

Style cross terms:

$$Cov(R_{C(i)}^{\phi}, R_{S(j)}') + Cov(R_{M(i)}, R_{S(j)}') + Cov(R_{I(i)}', R_{S(j)}') + Cov(R_{S(i)}', R_{C(j)}^{\phi}) + Cov(R_{S(i)}', R_{M(j)}') + Cov(R_{S(i)}', R_{I(j)}')$$

Pure Style term: $Cov(R'_{S(i)}, R'_{S(j)})$

Equity cross terms:

$$Cov(R_{C(i)}^{\phi}, r_{j}') + Cov(R_{M(i)}, r_{j}') + Cov(R_{I(i)}', r_{j}') + Cov(R_{S(i)}', r_{j}') + Cov(r_{i}', R_{C(i)}^{\phi}) + Cov(r_{i}', R_{M(i)}') + Cov(r_{i}', R_{I(i)}') + Cov(r_{i}', R_{S(i)}')$$

Pure Equity term: $Cov(r'_i, r'_j)$

Appendix D

Risk Warnings

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Telford House, 14 Tothill Street London SW1H 9NB 020 7222 9121 Fax 020 7222 6140

